

URBAN SYSTEMS STUDIES

**CLEANING A NATION:
CULTIVATING A HEALTHY
LIVING ENVIRONMENT**



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CULTIVATING
A HEALTHY LIVING
ENVIRONMENT**

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URBAN SYSTEMS STUDIES

CLEANING A NATION: CULTIVATING A HEALTHY LIVING ENVIRONMENT

CENTRE for
LiveableCities
SINGAPORE

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Set up in 2008 by the Ministry of National Development and the Ministry of the Environment and Water Resources, the Centre for Liveable Cities (CLC) has as its mission “to distil, create and share knowledge on liveable and sustainable cities”. CLC’s work spans four main areas— Research, Capability Development, Knowledge Platforms, and Advisory. Through these activities, CLC hopes to provide urban leaders and practitioners with the knowledge and support needed to make our cities better. www.clc.gov.sg

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FOREWORD

Singapore has enjoyed its reputation as a clean and green city for the last few decades. After independence, the government recognised the importance of cultivating a healthy environment to improve the quality of life of its people. The first nationwide public education programme to “Keep Singapore Clean” was launched in 1968, with the aim of making Singapore the cleanest and greenest city in the region. The “Keep Singapore Clean” campaign subsequently became an annual event and has since evolved into a series of events under the “Clean and Green Singapore” movement today. Different cleaning-related themes are emphasised each year to reflect the priorities of the time—from tree planting to clean air and water, from dengue prevention to a litter-free environment, from recycling to waste management and resource conservation.

The formation of the Ministry of Environment in 1972 marked a significant milestone in Singapore’s cleaning efforts. The Ministry then comprised a Public Health Division and an Engineering Services Division. The Public Health Division looked after the enforcement of public hygiene measures while Engineering Services provided and managed the infrastructure necessary to sustain environmental quality. Establishing an infrastructure that incorporated considerations for maintaining cleanliness and planned engineering solutions led the way forward in keeping Singapore clean. On the other hand, new institutions and regulations placed environmental issues in the limelight, and through public engagement programmes that stemmed from these institutions and regulations, social norms and values about cleanliness were instilled in the public.

We have made much progress over the years, but as Singapore’s population grows amid changing demographics, the framework needs to evolve in order to address concerns of any decline in cleanliness standards. Cleaning services need to be enhanced and uplifted alongside stiffer penalties for pollution, as well as increased enforcement efforts. At the same time, social norms have to be reinforced to encourage public ownership of a clean environment, as well as to inspire ground up movements that exert social influence.

Cleaning a Nation: Cultivating a Healthy Living Environment details the cleaning journey that Singapore has undertaken since the 1960s to cultivate a healthy living environment for her people. It takes an interesting standpoint that the lack of cleanliness is a “people-oriented problem”, and that people-centric solutions should be applied to tackle it.

I hope that through this Urban Systems Study on cleaning, readers will have a better appreciation of what it took for Singapore to become clean and green, and for her people to enjoy a good quality of life today. The battle to keep Singapore clean, however, requires long-term, sustained efforts that must be periodically reviewed. It is important that the “Keep Singapore Clean” campaign be seen in a holistic manner in order to fully understand the concerted efforts required!

Liak Teng Lit

Chairman, Public Hygiene Council
Group Chief Executive Officer, Alexandra Health System

PREFACE

The Centre for Liveable Cities’ (CLC) research in urban systems tries to unpack the system components that make up the city of Singapore, capturing knowledge not only within each of these systems, but also the threads that link these systems and how they make sense as a whole. The studies are scoped to venture deep into the key domain areas the CLC has identified under the CLC Liveability Framework, attempting to answer two key questions: How Singapore has transformed itself into a highly liveable city within the last four to five decades, and how Singapore can build on our urban development experience to create knowledge and urban solutions for current and future challenges relevant to Singapore and other cities through applied research. *Cleaning a Nation: Cultivating a Healthy Living Environment* is the latest publication from the Urban Systems Studies (USS) series.

The research process involves close and rigorous engagement of the CLC with our stakeholder agencies, and oral history interviews with Singapore’s urban pioneers and leaders to gain insights into development processes and distil tacit knowledge that have been gleaned from planning and implementation, as well as governance of Singapore. As a body of knowledge, the Urban Systems Studies, which cover aspects such as water, transport, housing, industrial infrastructure and sustainable environment, reveal not only the visible outcomes of Singapore’s development, but the complex support structures of our urban achievements.

CLC would like to thank the National Environment Agency, the Singapore Environment Institute and all those who have contributed their knowledge, expertise and time to make this publication possible. I wish you an enjoyable read.

Khoo Teng Chye

Executive Director
Centre for Liveable Cities

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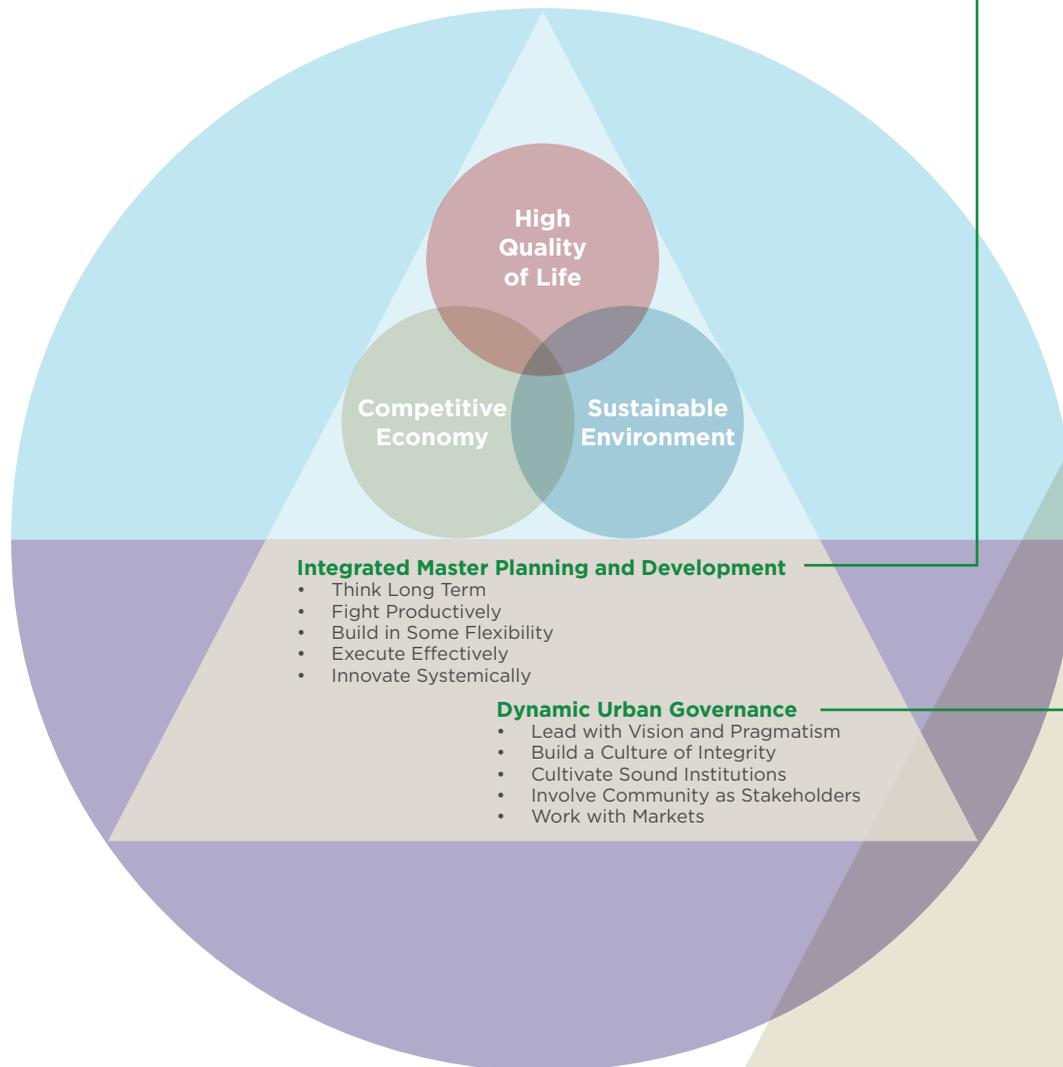
The Centre for Liveable Cities (CLC) gratefully thanks Mr Ananda Bhaskar Ram, Mr Daniel Wang, Mr Desmond Tan, Mr Eng Tiang Sing, Mr Eugene Heng, Mr Jack Sim, Mr Joseph Hui, Mr Kenneth Wong, Mr Khoo Seow Poh, Mr Koh Kim Hock, Mr Liak Teng Lit, Mr Lim Kew Leong, Mr Loh Ah Tuan, Mr Ong Seng Eng, Ms Rosa Daniel, Mr Tan Hang Kian, Ms Tan Puay Hong, the late Mr Tan Quee Hong, and Mr Tan Yok Gin for taking valuable time off to be interviewed by the Centre for Liveable Cities for the Urban Systems Studies series.

CLC also acknowledges the contributions of Ms Rachel Ng, Ms Heng Hwee Hwee, Ms Zing Lim, and Mr Chew Yuan Xiang for their invaluable contributions in information and data gathering.

THE CLC LIVEABILITY FRAMEWORK

The CLC Liveability Framework is derived from Singapore's urban development experience and is a useful guide for developing sustainable and liveable cities.

The general principles under **Integrated Master Planning and Development** and **Dynamic Urban Governance** are reflected in the themes found in *Cleaning a Nation: Cultivating a Healthy Living Environment*, detailed on the opposite page:



Integrated Master Planning and Development

Think Long Term

The solution of reducing waste volume by incineration, although expensive, was deemed cost-effective because of Singapore's small land footprint. A decision was taken in 1973 to build Singapore's first modern incineration plant.

(see Making Space for Waste, p. 19)

Fight Productively

In order to curb odours caused by poultry farming, poultry farms were made to either equip their farms with waste treatment technologies, or close down. This was done at the expense of local egg supply, but was deemed necessary in order to maintain quality of life.

