



Our Home Our Environment Our Future

**Sustainable Singapore
Blueprint 2015**



Sustainable Singapore Blueprint 2015

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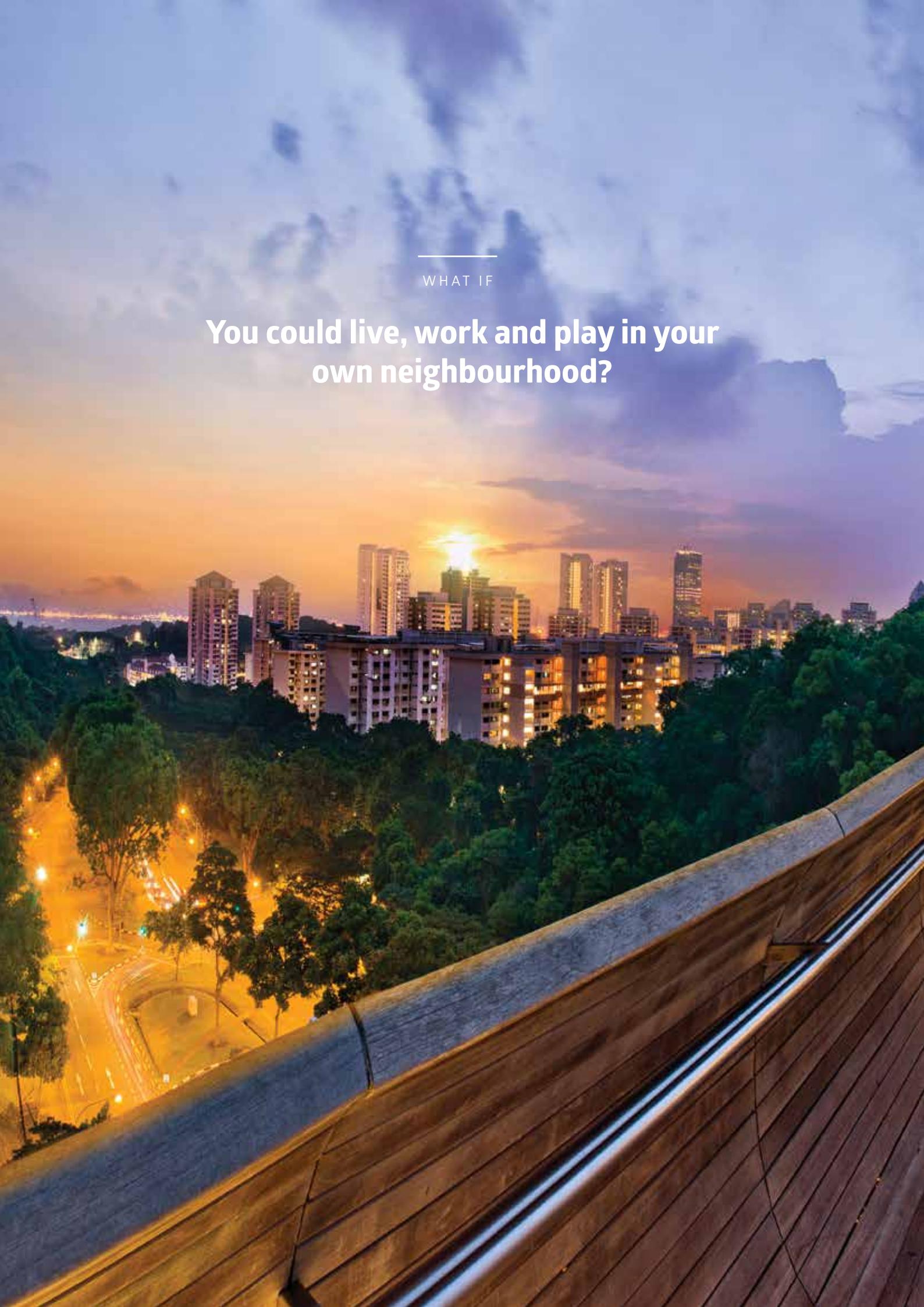
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WHAT IF

**You could live, work and play in your
own neighbourhood?**





HENDERSON WAVES

—
WHAT IF

**Businesses thrive because
they care for the earth?**





PSA TANJONG PAGAR TERMINAL

WHAT IF

Looking after the environment is second nature to us?





BISHAN-ANG MO KIO PARK

Our Singapore, Our Future





The Singapore Story on Sustainability and Liveability

Thanks to our pioneers, we were green even before it was fashionable to be green.

Our journey towards sustainability started in the 1960s before environmental issues became a global concern. We were a fledgling nation facing high unemployment, urban slums, poor infrastructure, lack of sanitation and an unskilled labour force.

Our leaders then asked bold questions about the long-term vision for Singapore and they made a conscious decision to green our country. Then Prime Minister Mr Lee Kuan Yew believed that “*a blighted urban jungle of concrete destroys the human spirit*” and that “*we need the greenery of nature to lift our spirits*”. In 1963, he planted the first tree that sowed the seeds to make Singapore a Garden City.

Thereafter, we saw the launch of the Keep Singapore Clean Campaign in 1968, the regulation of air pollution through the 1971 Clean Air Act and the decision to locate pollutive industries away from residential areas in the 1970s. These were bold steps for a newly industrialising country. In the 1980s, we transformed the Singapore River from a heavily polluted passageway for boats to the beautiful urban water catchment area and vibrant destination that it is today.

Today, Singapore is recognised as a liveable and sustainable city. In 2011, a Siemens-Economist Intelligence Unit study ranked Singapore as Asia’s greenest city. Our urban solutions have also attracted international interest and we see growing participation in our biennial World Cities Summit, Singapore International Water Week and CleanEnviro Summit Singapore. These platforms allow us to share our experiences with and learn from other cities about sustainable development, enhancing our capability and inspiring us to do better.

The Singapore we have today did not come about by chance. It is the result of visionary leadership, careful, long-term planning and the hard work of our forefathers who created this place we call home.



The 3 Pillars of Sustainable Development:
Promoting Social and Economic Well-Being while
Protecting the Environment



The Sustainable Singapore Blueprint

We built on this strong foundation and published the first edition of the Sustainable Singapore Blueprint in 2009. The 2009 Blueprint outlined plans for a *Lively and Liveable Singapore, one that Singaporeans love and are proud to call home.*

Singapore has made good progress in our sustainability journey and is on track to achieve our 2020 and 2030 targets laid out in the 2009 Blueprint. We have even exceeded some of our targets, such as the amount of recreational waterways and skyscraper greenery.

The new initiatives we have launched since 2009 include:

- Smart city pilots with sustainable features at Marina Bay, Jurong Lake District and Punggol
- Ambitious plans to ramp up public transport infrastructure
- Renewed greening efforts to make Singapore a City in a Garden
- Minimum energy and water efficiency standards for more household appliances
- More Active, Beautiful, Clean Waters (ABC Waters) projects
- A new Maritime Singapore Green Initiative
- The 3R fund to encourage waste reduction and recycling
- The Department of Public Cleanliness to integrate cleaning functions across the Government
- The Centre for Liveable Cities to promote knowledge-sharing on urban development with other countries.

These efforts have borne fruit. In the Sustainable Singapore Blueprint survey¹ that we conducted with 2,000 residents earlier this year, almost 80% of respondents viewed Singapore as a liveable and sustainable place.

Singapore has come a long way over the past 50 years. The future presents challenges that our generation, and those to come, must rise to meet. As cities around the world develop and as the global population grows, there will be increasing competition for a finite supply of resources. Coupled with the pressures brought about by climate change, these challenges mean that the road ahead may not be smooth sailing.

To provide a high quality living environment for Singaporeans, we have to carefully prioritise the use of limited land between competing national needs such as housing, transport and commercial uses. We also need to work harder to achieve an even cleaner and healthier environment with excellent air and water quality. Given our limited space for landfill, we must do our best to reuse, reduce and recycle our materials. If everyone plays a part, we can continue to be a model liveable and sustainable city – one that provides a good quality of life for Singaporeans today and in the future.



Sengkang Floating Wetland

¹ The Ministry of National Development and the Ministry of the Environment and Water Resources commissioned a survey to understand public attitudes and perceptions on sustainability, liveability and environmental issues.

Sustainable Land Planning Principles

- **Develop an efficient city** and adopt innovative ideas to improve our living environment and optimise land use
- **Promote the use of public transport** by providing an extensive rail network and intensifying land use around rail stations
- **Decentralise commercial centres** to provide more jobs near homes, as well as to reduce the need to travel and peak hour traffic congestion
- **Provide a quality living environment** by offering a wide variety of housing choices and comprehensive amenities within each new town
- **Conserve our natural and built heritage** by safeguarding Nature Reserves and Nature Areas and carefully conserving buildings with outstanding architecture and historical significance
- **Foster community spirit** through the provision of public spaces and by facilitating active civic participation in sustainable development

There are also many global challenges that Singapore has to grapple with.

Like many other countries, Singapore is vulnerable to risks arising from climate change, such as rising sea levels. Globalisation and the increased connectivity we have today also make it easier for any problem to be transmitted from one part of the world to another, such as supply chain disruptions and public health risks. We need to deepen our understanding of our vulnerability to climate change and plan early for climate change adaptation as a long-term insurance policy for Singapore.

In addition, global population and economic growth will place greater pressures on water, energy, food and raw materials, most of which Singapore imports. We must make better use of our limited water and energy resources at home and at work. While Singapore contributes less than 0.2% of global emissions, we are committed to mitigate our carbon footprint as much as we can.

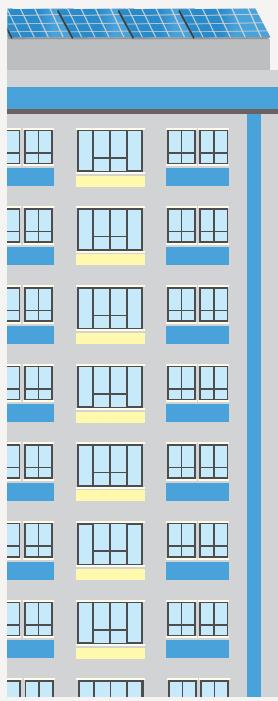
The Sustainable Singapore Blueprint 2015 is a response to these challenges. It outlines our national vision and plans for a more liveable and sustainable Singapore. Everyone has an important part to play if we are to succeed and realise our vision for

A Liveable and Endearing Home A Vibrant and Sustainable City An Active and Gracious Community

With a committed Government, forward-looking industry partners and active civic participation, Singapore can be a nation where every Singaporean is happy to live in and proud to call home.

Sustainable Singapore Blueprint – Where We Are Today

Eco-Friendly Buildings



Sustainability features implemented in some of our HDB flats



LED lighting in common areas

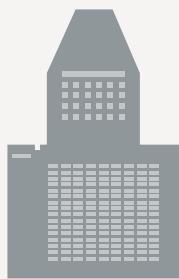


energy regenerative lift



centralised chutes for recyclables

>170 HDB blocks with solar panels



130 buildings have benefited from the **Green Mark Incentive Scheme for Existing Buildings**
2,100 with **BCA Green Mark** certification
>2,600 with **Water Efficient Building** certification

Green and Blue Spaces



More than **80%** of households within 10-min walk of a park

24 Active, Beautiful, Clean Waters projects completed with **26** more underway

The **Singapore Index on Cities' Biodiversity** allows cities to benchmark their biodiversity conservation efforts over time.



1/2 of new residential and 1/3 of new commercial buildings greened under **Landscaping of Urban Spaces and High Rises scheme** since 2009

110 existing buildings greened through **Skyrise Greenery Incentive Scheme**

	2009	2013
Amount of skyrise greenery (ha)	10	61
Amount of green space (ha)	3,602	4,040
Length of park connectors (km)	113	216
Amount of waterbodies open for recreational activity (ha)	650	959
Length of waterways open for recreational activity (km)	72	93

Sustainable Transport



Rail network extended to about **180 km** today
At least **4 in 5 buses** run every **10 minutes** or less during peak hours on weekdays
>**100 km** of cycling paths built since 2009
Carbon Emissions-Based Vehicle Scheme for more environmentally friendly vehicles implemented

Public Cleanliness



Department of Public Cleanliness has integrated public cleaning since 2012
>100 Enhanced Clean Mark accredited companies since 2012; licensing regime introduced in 2014
>300 litter-free Bright Spots created since 2012

Energy Use



>200 companies

are part of the **Energy Efficiency National Partnership**



\$125m of annual energy savings identified under **Energy Efficiency Improvement Assistance Scheme** and \$712m of projected lifetime energy savings from **Grant for Energy Efficient Technologies**

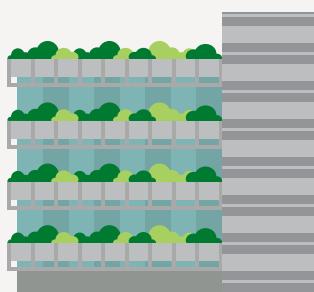


Mandatory Energy Labelling Scheme and Minimum Energy Performance Standards for household appliances

Energy consumption per \$ GDP, improvement from 2005 (%)

2008 from 15 to 22 2012

Water Use



>370 companies

have submitted voluntary **Water Efficiency Management Plans** since 2010



>70

projects funded under **Water Efficiency Fund**



Mandatory Water Efficiency Labelling Scheme and Minimum Water Efficiency Standards for household appliances and water fittings

Domestic water consumption (litres per capita per day)

2008 from 156 to 151 2013

Waste & Recycling



>140 signatories saved >20,000 tonnes of packaging waste under the **Singapore Packaging Agreement**



20,000 tonnes of waste to be reduced, reused or recycled with **3R Fund** projects



1 recycling bin for every HDB block rolled out since 2011

Air Quality



Power stations and refineries are implementing process improvements



Tighter emissions standards for new vehicles implemented



Annual ambient mean ($\mu\text{g}/\text{m}^3$)	From 2008 to 2013
PM 2.5	16 to 20
SO ₂	11 to 14

National recycling rate (%)

2008 from 56 to 61 2013



New Efforts in Sustainability and Liveability

The Sustainable Singapore Blueprint 2015 is an extension of the efforts outlined in the 2009 edition. This review takes into consideration feedback obtained from more than 130,000 people through recent initiatives, including the Land Transport Master Plan 2013 and the Urban Redevelopment Authority's Master Plan 2014.

ENVision Exercise

The Singapore Environment Council (SEC) conducted an exercise to understand Singaporeans' values and redefine a vision for our environment. It held a total of 19 dialogue sessions from February to April 2014 where about 440 participants shared their views on Singapore's environmental future. There was recognition that Singapore's clean, green and safe environment should not be taken for granted. The collective values and environmental vision developed through the exercise, along the lines of Home, City and Community, influenced the development of the Sustainable Singapore Blueprint 2015.

Over the past year, 6,000 people have been engaged through our dialogues, surveys and internet portal for the Sustainable Singapore Blueprint. We are grateful to those who have taken the time to share their experiences and thoughts on how Singapore can be more liveable and sustainable.

We are heartened to hear from Singaporeans that the Singapore we have today is a clean and green one that many of us appreciate and love. Singaporeans have also expressed hopes for a cleaner and greener future. More can be done to make our living environment even better and more inclusive to support the diverse needs and aspirations of Singaporeans.

Working together, we can realise the bold plans and ambitious targets outlined in this Blueprint to create a better future for ourselves.



Thanking those who contributed to ENVision

A Liveable and Endearing Home

“Eco-Smart” Endearing Towns



As smart technology and eco-friendly features are embedded into our towns and homes, Singaporeans will enjoy greater convenience and a better quality of life. Enjoying time with family and friends will be easier with parks, ABC Waters projects, sports facilities, and other community amenities nearby. A green lifestyle will be second nature for many, with more ways for people to save energy and water at home and with dual chutes to enable residents to segregate their recyclables easily while keeping our environment clean.

- Introduce a new generation of highly liveable housing districts with innovative design and technology, such as Punggol Northshore, Jurong Lake District, Kampong Bugis and Marina South
- Rejuvenate estates and introduce sustainability features through programmes such as Remaking Our Heartland and HDB Greenprint
- Promote environmental sustainability beyond buildings to a wider range of facilities and spaces through the BCA Green Mark schemes
- Provide and maintain lush greenery in our urban environment and conserve our natural heritage to realise a City in a Garden
- Implement more ABC Waters projects to create more recreational blue spaces
- Provide opportunities for the community to enhance public spaces in their neighbourhoods
- Make it easier for residents to save water and energy and reduce, reuse and recycle waste

A “Car-Lite” Singapore



With a denser rail network and extensive bus services, we will be able to travel seamlessly and efficiently around our city. Cycling and walking will become popular forms of getting around in our neighbourhoods and regions. Electric car-sharing and driverless car trials will be conducted in parts of Singapore. We can work together to achieve a peak hour mode share of 75% for public transport by 2030, up from 64% in 2013. With a “car-lite” Singapore, we can reduce our carbon footprint, as well as enjoy fresher air, a cleaner environment and a healthier lifestyle.

- Introduce innovative features and creative designs to towns to provide a better cycling and walking environment, starting with Ang Mo Kio
- Develop a comprehensive cycling network spanning more than 700 km by 2030, with supporting infrastructure and a code of conduct to promote safe cycling within and across towns
- Create more car-free spaces in housing estates and the city, such as the Civic District, where roads are temporarily or permanently closed for public activities
- Introduce driverless vehicles on a larger scale in Singapore
- Pilot an electric car-sharing scheme to allow residents convenient access to electric cars without having to own one

A Vibrant and Sustainable City

Towards a Zero Waste Nation



We will work towards becoming a Zero Waste Nation by reducing our consumption of, as well as reusing and recycling all materials to give them a second lease of life. The Government, the community and businesses will come together to put in place infrastructure and programmes that make this our way of life. We will keep Singapore clean and healthy, conserve precious resources, and free up land that would otherwise have been used for landfills, for our future generations to enjoy.

- Introduce centralised chutes for recyclables in all new HDB flats and facilitate recycling in private housing through better infrastructure support
- Introduce Pneumatic Waste Conveyance Systems in more HDB towns to support convenient and hygienic waste disposal
- Build an Integrated Waste Management Facility which will have the capacity to segregate recyclables from waste
- Introduce more initiatives to reduce food waste in Food & Beverage businesses and to improve recycling of electrical and electronic waste

A Leading Green Economy



Our businesses will adopt greener practices, our city will be a hub for the cutting-edge business of sustainable development, and Singaporeans can enjoy jobs in this exciting and meaningful sector. We will create Living Labs to test-bed ideas that improve lives and are good for the environment.

We aim to raise solar penetration rates and have 80% of our buildings achieve the BCA Green Mark standard by 2030, up from 25% today. Businesses in Singapore will be internationally renowned for doing well by doing good.

- Introduce new innovation districts such as the integration of CleanTech Park, Nanyang Technological University, future industrial estates like Bulim and Jalan Bahar, and Tengah, as a living laboratory that fosters creativity and innovation
- Plan to raise the adoption of solar power in our energy system to 350 MWp by 2020. To this end, create lead demand for solar deployment through the SolarNova programme
- Test more green innovations, including a Renewable Energy Integration Demonstrator – Singapore test-bed on Semakau Landfill
- Develop a \$52 million Green Buildings Innovation Cluster to grow our capability in developing green buildings
- Create more green, quality jobs, from an estimated 60,000 in 2011
- Launch initiatives to encourage Singapore-based companies to adopt best-in-class sustainability practices

An Active and Gracious Community



Singaporeans are at the heart of this Blueprint. We, and our children, are the beneficiaries of its desired outcomes. At the same time, our collective efforts and commitment today are needed to realise these outcomes in this Blueprint.

Singaporeans must become exemplary stewards of our environment. We must participate in shaping our neighbourhoods and building a more gracious society together. It should be second nature for people, businesses and the Government to come together to care for our common spaces and environment, take a long-term perspective in conserving precious resources, and champion a sustainable way of life.

- Provide more public spaces for communities to contribute in terms of design and programmes, such as enlivening new HDB town plazas in places like Punggol and Bedok
- Engage the public on The Ubin Project to collectively enhance our natural environment in a sensitive and sensible manner, create experiences, and experiment with new, sustainable technologies
- Work with stakeholders to realise and enhance the Rail Corridor as a contiguous green space for recreational use
- Create more litter-free “Bright Spots” as part of the Keep Singapore Clean Movement
- Encourage more businesses to be sensitive to their environmental impact and to participate in voluntary programmes
- Take the lead in environmental sustainability through the ‘Public Sector Taking the Lead in Environmental Sustainability’ 2.0 initiative

These ideas summarise how the Sustainable Singapore Blueprint 2015 aims for Singapore to become

A Liveable and Endearing Home A Vibrant and Sustainable City An Active and Gracious Community

The Singapore story has always been about individuals putting society above self, turning constraints into opportunities and coming together to build an endearing home for all.