(see Phasing out Old Industries, p. 14)

Innovate Systemically

Semakau landfill, an offshore waste disposal site, was unique as deliberate efforts were made to minimise environmental impact and to protect biodiversity.

(see Semakau: A Landfill out at Sea, p. 21)

Dynamic Urban Governance

Lead with Vision and Pragmatism

A hawker resettlement programme was launched to move itinerant hawkers into food centres with proper sewerage facilities, to provide people with a hygienic eating environment. These hawker centres are now an integral part of Singaporeans' lives.

(see Resettling the Hawkers, p. 18)

Cultivate Sound institutions

The formation of the Ministry of Environment (ENV) in 1972 was a significant turning point. Singapore was one of the first countries in the world to have an entire Ministry dedicated to the environment.

(see An Institutional Watershed: An Environment Ministry, p. 9)

Involve Community as Stakeholders

Environmental stewardship is moving from regulation and enforcement to include nurturing and empowering civil society to help build a true culture of cleanliness. The Restroom Association of Singapore, the Waterways Watch Society, the Singapore Environment Council, the Public Hygiene Council, and Keep Singapore Beautiful Movement are some of the organisations championed by civil society, working to identify issues of concern and to promote causes linked to cleanliness.

(see There's a Part for Everyone: Fostering Ownership, p. 35; and The Governance of Cleanliness: From State to Stakeholder, p. 49)

CHAPTER 1

**FOR THE GOOD OF
THE PEOPLE**



Only a people with high social and educational standards can maintain a clean and green city.¹

Lee Kuan Yew, founding Prime Minister

The story often told about the cleaning and greening of Singapore is that it was done mainly for the purpose of attracting international business and investments. In the city-state's early days as a newly independent country in the late 1960s, Singapore's rapid industrialisation and economic development plans were carried out in conjunction with its cleaning and greening efforts. However, it is less well-known that the political leadership prioritised public cleanliness for the well-being of citizens, so that they could enjoy a higher quality of life. The simple wisdom that health leads to happiness had been applied to the entire nation.

This study charts the journey to keep Singapore clean and liveable. Chapter 1 describes the untidy situation in Singapore before the 1970s, while Chapter 2 looks at planning and infrastructural elements that kept Singapore clean in spite of rapid urban development. Chapter 3 discusses the evolution of the cleaning workforce, the challenges of regulation and enforcement against anti-social behaviour. Chapter 4 examines the strategies adopted to encourage behavioural changes so that citizens would take greater ownership of the environment. Chapter 5 provides insights into governance considerations, policy decisions and examines the role of civil society in the cleaning of Singapore, and concludes by looking at the challenges that lie ahead.

THE 1950S AND '60S: RISING FROM THE SLUMS

In the early years, many parts of Singapore were in deplorable conditions. Living spaces were cramped and unhygienic, and public health standards were low. Many people suffered from cholera. Mosquitoes—the vectors for malaria—bred in drains, which had to be frequently oiled by the Rural Health Section of the Government Health Department.²

The City Council's Health Department also faced many challenges. Diesel vehicles with loud engines and even louder horns spewed thick fumes all over the city. Overhanging latrines and uncontrolled pollution sources tainted the Singapore River, where dead animals could be seen floating on foul waters. Hawker stalls that lined the banks were infested with rats and insects.³

In 1967, Member of Parliament (MP) for River Valley, Lim Cheng Lock, noted in Parliament that toilet facilities in most of Singapore's coffee shops, eating houses, restaurants and public places were so unhygienic that it put tourists off. He pointed out that, "Toilet facilities are one of the essential items which [are] being used daily. Yet, most coffee shops, eating houses and restaurant owners pay very little concern for their cleanliness... the water closets have been deliberately jammed and spoilt in order to save [on] water expenses. In quite a number of these public places, food is also being prepared for consumption adjacent to these filthy lavatories."⁴ Clearly, a lot of work was needed to attain at least a basic level of public health, before being able to keep up with Singapore's continued urban development.

"As little children, we would play together. One day, the sister of one of the boys failed to turn up to play for a few days. We asked, 'What happened to your sister?' And he said, 'She's down with fever.' A few days later, we noticed there was a funeral procession coming out of the house. The girl had died and it was just that: died of fever. There was no such thing as a report from the medical authorities to find out what was the cause of her death."⁵

Tan Gee Paw, Permanent Secretary of the Ministry of the Environment (1995-2001)

THE CLEANERS GO ON STRIKE

In 1961, Singapore had a public cleaning workforce of more than 7,000⁶ workmen under the charge of the Ministry of Health (MOH). This “Broom Brigade” consisted of unskilled labourers who had worked under the British administration. Using wooden handcarts and brooms, each workman covered a “beat” of two to five kilometres daily, sweeping the streets and clearing choked drains. However, there were far too few of them to meet the needs of a society where rampant littering and other anti-social behaviour were commonplace.

Mr Chor Yeok Eng, then Parliamentary Secretary to MOH, expressed a sense of helplessness with the situation in 1966, when he asked fellow MPs to “start their own campaigns within their own constituencies—the campaigns to clean up their own constituencies and to get rid of the mosquitoes.”⁷

A cleaners’ strike in 1967 proved to be a turning point. For some time, unhappiness had been brewing amongst the workers who were paid by the day. They felt that their welfare was being neglected.⁸ Negotiations with management over employment terms were not successful and on 1 February 1967, the President of the Public Daily-Rated Employees’ (DREs) Unions Federation, Mr K. Suppiah, led the first union strike after Singapore’s independence.⁹ 2,400 union members participated in the strike, leaving the streets unswept.

In response, the Singapore government¹⁰ declared the strike illegal because the workmen were “members of an essential service whose right of strike action has been specifically regulated by law... to serve a fourteen-day notice before going on strike. No such notice was served to the Ministry [of Health] and the strike which came on this morning took the Ministry by surprise.”¹¹ The government also took immediate measures to sustain cleaning work in housing estates and certain urban areas on the day of the strike by activating 15 convoys of refuse vehicles with 300 Emergency Cleaning Corps workers.

Following the strike, labour laws were amended to allow the cleaners to claim a day-off on any other day, in lieu of work done on a Sunday or public holiday. The cleaners returned to their posts, and the streets were swept and refuse removed daily without disruption.¹²

PRIORITISING PUBLIC HEALTH

In 1968, significant changes took place to address rising concerns about cleanliness. After battling cholera outbreaks in the preceding years, another potential outbreak in early 1968 highlighted the need for substantive action. In May, amidst on-going efforts to relocate and license itinerant hawkers, the MOH, under Mr Chua Sian Chin, took steps to reorganise the labour force for cleaning services. Integrating sections of the Public Health Division helped to strengthen the organisation, while the number of supervisory staff was boosted and cleaning methods were reviewed.

That August, the government divided Singapore into districts, with each district taken care of by a health officer, to better monitor and maintain public health. Each district was further divided into sectors, with a public health inspector or senior public health assistant in charge of each sector. This decentralisation gave field personnel more executive powers, and integrated the public health inspectorate with the public cleaning department.

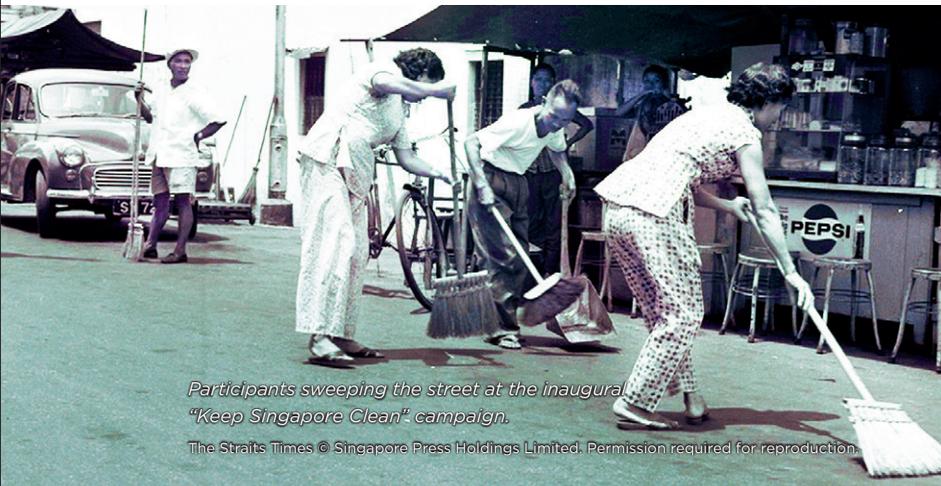
Although the relocation and licensing of hawkers had been taking place under the Hawkers Resettlement Programme since 1966, it was on a small scale. Efforts to curb illegal hawking were stepped up after these changes. Between December 1968 and February 1969, a landmark island-wide census of hawkers was conducted. A total of 28,845 hawkers, including 18,000 street hawkers, were licensed during this period.^{13,14}

NATIONAL CAMPAIGNS BEGIN

MOH recognised that the lack of cleanliness was a “people-orientated problem” requiring mass participation of the public, which had to be addressed if Singapore was to be a “garden city.”¹⁵ In October 1968, the first annual “Keep Singapore Clean” campaign was launched. It was the first nationwide public education programme aimed at making Singapore the cleanest and greenest city in the region. Mass-media platforms broadcast the campaign slogan while all government letters were stamped with the “Keep Singapore Clean” message. The franking on all postal articles also carried the message.

Heavy fines were imposed on individuals who littered, and competitions that rated schools, markets, community centres and government offices on their cleanliness were held. The cleanest premises were rewarded, while the dirtiest were publicly named.¹⁶ MPs and community leaders engaged residents during house visits and community events to boost the national campaign. MPs also led by example, often rolling up their sleeves to clean up common areas, demonstrating a sense of ownership of the environment.

The “Keep Singapore Clean” campaign became an annual event, and three years after the campaign began, the inaugural “Tree-Planting Day”¹⁷ was launched to foster morale and national pride through the promotion of greenery in common areas. Both campaigns have since expanded to become more sophisticated over the decades.