The ingenuity and strong “can-do” spirit of Singaporeans will continue to be instrumental in our journey ahead. A clean and green Singapore created and sustained through shared effort, commitment and shared values will make Singapore the exceptional Home for many generations of citizens to come. This Blueprint is a plan for action and provides all of us with a precious opportunity to work together to create a better home, environment and future.

A liveable and endearing HOME





Sustainable living and commuting, with nature and more vibrant shared spaces at our doorstep by 2030



Designing and Building Sustainable Homes

Better design through simulations of wind flow, temperature and heat gain

Develop a new generation of sustainable, smart and liveable housing, such as Punggol Northshore

Extend neighbourhood enhancement projects to mature HDB estates

Incorporate rooftop greenery, dual chutes for waste and recycling, and other sustainable features

Implement mandatory energy and water efficiency labelling as well as minimum efficiency standards for household appliances and water fittings



More Green and Blue Spaces

9% of land for Nature Reserves and parks

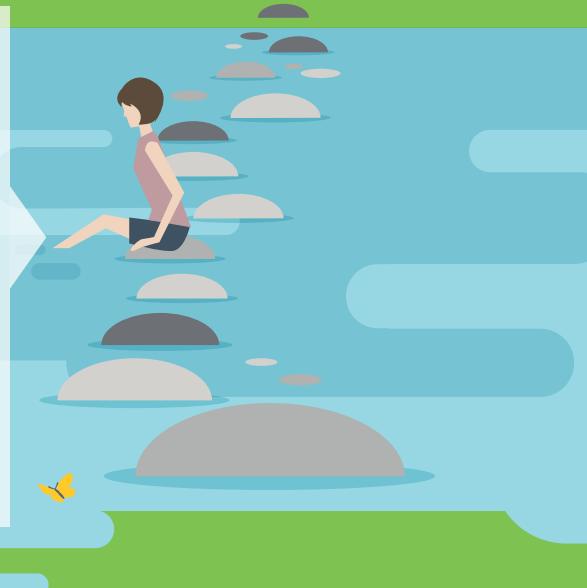
9 in 10 homes to be within 10-min walk of a park

400 km of Park Connectors

Enhanced ecological connectivity with 180 km of Nature Ways

Over 100 potential ABC Waters projects identified for implementation island-wide

200 ha of skyscraper greenery, equivalent to about 650 school fields



Greener Modes of Transport

A 360 km rail network

8 in 10 households within 10-min walk of a train station

80 new bus services and 1,000 more buses

More than 200 km of sheltered walkways to transport nodes

Over 700 km of cycling paths, together with enhanced cycling infrastructure and code of conduct for safer cycling

Test-beds of cleaner technologies like electric vehicles

Trials of autonomous mobility concepts, such as driverless buses

More Community and Recreational Facilities

More hawker centres

The majority of homes to be within 10-min walk of a sports or recreational facility

Expand areas in and outside the city area where streets are temporarily or permanently closed to private motorised vehicles

Cleaner, Healthier Homes

Maintain public cleanliness

Work hand in hand for a quieter living environment





Housing a Growing Nation



Residents enjoying the playground and fitness corner

We begin our sustainability journey at the heart of where it matters – the Home. Over half a century, we have transformed our housing landscape from one that provides shelter and essential services, such as clean water and sanitation, to a vibrant space that caters to the varied needs of residents.

Through thoughtful planning, design and running of our housing areas, we have made it increasingly easy for residents to embrace a sustainable lifestyle that enables everyone to live comfortably while caring for the environment.

We call this the “eco-smart” lifestyle – where living in harmony with and caring for the environment is the wise and natural thing to do.

We will plan for public transport to be the preferred mode of travel by making it even more

accessible to residents. There is a limit to the number of cars that land-scarce Singapore can comfortably accommodate. Currently, the amount of land allocated for roads is almost equivalent to the amount of land used for housing. Given our land constraints, we have to be judicious in the expansion and building of more roads.

Singapore’s homes of the future will also be designed to meet the needs of all ages and be conducive for a fulfilling community life. They will be close to parks and greenery, as well as jobs and amenities. Our residents will enjoy a wide range of safe, affordable and green mobility options – public transport, cycling and walking.

This is our vision for liveable, endearing and sustainable homes in Singapore, and it is already taking shape today.



Sustainable Housing in the Heartlands

Our Housing & Development Board (HDB) flats are designed for sustainability. Since the 1960s, HDB flats have been built to be cost-effective in construction and maintenance, and are planned with a comprehensive suite of community amenities for residents.

We aspire for every new HDB town to be better than the one before. This is evident in the evolution of our existing towns such as Punggol, Tampines and Jurong, which accommodate many generations of HDB flats.

Our HDB flats are designed to take advantage of our tropical climate so that residents can enjoy natural ventilation and lighting within their homes. During the planning process, HDB models town-level microclimatic conditions where simulations for wind flow, sunlight, heat and shading are conducted to optimise the living conditions. With new technology and urban environment modelling, HDB is able to design even more liveable and sustainable homes.

In the coming years, we will see more green innovations in our HDB towns, including:

Automated Waste Collection

New HDB housing areas, such as at Tampines North, Bidadari and the northern part of Punggol, will be fitted with Pneumatic Waste Conveyance Systems. These systems efficiently convey waste by air suction through an underground network of concealed pipes to a central location. Odours, pest infestations and exposed waste will be reduced, allowing residents to enjoy a more pleasant living environment. This process will also reduce the need for workers to collect refuse, as well as reduce refuse truck traffic.

Expanded Use of Solar Energy

As committed in the Sustainable Singapore Blueprint 2009, HDB has embarked on efforts

to test the use of solar panels in HDB towns across Singapore. 176 HDB blocks have been installed with solar panels which provide power for the lighting of common areas and allow residents to moderate their conservancy bills. By 2016, another 200 blocks will have solar panels and there are plans to progressively install more in the coming years.

Centralised Chutes for Recyclables on Every Floor

All new Build-To-Order (BTO) flats will come with a centralised chute on every floor for recyclables, making it easier for residents to recycle. Residents at Treelodge@Punggol have enjoyed this convenience since 2010. There are 2 refuse hoppers on each floor of every block – one for general waste and the other for recyclables. Treelodge@Punggol residents recycle about 3 times more than those in housing estates without dedicated chutes for recyclables.

Rainwater Harvesting

Rainwater harvesting has been implemented since 2011 in all new BTO public housing blocks in Punggol to encourage the use of non-potable water for the washing of common areas. HDB is also exploring other innovative systems, such as an underground rainwater detention tank system in Punggol Northshore.

Rooftop Greenery

All new multi-storey car parks will come with green rooftops. These green rooftops reduce urban heat, slow down water runoff and provide a pleasant environment for community activities.

Elevator Energy Regeneration System

Energy recovered from the movement of elevators can be used to power other common services. Such a system has been introduced in more than 350 blocks in Punggol and will be progressively introduced in more new and existing HDB blocks.

We will continue to explore new technologies and sustainable features that can help us design homes with greater comfort and convenience for residents. Pilots like Punggol Eco-Town help us build each town better than the previous one.

Sustainable living is not only possible in new HDB towns, but also in existing ones. We strive to ensure that residents in our mature estates, including seniors who age in place, can also lead “eco-smart” lifestyles. The HDB Greenprint initiative will be extended to Ang Mo Kio within the next few years.

Punggol Eco-Town – Sustainable Living in the 21st Century

From its humble beginnings as a fishing village in the 19th century, the coastal town of Punggol in the North East region of Singapore developed into an agricultural area with poultry and pig farms, as well as rubber and coconut plantations, in the 20th century. This area, formerly known as ‘Kampong Punggol’, is one of our oldest settlements and a vastly different place today.

Punggol found a new lease of life in the 1990s. With the vision of “A Waterfront Town of the 21st Century”, new planning concepts were incorporated into the planning and design of Punggol.

These included the development of more intimate estates with a public green lung known as a “common green”, new forms of housing integrated with car parks, a well-connected transportation system, commercial centres and a continuous waterfront promenade.

In 2010, HDB unveiled plans for Punggol to be Singapore’s first Eco-Town. A holistic sustainable development framework covering environmental, social and economic dimensions was drawn up to support it. Today, Punggol is a living laboratory for new ideas and technologies to create a better living environment for, and promote sustainable living among, residents.

In the coming years, Punggol’s town centre will be expanded into “Punggol Downtown”. There are plans to introduce a waterfront Market Village, a Learning Corridor to house future educational institutions, and a Creative Cluster to host commercial activities. “Punggol Downtown” will be a vibrant new destination in the North East region.



Sustainable Development Framework
for Punggol Eco-Town

HDB Greenprint @ Yuhua – Bringing Sustainable Living into HDB Towns

In 2012, HDB launched the HDB Greenprint at Yuhua neighbourhood in Jurong to introduce sustainable features to existing HDB estates. Yuhua, which comprises nearly 40 HDB blocks, has been HDB's test-bed for initiatives such as the Pneumatic Waste Conveyance System, the rainwater harvesting system, and solar panels at the roof tops. Through the \$1 million Greenprint Fund, HDB supports ideas from the public to improve their living environment. Winning

proposals include hobby farming at community gardens, ducted LED lighting along common corridors, and "community parklets" – mini-parks at the void decks.



Private developers are also encouraged to contribute to the design and development of more sustainable housing districts throughout

Singapore, such as in Marina South and Kampong Bugis.

Eco-Friendly Living in Marina South

Marina South is envisaged to be a lively mixed-use residential district with comprehensive pedestrian and cycling networks, allowing residents and visitors access to an array of amenities within comfortable walking or cycling distance. Marina South will have better wind flow through careful alignment of streets and varied building heights. Eco-friendly features such as rainwater collection, greywater recycling, extensive greenery, and more energy-efficient buildings will also be available in this district.



We are embarking on the development of “smart” HDB towns to provide greater convenience and safety, and to enhance the quality of the

living environment for our residents through the use of Information and Communications Technology (ICT).

Punggol Northshore – Embarking on Smart Technologies

HDB will be introducing and testing smart technologies in Punggol Northshore before extending them to other new towns in future. These smart technologies include:

- Smart Car Parks, which optimise the utilisation of parking spaces, especially for car parks used for both season parking and hourly parking
- Smart Fans, which are activated in response to temperature, humidity and human traffic movement

- Smart Lighting with Sensors, which studies human traffic flow, for optimised provision of lighting in common areas
- Smart Pneumatic Waste Conveyance System, which monitors waste disposal patterns to optimise waste collection cycles
- Digital infrastructure in flats to pave the way for intelligent homes. With such infrastructure in place, residents will be able to tap on smart home applications developed by commercial companies that can enhance energy savings and enable them to access services like healthcare in the comfort of their homes.



Artist's Impression of Punggol Northshore



Greener Homes



Mandatory labelling schemes for home appliances help families save on utilities bills

We have become accustomed to modern conveniences such as affordable and accessible water and energy. However, these finite resources must be safeguarded and conserved. We should reduce our use of water and energy to as little as possible.

Enhancing Water and Energy Efficiency

PUB, the national water agency, and the National Environment Agency (NEA) have been helping residents save water and energy through mandatory labelling schemes for home appliances and water fittings which require suppliers to provide information on the energy or water consumption of their products. Such information

helps consumers compare the efficiency and life-cycle costs of different models and make better-informed purchasing decisions. Today, about 7 in 10 Singaporeans would choose to purchase energy-efficient or water-efficient appliances.

Beyond this, minimum standards have been progressively introduced to ensure that only efficient appliances can enter the market. This protects consumers from the high cost of using inefficient appliances. Minimum efficiency standards for water fittings also make new building developments and those undergoing renovation more water-efficient.

Mandatory Labelling Schemes		Minimum Standards
Energy	Mandatory Energy Labelling Scheme (MELS) Air conditioners, Refrigerators, Clothes dryers, Televisions	Minimum Energy Performance Standards (MEPS) Air conditioners, Refrigerators, Clothes dryers
Water	Mandatory Water Efficiency Labelling Scheme (MWELS) Taps and mixers, Low-capacity flushing cisterns, Urinal flush valves, Waterless urinals, Washing machines	Minimum Water Efficiency Standards Taps and mixers, Low-capacity flushing cisterns, Water closet flush valves, Urinal flush valves, Washing machines

Note: There is also a voluntary Water Efficiency Labelling Scheme for showerheads.

List of labelling schemes and minimum standards that have been implemented

We regularly review our minimum standards to keep up with technological improvements and changing market conditions. These schemes will

also be extended to other appliances, such as general lighting and water heaters.

Enhancement of MELS Labels

We enhanced our energy labels in September 2014.

Old Label



New Label



The new label uses a more stringent rating scale that requires appliances to achieve greater energy efficiency for each tick rating. This enables consumers to identify more energy-efficient appliances.

The new label also translates the energy performance into the estimated annual energy cost of using the appliance, so that consumers can consider this when deciding what to buy.

Promoting Water Conservation

PUB's promotion of water conservation has lowered daily domestic water consumption per capita from 165 litres per day in 2003 to 151 litres per day in 2013.

One good example of our water conservation efforts is the Water Efficient Homes programme, part of PUB's 10-Litre Challenge, which aims to help individuals reduce daily water consumption



by 10 litres. Through this programme, PUB officers and volunteers install water-saving devices and share water-saving tips with households with high water consumption.

Making it Easier to Recycle

The large volumes of household waste we dispose of put tremendous pressure on our waste collection and disposal systems, including our only landfill at Semakau.

In 2013, households only recycled about 20% of the waste they generated. We can do much more.

Dual chutes for waste and recycling will become a standard feature at the common areas of new HDB blocks. NEA is also considering similar enhancements to recycling infrastructure in private high-rise residential developments.

Improved infrastructure will make it easier for everyone – at home, at school or at work – to reduce and segregate our waste.



Dedicated chutes for recyclables



Active Mobility

The sustainability journey continues when we step out of our homes and travel to our next destination.

Taking Public Transport as Part of a Green Lifestyle

Many of us use public transport to move around in Singapore. By doing so, we reduce our environmental footprint and contribute to cleaner air and blue skies. Public transport also allows us to optimise our land use and provide greater connectivity for residents. We envision a “car-lite” Singapore where public transport, walking and cycling are default choices for commuting and there is reduced reliance on private motorised vehicles.

Transport Mode	Average Carbon Footprint (CO ₂ per 10 km)
My own two feet	0
Pedalling a bicycle	0
Taking the bus	0.19 kg*
Taking the MRT	0.13 kg*
Driving a car	1.87 kg

*Assuming an average loading of 80 passengers per bus and 1,100 per train

We have been working hard to enhance the accessibility and convenience of our rail and bus network to ensure that service levels keep up with our residents’ needs. We aim to increase the public transport mode share during peak periods from 64% in 2013 to 75% by 2030.

Over the next 15 years, we will double the length of our rail network from about 180 km to about 360 km. About 100 more Mass Rapid Transit (MRT) stations will be built in the process. By 2030, our rail system will be more extensive than the ones in Tokyo and Hong Kong, and comparable to New York City’s.

Residents will benefit from this denser network of train stations both in and outside the city area. Almost everyone in the city area will be located within a 5-minute walk of an MRT station. Overall, 8 in 10 households will be within a 10-minute walk of a train station by 2030.

In 2012, we announced the Bus Service Enhancement Programme which will add 1,000 new buses and 80 new bus services to ease commuter crowds and shorten waiting times.

In the same year, the Land Transport Authority (LTA) released the MyTransport.SG app to help users manage their travel decisions. This app includes real-time bus arrival information, directions to MRT stations, bus stops and taxi stands, and cycling routes. Some upcoming features include sheltered walkway routes to transport nodes, updates on crowd levels at bus and train platforms, and information on car-sharing ports.

Travel Early Scheme



As a beneficiary of the Travel Smart pilot in law firm Rajah & Tann, Ms Belle Wang, Legal Secretary said, “Travel Smart has made a difference to my lifestyle. Other than cost savings on the MRT ride to work, I am able to spend more time with my two daughters in the morning when I join them and my husband on the car ride to their school, before I board the MRT train. My firm provides free early breakfast for staff who arrive before 8am. I love this programme not only for the benefits of free transport and breakfast but also because it allows me to have some early morning bonding time with my family.”



A variety of public transport options

Safe and Pleasant Walking for Everyone

Walking is by far the most environment-friendly way to move around in our city. Many walk to their places of work, schools and shops. Walking allows more opportunities for interaction with our neighbours and is good for our health. Our Sustainable Singapore Blueprint survey shows that more than 3 in 4 Singaporeans are willing to walk for up to 10 minutes to neighbourhood amenities or to MRT stations.

Today, HDB housing estates are planned for safe and pleasant walking with a comprehensive network of barrier-free footpaths and sheltered walkways which connect HDB blocks to nearby transport nodes, shops, amenities and recreational facilities. Seats along walking routes and directional signs are provided to enhance the walking experience.

Nevertheless, we can make our environment even more walkable for people of all ages and mobilities. This is especially important as Singapore experiences a demographic shift and the number of seniors grows.

A more walkable environment will encourage healthy lifestyles and benefit families with seniors, children and those with mobility challenges.

In the near term, we are implementing the following initiatives:

Under the new Walk2Ride programme, more than 200 km of sheltered walkways will connect neighbourhood facilities and amenities by 2018 – this is 4 times more than the 46 km we have today. Sheltered walkways will offer rest areas, directional signs, and pedestrian route maps.

The Green Man Plus scheme, which gives seniors and less mobile residents more time to cross the road at pedestrian crossings, has been implemented at more than 250 pedestrian crossings. This will double to about 500 by 2015. About 40 pedestrian overhead bridges will be progressively installed with elevators in addition to the current 6 overhead bridges where this facility is available today.

Today, all MRT stations and bus interchanges have at least one barrier-free access route, and almost all bus stops are barrier-free. From 2015, where feasible, LTA will progressively upgrade the remaining bus stops that have more complex site-constraints to be barrier-free.

The Urban Redevelopment Authority (URA) and LTA are working with other agencies to review standards and design to contribute to better walkability. URA and LTA are also studying, together with research institutions, the qualities of good walkability and the behavioural aspects of pedestrian route choice – all with the aim of making Singapore highly walkable.

More Car-Free Public Spaces

Since the 1990s, URA has been experimenting with fully pedestrianised streets, including Bussorah Mall in Kampong Glam, Smith Street in Chinatown, Waterloo Street, Albert Mall in Bras Basah/Bugis, Boon Tat Street next to Lau Pa Sat and parts of Clarke Quay. These streets are today characteristic of these areas.

With the support of local communities, URA and LTA spearheaded a trial in 2013 where Club Street and Haji Lane – 2 vibrant streets in the city lined with shophouses and Food & Beverage outlets – were closed to vehicles on Friday and Saturday evenings.

A similar weekend car-free zone was initiated at Circular Road in the same year by Singapore River One, a private sector-led place management organisation.

A Car-Free Civic District



The Civic District, home to some of the most significant historic buildings and spaces in Singapore, such as the former Supreme Court and City Hall buildings, Old Parliament House and the Padang, is envisioned to become Singapore's "Civic and Cultural District by the Bay". We plan to create a pedestrian-friendly precinct in the heart of the Civic District to allow visitors to walk freely and safely in the district.

Street-level pedestrian connectivity within the district and its adjacent precincts will be improved, including connections to Fort Canning Park, Bras Basah, Bugis, the nearby City Hall MRT station and the waterfront promenade around Marina Bay. Over the next year, we will pedestrianise the portion of Empress Place between the Asian Civilisations Museum and the Victoria Theatre and Concert Hall to integrate the buildings into a seamless park-like setting.



Artist's impressions of a car-free Civic District

We will explore the possibility of a fully pedestrianised Civic District in the future, such as through the possible closure of roads to private motorised vehicles and allowing access only for public buses and pedestrians. This will create a bigger civic open space and allow pedestrians to stroll freely.

In October this year, the Orchard Road Business Association commenced a 6-month trial on the closure of Orchard Road to all vehicles on the first Saturday of every month, billed as “Pedestrian Night”.

Occasionally, roads have been closed to facilitate yearly events and festivities. In areas with high pedestrian traffic, roads have been narrowed to provide more space for pedestrians. Such car-free and pedestrianisation initiatives have contributed to more walkable and active streets. We will continue to consider pedestrianising new areas where there is community support.

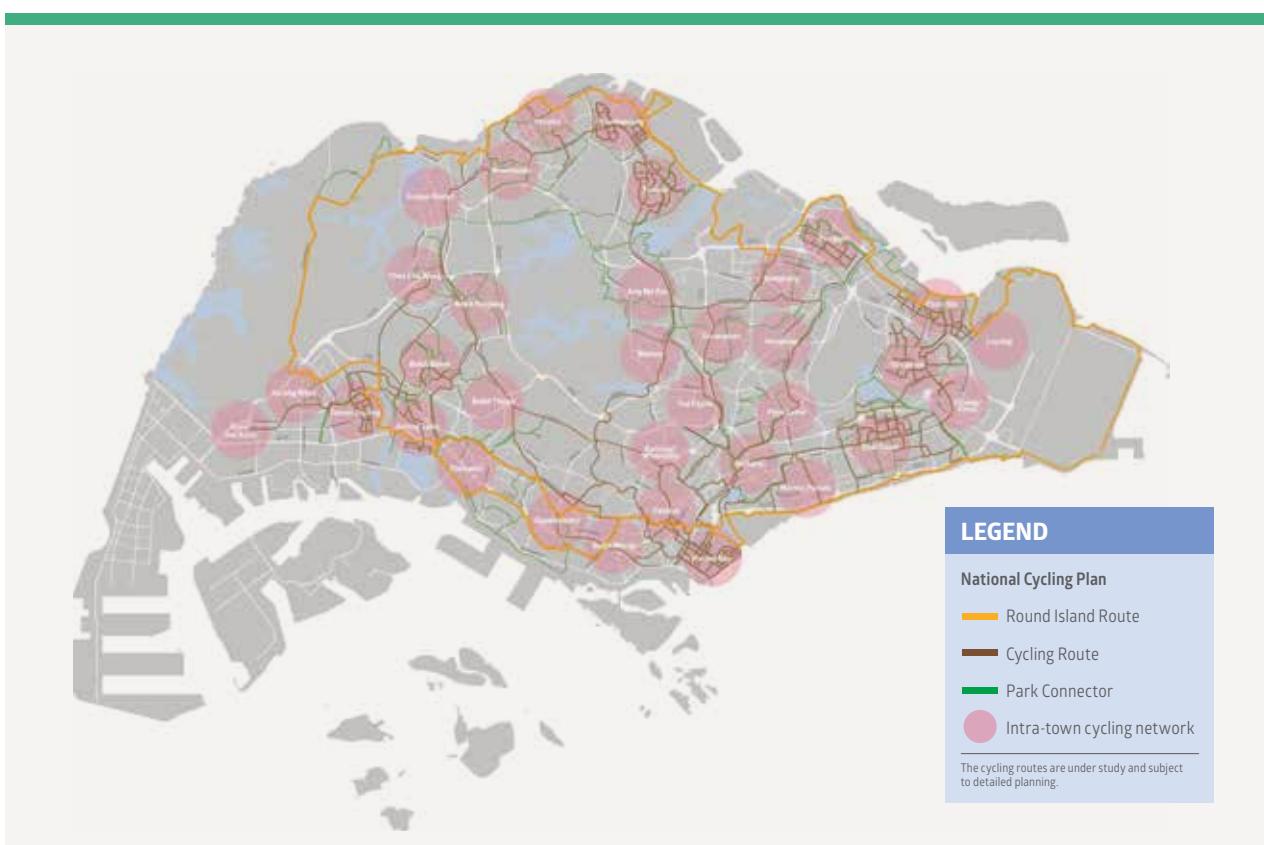
Cycling in our City

Cycling is another eco-friendly mode of transport that is becoming increasingly popular in Singapore for short trips to the MRT station or

bus interchange, as part of the journey to work, or simply for moving around the neighbourhood. Besides being affordable and convenient, cycling offers health benefits and brings people of all ages closer to nature and the outdoors.

Since the Sustainable Singapore Blueprint 2009, we have received much support to promote cycling as a way of getting around Singapore. Therefore, various agencies have worked together to expand and implement the National Cycling Plan. The plan is regularly updated with feedback from the community, cycling interest groups and urban planning professionals.

The latest plan was unveiled in 2013. This plan will expand our island-wide cycling paths from 230 km today to a network stretching over 700 km by 2030. Routes are being identified for cyclists to travel



Expanded National Cycling Plan unveiled in 2013



People cycling along an elevated Park Connector at Ayer Rajah

within and between towns and even to the Central Business District. Our aim is to make it safe and convenient for cyclists to travel within and across towns through a comprehensive network. One of the findings from our Sustainable Singapore Blueprint survey is that secure bicycle parking facilities will encourage more to cycle. Since 2011, LTA has built 5,000 new bicycle lots at MRT stations, with another 700 slated for completion by end 2014. New public housing developments will come with 1 bicycle lot for every 6 households. Bicycle racks will also be provided in partnership with residential and commercial developers at locations in Marina Bay and the Jurong Lake District, as well as on land parcels sold through the Government Land Sales programme.

A shared code of conduct will be rolled out and a national cyclist education programme is being developed to promote a cycling culture that is safe for cyclists, pedestrians and other road users.

Bicycle-sharing schemes are useful for those who do not own bicycles or prefer using bicycles for one-way trips. LTA is studying the introduction of pilot bicycle-sharing schemes in 2015 in areas like the Jurong Lake District and the city centre.

Encouraging Car-Sharing

Apart from bicycles, we hope to encourage more car-sharing schemes. Car-sharing allows people access to cars without owning one and reduces the overall number of vehicles on the road. Interest in car-sharing services is on the rise, with membership of such services at 8,000 in 2013.

More parking spaces for car-sharing will be distributed across towns for easy access. Today, HDB supports LTA's car-sharing initiative in 105 HDB residential car parks. More car-sharing lots will be introduced in more HDB car parks to facilitate convenient access to car-sharing services.

Sharing Electric Vehicles at our Doorstep

There are plans for the Economic Development Board (EDB) and LTA to co-lead a pilot electric vehicle car-sharing programme to make car-sharing more convenient and environmentally friendly.

The test-bedding of electric vehicles in Singapore was started in 2011 to assess different commercially available electric vehicle models and charging technologies. The test-bed was open to corporate users. A total of 89 electric cars and 71 charging stations were involved in the test-bed.

The test-bed showed that while electric vehicles were technically feasible in Singapore's operating conditions, some challenges to the mass adoption in the near future include the high costs of electric vehicles, limitations in the current state of electric vehicle technology and the lack of a widely-accessible charging infrastructure.

The car-sharing scheme will build on the lessons of the earlier test-bed and make electric vehicles more widely available to the public.



Electric vehicles in Singapore

At Jurong Lake District, Friendly Autonomous Buggy Rides Await

The National University of Singapore, Singapore-MIT Alliance for Research and Technology (SMART) and the Infocomm Development Authority of Singapore (IDA), in collaboration with LTA and other Government agencies, will conduct trials for autonomous buggies that ferry passengers in the parks and gardens within Jurong Lake District.

This will be part of the Smart and Connected Jurong Lake District Pilots and Trials initiative.

This will help residents to have better outdoor mobility experiences, especially those who may have difficulties walking longer distances.

Currently, plans are being studied for a larger-scale pilot of driverless vehicles in Jurong West which includes future residential areas and industrial parks like Bulim, Jalan Bahar and Tengah.



Autonomous vehicles – a new way to ride



Common Spaces, Shared Heritage – More Green and Blue Spaces near Homes

The National Parks Board (NParks) and PUB have brought residents closer to parks, waterbodies and waterways which are now part of our everyday environment and cater to a wide spectrum of social and recreational needs. We will actively look for new ways to create more accessible green and blue spaces where people live, work and play, and involve residents more when enhancing these green and blue spaces.

Ensuring Accessible and Ample Green Spaces

Today, close to one tenth of our land is devoted to green spaces. Our 4 Nature Reserves account for 3,300 ha of land – more than 5 Ang Mo Kio towns. Our 350 parks offer a wide range of natural and recreational experiences. For example, Bukit Batok

Nature Park offers breathtaking scenery amid natural landscapes and rich biodiversity.

Today, about 80% of our households are within 400 m or a 10-minute walk of a park. Our target is to increase this accessibility to more than 90% of households by 2030. To bring parks closer to homes, we will provide more neighbourhood parks and common greens within residential estates. NParks will also provide better connections between parks through the Park Connector Network. The network will be doubled from its current 216 km to 400 km by 2030. This includes a 150 km Round Island Route which will link major cultural, natural and historical attractions with other parks.

A New Jurong Lake Gardens

The Jurong Lake Gardens is envisioned to be an endearing garden that will span about 70 ha. It will comprise the Jurong Lake Park and the existing Chinese and Japanese Gardens, and will integrate the grounds of the new Science Centre.

The Jurong Lake Gardens will be a place where community gardeners from all over Singapore come together to create and maintain show gardens of high horticultural quality. Their efforts will be supported by NParks, local landscape designers and industry partners.

The Jurong Lake Gardens will be developed sensitively to preserve its rustic charm, with fresh elements incorporated to inject life and vibrancy.



Artist's impressions of the new Jurong Lake Gardens

A Splash of Life at Kallang River @ Bishan–Ang Mo Kio Park



In the surrounds of Bishan–Ang Mo Kio Park, many recreational possibilities present themselves, including dining options and community gatherings amid nature and water-themed play areas. This beautiful space is the flagship project of PUB’s ABC Waters Programme where an upper reach of the Kallang River has been transformed from a concrete canal into a meandering stream in a park.

During dry weather, the water flow is confined to a narrow stream. During storms, the adjacent

park area doubles up as water channels to carry rainwater downstream gradually.

Through collaboration with NParks, a combination of plants, natural materials and bio-engineering techniques has been introduced to soften the edges of the waterway, giving it a natural appearance and preventing soil erosion. This has created a habitat for a variety of aquatic and bird life. Today, it is home to over 20 species of dragonflies and damselflies.

ABC Waters: Bringing People Closer to Water

We have brought natural beauty closer to residents with the ABC Waters Programme launched in 2006 by PUB. Singapore’s drains, canals and reservoirs no longer merely perform their traditional functions of drainage, flood control and water storage, but are now also beautiful streams, rivers and lakes for all to enjoy. The ABC Waters design features are also sustainable green features that can be integrated with the urban environment to detain and treat rainwater runoff before it reaches our waterways.

By creating new community, social and recreational spaces, the ABC Waters Programme brings Singaporeans closer to water – to learn to value this precious resource of ours while enjoying it. Through the ABC Waters Learning Trails, students also use these sites for experiential learning and geographical investigations.

Over 100 potential ABC Waters projects have been identified for island-wide implementation in phases by 2030 so that more people can benefit from the programme. Of these, 24 projects have been completed and another 26 are underway.

Skyrise Greenery

Given our dense urban landscape, we need to look skywards in our quest to go greener.

In 2009, URA launched the Landscaping for Urban Spaces and High Rises (LUSH) programme. Through the provision of Gross Floor Area incentives, the programme encourages developers to provide communal green spaces at the ground and upper levels of buildings such as sky terraces and roof gardens.

More than 50% of eligible new residential developments have applied for at least one LUSH incentive in the last 2 years. More than one third of shopping centres, offices and hotels have gone greener with the assistance of these incentives.

In July 2014, URA announced LUSH 2.0. LUSH 2.0 covers a wider range of development types across Singapore. More green features, including communal ground gardens, will qualify for Gross Floor Area incentives.

We have also launched other greening schemes since the Sustainable Singapore Blueprint 2009. This includes the Skyrise Greenery Incentive Scheme which subsidises the installation costs of skyrise greenery in existing buildings. 110 buildings including companies, shopping malls and museums have benefited from the scheme. The Landscape Excellence Assessment Framework (LEAF) also recognises developments for excellence in greenery provision and management – 21 developments have been LEAF-certified so far.

Skyrise Greenery Blooms Large on Incentive Schemes



Ocean Financial Centre



Khoo Teck Puat Hospital



St Andrew's Community Hospital



Liang Seah Place

These schemes have contributed to more than 60 ha of skyrise greenery – more than 195 school fields.

Enriching our Natural Heritage

We will continue to build on, protect and reinforce our natural heritage within our urban environment.

For example, NParks introduced a Nature Ways programme to encourage the planting of biodiversity corridors in urban spaces that link to our Nature Areas. These Nature Ways provide habitats and travelling routes for birds and butterflies, as well as bring biodiversity into our living environment where people can appreciate them.

We aim to create more than 180 km of Nature Ways by 2030 – this adds to the current 8 Nature Ways totalling more than 43 km. NParks will collaborate with residents, community groups, schools and organisations to grow more plants along the Nature Ways and carry out biodiversity surveys to assess the effectiveness of planting efforts.

Expanding Communal and Recreational Spaces

Public spaces enable the community to come together and bond over common activities and experiences. We will involve residents in the design of the spaces and invite them to propose and organise their own activities. This will help create community-centric spaces and distinctive neighbourhoods.

Our new HDB estates will have generous provision of spaces for playgrounds, fitness areas and community gardens. Under the Sports Facilities Master Plan, an initiative by the Ministry of Culture, Community and Youth (MCCY), we will provide modern sports and recreational facilities within a 10-minute walk of the majority of homes.

We will also facilitate more mixed-use developments in our housing estates and regional centres to provide greater convenience to residents.

Joining Hands to Preserve Nature's Own Home



Biodiversity along Tengah Nature Way

The 13 km Tengah Nature Way connects the area between the Bukit Timah and Central Catchment Nature Reserves with the Western Catchment. These areas are rich with our native biodiversity and home to more than 840 flowering plants and over 500 animal species.

NParks has worked with the Chua Chu Kang Town Council, community groups, schools and non-governmental organisations to coordinate the planting of more than 80 species of trees and shrubs along Tengah Nature Way. We believe that this ecological corridor between the Nature Reserves and the Western Catchment will one day become home to even more birds and butterflies.

One such example is Kampung Admiralty in Woodlands. This mixed-use development includes HDB studio apartments, a medical centre, childcare and eldercare facilities, a hawker centre and commercial facilities. There is careful attention paid to the design of public spaces, including a community farm, a roof garden and a community plaza. Green features include underground bicycle storage, a Pneumatic Waste Conveyance System, bioswales, rainwater harvesting and solar panels. Kampung Admiralty is expected to be completed in 2017.



Artist's impression of Sports-in-Precinct Facility under MCCCY's Sports Facilities Master Plan

Re-Imagining Tampines – Efforts to Improve our Living Environment

The Centre for Liveable Cities in the Ministry of National Development (MND) and other agencies have been working with the people and private sectors on promoting ideas for liveability, including thoughtful design for better walking, cycling and public spaces, with an initial project at Tampines New Town. The study engages stakeholders in the process to enhance public life and public spaces by formulating strategies for active mobility, healthy living, green and blue spaces and community bonding.



Lively discussions at the Re-Imagining Tampines workshop

Hawker centres are a big part of our way of life. They offer a wide selection of affordable food that reflects our rich culinary heritage and spaces for people from all walks of life to meet and bond over meals.

To nourish this tradition, more hawker centres will be built in residential estates. The new centres will include tray-return, central washing and accessibility features. Some will be co-located with facilities such as community clubs, clinics and childcare facilities for greater convenience.

Bukit Panjang Hawker Centre Serves Up a New Experience

Located within walking distance of 2 Light Rail Transit stations, Bukit Panjang Hawker Centre is the first of a new generation of hawker centres. Its design incorporates many innovative environmental features, including an undulating roof resembling ‘a long stretch of hills’ – the literal translation of ‘Bukit Panjang’. The roof is uniquely designed to help dispel heat, smoke and odours while inviting ventilation and natural light into the space.

The hawker centre will also include green features such as a vertical green wall, a waste compactor, motion sensors in toilets and green cement for structures. A rainwater harvesting system will help with irrigation. The hawker centre is expected to open by the third quarter of 2015 and it will be managed by a social enterprise, NTUC Foodfare Co-operative Ltd. With 28 cooked food stalls, 14 market stalls and 15 lock-up stalls, it will be a vibrant centre of activity for residents who want good food and market produce at affordable prices.



Artist's impression of Bukit Panjang Hawker Centre



A Clean and Healthy Home

A clean and beautiful Singapore with blue skies, fresh air, clean and litter-free community spaces reflects our values – house-proud, considerate and environmentally conscious. Every one of us is responsible for the care and well-being of this home and this environment.

Maintaining Public Cleanliness

The Department of Public Cleanliness was established by NEA in 2012 to improve the standards of public cleanliness in Singapore by integrating public cleaning contracts for public areas, including roads, drains and parks. NEA deters littering with a firm enforcement regime, and works with its partners to cultivate values of

stewardship and graciousness, as well as to harness the energy and passion of our people to do their part to keep Singapore clean.

Striving for a Quieter Living Environment

Singapore is a compact city and we need to seek a balance between meeting residents' desire for a quiet living environment and the noise that comes from economic and community activities. Our approach involves everyone to realise a quieter living environment.

For example, commercial developments in residential areas, such as food or entertainment outlets, provide convenience for residents

Towards Higher Standards of Public Cleanliness – Integrate and Improve

Prior to April 2012, Government agencies were responsible for the cleaning of public areas under each of their responsibility. For example, PUB was responsible for the cleaning of drains, NParks for park areas and NEA for the cleaning of roads, pavements as well as certain private estates and public spaces.

In order to improve efficiency and deliver a higher standard of public cleanliness, the cleaning of public areas in Singapore underwent a major restructuring and the Department of Public Cleanliness (DPC) was formed on 1 April 2012. The DPC handles all municipal cleaning issues under the various Government agencies with a Whole-of-Government approach to ensure the cleanliness of public areas such as roads, pavements, drains, parks and vacant State lands.

Managing these integrated cleaning services can be a challenge. To raise productivity and improve service quality, the DPC developed the Integrated Public Cleanliness Management System (IPCMS). The system functions on mobile



Mr Hussain using the IPCMS

devices. It helps officers like Environmental Health Executive Mr Hussain Bin Hamid, who has been with NEA for about 40 years, to quickly retrieve information about various public areas from his tablet. Through the system, Mr Hussain can see clearly where and what needs to be inspected. He is also able to submit the results of his inspections promptly and immediately alert the service provider to rectify any cleaning lapses that he finds. This has helped in creating a cleaner environment that residents can enjoy wherever they go.

and create more vibrancy. However, these establishments may also generate noise from customers and traffic. We will continue to engage businesses near residential areas to minimise noise and show consideration for residents. At the same time, we seek residents' understanding and tolerance for noise that comes with the benefit of living in mixed-use areas.

Some residents living near MRT tracks that run above ground may have also found the rumbling of trains noisy. Efforts are underway to build more noise barriers along such tracks that run near residential areas and schools. About 20 km of noise barriers are expected to be installed by 2019 at a cost of \$300 million. These noise barriers are expected to bring railway noise levels down by 5–10 decibels.

LTA has also begun a trial to use noise barriers to reduce road traffic noise. Noise barriers have been installed at Anak Bukit Flyover and will be progressively installed along parts of West Coast Highway, Telok Blangah Drive and the new flyover along Braddell Road. LTA will monitor the effectiveness of these noise barriers before evaluating if such barriers should be installed at more locations.

Around our airports, there are also measures in place to manage noise levels. Civil aircraft operating in Singapore have to meet noise



Noise barriers near Jurong East MRT Station

standards stipulated by the International Civil Aviation Organisation. At Changi and Seletar Airports, aircraft have to adopt flight profiles designed to minimise noise disturbance.

Construction work may also affect residents. To reduce this impact, NEA passed a no-work rule on Sundays and Public Holidays for construction sites close to residential or noise-sensitive buildings in 2011. There have been fewer construction noise-related complaints since. NEA also requires that major construction projects close to residential buildings implement Noise Management Plans to address the noise impact on residents. The public sector will take the lead and require Noise Impact Assessments for major infrastructure projects and put in place the necessary measures early as we work towards a quieter living environment for everyone.



Our Liveable and Endearing Home

We have many plans and programmes to encourage people to lead a more environmentally friendly lifestyle and to make our housing estates and neighbourhoods more sustainable. However, all these can only be successful if everyone – families, businesses, individuals – plays an active role. Together, we can achieve, look forward to and be proud of a more Liveable and Endearing Home.

A vibrant and sustainable **CITY**





Exciting technologies and designs help us overcome resource constraints, make our economy greener and grow our green economy







Planning Ahead

Cities have been drivers of growth and vibrancy throughout history and they will be the organising unit of the future. A key feature of an exceptional city is its ability to make the best use of available resources to create good jobs, ensure a clean and healthy environment and improve the well-being of its residents.

We believe that Singapore has an advantage here.