Participants sweeping the street at the inaugural “Keep Singapore Clean” campaign.

The Straits Times © Singapore Press Holdings Limited. Permission required for reproduction.

PLANNING FOR CLEANLINESS

“ There must always be a refuse bin within walking distance so that people don’t litter.”¹⁸

Tan Gee Paw, Permanent Secretary for the Ministry of Environment

One success factor for Singapore’s high standards of cleanliness was the development of physical infrastructure that made it convenient for people to maintain this cleanliness. As former Permanent Secretary for the Ministry of Environment, Tan Gee Paw, said, “There must always be a refuse bin within walking distance so that they don’t litter. It’s no use telling [people], ‘You don’t litter,’ and they don’t know what to do with the litter that they have. They haven’t developed the habit of keeping it in their pockets and bringing it home.”¹⁹

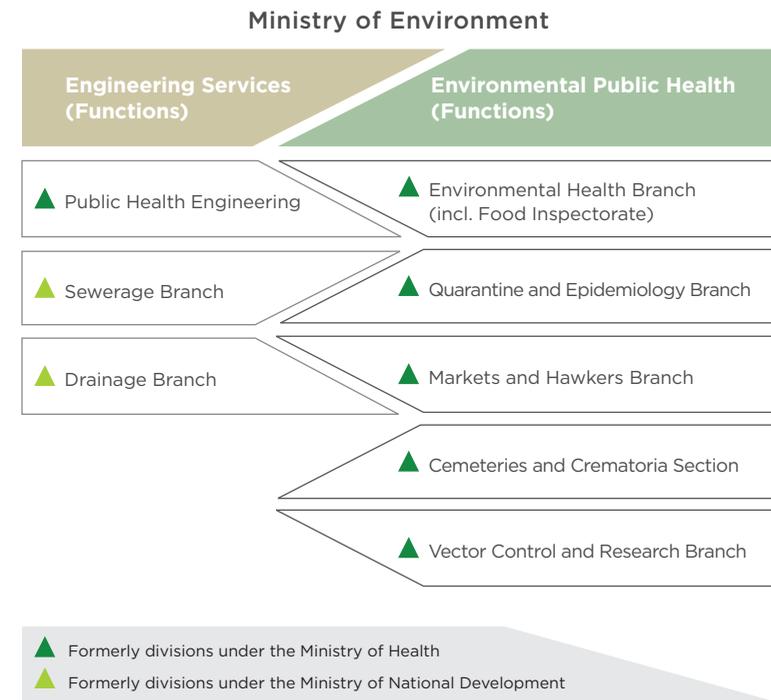
Long-term engineering solutions were favoured, especially those that were durable and cost-effective. For example, some ways to address mosquito breeding would be to kill mosquito larvae by spraying oil or insecticide in breeding areas, and to carry out extensive public education campaigns and enforcement. However, these measures required recurrent expenditure and manpower. On the other hand, engineering good drainage systems to prevent the formation of stagnant water bodies where mosquitoes could breed was a better, longer-termed solution.²⁰

This engineering approach to public health outcomes was institutionalised and effected through the merger of several departments under the Ministry of National Development (MND) and Ministry of Health (MOH).

AN INSTITUTIONAL WATERSHED: AN ENVIRONMENT MINISTRY

The formation of the Ministry of Environment (ENV) in 1972 was a significant turning point. Singapore is one of the first countries in the world to have an entire ministry dedicated to the environment. The ENV’s Environmental Public Health Division championed public hygiene, while the Engineering Services Division provided and managed infrastructure such as sewerage, drainage and solid waste management systems that would safeguard and sustain the environment.²¹ **Exhibit 1** shows the functions within the new ministry, and their origins.

Exhibit 1:
Functions under the Ministry of Environment (1972)



Adapted from *Singapore – My Clean & Green Home*, pg. 24.

Around the world, the quality of life in industrialised cities such as Tokyo was deteriorating due to environmental pollution. Singapore saw itself on a trajectory of industrialisation and urbanisation, and was wary of facing similar environmental problems.²² Thus, the mandate of ENV was broadened to include air and water, so as to manage the environment holistically.

“We need never face the high degree of danger to public health that is threatening some of the polluted cities of the industrial countries.... To keep up the quality of the environment in the face of industrialisation and urbanisation means considerable planning and expenditure on anti-pollution. As incomes go up, so does consumption.... There will be more high-rise flats, more cars, more buses and taxis, more refuse and garbage from each household, glass bottles, plastic containers and other waste. More electricity will be generated for more factories and homes, i.e. more sulphur dioxide belching from power stations and soot and chemical dust from factory chimneys.”²³

Lim Kim San, Minister for the Environment (1972 – 1975)

For the next 30 years, ENV looked after environmental public health as well as sewerage and drainage. After 13 years under the Prime Minister’s Office, the Anti-Pollution Unit (APU), which was tasked to curb pollution from industrial and trade premises, was transferred to ENV in 1983. In 2002, the National Environment Agency (NEA) was formed as a statutory board under ENV, inheriting most of its parent ministry’s operational functions. The ENV itself was renamed Ministry of the Environment and Water Resources (MEWR) in 2004. These changes reflect the on-going efforts to ensure that the organisations are structured to able to respond to new and evolving challenges effectively.

KEEPING PACE WITH DEVELOPMENT

In the 1970s and 1980s, rapid development of physical infrastructure had to be balanced against environmental considerations. These considerations presented major challenges when building extensions to the sewerage network, implementing a burial ground policy, controlling the routes used to transport hazardous chemicals and resolving conflicts of land use. Efforts made by the state to overcome these challenges were done mostly behind the scenes, in order to create a cleaner environment without having to depend on more behavioural changes by the people.

In the early 1970s, the General Services Unit (GSU) collected and disposed of night soil at three disposal stations in Singapore (Albert Street, Jalan Afifi and Toh Tuck Road), with 508 workmen serving 6,416 premises in 1975. However, in a rapidly urbanising environment, this arrangement was hardly sustainable. Providing adequate sewerage infrastructure for both households and industry became a pressing issue.



Night soil carriers collecting human waste deposited in buckets under the bucket system.

Image from Ministry of Information and the Arts Collection, courtesy of National Archives of Singapore

Planners recognised the importance of having two separate networks for collecting storm water and sewage early on. The separation would allow harvested rainwater to be kept as clean as possible, thereby minimising the cost of producing potable water.

A Sewerage Master Plan was developed in 1972 with advice from World Health Organisation (WHO) experts. It was based on the Singapore Concept Plan, which had been drawn up the year before with the help of the United Nations.²⁴ The sewerage plan divided Singapore into six catchments from which sewage would be collected via an underground network and sent to six separate treatment works—at Jurong, Kranji, Bedok, Seletar, Kim Chuan and Ulu Pandan—to be constructed over the next two decades.²⁵ Singapore received grants of US\$18 million from the World Bank to realise this Master Plan. This was the first time the World Bank had given a loan for sewerage development.²⁶

Ensuring that the public sewerage system was ready a few years ahead in areas where the Housing Development Board (HDB) was building new towns was no easy task for ENV. The internal sewerage system that served households in HDB estates had to be designed to flow well into the public sewerage system built by ENV. This required careful co-ordination of construction schedules between the two organisations. While the works were being carried out, the relevant departments also had to deal with public complaints when sewerage pipes were being laid, as they were usually very visible along roadsides. Numerous meetings were held for various departments to sort out their differences because laying the groundwork for these pipes often encroached onto other infrastructural projects. Despite the challenges, engineers of both the HDB and ENV learnt from experience and managed to work together to meet their deliverables.

Mr Lee Ek Tieng, former Permanent Secretary at ENV, recalls, “our biggest problem was trying to keep up with the industries that [were coming] into Singapore... to provide basic infrastructure.” In addition to developing Jurong as a major site for industrial use, smaller industrial parks were also being developed by the Jurong Town Corporation (JTC). There was tremendous pressure to provide basic infrastructure, such as water, electricity and sewerage for these factories, which “[could be] set up almost overnight.” In cases where the factories could not be connected to the sewerage system in time, they were allowed to use septic tanks as a stopgap measure.²⁷

In addition to treating human waste, the sewerage systems were necessary to channel and treat industrial discharge. The Trade Effluent Regulations introduced in 1977 (coinciding with the start of the Singapore River cleanup) imposed a limit on what industries could discharge into open drains and waterways.

Recommendations were made for industrial activities to be located in areas that were already sewered. In doing so, industrial waste would not have to be pre-treated to a high enough standard for discharge into open water bodies. Companies whose treatment standards were not on par with the latest regulations, and whose factories were not sewered, had to either bear the costs of upgrading their own treatment system, and laying their own pipeline to connect to the existing sewers, or relocate to a sewered area.

Meanwhile, the final night soil bucket was phased out in 1987, coinciding with the completion of the Singapore River cleanup. By the 1990s, Singapore was fully served by a modern sanitation system. This was a huge achievement, considering that just two decades ago, night soil was still being collected and manually disposed of for many households.

PROTECTING THE PUBLIC

In the 1970s and 1980s, the scope of ENV’s work in public health and chemical safety had to be broadened to include the management and control of hazardous industrial chemicals, in order to support new industries.

Dr Ahmad Mattar, who was appointed Minister for the Environment in 1985, noted in a Parliamentary sitting in March 1986 that there was “no single Act of Parliament at the moment for the control of hazardous substances in Singapore.” He pointed out that different aspects of hazardous substances were controlled under almost a dozen separated Acts that were “vested in a number of ministries.”²⁸ He identified the need to control industrial chemicals as being of particular concern.

An accident a few months later highlighted the urgent need to protect the public from potential exposure to hazardous chemicals. In June 1986, sulphuric acid leaked from a tank on a vehicle parked at the Causeway.²⁹ At first, no one suspected that this liquid was sulphuric acid as there were no indicative markings on the tank, which had

been previously used for carrying milk. The next morning, splashes from the leaking tank caused a passing motorcyclist to skid. Both the motorcyclist and his pillion rider were burned by the acid. The motorcyclist managed to save himself by jumping into the sea but his pillion rider died a few days later.