As a city-state, our resource constraints – land, water, energy – have long motivated us to find better ways to plan and design our city, and to optimise the use of these resources to support our needs. Our small size necessitates that we reduce pollution to ensure excellent air quality. Although Singapore contributes less than 0.2% of global carbon emissions, we are committed to address climate change. Ahead of the outcome on international negotiations on climate change, we have embarked on policies and measures that will reduce our carbon emissions by 7% to 11% below Business-As-Usual levels in 2020.

If we make a concerted effort, Singapore can thrive as a sustainable city with a vibrant and competitive economy.

Innovative Use of Land

We pursue innovative strategies to meet the diverse needs of our population and support a vibrant economy.

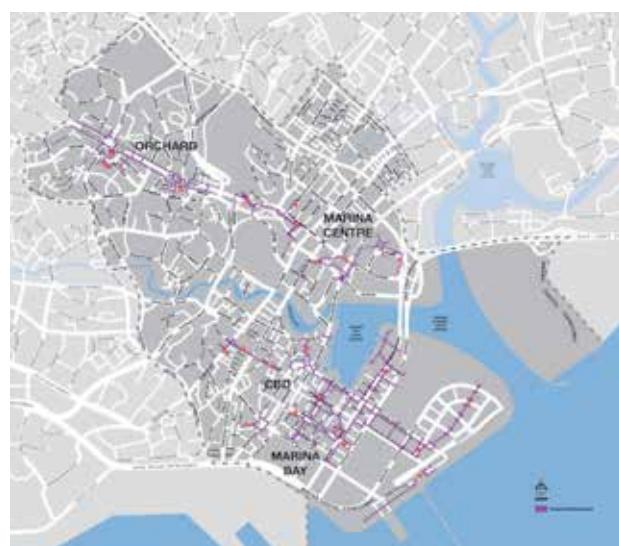
Our key strategy is to optimise land in Singapore through an integrated planning process where long-term strategies and goals are translated into short-term plans to guide development. We also co-locate complementary activities where possible, both for the convenience of users and to maximise the use of space.

We have started to decentralise jobs from the Central Business District to regional commercial centres such as Jurong Lake District, Woodlands Regional Centre and Paya Lebar, in addition to

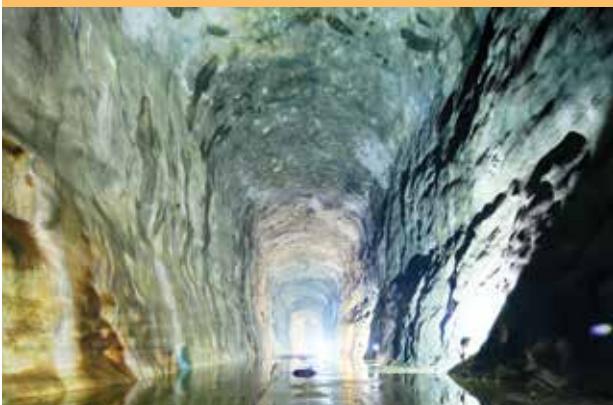
the more mature centres like Tampines Regional Centre. This brings jobs closer to homes and reduces the need for residents to travel to the city centre.

We have also started to implement plans for a North Coast Innovation Corridor that will span Woodlands Regional Centre, Sembawang, the upcoming Seletar Regional Centre to the Punggol Creative Cluster and the Learning Corridor. Industrial hubs such as Defu Industrial Park and Sungei Kadut will also be revitalised to meet current and future industrial needs.

Underground space presents yet another exciting prospect for Singapore's land needs. Much of our infrastructure today – expressways and MRT lines – are underground. We will do more to expand basement spaces for retail activities and underground pedestrian links between transport nodes and other key commercial and community facilities. Where feasible, we will also construct more underground caverns, building on our experience with the Underground Ammunition Facility and Jurong Rock Caverns. With bold imagination, careful planning and technological advancements, we can meet our needs and more.



Underground pedestrian links in the city



Beneath the Surface, Making Space for New Opportunities

Rock caverns deep underground present a unique opportunity to expand our usable space. Located 150 m underground and 130 m below the seabed, the Jurong Rock Caverns (JRC) is Southeast Asia's first commercial underground cavern for the storage of liquid hydrocarbons such as crude oil and condensate. The JRC is located beneath Jurong Island, Singapore's energy and chemicals hub, and it enhances the island's existing network of integrated infrastructure.

With this project, JTC Corporation (JTC) creates more productive economic space. By going underground, 60 ha of surface land has been freed up for other priority uses on Jurong Island.

More studies are being done on other potential uses for underground space. In addition, we are developing an underground space plan to see how practical underground plans can complement the above-ground Master Plan to make our city even more exciting and liveable.

To support further innovation, a \$135 million Land and Liveability National Innovation Challenge was launched in November 2012. It includes research on creating new space cost-effectively and optimising the use of space while maintaining liveability.

Ensuring Water for All

Adequate, sustainable and resilient – these are our aims for Singapore's water supply. Today, water demand is about 400 million gallons a day (mgd). PUB will plan ahead to meet a projected doubling of this water demand by 2060:

1 Local Catchments

Today, water catchment areas cover two-thirds of Singapore with rainwater collected in 17 reservoirs through a comprehensive network of drains, canals, rivers and stormwater collection ponds.

2 Imported Water

Water is imported from Johor, Malaysia. The bilateral water agreement will expire in 2061.

3 NEWater

NEWater helps to ensure Singapore's water sustainability by tapping on Singapore's used water network. Used water is channelled to Water Reclamation Plants (WRPs) for treatment. The treated used water is further purified at NEWater plants to make it ultra-clean and safe to drink. Today, our 4 NEWater factories are able to produce more than 100 mgd of water, mainly for process and cooling use by the non-domestic sector. A fifth plant, at Changi, will be completed by 2016. By 2060, PUB plans for NEWater to meet up to 55% of projected water demand, up from the current 30%.

4 Desalination

Singapore can now produce up to 100 mgd of water daily between our 2 desalination plants. By 2060, PUB plans to meet up to 25% of Singapore's water demand through desalination.

PUB is enhancing the used water sewer network. It has started the second phase of the Deep Tunnel Sewerage System (DTSS) – an underground sewerage superhighway that channels used water from sewers to centralised WRPs. Phase 1 of the DTSS was completed in 2008. By 2024, Phase 2 will extend the existing system to western Singapore with a 30 km-long South Tunnel linked to 70 km of sewers. A new Tuas WRP will be built and existing facilities will be progressively phased out to free up land for other developments.

In the Pipeline, Better Water Management with Real-Time Data

PUB is working with industry partners to develop a Smart Water Grid to monitor water quality and pressure and to detect pipe leaks quickly when they happen. Sensors throughout the water supply network will be able to collect real-time data that can then be used for modelling and analysis to improve PUB's water supply operations to ensure that Singaporeans and businesses have reliable access to clean water as and when they need it.



Building Phase 2 of the Deep Tunnel Sewerage System



Liquefied Natural Gas (LNG) Terminal on Jurong Island

Secure, Competitive, Sustainable Energy

Our pioneers made a strategic decision in our early development years not to go the way of many other industrialised nations to power our country with the use of dirty coal. This way, Singaporeans can enjoy clean and healthy air even as we develop our economy and meet the needs of a growing population.

This approach has laid the foundation for our energy choices today where more than 90% of Singapore's electricity is generated using natural gas – the cleanest fossil fuel. While we previously relied on piped natural gas, our Liquefied Natural Gas (LNG) Terminal on Jurong Island, which began operations in 2013, has since allowed us to diversify our sources of natural gas.

To further support Singapore's growing energy needs, we plan to expand the LNG Terminal's current capacity of 6 million tonnes per annum (mtpa) to around 11 mtpa through the addition of a fourth storage tank and regasification facilities by 2018. We are also looking at building a second LNG terminal.

We will continue to explore all energy options to meet our growing needs in a secure, competitive and sustainable manner. We are also exploring and facilitating the deployment of renewable energy, in particular solar energy.

Singapore is alternative-energy disadvantaged. Renewable sources prominent in other countries such as hydroelectric, geothermal, and wind energy, cannot be harnessed effectively in Singapore due to our geographical circumstances – generally flat, a small land area and low wind speeds.

Among the options, solar energy is the most feasible in our tropical location. Solar energy is clean and does not require any fuel imports. However, given our small size and dense urban landscape, it is still challenging. We will, nonetheless, continue to take proactive steps to support solar deployment in Singapore, including making regulatory enhancements and piloting innovative business models.

Here Comes the Sun! Fuelling Demand for Solar Energy

With solar energy becoming more cost-competitive, we plan to raise the adoption of solar power in our system to 350 megawatt peak (MWp) by 2020.

Through the SolarNova Programme led by EDB, the public sector intends to provide lead demand in solar energy so as to build industry capacity in this sector.

HDB has been identified as the central procurement agency for solar energy for the Government, and will also be a key adopting agency with plans to roll out 220 MWp of solar panels across 5,500 HDB blocks from 2014. We are exploring the feasibility of deploying floating solar panels on reservoirs with PUB and EDB currently conducting a pilot project at Tengeh Reservoir.

SolarNova will create new opportunities for Singapore-based companies and grow our solar industry capabilities. As potential adopters become more familiar with solar projects, we expect further growth of solar energy adoption in the private sector.



Managing Waste, Recovering Resources

In 2013, Singapore generated more than 7.85 million tonnes of waste – enough to fill 14,950 Olympic-sized swimming pools.

While about 60% of waste generated is recycled, our 4 Waste-to-Energy (WTE) plants still incinerate 7,740 tonnes of waste per day. In the process, these plants contribute about 2–3% of the electricity generated in Singapore. To provide capacity for the future, NEA will build a fifth plant by 2018 which will provide an additional capacity of 2,400 tonnes per day. Beyond this, plans for a bigger and more technologically-advanced Integrated Waste Management Facility are being developed to cater to our needs beyond 2020.

The ash from incineration and non-incinerable waste (such as chemical waste) is disposed of at our offshore Semakau Landfill which will provide for our disposal needs up to 2035.

We will continue to promote recycling to give waste materials another lease of life. This waste-to-resource strategy ensures that we do not constrain our development by using up our precious resources and instead get the most out of what these resources offer. Our recycling industries, currently located at Sarimbun, Tuas, Jurong and Sungei Kadut, extract valuable materials from waste for use as raw materials for new products. NEA, JTC and URA are currently studying the feasibility of a Multi-Storey Recycling Facility to recycle more waste with a smaller land footprint.

NEA also intends to extract more value from our waste, such as metals and incineration bottom ash, through different means. Besides recovering metals through magnetic separators at the WTE plants, a dedicated metals recovery facility is expected to begin operations in 2015. NEA will be exploring innovative uses for incineration bottom ash, recycling and treating it for road surfacing, construction material and land reclamation.



Semakau Landfill: Singapore's first offshore and only existing landfill

No Resource Left Behind: Integrating Water and Waste Management

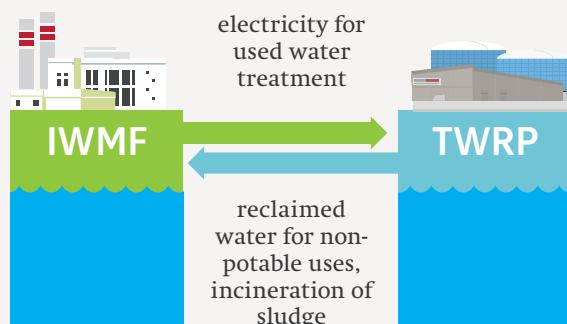
The treatment of used water and the treatment of municipal solid waste have traditionally been independent processes. Used water is channelled to water reclamation plants,

recyclables to recycling plants, and waste to WTE plants.

Now, Singapore is co-locating its upcoming Integrated Waste Management Facility (IWMF) with the Tuas Water Reclamation Plant (TWRP) to optimise land use and realise process synergies in the water-energy-waste nexus.

Situated in Tuas, both the IWMF and the TWRP are expected to be completed by 2024. These plants will support the provision of essential services for Singapore far into the future.

Potential process synergies





Greening our Economy

Plans for economic growth must take into account the limited resources and physical space in Singapore. This will enable us to pursue a sustainable and competitive economy over the long term to support the well-being of future generations of Singaporeans. We will work with local businesses to create an ecosystem of supporting infrastructure and policies to reduce resource consumption, carbon emissions and waste generated from our industries.

Conserving Energy and Water

Resources cost money and resource extraction creates ecosystem pressures. Being more resource-efficient not only increases energy and water sustainability, but makes business sense as it improves the competitiveness of companies based in Singapore.

Water consumption in the non-domestic water sector currently accounts for 55% of total water use and is expected to increase to 70% in 2060. Even as we build up our sources and supply of water, managing non-domestic water demand is a crucial part of the equation to secure Singapore's water future.

In addition, greater energy efficiency will help mitigate global climate change, enhance our energy resilience and improve companies' bottom lines.

We have developed a suite of initiatives and programmes to help businesses conserve energy and water.

Practices



Typically, a company can expect to reduce its energy consumption by at least 10–15% during the first years of implementing energy management practices.

Since April 2013, over 165 energy-intensive companies in the industry sector have been required under the Energy Conservation Act (ECA) to implement energy management practices. These requirements are intended to help businesses focus their attention and action on energy management. Under the ECA, companies have to submit energy-use reports and energy efficiency improvement plans to NEA.

The first round of submissions was completed on 30 June 2014. The data will inform efforts to help companies improve energy efficiency.



As at June 2014, more than 370 companies have submitted Water Efficiency Management Plans (WEMPs), a voluntary initiative to help companies improve their water efficiency. The WEMPs

help PUB to better understand the consumption characteristics of specific industries and companies. PUB can then use this information to set policies and propose water-saving measures for companies.

From 2015, it will be mandatory for all large water users to submit annual WEMPs so that more can reap its benefits.² Large water users will also be required to install private meters to measure and monitor water consumption at key water usage areas.

² Large water users refer to those which meet the water consumption threshold of at least 60,000m³ in the preceding calendar year.

Awareness

The Energy Efficiency National Partnership (EENP) Programme is a voluntary programme to help companies learn and share best practices.

Since the programme's commencement, more than 200 companies have signed on as EENP Partners, and 56 EENP Awards have been given to companies, energy managers and public buildings that have demonstrated excellent energy management practices and results.

To help small and medium-sized enterprises (SMEs) optimise the use of energy, SPRING Singapore has also developed the SME Energy Efficiency Initiative.

The initiative will assist SMEs in improving their energy efficiency through raising awareness and providing grant support for energy audits, energy efficiency projects and implementation of energy monitoring solutions.



The 10% Water Challenge was launched by PUB to raise awareness and enhance the capabilities of companies and organisations in improving their water efficiency.

Capabilities

The Singapore Certified Energy Manager (SCEM) programme equips facilities personnel with the knowledge and skills to help them manage energy use of their buildings and operations. SCEM training grants have been awarded to more than 1,200 candidates.



PUB's Water Efficiency Manager Course equips facilities personnel with skills to improve water-efficiency. More than 500 participants have been certified to date.

Incentives

Several schemes have been put in place to encourage businesses to make energy-efficient choices throughout the whole value chain of their planning and operations.

The Design for Efficiency Scheme (DfE) supports companies investing in new facilities or facility expansion projects to identify and integrate energy and resource efficiency improvements at the upstream design stage.

The Energy Efficiency Improvement Assistance Scheme (EASe) helps companies carry out detailed energy audits of their current operations. So far, 282 companies have benefited from the scheme and about \$125 million in annual savings have been identified.

The Grant for Energy Efficient Technologies (GREET) helps owners and operators of industrial facilities to offset part of the cost of investing in energy-efficient technologies or equipment. Grants have been awarded for 57 projects and these projects are expected to yield total lifetime energy savings of \$712 million.

As part of SPRING Singapore's SME Energy Efficiency Initiative, the Innovation & Capability Voucher provides funds for SMEs to conduct energy audits of their operations and identify areas for improvement. IDA's iSPRINT also allows SMEs to install energy monitoring systems to monitor and better manage their energy consumption.



The Water Efficiency Fund (WEF) under PUB supports users in the non-domestic sector to implement water efficiency projects such as feasibility studies, water audits, water recycling, the use of alternative sources of water such as seawater, and even community-wide water conservation campaigns. More than 70 projects have been granted funding under the WEF.



SPRING Singapore has put in place initiatives to help SMEs build green capabilities and reduce costs and wastage through process improvements. SMEs keen to adopt green standards can tap on the Capability Development Grant which helps defray qualifying project costs required to meet the following standards:

- ISO 14064** Greenhouse Gas Management
- ISO 14001** Environmental Management Systems
- SS 587** End of Life ICT Management Systems
- ISO 50001** Energy Management Systems
- SS 577:2012** Water Efficiency Management Systems

Saving Energy and Water in Wafer Fabrication Plants

The wafer fabrication industry is a high-value segment of Singapore's electronics manufacturing sector. Many wafer fabrication plants have joined in conservation efforts, saving costs while saving energy and water.

GlobalFoundries Singapore Pte Ltd is a company that enjoys annual energy savings of \$7.5 million as a result of retrofitting two of its chiller plants. With a focus on energy efficiency improvements led by a cross-functional energy management team, GlobalFoundries also won an Energy Efficiency National Partnership Award for Excellence in Energy Management in 2013.

In 2013, semiconductor and electronics firms took up about 22.5% of Singapore's total non-domestic water demand. The Systems on Silicon Manufacturing Co. (SSMC) has been relentless in its water conservation efforts, optimising water use in its processes and commissioning a wastewater recycling plant. SSMC's many initiatives have helped it to recycle 68% of its used water and save 1 billion litres of water yearly. In recognition of its efforts, SSMC won PUB's Watermark Award in 2013.



Employees at SSMC

Green Ideas for Waste Reduction

We have a bold vision for Singapore's waste management system – 'Towards Zero Waste'. Through the 3Rs – Reduce, Reuse and Recycle – we believe that we can work towards achieving a Singapore where no food or material is wasted and is reused and recycled where possible. This will both extend the use of our precious resources and the lifespan of Semakau Landfill. With collective effort, wise planning and technology breakthroughs, this ambitious vision can be within reach.

Companies – with a head for business and a heart for the environment – are an important partner in this effort.

Singapore Packaging Agreement

The voluntary Singapore Packaging Agreement (SPA) is an important part of our efforts to reduce packaging waste which amounts to about one third of Singapore's domestic waste by weight.

The SPA has more than 140 signatories including industry associations, companies, non-governmental organisations and waste management companies. Since the launch of the first SPA in 2007, the signatories have cumulatively reduced about 20,000 tonnes of packaging waste and saved more than \$44 million in material costs of locally-consumed products.



3R Packaging Awards 2014 winners

Mandatory Waste Reporting for Large Commercial Premises

Large commercial premises generally provide recycling bins but their recycling rates remain low. In many large hotels, the recycling rate is estimated to be less than 10%.

Since April 2014, NEA has made it mandatory for large commercial premises to report waste data and submit waste reduction plans. As with the ECA and the WEMP, mandatory waste reporting focuses building owners' and managers' attention on the potential for improvements in waste management processes and encourages them to take action. NEA also works closely with companies to design waste management programmes that suit their operating environment.



3R Fund

The 3R Fund supports waste reduction and recycling projects with a focus on waste streams with low recycling rates such as food, plastic and glass. It has co-funded many successful projects including recycling programmes at Shangri-La Hotel Singapore, City Square Mall and NUS. Its 20 ongoing projects are expected to reduce, reuse and recycle 25,000 tonnes of waste on an annual basis.

Food Waste Recycling Initiatives

NEA estimates that about 10% of all waste generated is food waste and that less than 15% of food waste is recycled. To supplement existing efforts to reduce and recycle food waste, the 3R Fund is co-funding trials on in-situ food waste treatment at premises such as hotels and shopping malls. NEA is also exploring the feasibility of such treatment at hawker centres.

National Voluntary Partnership Programme for Recycling E-waste

NEA is considering a national voluntary partnership programme for recycling all electrical and electronic equipment including ICT equipment, home appliances and consumer electronics. There will also be initiatives to raise awareness and promote e-waste recycling habits.



Recycling e-waste



In-situ food waste recycling at Marina Bay Sands



Redefining Our City through Greener Construction and Buildings

Part of a city's identity comes from the character of its buildings. These building blocks of our city offer possibilities to improve our environment while reducing our resource impact and growing our capabilities in green buildings and construction.

Greening Our City Skyline

Greening our buildings is one of the most effective ways for a city to reduce its overall carbon footprint in terms of energy and water efficiency, waste reduction and the use of sustainable materials. In 2005, the Building and Construction Authority (BCA) launched the BCA Green Mark scheme, a rating system (Certified, Gold, Gold^{Plus} and Platinum) designed specifically for buildings in the tropics, to evaluate a

building's environmental impact and recognise its sustainability performance.