The Poisons Act, first gazetted in 1939 and administered by the Ministry of Health (MOH), was subsequently amended in 1987 to give ENV officers the authority to issue licences relating to industrial and agricultural poisons.³⁰ The ENV was also put in charge of the overall management of hazardous chemicals, which meant it had to plan routes and implement safety procedures for the transportation of these chemicals.

The ENV's authority did not go unchallenged by the industry. In the 1990s, one company complained to the Economic Development Board (EDB) that the detours taken by its trucks to avoid driving near housing estates incurred additional costs in terms of both time and money. The company insisted that their tanks were thick and strong, and therefore would not be easily breached even under extraordinary circumstances.

However, when ENV invited scientific experts to verify the company's claims, the experts showed that the steel plates used in the tank could still be breached under certain circumstances, and therefore recommended that no exceptions be made. This is just one example of the extensive amount of work and attention to detail that is required to maintain a high level of safety for the public. Since much of the action occurs behind the scenes, protection from hazardous chemicals is usually taken for granted by the public.

PHASING OUT OLD INDUSTRIES

In the early decades after Singapore's independence, the speed at which public housing was being built posed yet more challenges when it came to managing public health.

Bukit Merah used to house a glass factory, which emitted sulphur dioxide, an air pollutant. In the past, the emissions did not have much of an effect as Bukit Merah was considered a remote area. As the HDB began building more flats closer to the factory in the 1970s, residents started to complain about the emissions. As the glass factory had

started operations long before the residents moved in, it did not seem reasonable for the government to close the factory down. However, the government did then require the factory to comply with pollution control regulations. Eventually, the factory owner found that the same housing developments that were the source of increasing complaints from residents were also instrumental in increasing the land value where his factory was located. He decided to move his glassworks to Malaysia.

While some environmental problems such as odours and noise may be seen as minor nuisances, they still need to be managed because they undoubtedly affect the quality of life for residents. However, as such nuisances are hard to measure and quantify, actions taken to address the problem can be difficult to justify, particularly if the actions required are costly and disruptive.

One such example of environmental nuisance is the odour from poultry farming. Four poultry farms were previously located in the Sungei Tengah area, and together, they reared some 1.2 million chickens. The farms had been established in 1987 on 20-year leases to produce eggs for the Singapore market. However, after flats were built in the Chua Chu Kang and Yew Tee areas, complaints from residents about unpleasant smells increased more than seven-fold between 1999 and 2000.

As a result, the Agri-food & Veterinary Authority (AVA) appointed a consultant to conduct a study which concluded that improper handling and composting of poultry waste by the farms were the major causes of the smell, and that the odours could be detected as far as three and a half kilometres away. The farms were given the deadline of 19 April, 2002 to exercise one of two options. The first was to completely upgrade and convert their farms to enclosed poultry houses, equipped with appropriate waste treatment technologies. The other option was to accept an ex-gratia payment for closing down before their 20-year lease was up.³¹ Three of the four chicken farms accepted the second option, citing that the cost of upgrading would have made their businesses uncompetitive. Seng Choon Farm was the only farm that did not choose to close down early.

This turn of events meant that the AVA had to scale down its goals of increasing local egg supply, but it was deemed a necessary trade-off between food self-sufficiency and maintaining quality of life of the surrounding community.

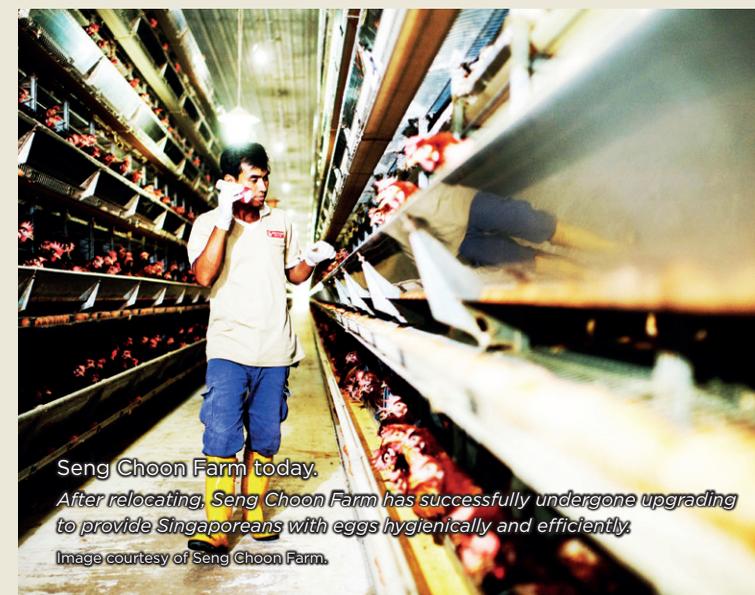
THE CHICKEN OR EGG DILEMMA: SENG CHOON FARM



For Mr Koh Swee Lai, owner and chairman of a small farm called Seng Choon Farm, the cost of upgrading waste and smell treatment operations at his farm was considerably high. Faced with the deadline given by the Agri-food & Veterinary Authority (AVA), Koh wanted to keep his trade rather than close down his farm.³² Then came the dilemma: get rid of the smell, or move the farm?

Mr Tan Quee Hong, former Director of Pollution Control at National Environment Agency (NEA), was intimately involved in addressing unpleasant smells generated from the poultry farms. "I met [Mr Koh] so many times," he recalls. "And my advice to him was, 'You had better find an alternative' and then he got a consultant to do a quote for him... For full odour control, \$12 million... [to] try to minimise the smell, it's just about \$1 million. Obviously, he chose that low cost [option]. But I told them that if you put this [in place], the problem is not going to go away. It will be there and ultimately, you will still have to relocate. So they wanted to give it a try... True enough, they put [in] this equipment, it didn't solve the problem.... In 2008, he accepted an offer for the alternative site..."

Koh's passion and pride for his trade, which was evident during this episode, left a strong impression on Tan. "I remember certain occasions when I met Mr Koh and in front of me he talked and talked until you could see the tears drop, you also don't feel good. But at the end of the day, when the case is successfully resolved and the [affected] party is also quite happy about it, like for this case [with] Mr Koh, you feel a sense of satisfaction and accomplishment."³³ In 2010, Seng Choon Farm relocated to Lim Chu Kang Agrotechnology Park and was able to upgrade its machines, systems and poultry houses.³⁴



Seng Choon Farm today.

After relocating, Seng Choon Farm has successfully undergone upgrading to provide Singaporeans with eggs hygienically and efficiently.

Image courtesy of Seng Choon Farm.

RESETTLING THE HAWKERS

In 1970, a hawker resettlement programme was launched to move itinerant hawkers into proper markets and food centres. Yung Sheng Food Centre was the first hawker centre built from this programme in 1972, drawing from the government's initial provision of S\$5 million for the construction of permanent hawker centres and markets with proper sewerage facilities disbursed to the HDB, JTC and the MOH. By February 1986, about S\$100 million had been spent on building 103 markets and food centres to re-site all street hawkers.³⁵

Those affected were reassured that the alternative was tangibly better. Mr Lee Ek Tieng, then head of the APU, said, "Most hawkers and squatters... know that they will moving into something better and cleaner. Squatters will be moving into new HDB flats. Even the motorcar workshops—they were spilling all the waste down the drain—we built special garages, shops and everything, with grease traps. So, they could see that these [changes] were good."³⁶

Today, hawker centres, which started off as a way to safeguard public cleanliness, have evolved into a daily staple, even a cultural icon, for Singaporeans. NEA Deputy Chief Executive Officer, Mr Khoo Seow Poh, shares, "Over the years, eating in hawker centres [has] become a lifestyle. Singaporeans are demanding that we need to sustain this lifestyle... Singaporeans need affordable food... it's another reason why we need to consider whether we need more hawker centres."³⁷



Hawker centres in Singapore have evolved to be a mainstay in the lives of Singaporeans for clean, affordable food.

Image courtesy of Sheep'R'Us.

MAKING SPACE FOR WASTE

In the early days, refuse that could be burned was sent to an incinerator at Kolam Ayer.³⁸ Refuse that could not be burned was dumped in a designated swampland along Bendemeer Road, or in places such as Choa Chu Kang. In 1972, as the Choa Chu Kang Dumping Ground was being depleted quickly, the Master Planning Committee approved that 70 acres of tidal swampland at Lorong Halus be used as a landfill, and acquired another 55 acres of swampland at Lim Chu Kang.³⁹ By 1975, existing dumping grounds at Koh Sek Lim and Tampines were completely filled up.



The Lorong Halus Landfill had been in operation since the 1970s. This became Singapore's only landfill from 1992, before it was closed completely in March 1999, when the offshore Semakau Landfill was opened. Image courtesy of the National Environment Agency.

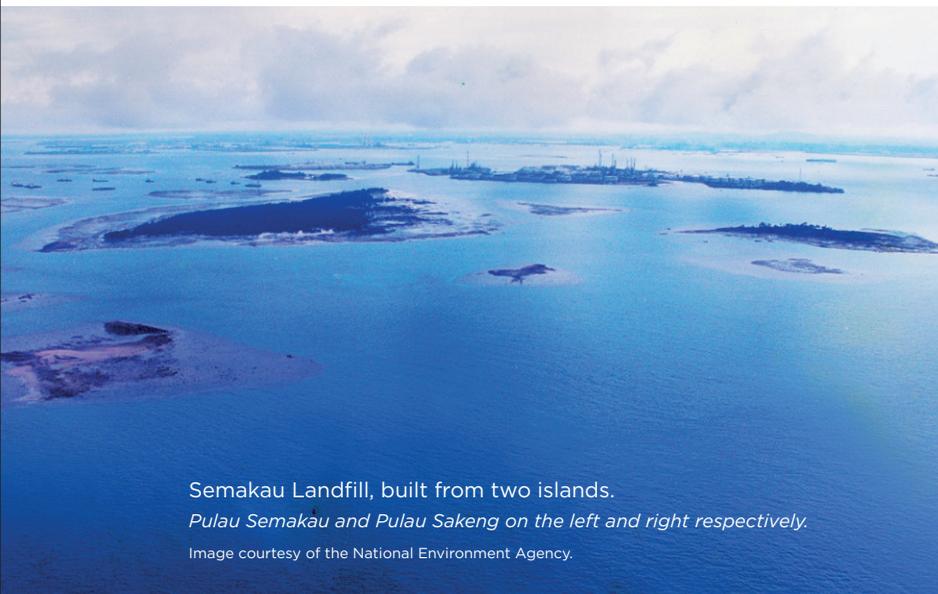
Early on, the solution to reducing waste volume was incineration. Although relatively expensive, it was nonetheless deemed cost-effective because of Singapore's small land footprint. Incinerating waste and sending the incineration ash to the landfill resulted in a volume reduction of up to 90%.

A decision was taken in 1973 to build Singapore's first modern incineration plant at a cost of S\$94 million. This was a hefty investment by the government at the time. To assist in financing the project, a loan of US\$25 million was taken from the World Bank to build the plant at Ulu Pandan with the help of German consultants. Former Director-General of Environmental Public Health, Mr Daniel Wang, was put in charge of constructing the first waste-to-energy incineration plant. He was initially surprised, because "there were a lot of competing agencies

for the S\$100 million—schools, hospitals, roads”, which could have brought more immediate benefits to the people. He credits the political leaders then for having “really clear foresight as to the need for [an incineration plant]”. As this incineration plant was the first of its kind in Singapore, there was huge responsibility and pressure on the team to make sure that the money was well-spent.⁴⁰

The Ulu Pandan waste-to-energy incineration plant was commissioned in 1979, with three incinerator-boiler units and a capacity of 1,200 tonnes of waste per day. By 1982, a fourth incinerator-boiler unit was added to meet the increasing amount of waste generated. Subsequently, waste-to-energy incineration plants were commissioned at Tuas and Senoko in 1986 and 1992, respectively.

The demand for more refuse disposal facilities continued until the fourth waste-to-energy incineration plant, the Tuas South Incineration Plant, was commissioned in 2000. Then, it was one of the largest incineration plants in the world, capable of incinerating 3,000 tonnes of refuse each day. With sufficient incineration capacity in place, it became a regulatory requirement in Singapore for waste collectors to dispose of all incinerable waste at the incineration plants. Action was then taken to create Singapore’s only landfill on the island of Pulau Semakau, where only non-incinerable waste and the ash generated from the incineration process would be disposed of.



Semakau Landfill, built from two islands.

Pulau Semakau and Pulau Sakeng on the left and right respectively.

Image courtesy of the National Environment Agency.

SEMAKAU: A LANDFILL OUT AT SEA

In 1992, the Lim Chu Kang Dumping Ground reached its maximum capacity and was closed. The Lorong Halus Landfill became the only remaining landfill site in Singapore. Anticipating that the Lorong Halus Landfill would soon be filled up as well, the Development Planning Committee gave approval for the next landfill site to be located in Punggol, a pig and poultry farming area in the north of Singapore. By the early 1990s, ENV and the resettlement department of HDB started engaging with farmers in the Punggol area with regard to the prospective acquisition of their land for the landfill.

However, in a twist of events, Punggol was earmarked as a new housing estate instead, in view of Singapore’s growing population. This was unexpected for the ENV, as Punggol had already been approved by the Master Planning Committee as a landfill area to meet Singapore’s waste disposal needs. ENV had to search for an alternative site—a challenging task—as there was little space left on Singapore’s main island. Even offshore islands had been earmarked for other purposes. Eventually, a proposal was submitted to create a landfill out of strips of land (bunds) connecting Pulau Sakeng and Pulau Semakau, known as the Semakau Landfill. The Cabinet approved this proposal in 1994.

The Semakau Landfill is unique in that there were deliberate efforts made to minimise environmental impact and to protect biodiversity in the vicinity from the beginning. As part of the design, Pulau Sakeng and Pulau Semakau would be joined by two earth bunds, which would affect nearby marine and plant life. The Parks and Recreation Department (now NParks) was concerned about its environmental impact, particularly as there was no such precedent in the world. The Maritime and Port Authority (MPA) also wanted to ascertain that the proposed earth bunds, which could affect the currents, would not pose risks to shipping routes. Thus, a feasibility study was conducted to study how the landfill should be operated in order to minimise environmental damage.

Efforts were made to conserve existing mangroves on the islands. ENV worked with prominent biologists like Chou Loke Ming, Lee Sing Kong and Leo Tan to replant the affected mangrove swamps. The Semakau Landfill cost over S\$600 million to build, of which over S\$6 million was spent on replanting mangroves. The construction of a longer bund and an additional channel between this bund and Pulau Sakeng would



The completed Semakau Landfill in 1999.
Image courtesy of the National Environment Agency.

have enabled those mangrove swamps to be left alone. Conversely, alternative methods to avoid affecting the mangroves would have cost S\$20 million. The remaining cost of building the Semakau Landfill was invested in modifying the method of transferring waste and ash from the Tuas Marine Transfer Station to the Semakau Landfill. Instead of using small open barges pulled by tugboats, the project team designed a 3,000 tonne covered barge that would be pushed instead. This innovative method, although more costly upfront, would be far cleaner and much more efficient in the long run.

After the Semakau Landfill was completed, the Lorong Halus Landfill, which had accumulated about 234 hectares worth of organic waste and incineration ash in less than 30 years, was officially closed on 31 March 1999.⁴¹ Henceforth, all incineration ash and non-incinerable waste were sent to the Semakau Landfill. If Singaporeans learn to minimise waste through efforts to reuse, reduce and recycle, the Semakau Landfill should be the last landfill that Singapore will ever need.

CHAPTER 3

CLEAN CITY OR “CLEANED CITY”?

“ We want Singapore to be a clean place, not just a cleaned place.... [We] need community participation, community leadership...to achieve this vision.⁴²

Vivian Balakrishnan, Minister for the Environment and Water Resources (2010-2015)

Singapore has a strong reputation as a clean and green city. But whenever there are worsening trends, such as rising incidences of littering, the question as to whether she is a genuinely clean city, or simply a “cleaned city”⁴³ is raised.

The reality is that managing Singapore’s cleanliness requires a delicate balance between what the state can do and what the private sector and civil society can contribute. To sustain the environment, even the most effective public service is powerless without the involvement of other stakeholders. Measures implemented for managing the street cleaning workforce, and maintaining air quality and public health, including vector control, wet markets and littering demonstrate this.

STREET CLEANING GOES HIGH-TECH

No city can be kept clean if the cleaning workforce itself is not in good health. Recognised as being vital to the upkeep of Singapore, the authorities have increasingly sought to remove impediments to the cleaning process.

After the cleaners’ strike of 1967, labour laws were amended. With the enactment of the Environment Public Health Act in 1968, the cleanliness of public places and the collection and removal of refuse were more effectively enforced under the Public Health (Public Cleansing) Regulations, 1970. Subsequent industry adjustments made as a result of advancements in cleaning technology helped to further enhance the efficiency of the public cleaning workforce.

“Billy Goats” and other Cleaning Technology

By the late 1980s, most of the street-cleaning workforce was approaching retirement age and the prospect of recruiting younger cleaners was daunting. It was a time of economic prosperity and an increasing range of employment opportunities beckoned to the younger generation. The cleaning workforce had dwindled to 2,100 workmen⁴⁴ from over 7,000 in the 1960s, while the number of walkways, pavements, drains and grass verges they were tasked to maintain had increased with urban development. This sharp imbalance between available labour resources and the workload needed to be addressed, and technology was the answer.

To improve the efficiency of roadside cleaning, mechanical sweepers were introduced. These sweepers were essentially trucks mounted with large round bristles on the kerb side of the vehicles, with holding tanks for collecting and retaining debris and dried leaves. Each mechanical sweeper could sweep 50 to 60 kilometres of road daily⁴⁵—the equivalent of what 40 workmen could manage manually.

The Ministry of Environment (ENV) also began to test-run four one-man-operated mobile vacuum cleaners for areas not accessible to roadside mechanical sweepers.⁴⁶ Equipped with long flexible vacuum hoses, these cleaners—nicknamed the “Billy Goats”—could clean nooks and crannies along walkways and around roadside kerbs much faster. In April 1989, ENV procured 25 “Billy Goats” for S\$100,000. Since then, the deployment of new technology to improve efficiency has continued.

WASTE COLLECTION GOES PRIVATE

By the late 1990s, ENV began to work more closely with the cleaning industry to leverage private-sector expertise for even greater operational efficiency. To ensure that policy objectives and service levels to the public were achieved, the Ministry launched a pilot project that would corporatise its refuse collection arm over three years. The resulting entity, SEMAC Pte Ltd, started off as a monopolistic provider of waste collection services for households in 1996.⁴⁷

Satisfied with the results of the pilot project, ENV took further steps to wholly privatise the collection of public refuse by 1999. Singapore was divided into nine service sectors, and the performance of private waste collection companies was closely monitored by the Ministry.

With strict regulations and controlled licensing in place, the privatisation of household waste collection proved to be effective in improving efficiency and lowering waste collection fees over the years. Customer surveys show that service quality has been maintained at satisfactory levels.

Formed in 2002, the National Environment Agency (NEA) inherited the street cleaning function from ENV. Under the NEA, the private cleaning industry continues to play an important role in maintaining Singapore's 3,800 kilometres of public roads, 160 kilometres of expressways, 3,700 kilometres of pedestrian pavements, 300 overhead bridges and underpasses and almost 7,000 litter bins.⁴⁸

AIR QUALITY: CLEARING THE AIR

Air pollution was another area of growing concern in the face of rapid urbanisation and industrialisation. Mr Ong Seng Eng, former Director of Waste and Resource NEA, recounted an incident in the 1970s where, "a resident complained that her white cat had become a black cat"⁴⁹ because of the soot released from nearby diesel hammers, a type of pile driver widely used then as a cheap way to do piling in construction work.