Today, our buildings are designed from the start to save energy and water, and owners and tenants work together to be greener. Our target is for 80% of buildings in Singapore to achieve the standards of Green Mark by 2030, up from about 25% today.

BCA launched the third Green Building Masterplan in 2014. The new Masterplan maps out a holistic strategy to accelerate the “greening” of existing buildings and encourage building owners, managers and occupants to play a greater role in our green building movement. Under this, we will also train 20,000 specialists in the green building sector by 2020, up from about 5,000 today.

Going Platinum at Pickering

Located at the gateway to Singapore's Central Business District, PARKROYAL on Pickering and the adjoining One Upper Pickering received the BCA Green Mark Platinum rating in 2012. The joint hotel and office development was also a recipient of the Solar Pioneer Award for using solar-powered landscape lighting in its sky gardens.

PARKROYAL on Pickering's sustainability features are designed to help save more than 3,000 MWh in energy – which can serve around 650 4-room HDB households – and almost 7 million litres of water each year. Sky gardens and lush landscaping make up more than 2 times the plot size. Its energy-saving features include the extensive use of LEDs and the installation of photovoltaic cells on its building roof to harness solar energy. On-site rainwater harvesting also provides water to sustain the plants in the building. To encourage recycling, hotel guests at PARKROYAL on Pickering enjoy the convenience of dual refuse and recycling bins in their rooms.



PARKROYAL on Pickering and its office tenant, the Attorney-General's Chambers, have signed a lease where they commit to BCA Green Mark Platinum standards regarding energy and chilled water consumption.

Three major initiatives of the third Green Building Masterplan are a \$52 million fund for the Green Buildings Innovation Cluster, a \$50 million Green Mark Incentive Scheme for Existing Buildings and Premises, and a new award – the Green Mark Pearl Award – to recognise developers and building owners who have actively engaged their tenants to collectively reduce energy consumption.

There is a growing demand for green buildings in many cities around the world as more come to understand its role in the sustainability of their cities. Singapore's expertise in green building capabilities is also shared with others through our involvement in international projects such as the BCA Centre for Sustainable Buildings – a collaboration between BCA and the United Nations Environment Programme. Training programmes on sustainable buildings have been organised to raise awareness on best practices in energy efficiency and reducing greenhouse gas emissions.

Building Water Efficiency

PUB's Water Efficient Building (WEB) certification focuses on the water usage of individual buildings. It encourages non-domestic buildings such as those run by businesses, industries and schools to put in place water-efficient measures on their premises.

A building can be accorded the WEB (Basic) Certification when it installs water-efficient fittings or adopts water-efficient flow rates or flush volumes which can save about 5% of its monthly water consumption. To recognise water users who are exemplary performers in water efficiency and who adopt the water efficiency management system, WEB (Gold) and WEB (Silver) tiers were introduced in 2013.



Lifestyle Destination Sets a Green and Gold Standard

Despite being three decades old, Parkway Parade – a popular suburban shopping centre – has managed to put in place a host of water efficiency measures including the use of water fittings with the maximum “3-tick” water efficiency rating. The mall also uses rainwater for irrigation and toilet flushing. This saves up to 28% of the mall’s water consumption.

Private water meters have been installed at key water usage areas with daily monitoring of water consumption at these points. Parkway Parade is also planning to extend its drip irrigation system to more landscape areas and to implement the reuse of condensate from its Air Handling Units for non-potable use. Parkway Parade was awarded the Green Mark Platinum Award in 2010, and the WEB (Gold) Certification in 2014 in recognition of its efforts for water sustainability.

Since the launch of the WEB (Basic) Certification in 2004, more than 2,600 buildings have been certified, including a range of schools and institutions, manufacturing and industrial buildings, and Government and commercial offices. 40 premises have also been certified WEB (Silver) and 11 premises WEB (Gold). We hope to encourage more to step forward and participate in this scheme.

Greener and More Gracious Construction

A sustainable built environment is more than just green buildings. It also nurtures a culture of green builders. In 2009, BCA launched the voluntary Green and Gracious Builder Scheme to recognise builders who address environmental issues and the public's concerns arising from construction works.

To improve the living environment, BCA encourages builders to reduce disamenities that may arise during construction, such as noise, dust and accessibility issues. Builders are also encouraged to practise green habits such as recycling construction materials and reducing energy use. These efforts are recognised by the Green and Gracious Builder Award.

BCA also works with the Singapore Contractors Association Limited and other builders to regularly review the criteria for the schemes.



Noise barriers being used in an LTA construction project

In April 2014, the Green and Gracious Builder Scheme was extended to small- and medium-sized construction firms. BCA's \$15 million Sustainable Construction Capability Development Fund co-funds companies' efforts to adopt sustainable construction methods and materials.

To date, 104 builders have been recognised under the Green and Gracious Builder Scheme. BCA aims to certify 400 builders by 2016.

In February 2014, NEA launched a \$10 million Quieter Construction Fund. This fund encourages construction companies to deploy noise mitigation measures including quieter construction machines or noise control equipment by defraying the costs incurred. In the longer term, such noise mitigation measures will help raise construction standards, lower the cost of putting in place noise mitigation measures, and develop local expertise on innovative noise control equipment. As a result, residents can also enjoy a quieter, restful living environment.

Building the Future of Young Minds, and Green Awareness Too

Guan Ho Construction Co. Pte. Ltd. contributes to the education of future generations. Its projects include the upgrading of many primary schools, including Fengshan, Gan Eng Seng, Townsville, Telok Kurau, Temasek and White Sands. Guan Ho Construction's green mindset is evident in the way they carry out these projects. In the building process, Guan Ho Construction implements extensive noise barriers, uses recycled materials widely, and installs an Erosion Control Blanket to reduce noise and dust. For its efforts, the company was awarded BCA's Green and Gracious Star Award in 2014.



Greener Vehicles

For Singapore to be a truly sustainable city, we need green vehicles that move people and goods across our city in a sustainable way. Vehicles emit pollutants and carbon that dirty our air and contribute to climate change. Vehicles also add to ground-level ozone that is produced when complex chemical reactions involving vehicular emissions of hydrocarbons, nitric oxide and nitrogen dioxide take place. Our vision for greener transport involves reducing our environmental impact and encouraging more fuel-efficient alternatives. These efforts go towards ensuring a greener, healthier and more pleasant city for Singaporeans and visitors alike.

Regulations and Standards

To achieve a cleaner and greener vehicle fleet in Singapore, NEA has implemented new or higher emissions standards for vehicles in recent years and will continue to raise these standards over time.

Type of vehicle	Current standard	Date
Diesel vehicles	Euro V	1 Jan 2014
Petrol vehicles	Euro IV	1 Apr 2014
Motorcycles and scooters	Euro III	1 Oct 2014
Off-road diesel vehicles ³	US Tier 2 / Japan Tier 1 / EU Stage II	1 Jul 2012

To further reduce our vehicles' environmental impact, NEA will introduce new regulations on the composition of petrol and diesel fuel supplied in Singapore from 2017. LTA and NEA also have a range of strategies to green our vehicles.

Incentive Schemes

In 2013, LTA and NEA implemented an Early Turnover Scheme (ETS). The scheme encourages owners of older and more pollutive pre-Euro



Vehicles on Singapore's roads

and Euro I diesel vehicles with Category C Certificates of Entitlement to upgrade to newer Euro V-compliant vehicles instead. More than 4,000 diesel vehicles have taken up the ETS since its introduction.

The Carbon Emissions-based Vehicle Scheme was also introduced in 2013. Cars with low carbon emissions are given a rebate on vehicle ownership taxes while cars with high emissions incur a surcharge in vehicle registration fees.

Information

To help consumers make better decisions, LTA administers the Fuel Economy Labelling Scheme for cars and light goods vehicles. This makes it easier for consumers to choose greener vehicles and save on fuel costs at the same time – a win-win for drivers and the environment.

New Technologies

We will also pilot even cleaner technologies. With sponsorship from Volvo, SBS Transit and Volvo will conduct a one-year trial to test the performance of a diesel hybrid bus under our local conditions. If successful, we may see more environmentally friendly public transport on our roads.

³ Examples include construction equipment such as cranes, excavators, forklifts and power generators.



Greener Shipping

Singapore is a major hub port, a flag state, an International Maritime Centre and also a littoral state of a busy waterway. Thus, we need to ensure that shipping and its related activities grow in an environmentally-responsible and sustainable manner.

The Maritime and Port Authority of Singapore (MPA) is committed to this development path for our shipping industry. In 2011, it pledged to invest up to \$100 million in the Maritime Singapore Green Initiative. There are 3 parts to this initiative.

The Green Ship Programme incentivises owners of Singapore-flagged ships to adopt energy-efficient ship designs or approved sulphur oxides scrubber technologies that exceed the International Maritime Organization's requirements. Depending on the design of their ships, owners can enjoy reductions on their initial registration fees and rebates on their annual tonnage taxes. More than 170 Singapore-flagged ships have qualified under the Green Ship Programme.

The Green Port Programme encourages ocean-going ships calling at the Port of Singapore to reduce the emissions of pollutants. Under the Green Port Programme, ocean-going ships that burn clean fuels or use approved abatement technology enjoy lower port dues. More than 2,600 vessel calls have enjoyed such concessions under this programme.

The Green Technology Programme encourages local maritime companies to develop and adopt green technologies. The programme provides grants to co-fund up to 50% of total qualifying costs to develop and adopt green technological solutions or systems. About 15 companies and 50 Singapore-flagged ships have participated in the Green Technology Programme.

Our shipping companies are also stepping up. As of December 2013, about 60 companies have signed the Maritime Singapore Green Pledge to affirm their commitment to clean and green shipping in Singapore.



Ships berthing at the Port of Singapore



Greener Industries

Singapore's story of export-oriented industrialisation growth has made us one of the world's major commercial hubs. Our manufacturing industries are an important part of our diversified economy and generate about 20% of Singapore's GDP. It is imperative that we implement strategies that ensure that our industries use resources sustainably and contribute to the well-being of Singaporeans by adopting responsible environmental practices.

Greener Practices Protect Our Air Quality
We have made active efforts to reduce pollution and ensure a clean and green living environment. In 2013, refineries and power stations accounted for 97% of Sulphur Dioxide emissions and 36% of Particulate Matter (PM) emissions. There are policies and programmes to manage air pollution from the industry.



ExxonMobil's Singapore hydrotreater helps produce ultra-low sulphur diesel and contributes to lower vehicle emissions

NEA imposes strict regulations and provides guidelines through the Code of Practice on Pollution Control.⁴ Industries that are potentially pollutive are required to install pollution control equipment to meet our emissions regulations. The emissions limits are regularly reviewed and benchmarked against international standards.

NEA has implemented a real-time emissions monitoring system and is progressively

connecting companies to the system. This gives NEA timely data to intervene and support companies to rectify any pollutive emissions that are of concern. It also allows NEA to take to task errant companies which flout rules without regard for public health.

To achieve Singapore's 2020 air quality targets, we must do more to reduce industrial emissions. NEA is working with agencies such as EDB and the Energy Market Authority (EMA) to help the industrial and power generation sectors improve their processes and decrease their emissions of pollutants. We are encouraged that many of these companies also share our vision of clean and fresh air for Singapore.

Greener Industrial Estates Pave the Way

A sustainable industrial sector must be supported by sustainable industrial infrastructure.

With its Environmental Sustainability Framework, JTC aims to implement smart and sustainable solutions in its industrial estates and developments, and overcome issues such as environmental and land-use challenges through innovation. Sustainable planning systems such as climatic mapping and automatic carbon tools are used in existing and future industrial developments such as one-north and CleanTech Park. JTC aims to green its current estimated Gross Floor Area of 1.3 million square metres of industrial space by 2018. This will help create a greener environment and let tenants benefit from improved energy and water efficiencies.

JTC continues to foster open innovation through partnerships. In June 2014, JTC launched an Industrial Infrastructure Innovations Partnership Programme to test-bed sustainable solutions in its developments. It will set aside \$2.5 million per year for this programme.

⁴ These address not just air pollution, but also water pollution, noise pollution and the handling of hazardous substances.

Nature Unfolds in an Industrial Park



Jurong Eco-Garden, the central green lung of CleanTech Park, provides 5 ha of green space to tenants within CleanTech Park and residents staying in neighbouring estates. Jurong Eco-Garden features unique habitats such as a butterfly garden and a freshwater swamp forest. Its varied landscape with walking paths and trails provides a rustic park environment for visitors, who may enjoy green surrounds and discover Jurong's ecological heritage at first hand.

During the development of the Jurong Eco-Garden, JTC made great efforts to conserve the

natural environment and biodiversity of the area. The undulating topography was retained as were original waterbodies like the streams, swales and ponds that help to create a freshwater swamp forest habitat. This design – a first among industrial parks in Singapore – will enable 65% of stormwater runoff to be retained and reused for non-potable purposes within CleanTech Park. In constructing the Eco-Garden, JTC also reused felled wood from the project for signage and park furniture, and incorporated materials from its other innovative developments, such as excavated rocks from the Jurong Rock Caverns.

Doing More to Make Industries Greener

We must build on existing efforts to further green our industries. We aim for Singapore to be an international benchmark where companies are recognised for their best-in-class sustainability practices. Beyond existing programmes that help industries to improve their practices, EDB and NEA will put a special focus on working with individual companies that have resource-intensive operations. This will require partnerships among plant owners, design consultants, and engineering, procurement and construction companies.

We are also reviewing existing incentive schemes on water, energy and waste to help companies improve their resource footprint and environmental sustainability.

To further improve the environmental footprint of our industries, we will pilot improvements to environmental impact studies for selected developments. Currently, as part of their building clearance processes, certain industrial developments have to undertake a Pollution Control Study to address their pollution impact, or a Quantitative Risk Assessment Study to assess hazards and risks associated with their use or storage of hazardous chemicals, or both. Building on these, pilot studies for selected industrial developments will help determine how our environmental assessment processes can be pragmatically improved to help companies address the potential environmental impact of their operations early on and save them costs over the longer run.

Building a Factory of the Future

GlaxoSmithKline (GSK) began an energy conservation programme in 2003 and now has a comprehensive sustainability strategy which prepares GSK to be future-ready. Its initiatives include a tri-generation plant at GSK's vaccines plant in Tuas where a gas engine generates 1.8 MWh of electricity while its waste heat is used to generate hot water, 1.17 t/h of steam and run an absorption chiller. This project provides GSK with annual energy savings of 8,800 MWh.

GSK is now working with EDB to pioneer sustainable processes and green technologies in a "Factory of the Future". Once completed, it will be replicated globally by GSK in its other factories.



GlaxoSmithKline's manufacturing facility in Singapore

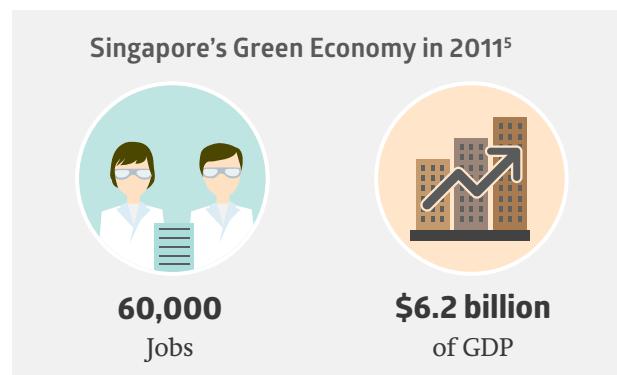


Building Momentum for Green Growth

A greener economy creates new economic opportunities for Singapore. Private sector companies, non-profit organisations, and Government-funded research centres can contribute to both environmental sustainability and economic growth. In particular, green technologies and solutions that are developed in Singapore can drive growth and exports.

Singaporeans who have a passion for the environment can also look forward to exciting jobs in this sphere and be part of pioneering efforts that will eventually transform cities around the world into sustainable, highly-liveable places.

Growing the Green Economy



We will continue to grow our strong base of green companies to realise these green growth opportunities. They will be supported by Singapore's research and development (R&D) capabilities and talent, opportunities for piloting in Singapore's Living Labs, and our good business environment.



REC's solar production facility in Tuas

Water Industry

Our vibrant water industry ecosystem has about 150 companies and 26 research centres. Many have strong capabilities and solutions in growth segments such as wastewater treatment and industrial water which are in high demand by cities worldwide.

Energy and Carbon Industry

Solar, bio-renewable, smart grids and energy service providers are some of the diverse companies that make up Singapore's energy and carbon industry.

Making a Splash, at Home and Abroad



Dr Adrian Yeo is General Manager at Membrane Instruments and Technology Pte Ltd. (MINT), a company he set up to commercialise a Membrane Integrity

Sensor developed at Nanyang Technological University to monitor the health of water treatment plants. Dr Yeo is also Director at De.Mem Pte Ltd. which builds and operates decentralised water treatment facilities throughout Southeast Asia.

Over the years, Dr Yeo has worked with students to bring clean water to over 100,000 people living in water-scarce parts of Indonesia, Myanmar and Cambodia. In recognition of his contributions, he received PUB's Watermark Award and has also been honoured with the Nanyang Award for Humanity (Individual).

⁵ This included activities related to improved energy and water efficiency, pollution and waste reduction and removal, de-carbonisation of the economy and natural resource conservation and management.

Corporate Sustainability Teams

Many companies such as CDL, Ikea, DHL and YTL Corporation have established global or regional sustainability teams in Singapore to develop and drive their sustainability strategies.

Sustainable Service Providers

About 135 international organisations in Singapore provide advisory services such as sustainable sourcing and reporting, environmental footprint measurement and reduction, and standards setting.

Many business consultancies have desks that provide services in sustainability strategy and reporting. An example is McKinsey's Capability Center Green Campus set up in Singapore as its first model factory worldwide for training in green operations transformation capabilities.

Raising Standards and Productivity

NEA is also working to raise productivity and standards in more labour-intensive industries that provide environmental services, so that businesses can moderate their costs where labour and material resources are increasingly limited and could become more expensive, yet deliver high standards of service that help keep Singapore clean and green.

Cleaning Industry

Since 1 September 2014, licences have been required for all general cleaning businesses. This ensures better training and employment conditions for cleaners, including a Progressive Wage Model to mandate better wages in tandem with higher productivity.

Waste Management Industry

NEA has also been working with partners in the waste management industry to develop a pipeline of initiatives to improve their productivity. This includes technology innovation and adoption, a training roadmap to help their employees be more effective in their work, and new Singapore Standards for the industry.



A cleaner using the 'Billy Goat' vacuum sweeper

Waste management industry



500
companies



12,000
workers

Cleaning industry



1,001
companies



52,000
cleaners

Shaping the Future with Green Research

We want to establish Singapore as the place to develop, test and deploy smart and sustainable urban solutions, and be the launchpad for these solutions to the region and beyond. The collective efforts of our research institutions and companies are part of this long-term vision. To do so, we strive to build a viable pool of local research capabilities that are suitable for deployment and commercialisation, both locally and globally.

Clean Water

Since 2006, the National Research Foundation (NRF) has committed \$470 million to discover innovative water solutions for Singapore and catalyse the development of the water industry. This sum is administered by the Environment & Water Industry Programme Office, a multi-agency platform led by PUB, which includes agencies such as EDB, SPRING Singapore and International Enterprise Singapore. Several technology and manpower development programmes have been established by this platform, including the \$185 million Incentive for Research and Innovation Scheme which supports basic and applied research in areas such as seawater desalination and membrane efficiency.

Today, Singapore is recognised as a global leader in water R&D. Research institutes at our local universities (the National University of Singapore and the Nanyang Technological University) ranked first and second respectively in Lux Research's recent ranking of top global universities in water research. There are currently 26 water R&D centres in Singapore, up from only 5 in 2006.

Energy

The Energy Strategic Research Programme is jointly led by EDB and EMA with plans to grow the clean energy sector in Singapore. In 2011, NRF committed \$195 million to this area, of

which \$140 million has been allocated to the Energy Innovation Research Programme. Key research institutes – including the Solar Energy Research Institute of Singapore (SERIS) in the National University of Singapore and Energy Research Institute @ NTU (ERI@N) in the Nanyang Technological University – have also been established and are actively carrying out research in this field.

Another exciting initiative we have undertaken is the \$300 million National Innovation Challenge on Energy Resilience for Sustainable Growth. Led by NRF, it was launched in 2011 to develop cost-competitive solutions that can be deployed within 20 years, to improve energy efficiency, reduce carbon emissions and increase energy options for Singapore.

Green Buildings Innovation Cluster

An integrated research, development and demonstration hub, the Green Buildings Innovation Cluster will provide platforms to demonstrate promising building solutions and build capabilities in energy efficiency. BCA will also set up a National Building Energy Efficiency Repository to collect and analyse data which can, among other things, be used to verify the performance of energy-efficient demonstration projects.

EDB has launched the Pre-Project Innovation Consortium initiative, the first of its kind in the building industry worldwide. This brings players from different parts of the building industry ecosystem together to innovate during the early stages of a project, and integrate innovative products and systems into the design for even greener buildings.



Solar Energy Research Institute of Singapore

Zero Energy, Boundless Opportunities

Originally a three-storey workshop on BCA Academy grounds, the Zero Energy Building (ZEB) is Southeast Asia's first net zero-energy building. A wellspring of green technologies, it houses classrooms, offices, a library, a multi-purpose hall and a visitor centre.

ZEB serves as a test-bed for innovative and energy-efficient building designs. Its technologies have potential applications for buildings that are striving to achieve Green Mark certification. ZEB also serves as an educational hub for the study of energy efficiency and green buildings.



During more than four years of its operation, ZEB has accumulated a net surplus of more than 55 MWh of electricity. This innovative development has won accolades locally and internationally.

Beyond individual buildings, the ERI@N is working with EDB and NEA to implement a microgrid integrating an entire suite of renewable energy technologies – solar, wind, and marine – on Semakau Landfill. With the use of energy storage technologies to help manage fluctuations in energy supply, the Renewable Energy Integration Demonstrator – Singapore aims to turn Semakau Landfill into a zero-energy island where all electricity is provided by renewable sources at Semakau itself. This Living Lab will build up capabilities in integrating multiple energy sources and also develop viable green energy solutions for off-grid communities in the Southeast Asian region.

Clean Environment

NEA's \$27 million Environment Technology Research Programme funds applied research in waste management. Its scope will be expanded to include research in areas such as pollution control and public health. NEA also manages a \$16 million Innovation for Environmental Sustainability fund for companies seeking to test-bed technologies

related to energy efficiency, environmental protection and public health. In August 2014, \$25 million was also allocated under NRF's Energy National Innovation Challenge for research, development and demonstration in enhancing energy and resource recovery from municipal solid waste.



Living Labs

Singapore is a Living Lab where companies can work closely with Government agencies to develop, test and commercialise sustainable urban solutions. Several major zones in Singapore across residential, commercial, industrial, research and educational uses have been designated as experimental locations where companies are able to push the boundaries of innovation and technology. A major advantage we have is our expertise in developing systems-level solutions that involve close collaboration among companies and Government agencies.

Jurong Lake District

The 360 ha Jurong Lake District (JLD) is being developed as a new mixed-use growth area and will be developed as a unique and sustainable lakeside destination for business and leisure. This is part of a broader strategy to decentralise commercial activities to regional centres so Singaporeans can enjoy the convenience of living, working and playing closer to home. All new developments within the JLD will achieve a minimum Green Mark Gold^{Plus} accreditation, with public buildings required to attain even higher standards – Green Mark Platinum. The district will be pedestrian- and cyclist-friendly with more community spaces for recreation and interaction.

The JLD is an example of our Living Lab and will offer companies the opportunity to work with Government agencies to jointly conceptualise, develop and test-bed innovative urban solutions. IDA and partner agencies are working with more than 20 companies and start-ups to progressively deploy and trial innovative technology in the district. These include implementing Above-Ground Boxes (or access points for fibre-optics) and over 1,000 sensors across the district.

Mixed-Use Development in the West

There are plans to integrate CleanTech Park, Nanyang Technological University (NTU), Jalan Bahar and Tengah to create a mixed-use development that may be a glimpse of what cities of the future could be. We have plans to make better use of land in this area and create a vibrant, liveable and sustainable district that encompasses residential, recreational, educational and commercial life.

Bulim – Estate Goods Mover System

The Estate Goods Mover System is akin to an ‘MRT system for goods’. It will transport goods from one point to another without relying on roads or heavy vehicles. This system allows for safer and less crowded roads, cleaner and fresher air, and higher productivity and reliability for businesses. JTC, which is overseeing this project, envisions that the goods mover system will be the next major transportation mode to deliver goods beyond the estate level to other parts of Singapore.

Nanyang Technological University – EcoCampus

In partnership with EDB and JTC, the NTU, known for its strengths in science and engineering, aims to be the greenest university campus in the world. It has set ambitious targets to reduce energy, carbon, water and waste intensity by 35% by 2020 from a 2011 baseline. The EcoCampus will be a high-impact Living Lab to assess cutting-edge technologies at both building and district levels. Successful trials there can be scaled up to apply to residential and commercial districts. The NTU is also working closely with leading companies such as Siemens and GDF Suez to transform its campus and to derive synergies with the adjacent 50 ha CleanTech Park by JTC.



Environmental Sensors

Air Quality

With greater urbanisation and more intensive industrial development both locally and in the region, monitoring and managing our air quality will be of increasing importance. We will face increasing challenges to identify, quantify and prioritise air pollution sources as it will be difficult to differentiate the impact of transboundary sources from local sources. In anticipation, NEA will transform its existing Telemetric Air Quality Monitoring Network into a system that will be ready to address these challenges. More stations are being added to the network, and an air dispersion modelling capability added to better forecast air quality and trace pollution sources.

Coastal Water Quality

In collaboration with the Singapore-Delft Water Alliance, an interdisciplinary water knowledge research centre based at the National University of Singapore, NEA has developed a system to monitor Singapore's coastal water quality in real-time.

Eight buoy-based monitoring stations with sensors will allow us to forecast the onset of pollution incidents. When fully operational, the system will allow alerts related to water pollution incidents to be shared with the public.

Integrated Environment System

NEA is bringing together all environmental and weather sensor networks within and outside NEA to be part of an Integrated Environment System. It will draw on real-time and historical data and allow NEA to work with other Government agencies, research institutes and private companies to prevent, detect and mitigate any environmental or public health risks in a more timely way. One such effort is a partnership with IBM to develop new analytic and predictive abilities for environmental variables.





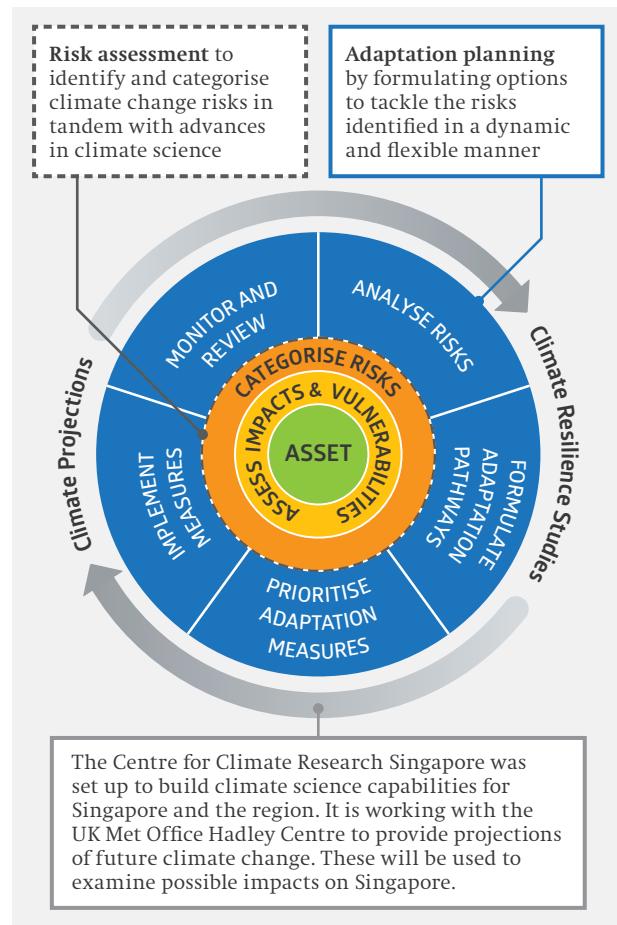
Building Resilience to Climate Change

As a small, low-lying island city in the tropics, Singapore is vulnerable to the impacts of climate change. Our rainfall patterns have become more volatile which could lead to the increased risk of flash floods. Rising sea levels will also be a concern in the long term. Together with other countries, we must take action now to reduce and mitigate our carbon emissions in order to limit the rise in global temperatures. However, we cannot completely reverse the impact of what the world had already emitted in the past. Singapore must also act now to future-proof our city against the potential impacts of climate change.

A Contextualised Approach to Adaptation

Adaptation planning in Singapore is guided by a Resilience Framework.

Singapore's Resilience Framework



Adaptation planning is an ongoing effort, and risk assessments and action plans will be reviewed and adjusted as new climate science and data emerge. Singapore will rely on the best available science and take practical adaptation measures, without limiting our flexibility to exercise future options as our scientific knowledge grows. We have already implemented several adaptation measures as part of our long-term development plans.

Protecting Our Coasts

Coastal protection structures such as sea walls and stone embankments have been constructed along 70–80% of Singapore’s coastline. There are also ongoing works to address erosion in other areas such as mangroves. In 2011, minimum reclamation levels were raised by one metre to reach 104.5 m RL (100 m RL is equivalent to the mean sea level) along the northern coast and 104 m RL along the southern coast to build greater resilience to long-term sea level rise. BCA is carrying out a coastal adaptation study that is expected to be completed by 2017. This study will detail more measures we need to take to protect our island city.

Addressing Flood Risks

Over the last 30 years, Singapore has invested some \$2 billion in building and upgrading Singapore’s drainage infrastructure. This has reduced flood prone areas by almost a hundred-fold, from 3,200 ha in the 1970s to 36 ha in 2013. Today, our drainage system is guided by PUB’s source-pathway-receptor approach which addresses flood protection not just along the drains and canals (“pathways”) but also in areas generating stormwater runoff (“source”) and where floods may occur (“receptors”).

From 2014, developers of new and re-developed sites will need to implement on-site detention and/or retention measures to reduce peak runoff from developed areas into the public drainage system. As an additional safeguard, PUB has also raised the minimum platform and crest level requirements for new developments, and LTA is installing flood barriers at selected MRT stations to protect our critical transport infrastructure. It is not

possible to completely eliminate floods, but we can certainly reduce their frequency of occurrence, and reduce their impact when they occur.

Strengthening Public Health

Research is ongoing to determine how climatic factors affect public health risks, such as dengue fever. We are also identifying measures to manage the effects of such risks.

Marina Barrage: A Study in Adaptation



The Marina Barrage created Singapore's first reservoir in the heart of the city. A dam built across the 350 m-wide Marina Channel, it forms an urbanised water catchment area of 10,000 ha, one-sixth the size of Singapore. It is also part of a comprehensive flood control scheme for our city area and serves as a recreational space for the public to enjoy. This thoughtful adaptation measure delivers 3-in-1 benefits!



Working Together to Build Resilience

Every one of us has a part to play in climate change adaptation, including being prepared and knowing how to respond to risks. The Government will do our part to facilitate community and individual efforts to do so.

In the near term, providing accurate and timely information can help the public to react quickly to sudden changes in the weather.

PUB's network of water level sensors and CCTVs in major drains and storm canals allows members of the public to monitor water levels during intense rainstorms. We can receive information through a variety of ways: by subscribing to a free SMS alert system, following PUB's Facebook and Twitter

pages and through notifications from PUB's MyWaters smartphone application. Along with the Meteorological Service Singapore's heavy rain warning service, we can obtain timely information to help us plan our activities. This helps improve overall public resilience towards floods.

In April 2014, NEA revised the Pollutants Standard Index (PSI) to incorporate data on fine particulate matter (PM2.5) into the index. The PSI is now reported hourly from 7:00am to 11:00pm, and round-the-clock during the dry season where there is a higher risk of transboundary haze. This helps alert members of the public to any deterioration in air quality and helps us plan our activities.



Our Vibrant and Sustainable City

A sustainable city and economy – this will be our new competitive advantage to fuel economic growth. Our infrastructure – the backbone of our city – will be thoughtfully planned to further optimise resource use and to adapt to face new challenges. Our companies will use resources even more efficiently, and seize opportunities to develop solutions for a greener future. As the saying goes, Health is Wealth. Caring for our environment and growing our economy is mutually reinforcing. This is how we will achieve our vision of becoming a truly Vibrant and Sustainable City.

An active and gracious **COMMUNITY**

A photograph of a man and a young boy in a lush green garden. The man, wearing a red and white striped shirt, is holding the boy who is wearing a light blue t-shirt. They are looking down at something in their hands. In the background, there's a paved walkway where a family is walking away from the camera. A large white apartment building is visible behind the garden. The foreground is filled with various green plants and leaves.



Many have joined us on our journey towards a more liveable and sustainable Singapore. How about you?

Coming Together for a Greener Singapore

Community Development Councils' Green Plans

Education and awareness

Volunteerism

2,100 HDB Heartland Ambassadors

15,000 Keep Singapore Clean volunteers

4,000 Litter-Free Ambassadors

>300 litter-free Bright Spots

3,200 dengue prevention volunteers

>1,000 active green volunteers

20,000 community gardeners

>700 Community in Bloom gardens

570 participants in 3 hackathons

DREAM



Bringing Our Common Spaces to Life

Creating new public spaces and rejuvenating existing ones for the community

>280 individuals and organisations
in the Friends of Water initiative

Growing Corporate Social Responsibility (CSR)

Sustainability Reporting

Garden City Fund

Enabling CSR Journeys portal
by Singapore Compact

Public Sector Taking the Lead in
Environmental Sustainability



Together, a Sustainable Singapore

A community is truly more than the sum of its parts. When connected in the right ways, societies thrive and work together towards common aspirations. People grow closer and are more motivated to take care of the environment and their neighbourhoods.

In our Sustainable Singapore Blueprint survey, almost three quarters of the respondents agreed that looking after the environment was a shared responsibility. A fifth of our respondents believed that individuals had the greatest responsibility to do so.

These are encouraging responses.

We will provide more opportunities for individuals, communities and organisations to collectively improve our environment. We want to tap into the values and deep beliefs of Singaporeans and our Singapore identity – values of graciousness and mutual respect for one another. We hope that everyone takes a long-term perspective to protect and conserve now so that our future generations can also enjoy a quality of life as good as – if not better than – ours. We hope to see everyone do their part and be good stewards of our environment.

In other words, even as we enhance our physical capital – our living and natural environment – we must also enhance our social capital and contribute to the fuller meaning of a Sustainable Singapore.



Vibrant Spaces for the Community

Our public spaces are where the nurturing of collective responsibility for the living environment begins. These include playgrounds, parks, hawker centres and void decks – places where people can rest and relax, and meet and mingle with friends and neighbours. At our public spaces, communities come together to exchange ideas, organise activities, bond and build a sense of belonging.

Since public spaces are for the community, they can also be designed, maintained and made

livelier by the community. Across a wide range of public spaces, from intimate neighbourhood spaces to larger regional ones, there are many opportunities for interest groups, schools and the local communities to collaborate with Government agencies.

Through these efforts, we will create public spaces that people value and can identify with, so that these spaces will serve to enhance our community life.

Reminiscing the Rail Corridor

The return of the former railway land from Malaysia presents a unique opportunity for us to pursue innovative ways to green Singapore and strike a balance between competing needs in our urban environment.

Stretching approximately 24 km as an almost seamless corridor from Woodlands to Tanjong Pagar, the Rail Corridor will be part of the future 150 km Round Island Route and the larger Park Connector Network.

In May 2012, a Rail Corridor Partnership, comprising people with diverse interests and backgrounds, was established to look into the promotion of community activities and to provide suggestions for future plans at the Rail Corridor.

Since then, MND and URA have extensively engaged the public and interest groups through platforms such as workshops, sharing sessions, exhibitions and a competition to gather suggestions and proposals on how the Rail Corridor can be a vibrant space that connects people and communities.



Treks along the Rail Corridor

Growing the Green Roots of Pulau Ubin

Pulau Ubin is a familiar retreat for many Singaporeans and we intend to enhance its natural charm as a legacy for future generations.

In March 2014, MND announced The Ubin Project to seek ideas from the public on how we can build on existing efforts and work with the community to preserve the rustic, natural environment of Pulau Ubin while enhancing the experience on the island for Singaporeans.

The Ubin Project provides a platform for Singaporeans to collectively enhance our environment in a sensitive and sensible manner, create experiences, and experiment with new sustainable technologies. We welcome people with the passion and interest to learn more about the thriving biodiversity and a more eco-friendly way of life on the island.

MND has formed the Friends of Ubin Network (FUN), a broad network of people who are passionate about Ubin and keen to share their ideas for its conservation and improvement.

The discussions of FUN centre on the broad themes of biodiversity conservation, education and research, heritage, history and community, nature-based recreation and sustainable design and practices. Many people have also stepped forward to help us to reach out to and engage the public on The Ubin Project.

Recent activities undertaken at Pulau Ubin include biodiversity and heritage mapping, trials of innovative technologies through a clean electricity microgrid test-bed and reforestation of areas affected by forest fires.

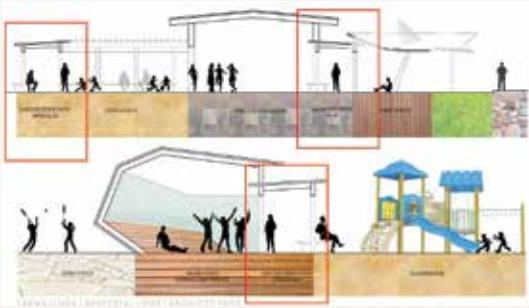


Ubin Quarry



Minister of State for National Development Mr Desmond Lee speaking at a FUN session

Fostering a Sense of Belonging in our Heartlands



Over the past 50 years, HDB has put in place many different design concepts in our public housing estates to encourage community bonding. Studies have shown that neighbours meet one another most frequently along linkways, such as common corridors and sheltered walkways. HDB is thus exploring the concept of Social Linkways, where spaces near common linkways can be turned into activity nodes to encourage residents to linger and engage in deeper interactions with one another.

The Social Linkways concept will be tested at Tampines Town. This pilot will help HDB and its partners assess the feasibility of such concepts and their effectiveness in deepening ties among residents.

Pick a Bench, Pick a Place: Historical Benches Get a New Audience

When the former National Stadium was demolished between 2010 and 2011 to pave the way for the Singapore Sports Hub, many of its seating planks were saved. The “upcycling” of these planks into benches with unique designs has allowed URA to commemorate and memorialise this historic venue. Visitor-friendly locations like the Singapore River and Gardens by the Bay now play host to 26 of these benches, with others still being installed all across Singapore.

In November 2013, URA launched the PubliCity Initiative to involve the community in designing and celebrating good public spaces. “Pick a Bench, Pick a Place” is a project under PubliCity where the public voted on 24 designs created by our local designers, artists and architects, and on 24 public spaces spread out across the city centre and heartlands.

A total of 42 more benches are now being installed at the 15 locations that garnered the most votes. They celebrate our rich sports and games heritage while providing rest and respite at our public spaces.



Students relaxing on the Wave bench at Gardens by the Bay

Our parks, ABC Waters projects and common neighbourhood spaces have transformed the landscape of Singapore, and influenced how we interact with each other. We want to do more to ensure that these spaces remain relevant to the community.

Our agencies have experimented with ways to partner interested stakeholders. For example, the Waterways Watch Society (WWS), a non-governmental organisation, has been actively promoting and enhancing awareness on

environmental stewardship at Kallang Riverside Park for over 15 years. WWS' community outreach efforts were extended to Punggol Waterway in 2014. In the near future, we can also expect more opportunities for residents to undertake more activities at HDB's upcoming town plazas in Punggol and Bedok.

Such efforts will make our public spaces more vibrant and encourage a sense of shared responsibility for and pride in these spaces.



Members of the Waterways Watch Society in action



Coming Together for a Greener Singapore

Educating the Next Generation

Values must be nurtured from a young age. Environmental education can be found in various parts of our school curriculum.

Today, students are introduced to the need to protect and conserve our environment through

an appreciation of its interdependence and fragility. Environmental issues are part of many subjects such as geography, social studies and the sciences in the schools. Through field-based learning, students can also experience the rich diversity of our environment as well as appreciate and contribute to a Sustainable Singapore.

A Pioneer in the Classroom and Beyond



Ms Fuziah with the next green generation

Ms Fuziah Bte Muhamad Taha, Principal of Fuhua Primary School, feels that environmental education should involve the design of sustainable programmes that are anchored on strong values. She believes in using the “Head, Heart and Hands” approach: acquiring knowledge through observation and research (“Head”), igniting passion for environmental causes (“Heart”), and providing platforms for pupils to engage in green activities (“Hands”).