Legislation granting powers to keep air pollution in check had to be enacted before meaningful action could be taken in that regard. In 1970, the Anti-Pollution Unit (APU) was formed to address air quality. As part of the Prime Minister's Office, the APU was given high level of attention in its mandate to improve air quality. Within the same year of the APU's formation, a smoking ban was introduced in cinemas and buses.

In 1971, the Clean Air Act was passed. Policy-makers referred to similar acts from Australia and New Zealand as benchmarks. The passing of this piece of legislation embodied the political will to curb air pollution. Mr Joseph Hui, Deputy Chief Executive Officer of NEA, explains that it was "written up in such a way that it gives the authorities the power to control the polluters... the Minister [even has] the power to stop a factory from operating if it is posing danger and threat to the people around."⁵⁰

The powers accorded to the authorities under the Clean Air Act made it a lot easier for NEA officers to deal with enforcement problems. According to Hui, this was recognition that "even 0.01% of pollutants

from a factory may be sufficient to cause a problem to somebody living next door to it." The APU worked with other government agencies to ensure proper zoning in order to keep sources of pollution away from residential areas.⁵¹ In 1976, the use of smoky and noisy diesel hammers for piling was prohibited in construction sites located within certain distances from schools, hospitals and residences.⁵² Eventually, the diesel hammers were replaced altogether by piling rigs based on improved technology that emitted much less pollution.

The "Cat-and-Mouse" Game of Enforcement

Despite the strong political support for tackling air pollution, enforcement on the ground was nevertheless challenging, and something of a "cat-and-mouse" game. "There were old private buses; old, privately-owned taxis, and they were running all over the place, full of black smoke," recalled Mr Tan Gee Paw, former Permanent Secretary of ENV.⁵³

The law empowered the relevant enforcer to go after these smoke-emitting vehicles and to fine their drivers, but the ENV did not have sufficient manpower resources for this task. Seeking the help of other vehicle-related enforcement personnel was also difficult, as the few policemen from the Registry of Vehicles saw their job solely as ensuring that vehicles were mechanically safe, while the goal of the Traffic Police was to ensure good traffic conduct.⁵⁴

Singapore's early air quality enforcers also had to tackle air pollution from the construction and other industries. Open burning of wood waste was commonplace, especially at construction sites. A prohibition order against open burning was put in place to curb air pollution from the smoke. However, as most open burning was done late at night, enforcing the prohibition order was challenging.

"We carried out air emission tests.... We were equipped with our own helmets, safety boots, boiler suits and test equipment, and climbed up chimneys to extract samples of flue gas following a strict procedure so that the results... are admissible as court evidence should prosecution action be taken."⁵⁵

Ong Seng Eng, former director of the Waste & Resource Management Department, National Environment Agency

As Singapore developed, the need to carry out enforcement lessened. It gradually became less advantageous for woodwork companies to operate in Singapore. Similarly, the level of sulphur dioxide and dust from oil-dependent power plants gradually reduced. “Now that we have moved away [from oil] to gas, there is much less dust and acid in the air from power plant operations,” says Mr Ananda Ram Bhaskar, Director of NEA’s Energy Efficiency and Conservation Department.⁵⁶

Vehicular Emissions: Balancing Health and Growth

Certain constituents of fuel give rise to air pollution and therefore the contents of fuel products in Singapore needed to be controlled. In 1976, limits were set for the amount of sulphur in diesel sold within the country.⁵⁷ Meanwhile, evidence was emerging overseas that lead particles emitted into the air through the use of leaded petrol had adverse effects on brain development. Limits on lead content in petrol were first set in 1980, and the level of lead in petrol was progressively decreased from 1981 onwards.⁵⁸ In 1991, a differential tax system made unleaded petrol cheaper than leaded petrol by 10 cents per litre. Leaded petrol was phased out by mid-1998.

Vehicular exhaust emissions standards were introduced in 1984, but only for new petrol vehicles. In 1991, this was extended to new motorcycles, scooters and vehicles with diesel engines. Discussions among the economic agencies, the APU and ENV considered the overall impact of the new emission standards and decided that for economic reasons, the existing fleet of vehicles would be spared from complying with the new standards. This gesture reflected the government’s need to balance between protecting the environment and pursuing economic growth then.

PUBLIC HEALTH: SOME PERSISTENT CONCERNS

In spite of monitoring, enforcement and public education, some public health concerns from the early days still persist today. In the 1970s and 1980s, Singapore worked to remove possible sites where pathogens and disease-spreading vectors could breed. In 1982, Singapore became one of the few countries in the equatorial region to be declared malaria-free. This was due to tireless efforts to eliminate brackish pools of water—the breeding grounds for the *Anopheles* mosquito.

However, dengue fever is not as easy to eradicate because the *Aedes* mosquito breeds in clean, stagnant water, which can easily accumulate in households if conscious and continuous efforts are not made to eliminate them. As recently as 2013, Singapore saw a switch in the strain

of the dengue virus, and recorded one of the highest weekly dengue cases as a result. Massive efforts have since been launched to educate the public and raise awareness of hotspot areas.

Another lingering public health concern is food poisoning. A preventive measure enforced in 2012 now requires food caterers to display a four-hour time stamping for food on display, as a safety advisory for customers. Faced with year-round heat and humidity, food not stored under chilled conditions can deteriorate very quickly, necessitating such a measure.⁵⁹

No More Open Slaughter: Changing the Wet Market Culture

The force of habit is a major obstacle to behavioural change. This was certainly the case when it came to wet markets. Wet markets are a key feature in the everyday lives of many Singaporeans. In the past, chickens were slaughtered on site, raw meat was not stored in chillers, and conditions were generally unhygienic. Thus, in 1990, it became mandatory that chickens could only be slaughtered in abattoirs. This was to align with the aims of the Agri-food and Veterinary Authority (AVA) in improving quality control.⁶⁰ The challenge was to convince stallholders that this was a better option. For the sellers, they would not have to start their day so early in the wet markets. For the customers who had come to expect that the live chickens could be inspected before purchase, this was a change of habit that they would have to adapt to. Authorities argued that if chickens were slaughtered at abattoirs, it would be easier to check on levels of antibiotics injected.⁶¹ Gradually, the sale and slaughter of live chickens were phased out from wet markets.

When the first human case of bird flu appeared in 1997, cities such as Hong Kong had to cull thousands of live chickens in their wet markets to prevent the spread of the virus. In hindsight, Singapore’s move to phase out the sale of live chickens turned out to be a “blessing in disguise.”⁶²



Singapore wet markets of yesteryear. Customers were able to inspect all food items—including live chickens, before purchase.

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PRE-EMPTIVE PUBLIC HEALTH: HAND, FOOT AND MOUTH DISEASE (HFMD)



A key element in safeguarding public health is to pre-empt new threats by planning appropriate responses. This was the case for an outbreak of hand, foot and mouth disease (HFMD) in Malaysia and Taiwan in the late 1990s. Although HFMD is generally a mild childhood disease, this outbreak killed several children.

Mr Daniel Wang, former Director-General of Environmental Public Health, recounted the challenges and seemingly thankless task of public health when he was tackling HFMD as Commissioner of Public Health at ENV. To pre-empt an outbreak of HFMD in Singapore, a task force was formed, including representatives from the Ministry of Health (MOH) and Ministry of Community Development (now the Ministry of Culture, Community and Youth). One particularly difficult decision was whether to make HFMD a notifiable disease (one required by law to be reported to the authorities), as the then current list of notifiable diseases was already very extensive.

“We all agreed that if we see two children die within 10 days, we’re going to close down all the childcare centres because this is how it’s spread—person to person—and [the disease] usually attacks children,” explained Wang.

One Saturday, on 30 September 2000, Kandang Kerbau (KK) Hospital (now known as KK Women’s and Children’s Hospital) reported that two siblings had died of the disease. The Chairman of KK Hospital personally informed Wang, who then updated Mr Lee Yock Suan, who was the Environment Minister then. Wang recalls, “It was his last day. So I went into his room. He thought I was going to wish him goodbye, and I said, ‘I wish you goodbye but I have sad news.’” Lee then informed the Prime Minister, who advised that there should be no public panic. The Community Development Minister then agreed to put into action the standard operating procedure (SOP), which had already been prepared by the task force. This was approved by the Cabinet, and in October 2000, HFMD was made a notifiable disease.⁶³

Once the SOP was activated, all childcare centres were closed on the following Monday to prevent further spread of the disease. While this certainly inconvenienced families with young children, it was necessary to help curb the spread of the disease. Wang recalls that “there was a big public hoo-ha. Fortunately, it happened over a weekend, so... people [still] had Sunday to work out alternative plans.”

Even though the implementation of the SOP was successful in containing the disease, doubts were still cast after the incident. “A question was asked: Is it really necessary to close down childcare centres? Your action: Was it an over-reaction?” shares Wang. “I said, well you know, that’s the funny thing about public health. When things don’t happen because you have taken preventive action, people ask, ‘Was it necessary?’”⁶⁴

STREET LITTER: DEALING WITH HUMAN NATURE

When it comes to litter on the streets, pervasive anti-social behaviour is the “enemy.” To deter litterbugs, Singapore imposes fines on those caught littering. For the first offence, the maximum court fine is S\$1,000; S\$2,000 for the second offence; and S\$5,000 for third and subsequent offences. But there were periods when fines did not seem effective in discouraging litterbugs.

To complement fines, the Corrective Work Order (CWO) was added to the deterrence system. Introduced in 1992, the CWO adopted both punitive and reparative objectives to reform recalcitrant littering offenders. On top of being fined, offenders were required to carry out litter-picking in public areas such as parks and beaches. It was hoped that littering would become associated with anti-social behaviour and offenders would realise the difficulties faced by cleaners. The CWO drew some criticism, including the view that the shaming effect would not deter repeat offenders.⁶⁵ However, Mr Daniel Wang explains, “the shame factor... helped as a deterrent. Paying fines would not mean anything to some people.”⁶⁶

From 2009, both a court fine and a CWO were imposed on all repeat-offenders of littering. To increase the deterrent effect, seven rounds of CWO were conducted in prominent areas of town centres, such as East Coast Park and Pasir Ris Park, as part of the renewed anti-littering campaign in 2010. Consequently, an increase in number of enforcement officers showed a decrease in littering offences between 2009 and 2010.

It should be noted that enlisting the help of “enforcers” on the ground is not easy. No one wants to be the “bad cop” and be on the receiving end of flak from the public. Today, the quest for maintaining the balance between enforcement and engagement carries on. NEA continues to seek community volunteers to keep watch over their neighbourhoods, and take down details of any litterbugs they come across.

STICKING TO THE CHEWING GUM BAN



Chewing gum used to be a nuisance in Singapore. In Housing Development Board (HDB) flats, lift doors were constantly jammed with gum stuck on by inconsiderate gum chewers. Approximately S\$150,000 had to be spent each year to remove gum on the floors and walls of HDB estates. As early as 1983, there was talk of banning chewing gum to keep the country clean.⁶⁷ Then Minister for Foreign Affairs and Culture, Mr S. Dhanabalan said that he could imagine Singapore as “the only place in the world that has banned chewing gum. I’m not worried about that... All we are concerned about is how we can improve our environment.”⁶⁸ He called for the ban on chewing gum advertisements and its sale in schools, which came into immediate effect.

However, chewing gum continued to tarnish the environment. In July and August 1991, chewing gum stuck over the door sensors of an MRT train resulted in disruptions to the train service. Then Prime Minister Mr Lee Kuan Yew demanded an immediate ban on chewing gum. By 3 January 1992, the sale of chewing gum was illegal in Singapore.

Instead of allowing gum sellers to clear their stock, the instruction was to ban chewing gum straightaway. Sellers were compensated for their losses instead. The ban came under the mandate of the Ministry of Environment, which had jurisdiction over the Sale of Food Act, and attracted controversy worldwide.

Singapore is still widely known for the banning of chewing gum. Although still in place today, an exception was made in 2004 to allow chewing gum of therapeutic value to be sold by prescription. But Mr Daniel Wang, Former Director-General of Environmental Public Health, maintains that from the standpoint of maintaining cleanliness, the ban makes perfect sense, because of the high cost of removing dried gum stuck in public places. “Actually, if you ask [other countries] privately, they [would] say [it is a] very good idea.”⁶⁹

CHAPTER 4

THERE'S A PART FOR EVERYONE: FOSTERING OWNERSHIP

“The best way... is to put social pressure on those who dirty the environment... if you see somebody who is littering, tell them to pick up after themselves, and make sure we ourselves do not do it.”⁷⁰

Lee Hsien Loong, Prime Minister

Public education and engagement on cleanliness in Singapore has grown in scope over the years. The “Keep Singapore Clean” campaign of 1968 set the tone for future public engagement programmes. At the inaugurating speech of the campaign, then Prime Minister Lee Kuan Yew pointed out that the campaign was targeted at “not only our young in schools, but also our adults.”⁷¹ He noted that cleaning was also tied closely with greening as “Singapore has become one home, one garden, for all of us.” In 1971, the first Sunday of November was designated as an annual tree-planting day to promote a green Singapore. In 1990, the dual environmental priorities of cleanliness and greenery were merged when the “Keep Singapore Clean” campaign was renamed “Clean and Green Week.” This was later rebranded as “Clean and Green Singapore” (CGS) in 2007, to signify that the environment should be a concern all year round. (See Appendix A for a full list of campaign themes.) These initiatives focus on community ownership, emphasising that sustaining the environment is everyone’s responsibility. Fostering this sense of civic duty continues to be the state’s on-going mission, to influence Singaporeans to take ownership of keeping Singapore clean.

CONSERVING RESOURCES: BRINGING RECYCLING HOME

Resource conservation became an important theme after the turn of the century. The closure of the Lorong Halus Landfill in 1999 highlighted the challenge that land constraints posed. In order to reduce solid waste, the best response was to focus on recycling efforts. However, recycling is only effective if people pick out recyclable waste at the point of disposal. Cultivating this habit has been no easy task.

In the 1990s, the Ministry of Environment (ENV) tried implementing recycling bins, a common concept in many developed countries. These bins were placed at various locations across the island, such as in Urban Redevelopment Authority (URA) car parks and near Mass Rapid Transit (MRT) stations, with the hopes of making it convenient for commuters and drivers. However, there was poor public response. The bins were also frequently misused, which resulted in higher maintenance, and eventually led to the programme’s termination.⁷²

In 2001, a different model for recycling domestic waste was adopted as part of the National Recycling Programme (NRP). ENV observed that a private company was going from door-to-door collecting recyclables, and was quite successful. It collaborated with the Community Development Council (CDC) to give out free plastic bags to residents to collect recyclables fortnightly. Part of the profits from selling the recyclables was donated back to the CDC. However, the company limited the service to selected Housing Development Board (HDB) flats, where response rates were higher. It also limited the types of recyclables collected.⁷³

The ENV and later the National Environment Agency (NEA) then made adaptations based on this model, and decided to include the collection of recyclables in the contracts of public waste collectors. Households received plastic bags from their waste collectors to dispose their recyclable trash for collection by the waste collectors. The initial response was favourable. However, this method proved to be labour-

intensive and was also viewed as competing with the local *karang guni* (rag-and-bone) men, many of whom depended on these recyclables as a means of livelihood. Although some waste collectors collaborated with the *karang guni* men to do the collection, there were lapses. Coupled with forgetful or uncooperative residents, the system proved costly and inefficient.⁷⁴ Residents also faced space constraints in their homes when storing recyclables for collection.

In August 2007, NEA complemented door-to-door collection with a recycling bin for every five HDB blocks. But the usage of these bins varied between places and times, which made it challenging to optimise collection. NEA reviewed the recycling model and decided in 2011 to remodel it to a more cost-effective bin-only system, which required residents to take their recyclables to bins near their homes.

One of the challenges faced when promoting recycling was that existing refuse chutes in many high-rise buildings provided a very convenient way for residents to dispose of their waste. Meanwhile, recycling required that part of the household waste generated be stored temporarily within the residence. Trial projects showed that if separate chutes for recyclables were provided, residents would be more willing to recycle due to the convenience. As the cost of providing such a chute has reduced over time, separate chutes for recyclables have been installed in some of the HDB new Build-to-Order (BTO) and Selective En-bloc Redevelopment Scheme (SERS) developments.

Further behavioural and cultural shifts are needed for recycling measures to be more successful. Since the early 2000s, NEA's educational and outreach programmes have incorporated recycling as a key message. In September 2002, the Recycling Corner Programme for schools was launched with the aim of educating and inculcating habits of the 3Rs (Reduce, Reuse, Recycle) in students. From November 2008 onwards, legislation required the management corporations of condominiums and private apartments to provide receptacles for collecting recyclables within their estates and that the items collected must be sent for recycling. From 2014 onwards, large hotels and shopping malls are required to report their waste data and propose waste reduction plans.

REDUCE AND REUSE: CUTTING WASTE

While recycling is a good practice, not producing waste in the first place is even better. Of particular concern are plastic items, especially in packaging, which are not easily degradable.

In the 1980s, a campaign was launched to promote the responsible disposal of refuse by using plastic bags.⁷⁵ At that time, plastic bags were seen as a tool to promote cleanliness, with the benefit of containing refuse, especially wet refuse, thereby preventing spillage, odour and pest infestation during waste collection.⁷⁶

Over time, the plastic bags themselves came to be seen as part of the problem. The “Why waste plastic bags? Choose reusable bags!” campaign was launched on 11 February 2006. To limit the wastage of plastic bags, the monthly “Bring Your Own Bag Day” (BYOBD) held on the first Wednesday of the month started in 2007.⁷⁷ In 2008, major supermarkets, with support from the Singapore Environment Council (SEC) and NEA, increased the frequency of BYOBD to every Wednesday.⁷⁸ The National Trades Union Congress's (NTUC) Fairprice chain of supermarkets also gives 10-cent discounts to customers who opt not to use plastic bags, while the furniture store IKEA has implemented a charge for customers who want plastic bags. While the BYOBD initiative may have ended in 2010, it has been observed that more people have since inculcated the habit of bringing their own shopping bags.⁷⁹ Instead of imposing a ban on plastic bags, approaches that “nudge” the consumer to make personal choices to reduce wastage rely on the environmental consciousness of the consumer.

Approaches that rely on “nudging” are not just limited to the end-user. NEA recognised the importance of targeting different levels of the supply chain, and launched the Singapore Packaging Agreement (SPA) in June 2007. Companies that signed the agreement committed to reducing their packaging waste over five years by redesigning their production processes and products to eliminate unnecessary packaging.⁸⁰ In the first five years of the agreement, the signatories cumulatively reduced about 10,000 tonnes of packaging waste, with savings of more than S\$22 million in material costs for locally consumed products.

The first SPA, which expired on 30 June 2012, was succeeded by another SPA that took effect from 1 July 2012. Under the second SPA, signatories are committed to working towards annual reduction of 6,500 tonnes of packaging waste by 2015, using figures from 2007 as the base year. (In 2012, the annual reduction was about 3,000 tonnes.) The new SPA also aims to increase the number of signatories to 315 by 2015.

THE POWER OF SOCIAL CAPITAL: THE SARS BATTLE

A country can stay clean and healthy only with the cooperation of individuals, communities and social networks. The Severe Acute Respiratory Syndrome (SARS) episode of 2003 highlighted the importance of having a system of such networks.