Ms Fuziah has initiated activities such as an annual No Cleaners Week to help students better appreciate the work of their school cleaners and the importance of keeping their environment clean. She also supports many other green

projects such as “Garden in a Bottle”, which features a small wetland system that collects and treats rainwater for use in the school’s aquaponics farm. The wetland system has become an educational showcase for many students at Fuhua as well as those from other schools.

Under her leadership, Fuhua Primary School’s efforts have been recognised through several awards, including SEC’s Green Audit Lotus Award in 2010, PUB’s Watermark Award in 2011, the ASEAN Eco-Schools Award in 2012 and the President’s Award for the Environment in 2013. For her vision and leadership in championing the environmental cause, Ms Fuziah was also presented with NEA’s EcoFriend Award in 2012.

Engaging the Community

Many of us will remember at least one, if not a few, of our national campaigns over the years. Many were launched in our early years of independence including the Keep Singapore Clean campaign which started in 1968. Today, we continue to organise many campaigns and programmes for a greener and more

gracious society. These campaigns range from water conservation to neighbourliness and consideration for fellow diners by returning our trays and cutlery at hawker centres and food courts. These serve as good reminders of what our society values, and reinforce positive social norms that allow our diverse population to live harmoniously.

You can be a Dengue Fighter

In 2013, NEA used insights from its consumer research to provide strong encouragement for people to take action to eliminate mosquito breeding grounds and prevent the spread of dengue.

The Dengue Fighters campaign has since taken a creative turn. Instead of showing the damage caused by dengue, the campaign empowers Singaporeans to be part of a community of dengue fighters who are able to protect themselves and their families by practising the 5-Step Mozzie Wipeout. This rallying call for the public to take an active role in dengue prevention won a bronze award at the Singapore Effie Awards for effective marketing communications.



Our Sustainable Singapore Blueprint survey found that many are willing to do their part for the environment



Hold on to one's trash until one finds a bin to dispose of it



Practise energy-saving habits to conserve electricity



Practice water-saving habits to conserve water



Only purchase what one needs to reduce waste



Recycle more often to reduce waste

We also organise many events throughout the year to engage all segments of the community. These include Clean & Green Singapore, Youth for the Environment Day, the Festival of Biodiversity, Green Building Exhibitions and Singapore World Water Day. During Singapore World Water Day 2014, which coincidentally took place in the midst of a dry spell, community-led initiatives saw over 250 community partners reach out to more than 300,000 people all over Singapore to emphasise the importance of conserving water.

Celebrating Nature, Nurturing Awareness

As we walk through our parks or Nature Areas, we grow to appreciate the beauty of the natural world. The new Sisters' Islands Marine Park, which will be a platform for outreach, educational, conservation and research activities related to our native marine biodiversity, also involves the community in conserving our precious natural heritage.



NParks and the Biodiversity Roundtable – a group comprising nature experts, students and interest groups on biodiversity issues – also reaches out to the community through the Festival of Biodiversity, an annual event that raises greater community awareness of our natural heritage and excites more Singaporeans about the diverse flora and fauna in Singapore.

Each year at the festival, NParks curates an informative and interactive exhibition that features Singapore's cornucopia of plant and animal specimens. To highlight the importance of conserving Singapore's biodiversity, volunteers also share stories and interesting information on our local biodiversity.

Encouraging Green Volunteerism

Care for the environment is a social responsibility that an increasing number of people have embraced.

Today, NParks has over 1,000 active green volunteers who help to plant up green spaces or give guided walks. We also have more than 3,200 Dengue Prevention Volunteers, 4,000 Litter-Free Ambassadors and 2,100 student Heartland Ambassadors who devote their time and energy to educate and reach out to residents and communities on issues concerning public health and the environment, as well as championing gracious and responsible heartland living.

Many students with a passion for the environment have also stepped forward to be trained by NEA to become Environment Champions in their schools and community. Youths from the institutes of higher learning and youth interest groups also participate in the green drive as Youth Environment Envoys.

By Youth, for the Community – HDB Heartland Ambassadors Give Back

Since 2010, HDB's Heartland Ambassadors Programme has imparted concepts of gracious and responsible heartland living to students from over 40 schools. These students have reached out to some 4,300 residents, providing tips on how to care for people and the environment in our housing estates.

For example, in 2013, 39 Heartland Ambassadors from Punggol Secondary led their schoolmates in sharing tips on being eco-friendly with 450 households in the Punggol Gardens precinct while promoting neighbourliness and community bonding in the heartlands. These student ambassadors also organised a photo hunt that enabled residents to know their neighbourhood better.

Volunteers Pitch in for Cleaner Neighbourhoods

As a participant in NEA's Community Volunteer Scheme, Mr Low Kok Peng encourages his fellow residents to play an active role in keeping community spaces clean. Over the past year, he has asked more than 300 litterbugs to pick up their litter. A surprising number thanked him for the reminder.

NEA's Community Volunteer Scheme promotes greater stewardship of our environment by empowering members of the public to take action to deter littering. Selected volunteers complete a mandatory training course that equips them with the knowledge and skills to exercise their authority appropriately.

Since 2013, NEA has added 203 volunteers to its pool of empowered litter fighters. This "volunteer force" has approached many litterbugs to advise them to take responsibility for their litter and the majority of those approached have been cooperative.



Mr Low helping to keep Singapore clean

Bonding Over our Waterways as Friends

There is a growing community of stewards who care for our water resources in Singapore. More than 280 individuals and organisations have taken ownership of our waterways and ABC Waters sites through the Friends of Water initiative. They care for their adopted sites by conducting clean-ups, learning about the biodiversity in and around our waterways, and encouraging other Singaporeans to enjoy the waterways in a responsible manner.

Friends of Water from our various community partners actively utilise our blue spaces and surrounding amenities to enjoy activities on, and by, the water.



Students from Anchor Green Primary School leading employees of Brother Singapore on a learning trail at Sengkang Floating Wetland

Keeping Singapore Clean, One Act at a Time

Our living environment is shaped by people who care about their neighbourhoods and shared spaces, and who are prepared to act upon it. One example of this proactive spirit is the Keep Singapore Clean Movement – initiated by the Public Hygiene Council, Singapore Kindness Movement, Keep Singapore Beautiful Movement and NEA – which aims to inculcate positive social norms and encourage community action to help keep Singapore clean and green.

Launched in 2012, the Keep Singapore Clean Movement wants Singapore to be a “clean city” instead of a “cleaned city”. It has brought together over 15,000 students, NGO volunteers, grassroots

leaders and residents to keep the places they love clean. Many community initiatives centred on this theme have also taken off.

One such initiative is the “Turning Hot Spots to Bright Spots” programme where the Public Hygiene Council identifies littering “Hot Spots” and works with the community to convert them into role model “Bright Spots”. The Public Hygiene Council organises clean-ups of these spots which residents can participate in. It is common to see residents of all ages come together with refuse bags and tongs to pick up litter in their neighbourhood. There are now more than 300 “Bright Spots” island-wide and the Council is working towards a target of 500 “Bright Spots” by 2015.

Hand in Hand for a Cleaner Environment

Mr Tan Ken Jin initiated the Singapore Glove Project in 2012 to raise community awareness of litter in our surroundings and to encourage everyone to take the initiative to maintain the cleanliness of our environment.

Every fortnight, Ken Jin and other like-minded volunteers, including students, working professionals, housewives and retirees, organise a walk or run to pick up litter at identified “Hot Spots”. In true Singaporean fashion, participants conclude each session with a meal to celebrate their friendship and commitment to keep Singapore beautiful. The Singapore Glove Project’s footprints have reached many parts of the country, from Chinese Gardens to East Coast Park and from Marina Bay to Marsiling.

Ken Jin also promotes the Singapore Glove Project as a way for Singaporeans to “Get Healthy, Make Friends, Clean Singapore”, in order to grow its volunteer pool. Sharing and learning with other groups like the Public Hygiene



Volunteers from the Singapore Glove Project helping to keep Singapore clean

Council, WWS and Greenbird Singapore have also helped the Singapore Glove Project. Today, its events are more frequent, draw on a wider pool of volunteers and are more well-publicised.

The project has also inspired many of its members to embark on their own clean-up sessions and do their part for the community.

In Jelapang, a Community Garden for All



At Bukit Panjang, Zhenghua-Jelapang RC Community Garden fosters a strong community spirit and warm neighbourliness among residents.

Since the garden was opened in April 2013, neighbours have often come together to plant crops and share gardening tips while catching up with one another on the latest happenings in the neighbourhood.

On numerous occasions, the gardeners play host to children out on educational trips from the kindergartens nearby.

The community garden has become a “must-visit” stopover, welcoming and bonding residents of the Zhenghua-Jelapang community together.

Nurturing the Kampong Spirit

NParks' Community in Bloom (CIB) programme is another movement that has gained ground.

A gardening movement that began in 2005, CIB today has over 700 community gardens where 20,000 gardening enthusiasts grow plants and edible crops. These gardens have become places where residents connect with one another and flex their green thumbs in the pleasant company of native birds and butterflies.

If there is interest from the community, NParks is prepared to provide horticultural advice to as many as 2,000 CIB groups by 2030. To facilitate this, HDB has been including areas for community gardening in new public housing developments.

Shaping the Green Landscape with Community Development Councils

Many residents also help to shape Singapore's green landscape through programmes organised by regional Community Development Councils (CDCs). These programmes include seed funding opportunities for green projects and the provision of green living tips and guidance. These activities are not only good for the environment, but also good for community bonding.

Each CDC's green plans and targets are developed in consultation with their stakeholders and effect real change on the future of their district and

environment. Just a few of their many initiatives are shared here.

The North East Actions by the Community for the Environment (ACE) Plan



Started in 2012, the **North East Eco Kids Programme** aims to inculcate a love for the environment in pre-school children. As part of the programme, modules designed to bring environmental issues closer to students' hearts are taught at several kindergartens in the North East district.

Children are given activity books on environmental topics like dengue prevention and resource conservation and they carry out upcycling projects first-hand. The opportunity to reach out to the pre-schoolers' families is not missed. At the programme's JOE (Just One Earth) Day carnival, primer booklets on being green are also given to the children's families.

BENEFITS OF PROGRAMME:

- **Environmental:** Green messages reach more than 4,700 pre-schoolers
- **Social:** Develops values and character from a young age

“The materials children create during their time here, such as the handmade bag, encourage them to bring their own reusable bags for shopping instead of using plastic bags. This drive to reuse and recycle as part of the everyday is the most valuable part of this programme.”

Ms Rahilah Bte Mohd Hassan, a teacher

The South East GreenPlan



The Heartland E-Waste Recycling Programme, started in 2013, has seen Panasonic Asia Pacific partner Government agencies, grassroots organisations and companies in piloting Singapore's first recycling programme dedicated to e-waste and home appliances.

Corporate and grassroots volunteers help out at monthly collection drives and 4 schools have set up e-waste bins and held talks on e-waste recycling. For each e-waste item recycled, Panasonic has pledged to donate at least one energy-efficient light bulb to a less-privileged family. The pilot was successful and has now expanded to cover more areas.

BENEFITS OF PROGRAMME:

- **Environmental:** 10,000 kg of e-waste items collected, close to 3,000 energy-efficient light-bulbs to be installed
- **Social:** 600 low-income families received energy-efficient light bulbs

“Through the shared responsibility of Panasonic, our partners and the community, the programme has served as a platform for the community to recycle e-waste and gain a better appreciation of the importance of e-waste recycling in creating a better life and a better world.”

Mr Low Beng Huat,
Panasonic Asia Pacific

The Central Singapore Environmental Sustainability Plan

S.W.I.T.C.H. (Simple Ways I Take to Change my Habits) @ Central Singapore is a collaboration between Central Singapore CDC and NEA that aims to promote an environmentally sustainable lifestyle through awareness, action and advocacy of simple lifestyle changes. Started in partnership with Maybank in 2011, the programme promotes good energy-saving habits and installs energy-saving light bulbs for low-income households living in rental flats. Following its success, the second phase of this programme, in collaboration with Philips Lighting Singapore, was officially launched in July 2014.

BENEFITS OF PROGRAMME:

- **Environmental:** 12,000 light bulbs to be exchanged for more energy-efficient versions by April 2016
- **Social:** For the second phase of the programme, 6,000 more low-income households are estimated to save \$80 annually in utility bills each

“It’s very rewarding to get to know people from different walks of life under this programme. I’m glad I took time out to volunteer and would definitely participate in more of these events.”

—
Ms Melissa Wong,
Philips Lighting Singapore



Green Living @ North West



Reduce @ North West educates and encourages North West CDC residents to do their part to reduce energy consumption, fight climate change and improve environmental sustainability. The programme, spun off in 2012 from an earlier North West initiative, harnesses community resources, especially schools, to empower youths to take the lead in engaging the community on environmental issues.

Households are also encouraged to participate in an energy audit, where electricity bills are tracked over a 4-month period to help households better understand what they can do to reduce their energy consumption and save on electricity bills.

BENEFITS OF PROGRAMME:

- **Environmental:** Annual savings of 30,000 kWh of electricity by 4,150 households which took part in an energy audit programme
- **Social:** Grow green social capital, with 4,500 student volunteers and 4,150 residents reaching out to 80,500 households over 2 years

“At the end of the day, we are winners because we can save a lot on our electricity bills just by being a little more conscious about the way we use energy.”

Mr Rajendran Shanker,
a Reduce @ North West participant

The Environment and Community (ECo) Plan @ South West



Recycle-A-Bulb @ South West, launched in January 2014 as Singapore's first light bulb recycling programme, is a partnership between South West CDC and Global Lamp Recyclers Pte Ltd, General Electric Pte Ltd, NEA and grassroots organisations. Residents can recycle used light bulbs at more than 30 Residents' Committee (RC) Centres and Community Clubs (CC) around the district and each light bulb recycled will result in a matching donation of a light bulb to families in need. This programme builds on South West's strong track record of environmental programmes such as the district Trash-for-Groceries Recycling event, "Clean Up South West!"

BENEFITS OF PROGRAMME:

- **Environmental:** 2,000 light bulbs to be recycled in 2014
- **Social:** 500 low-income households to receive energy-efficient light bulbs

"The new initiative makes it easy for residents to recycle used light bulbs through RCs and CCs that are near their homes. Grassroots leaders also find it easier to bring new eco ideas that are meaningful and convenient to the residents."

Mr Tan Kin Teo, BBM
Chairman of Hong Kah North Green Committee

These efforts and more, beyond what has been highlighted in this Blueprint, are proof of how, together, we can protect the environment that we care about.



Gathering Creative Ideas from the Community

Small Ideas, Big Impact

Many big ideas start small and are ignited by a spark of creativity from one person. We should make better use of crowdsourcing to draw innovative ideas from our community to create a more liveable and sustainable Singapore together.

The Call for Ideas Fund, set up by NEA in 2013, provides co-funding for creative projects that promote environmental ownership or meet environmental challenges.

HDB's Cool Ideas for Better HDB Living is another initiative that encourages people to put their ideas into action to solve day-to-day issues faced by HDB residents. A \$500,000 Cool Ideas Fund has also been set up to provide co-funding and help winning participants turn their ideas into real-life prototypes.

Encouraging even more Environmental Sustainability

There are many programmes and events to promote environmental sustainability being run by both Government agencies and organisations such as the Singapore Environment Council.

We will explore new ways to help like-minded people connect and match potential ideas with resources and experts, so that a seed of an idea can bear fruit.

Planting a Seed in the Home



Created by Mary Quah, James Lee, Theresa Tseng, Ivy Kuah and Alvin Lee, the Sustainable Plant Box originated from a desire to grow organic vegetables and herbs at home while avoiding stagnant water which can lead to mosquito breeding.

The co-inventors worked to design a box with an airtight tray to collect excess water which can be used to water plants. Kitchen waste like egg shells can also be used as compost. The Sustainable Plant Box was the top prizewinner of the HDB's Cool Ideas for Better HDB Living Call for Ideas on Growing Home Vegetables at Home in 2012.

Clean and Green Apps

Smart devices and mobile apps are becoming more widespread and we can use them to help Singaporeans make more sustainable choices or help businesses improve their operations. As part of these efforts, NEA and EMA have organised 3 Hackathons to bring the information and communication technologies community together to work on new, collaborative ideas.



2nd Clean & Green Hackathon: Smart Ideas Win the Day



Participants at the 2nd Clean & Green Hackathon

Participants pored through 127 datasets from Government agencies such as NEA, IDA and the Singapore Land Authority, and were guided by the technical expertise of private sector partners such as Samsung, StarHub and Amazon Web Services. By the close of the Hackathon, 15 original environment-related mobile app prototypes had been produced.

OVERALL WINNER

Team: Recycle Bots

What: A smart recycling bin that detects the sound of items falling into the bin and alerts users when non-recyclables are deposited. An accompanying website educates people on materials and items that can be recycled and shares recycling tips.

RUNNERS-UP

Team: Bin Cleaner

What: DYLA is an app that allows people to notify agencies when trash bins are full by tapping their phones on a Near Field Communications technology tag attached to the bin. Users are also awarded points that can be redeemed for rewards, to thank them for sparing a thought for their community.

Team: Botscan

What: A game app that educates people on recycling by encouraging users to earn points and in-game perks through real-life recycling.

Team: Clean Sing

What: A web-based system that uses public feedback to provide cleaning contractors with a map of locations that require cleaning, helping them to plan their cleaning schedules more effectively.



Nurturing Corporate Environmental Responsibility

Businesses can also care for the environment.

As they grow and flourish in Singapore, it is important that businesses share our vision for a clean, green and Sustainable Singapore.

We encourage companies to be part of our green movement and to challenge themselves to contribute to our sustainable development. More businesses can embrace the idea that doing good for the environment is an essential part of doing business in Singapore and sets them apart from others.

To encourage green tourism, the Singapore Tourism Board has developed a set of sustainability guidelines for the Singapore meetings, incentive travel, conferences and exhibitions (MICE) industry. Launched in 2013, these encourage local companies to understand the sustainability impact of their operations and event plans, and to adopt environmentally sustainable practices.

Staying Ahead with a Sustainable Stay

Siloso Beach Resort was conceptualised with sustainability in mind from the very start. In 2003, it was designed to preserve the natural terrain on which it was built – over 200 trees were preserved and another 450 were planted post-construction. Many materials were also reused during the building of the hotel grounds.

Today, Siloso Beach Resort uses rainwater harvesting to irrigate its roof garden. An all-natural spring water landscape pool helps to provide natural cooling, while the resort's open concept maximises natural lighting and allows birds and insects to move through the hotel grounds freely. As evidence of its lush natural setting, hornbills are often seen.

Vegetables are grown organically on the rooftop garden and 50 kg of food waste is recycled every day by the resort's on-site food waste decomposer.

The hotel also runs an active Corporate Social Responsibility (CSR) programme that includes the website (<http://biodiversity.sg>) developed with Conservation International, the Worldwide Fund for Nature, SEC and the National



University of Singapore. Complimentary eco-tours are provided for resort guests, schools and walk-in visitors.

For its outstanding commitment to the environment, Siloso Beach Resort has won numerous awards including the ASEAN Business Award for CSR in 2012 and the President's Award for the Environment in 2013.

Sustainability Reporting

We will also encourage companies to benchmark the environmental impact of their activities with other companies through sustainability reporting.

Understanding a business' triple bottomline – Profit (financial), People (social), Planet (environment) – will enable companies to make a real positive impact for their customers, employees and shareholders. With the information from their Sustainability Report, companies can enhance

their business competitiveness and branding, realise tangible cost savings from process improvements, strengthen investor engagement, and improve public trust through greater transparency.

The Singapore Exchange (SGX) plays an important role in driving sustainability awareness and efforts in Singapore. In recent years, SGX has worked to help focus companies and investors on their sustainability footprint.

The SGX and Sustainability Reporting

2011: Released Guide to Sustainability Reporting –

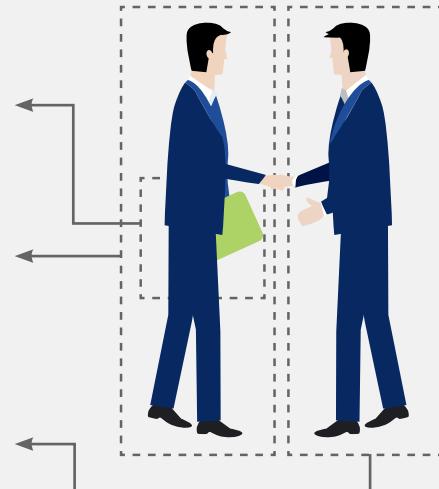
Setting out broad principles for listed companies on developing sustainability reporting frameworks

2013: Released Investor's Guide to Reading Sustainability Reports –

Helping retail investors understand the value of sustainability practices and guiding them in assessing companies' sustainability reports

Longer-term:

Consider “Comply or Explain” approach on sustainability reporting for listed companies



The Singapore Compact for CSR and the National University of Singapore Business School have conducted a study⁶ on sustainability reporting by companies listed on the SGX Mainboard. Of the 537 companies that were assessed in 2013, 160 communicated sustainability information on environmental, social or governance aspects of their businesses. Also, 16 Singapore-listed

companies have submitted sustainability reports to the Global Reporting Initiative (GRI) whose Sustainability Reporting Framework is internationally recognised as an established framework for companies.

More can certainly be done to build on these promising numbers.

⁶ Lawrence Loh, Bernadette Low, Isabel Sim and Thomas Thomas. “Accountability for a Sustainable Future: Sustainability Reporting in Singapore among Singapore Exchange Mainboard Listed Companies 2013”, July 2014.

Conserving and Reporting while Constructing

Recognising the impact of the built sector on the environment, City Developments Limited (CDL) has committed itself to “Conserving as it Constructs” since 1995.

CDL embarked on sustainability reporting to communicate its efforts and performance, and aligned its entire business operations with this green conviction. It was the first Singapore company to publish a GRI-checked sustainability report in 2008, and the first Singapore-listed company and developer to publish a GRI-checked Level A+ Sustainability Report in 2012. With the publication of annual reports since 2008, CDL strives to continue improving its CSR performance and enhance the quality of its sustainability reporting.

Due to its commitment to the triple bottomline, CDL was the first Singapore company to be listed on 3 global sustainability benchmarks – the FTSE4Good Index Series (since 2002), the Global 100 Most Sustainable Corporations in the World (since 2010) and the Dow Jones Sustainability Indices (since 2011). CDL was also ranked top among Asian developers by the Channel NewsAsia Sustainability Ranking 2014.



CDL's Sustainability Report

An Extra Hand Along the Journey

To help companies understand the benefits of being green and kickstart their sustainability journey, Singapore Compact has developed a one-stop resource portal – Enabling CSR Journeys – with support from NEA. It includes information on ISO 26000: Social Responsibility, which provides businesses with guidelines on how they can operate in a socially responsible manner. It also features a start-up guide to sustainability reporting and best-practice cases for businesses to learn from and adapt.

To gain more support from business leaders, NEA, Singapore Compact and the Singapore Business Federation are also looking to nurture a group of local CEOs who will champion sustainability and share their sustainability journey experiences, and inspire others to adopt sustainability initiatives as part of business.

Companies can also contribute to environmental responsibility through the Garden City Fund, a registered charity and Institution of Public Character, established by NParks to encourage greater collaboration with companies and individuals. This supports interesting features and

educational programmes which enable the growth of our City in a Garden.

These actions will help to raise awareness and deepen community connections with the natural environment.

Standing Tall for Local Biodiversity



The Sembcorp Forest of Giants at the Southern Ridges is a special collection of giant trees native to our region. The arboretum, a living gallery of trees for education and research, also contributes to NParks' efforts to enhance biodiversity in urban areas.

The development of this feature and its programmes were fully funded through a \$1 million Sembcorp Industries sponsorship.

The donation was used to fund the planting of the giant trees as well as outreach programmes to promote awareness and enjoyment of our natural heritage.

In addition to monetary support, Sembcorp's staff also volunteer with the programmes here.

PSTLES 2.0: Fully Engaged and Committed as a Sustainability Leader

The public sector – as an employer of about 139,000 people and which runs about 1,000 facilities – will also do its part to push towards a more Sustainable Singapore. The Public Sector Taking the Lead in Environmental Sustainability (PSTLES) initiative was introduced in 2006 to improve resource efficiency within the public sector and to show that we walk the talk. Since then, much progress has been made.

The public sector can – and will – do more. Under a new PSTLES 2.0, agencies will set more

ambitious targets for resource efficiency and put in place better organisational processes to help achieve these targets. In each Ministry, a Sustainability Manager will coordinate efforts within the Ministry and with its Statutory Boards and share good practices through a Sustainability Manager network. Agencies will develop and submit plans on how to achieve their sustainability targets.

The public sector will share its progress on this PSTLES 2.0 journey by way of a Public Sector Sustainability Report that will be published every 3 years.

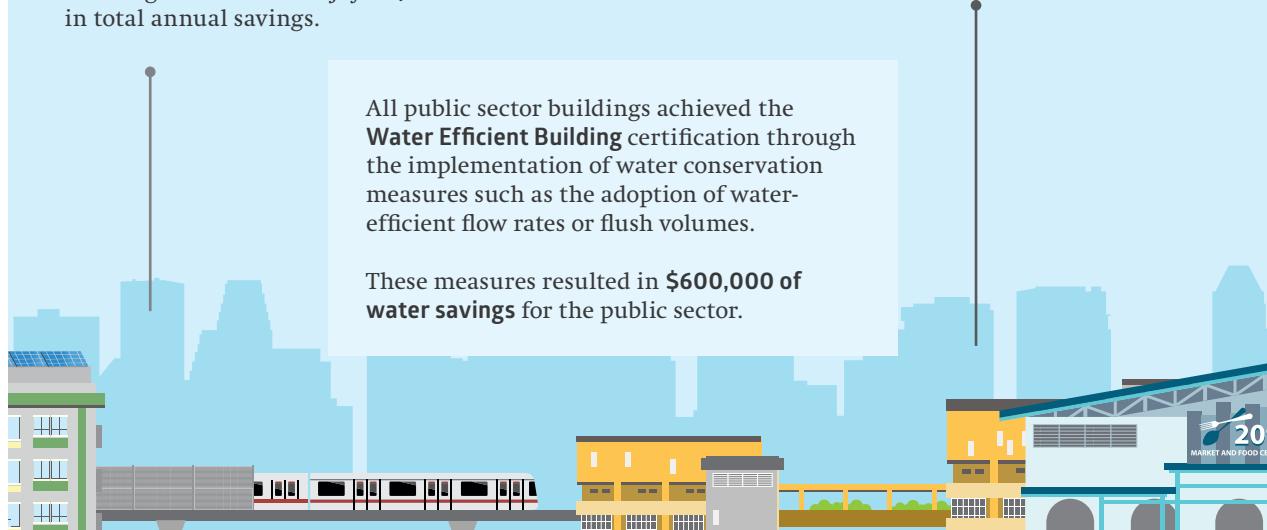
The PSTLES initiative was introduced in 2006

15 large Government buildings embarked on air-conditioning plant retrofits to improve their energy efficiency. These building owners have enjoyed **\$9 million** in total annual savings.

63 new public sector buildings and 15 existing buildings have been rated either **Green Mark Platinum** or **Gold^{Plus}**.

All public sector buildings achieved the **Water Efficient Building** certification through the implementation of water conservation measures such as the adoption of water-efficient flow rates or flush volumes.

These measures resulted in **\$600,000 of water savings** for the public sector.





Learning from and Working with the World

As we work towards our vision of a liveable and sustainable home, we also need to deepen our understanding of the environment, develop capabilities and find new innovative solutions. This requires that we keep exchanging knowledge and share our experiences with others, within and outside of Singapore.

The Centre for Liveable Cities (CLC) was established in 2008 to distil, create and share knowledge on liveable and sustainable cities. It looks inward to Singapore's past experiences to glean learning points, and outward to study the good practices of other cities, institutes and experts. Based on their work, CLC has derived a liveability framework as a guide for developing liveable and sustainable cities.

CLC also collaborates with many international thought leaders and partners, and conducts training programmes for officials from Singapore and other cities. Since 2010, CLC has organised more than 20 capability development programmes for a diverse range of city officials and industry leaders.

International conferences and events also present opportunities for knowledge-sharing. Over the years, Singapore has facilitated dialogue on sustainable development. Our flagship event is a biennial trio of events – the World Cities Summit (WCS), Singapore International Water Week (SIWW) and CleanEnviro Summit Singapore (CESS). They provide a platform for government leaders and industry experts to learn and share

their rich experiences about sustainable urban solutions, and matchmake governments seeking solutions with industry players who can provide these solutions. Other events like the Singapore International Energy Week, the Singapore Green Building Week and the Singapore Garden Festival are also held regularly to share ideas on specific focus areas.

Since 2008, the WCS and SIWW have grown from strength to strength. They were joined by the CESS in 2012.



Year	2008	2014
Number of events	2 (WCS & SIWW)	3 (WCS, SIWW, CESS)
Visitors	8,500	20,000
Ministers & Mayors	46	154
Deals & MOUs signed	\$367 million	\$14,500 million

A Unique Eco-city in China

Prime Minister Lee Hsien Loong and former People's Republic of China Premier Wen Jiabao jointly launched the Sino-Singapore Tianjin Eco-city (SSTEC) in November 2007. Recognised by The New York Times in 2013 as the most successful eco-city project in China, the SSTEC has served as a reference for China's reforms in sustainable development and urbanisation.

To ensure the SSTEC's continued relevance, both governments in 2013 endorsed its refreshed vision to be a leader in eco-development, a vibrant model satellite city and a harmonious city with an innovative social governance framework. Both countries collaborate in diverse areas that include urban planning, water management, waste management and social development. Today, SSTEC residents live in 100% green buildings and actively practise recycling. The SSTEC also has affordable public housing and attractive social amenities, which are modelled after those in Singapore.



The Sino-Singapore Tianjin Eco-city

International Cooperation for Sustainable Development

In an interdependent world, many environmental problems cannot be solved by a single country. Singapore, being a small island-state, feels this acutely and we strive to collaborate actively with other countries to respond to the multifaceted environmental challenges that we face.

At the bilateral level, Singapore has ongoing cooperation with countries, such as our neighbours, to address environmental issues of mutual interest including air pollution, water quality and waste management. Singapore also has environmental cooperation frameworks with countries further afield and plays an active role at the regional level in the Association of Southeast Asian Nations (ASEAN) environmental forums. These platforms allow member states to address issues such as transboundary haze pollution, water resource management, and threats to biodiversity from economic activity and climate change.

As a responsible global citizen, Singapore supports international efforts, including those by the United Nations, to chart a sustainable development pathway for the world. Singapore has joined a number of Multilateral Environmental Agreements with the international community to tackle shared environmental challenges. These challenges include environmental health, climate change, ozone depletion and the transboundary movement of hazardous wastes.

International Collaboration on Biodiversity in Cities

The Singapore Index on Cities' Biodiversity (Singapore Index) is a tool to help cities evaluate and monitor their biodiversity conservation efforts. The idea was mooted in the Sustainable Singapore Blueprint 2009 and developed by NParks in collaboration with the Secretariat of the Convention on Biological Diversity and the Global Partnership on Local and Subnational Action for Biodiversity. At the Tenth Conference of Parties to the Convention on Biological Diversity (COP-10) in October 2010, parties endorsed the Singapore Index as a biodiversity monitoring tool for cities.

Currently, 22 cities have adopted the Singapore Index, such as Montreal (Canada), Durban (South Africa), Brussels (Belgium) and Nagoya (Japan). Close to another 20 cities have indicated interest in doing so. We are proud to have been a prime mover of this project, which has raised awareness and action on global urban biodiversity conservation.



Our Active and Gracious Community

An Active and Gracious Community flourishes in a Sustainable Singapore, and a Sustainable Singapore requires an Active and Gracious Community to flourish. This symbiotic relationship drives our value system and defines our identity as Singaporeans.

Our mutual respect and consideration for each other, and our collective care and responsibility for our shared environment, set us apart. Together, we can be the proud stewards of a sustainable home and city, one that can be enjoyed by many more generations of Singaporeans to come.

Our Journey Ahead





Our Journey Ahead

Imagine Singapore in a few decades' time.

Will we have a home where we live, work and play in our own neighbourhood?

Will we have a city where businesses thrive because they care for the earth?

Will we have a community where looking after the environment is second nature to us?

We asked these questions as we were developing the Sustainable Singapore Blueprint 2015.

Along the way, many – including academics, industry experts, business owners, students and fellow Singaporeans – contributed their views. Through public dialogues, focus group discussions and surveys, 6,000 people contributed in one way or another to this Blueprint for our future.

Together, we envisioned a bold future for Singapore and looked at how we could turn this vision into reality.

We stand on the great efforts of our pioneers and those who came before us in our journey to create an even more liveable and sustainable Singapore. We will build on these by overcoming constraints through innovative solutions and by turning obstacles into opportunities for growth. We are determined to make our country a better home for our children and their children.

Every one of us has an important role in creating a liveable and endearing home, a vibrant and sustainable city and an active and gracious community. Every action counts and it is never too early to start taking action.

We invite you to join us on our journey to create a better home, environment and future. Let us realise a Sustainable Singapore together.



Targets for 2030





	Indicator	2013 Levels	Targets for 2030
Green and Blue Spaces			
1	Amount of skyscraper greenery	61 ha	200 ha
2	Amount of park space and waterbodies open to recreational activity	4,040 ha	Park Provision Ratio of 0.8 ha / 1,000 population
a)	Parks		
b)	Waterbodies	959 ha	1,039 ha
3	Length of park connectors and waterways open to recreational activity	216 km	400 km
a)	Park connectors ¹		
b)	Waterways	93 km	100 km
4	Length of Nature Ways	21 km	180 km
5	Proportion of households within 10-min walk of a park	80%	90%
Mobility			
6	Length of cycling paths	230 km	700 km
7	Modal share of journeys during peak hours made via public transport	64%	75%
8	Length of rail network	180 km	360 km
9	Proportion of households within 10-min walk of a train station	58.5%	80%
Resource Sustainability			
10	Proportion of buildings to achieve BCA Green Mark Certified rating	21.9%	80%
11	Energy intensity improvement (from 2005 levels)	22% (in 2012) ²	35%
12	Domestic water consumption per capita per day	151 L	140 L
13	National recycling rate	61%	70%
a)	Domestic recycling rate		
b)	Non-domestic recycling rate	77%	81%
Air Quality			
14	Air Quality		
a)	PM2.5		
	Annual mean	20 µg/m³	12 µg/m³ (Long term: 10 µg/m³)
	24-hour mean (99th percentile)	176 µg/m³	37.5 µg/m³ (Long term: 25 µg/m³)
b)	PM10		
	Annual mean	31 µg/m³	20 µg/m³
	24-hour mean (99th percentile)	215 µg/m³	50 µg/m³
c)	Sulphur Dioxide (SO₂), 24-hour mean (Max)	75 µg/m³	50 µg/m³ (Long term: 20 µg/m³)
d)	Ozone, 8-hour mean (Max)	139 µg/m³	100 µg/m³
e)	Nitrogen Dioxide (NO₂)		
	Annual mean	25 µg/m³	40 µg/m³
	1-hour mean (Max)	132 µg/m³	200 µg/m³
f)	Carbon Monoxide (CO)		
	8-hour mean (Max)	5.5 mg/m³	10 mg/m³
	1-hour mean (Max)	7.5 mg/m³	30 mg/m³
Drainage			
15	Flood-prone areas	36 ha	23 ha
Community Stewardship			
16	Number of active green volunteers	>1,000	5,000
17	Number of Community in Bloom Gardens	>700	2,000
18	Number of litter-free Bright Spots	>300	500 (by 2015)

¹ Includes Round Island Route

² The 2013 figure for % energy consumption per dollar GDP improvement from 2005 levels will be released in 4th quarter 2014.

Thank You

This Sustainable Singapore Blueprint would not have been possible without the many people who contributed their views and gave us their support as we drew up these plans.

URA Master Plan 2014

100 participants

3 consultations

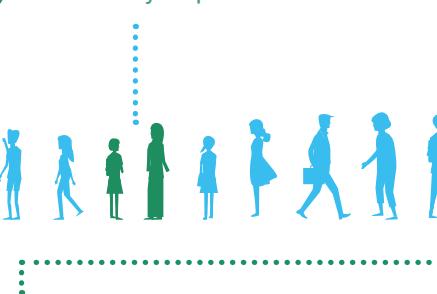
61,000 visitors



Land Transport Master Plan 2013

400 Focus Group Discussion participants

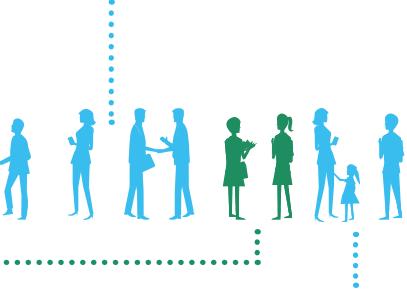
1,700 survey respondents



BCA Green Building Exhibitions

2012–2014

65,000 visitors to the exhibitions



HDB Public Exhibitions – “Future Homes, Better Lives”

2013

4,000 participants in on-site surveys

More than **130,000 people** visited and participated in various exhibitions and consultations over the past few years.

ENVision Exercise – ENgaging people for the Vision

Singapore Environment Council

February–April 2014

19 dialogue sessions

440 participants

Conversations on Sustainable Singapore – Energy and Climate Change, Waste and the 3Rs, Food Security

Nature Society (Singapore), SMU Verts and Green Future Solutions

April–May 2014

3 conversations

100 participants

Almost **550 people**

contributed their views and aspirations for a liveable and sustainable Singapore.



Another **550 people** answered our call to share their views through focus group discussions and online surveys on topics related to this review.

Waste-to-Resource Management **31 May 2014**

A better understanding and convenience will help households to recycle, and more can be done to recycle electronic waste.



“Waste is not waste. It is resource untapped.”

~ Participant

Public Hygiene and Cleanliness **21 June 2014**

While enforcement is necessary, it is more important to build intrinsic values to keep Singapore clean as part of a social norm.

Sustainable Energy and Water Use in the Industry Sector **4 July 2014**

Resource efficiency is clearly desirable and possible.

“We have to create a culture where it is the norm to have a pro-environment mindset, beyond dollars and cents, where companies make improvements in resource efficiency because they want to do it.”

~ Participant



Vibrant Spaces for the Community **5 July 2014**

Public spaces are important for community bonding as they provide a common space for residents and neighbours to engage in activities and common interests, such as community gardening or group exercises. It is meaningful to involve residents in both the design and programming of public spaces.

A More Walkable Singapore **12 July 2014**

A good standard of walkability is important for Singapore in view of our ageing population. Walking also contributes to greener and healthier living, the potential for deeper engagement with neighbours and their living environment, lower transport costs and improved safety in the area (as more people walk).

Smart Nation **2 September 2014**

Over a range of possibilities for adopting smart technologies, discussions focused on healthcare, mobility, energy management, and apps for data crowdsourcing.

EDB also held a Green Industry Roundtable on 31 July 2014 where industry representatives discussed ideas on how to extend best practices and enhance efforts to innovate and develop capabilities on corporate sustainability for greener growth.



2,000 people took part in a face-to-face survey which helped us better understand perceptions of the environment and sustainable lifestyles.

More than **2,900 online quiz-takers** also told us about how they would contribute to a liveable and sustainable Singapore.

Our pioneers planted the seeds of this Blueprint when they built a clean and green city out of a newly-independent Singapore. Countless people past and present have worked tirelessly to shape our shared environment in their own way. We are heartened by and grateful for the many individuals and organisations that have come forward to join us in charting our next journey towards a better home, environment and future.

Our appreciation also extends to the NUS Centre for Sustainable Asian Cities which worked with us to design the face-to-face survey and analyse the findings, Ngee Ann Polytechnic students and lecturers with whom we developed the online quiz, and the many who came together to listen to Singaporeans' diverse views, debate strategies, and pull this Blueprint together.

Thank you, once again, for taking another step together towards a better Singapore for us and our future generations.

Special thanks to the following organisations and individuals for the images in this Blueprint:

Central Singapore Community Development Council
City Developments Limited
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Fuhua Primary School
GlaxoSmithKline
Housing & Development Board
JTC Corporation
Khoo Teck Puat Hospital
Land Transport Authority
Marina Bay Sands
Maritime and Port Authority Of Singapore
Ministry of Culture, Community and Youth
Ministry of National Development
Ministry of the Environment and Water Resources
National Environment Agency
National Parks Board
National University of Singapore
Nature Society (Singapore), SMU Verts and Green Future Solutions
North East Community Development Council
North West Community Development Council

PARKROYAL on Pickering
Parkway Parade
PSA Singapore Terminals
PUB, the national water agency
REC Solar
Siloso Beach Resort
Singapore Environment Council
Singapore Glove Project
Singapore-MIT Alliance for Research and Technology
South East Community Development Council
South West Community Development Council
StarHub
Swissotel The Stamford
Systems on Silicon Manufacturing Co.
Waterways Watch Society
Urban Redevelopment Authority

Mr Darric Tan
Mr Robert Teo
Dr Adrian Yeo



Ministry of the Environment
and Water Resources