The SARS virus originated from Guangdong province, China, in November 2002. Very quickly, it swept through a large part of the world and reached Singapore in late February 2003. Prime Minister Lee Hsien Loong convened a task force led by the Ministry of Health (MOH) and on 5 April 2003, instructed a ministerial committee to oversee the crisis.⁸¹

This committee implemented several measures to contain the spread within Singapore's borders. Parliament amended the Infectious Disease Act so that infected persons could be required by law to be quarantined at controlled facilities, and also introduced Home Quarantine Orders. The Ministry of Defence assisted in the contact tracing of infected persons. Government agencies worked with grassroots organisations, business groups, diplomats, religious organisations and other groups to raise awareness about the SARS situation. MOH purchased preventive equipment in bulk, such as facemasks, thermometers, gowns and other medical equipment for hospitals, to safeguard the health of medical workers.⁸²

To prevent the virus from spreading further within Singapore, the Defence Science and Technology Agency (DSTA), together with Singapore Technologies, designed an infrared fever screening system within a week. The thermal scanners were first deployed at Singapore's airport, seaport and the two border crossings. Singapore also worked closely with the World Health Organisation (WHO) to issue travel advisories, and provided WHO observers with access to raw data and daily updates, thereby contributing to the international monitoring of the pandemic.⁸³

These measures ultimately paid off. By 28 April 2003, SARS was largely contained in Singapore and a severe crisis averted. The outbreak in Singapore also became a turning point for improvements in Singapore's cleanliness standards. Public talks were organised to raise awareness on topics about personal hygiene, as well as to boost people's confidence in crowded public areas by reassuring them about the cleanliness of these venues.

On 6 May 2003, then Environment Minister Mr Lim Swee Say launched the "Singapore's OK" (SOK) campaign⁸⁴ in a neighbourhood coffee shop at Ang Mo Kio Avenue 10. The campaign aimed to promote good personal hygiene and a high standard of cleanliness in public places, and hinged on the collaboration between the Public-People-Private (3P) sectors, in order to expand its outreach. NEA actively encouraged stakeholders of food establishments, schools, condominiums, markets, construction sites and workers' dormitories to embark on the voluntary scheme and show their commitment towards public health by displaying an SOK decal. There was a certain urgency to restore public confidence, which had been shaken during the SARS crisis, and collaterals to raise awareness about SOK were sometimes prepared overnight.⁸⁵

The social capital that environmental public health officers had accumulated over the years—built upon trust within the community—was put to good use during this time. Backed by MOH and the Health Promotion Board (HPB), NEA's regional officers supported constituency-level response teams of grassroots volunteers to work with shops, food outlets, and offices to have their premises certified "SOK".

NEA also worked closely with the Restroom Association of Singapore (RAS), a non-governmental organisation, on the SOK campaign for public toilets. This evolved into RAS's "Happy Toilet" programme. Launched on 1 July 2003, this initiative focuses on the design, cleanliness, maintenance, effectiveness and satisfaction of public toilets and grades them according to a number of stars.⁸⁶ Today, the RAS continues to work closely and vigorously with NEA and its stakeholders to improve the architectural design of public toilets, behaviour of users, and cleanliness standards.⁸⁷



"Singapore's OK" decals.

A series of collaterals that were produced quickly in response to the 2003 SARS crisis.

Image courtesy of National Environment Agency.

SARS: THE UNSUNG HEROES



While public health officers took the media spotlight at the frontline of the battle against SARS in 2003, another group of heroes remain unsung: the cleaners. They were the ones who risked their personal safety to enter quarantined areas to disinfect them. Without their efforts, SARS would have been even more widespread.

Mr Tan Hang Kian, Executive Director of Clean Solutions, a private cleaning company, recounted how he was unexpectedly called up by a government officer to go to the Pasir Panjang Wholesale Centre as part of “national service.” The centre had already seen a few cases of SARS, and it was deserted. Nobody wanted to enter the premises.

However, the place needed to be disinfected, in particular, the vegetable wholesale area, where a few people had fallen victim to SARS. Two of Tan’s

supervisors resigned immediately when they learnt of the nature of the task. He brought his remaining team into the building. “The whole place [was] in a mess; everybody [had been] told to leave the place. Vegetables [were strewn] everywhere, and in the cold room,” he recalled.⁸⁸

It took his team two weeks to clear the place. They threw everything in the vegetable wholesale area away, even tables and chairs, and disinfected the whole area with chlorine. For their safety, the team had to wear protective masks that made them hot and uncomfortable. Nevertheless, they persevered.

This incident occurred at the beginning of the SARS outbreak in Singapore. Throughout the trying period, Tan’s team, as well as many other cleaners, were activated to disinfect places such as childcare centres and schools. When somebody living in an HDB apartment contracted SARS, they also had to disinfect the apartment, the elevators, and even the rubbish chutes.

As it was the first outbreak of its kind in Singapore, everyone involved had to learn while they were on-the-job in order to come up with effective cleaning methods. Having gone through this experience, the country is now better prepared to cope with future outbreaks.⁸⁹ None of this would have been possible without the tireless work of the cleaners who continue to keep the city safe and healthy.

A LITTER-FREE SINGAPORE: COMMUNITY INITIATIVES

Littering is one area where the shift from enforcement to engagement has been very active. Different approaches to engaging different groups have been tried over the years.

In 2002, the “Singapore Litter-Free” campaign was launched, encouraging participants of outdoor events to take ownership of their litter and leave the venue litter-free. NEA partnered event organisers such as non-governmental organisations (NGOs), Residents’ Committees, public agencies and schools, as well as landowners such as HDB, National Parks Board (NParks) and the Singapore Land Authority (SLA), to broadcast litter-free messages during major events to reinforce the campaign message. The campaign was also extended to designated premises such as hawker centres, bus interchanges, coffee shops, parks and reservoirs.

To understand the psyche of litterbugs better, NEA commissioned a sociological study on littering in 2009.⁹⁰ Based on the study’s findings, NEA launched a new anti-littering campaign on 6 June 2010 with the tagline: “Do The Right Thing. Let’s Bin It!” The objective was not very different from previous campaigns, but this campaign adopted a three-pronged strategy: (1) to improve the provision of litter bin infrastructure; (2) to increase visibility of enforcement at strategic public areas; and (3) to implement a targeted public outreach and education programme.

NEA partnered Community Development Council (CDC)s, grassroots organisations, schools and pre-schools to recruit and train “Litter-Free Ambassadors” to promote the litter-free message. Their activities include patrols at littering hotspots and areas with high human traffic, house-to-house visits to distribute anti-littering educational materials to residents, and taking the lead to organise litter-free events within the community.

Despite these efforts, the government recognised that more advocacy groups were still needed. In December 2010, the Public Hygiene Council was formed as a quasi-NGO with the objective of building strong public ownership to achieve the outcomes of an increased awareness of good personal hygiene, clean public toilets, and a litter-free Singapore.

Supported by NEA, its role is to bridge the gap between hardware and societal values and norms which currently “do not befit the hardware,” according to Council Chairman Mr Liak Teng Lit.⁹¹

Society today is very different from what it was in the 1960s and 1970s. Back then direct campaigning was deemed sufficient to create awareness of cleanliness norms in society. However, a study conducted in 2009 showed that more nuanced approaches were needed to prompt behavioural change in a diverse Singapore. The most desirable state is one in which the public takes it into their own hands to care for the environment. To encourage increased participation from the public, a greater sense of empowerment needed to be fostered. Only then would there be a higher level of commitment and responsibility from ordinary citizens with regard to public cleanliness.⁹²

“Today, people have the means to complain about almost anything easily and quickly, and they expect quick response. Our strategy should thus be one that focuses on pre-emptive measures to reduce complaints. Hence, we need to plan ahead for infrastructure such as recycling bins and chutes for recyclables. We also need to build up and strengthen partnerships, to get our partners to have their own programmes, such as to integrate the 3Rs in their businesses, step up public education efforts and promote compliance rather than just enforcement of rules.”⁹³

Ong Seng Eng, former director of the Waste & Resource Management Department, National Environment Agency

BAY WATCH: KEEPING SINGAPORE'S RIVERS CLEAN

In the early 1990s, the Government Parliamentary Committee (GPC) for the Environment invited the private sector to join in as members, to better understand the government's long-term plans. At that time, the clean-up of the Singapore River had just been completed and no one wanted the river to deteriorate back to pre-clean-up conditions. There were plans to have waterfront eateries along the Singapore River, in the heart of the Central Business District.

It was suggested that a community group could play a more active role to help look after the river. The group could act as a vigilante, helping to patrol the river to ensure that it stayed clean, and that people did not swim in it.

This idea that a community group would take ownership of the cleanliness of the Singapore River was approved by ENV, which also agreed to fund the project. Initially, no one took the lead, because members had limited knowledge on conducting water-based projects. Mr Eugene Heng, a banker and member of the GPC, happened to be passionate about water. He was eventually appointed to champion the group that came to be called the Waterways Watch Society (WWS).

The office of the WWS is a humble place tucked away in a quiet corner of the Kallang Riverside Park—under a bridge, without even an address. A non-governmental organisation,

the WWS's mission is to maintain the cleanliness of Singapore's waterways, in particular the Marina Bay catchment area, through boat and bicycle patrols, as well as through education and outreach programmes. Through Heng's personal connections, WWS acquired two old boats and gathered a group of volunteers from the former Punggol Marina Club as members.⁹⁴

The WWS was formally launched in conjunction with Clean and Green Week in November 1997. WWS has managed to make the best of mostly ad hoc funding and in-kind support received. Since its launch, WWS has grown from a small operation to a relatively large society running regular weekly educational programmes on top of its regular patrolling work. The WWS can be said to be keeping former Prime Minister Mr Lee Kuan Yew's 1977 vision of "a clean Singapore River" alive and is a good example of how much a community initiative can achieve and contribute to society.



The Waterways Watch Society regularly patrols Singapore's rivers to ensure that they are kept clean for all to enjoy.

Image courtesy of the Waterways Watch Society.

CHAPTER 5

THE GOVERNANCE OF CLEANLINESS: FROM STATE TO STAKEHOLDER

“ People just expect that leaves have to be cleaned up... they don't care how it's done.”⁹⁵

Desmond Tan, Director, Department of Public Cleanliness, National Environment Agency



An NEA Cleaning Environment Support Assistant sweeping the streets.

Along with the government maintaining cleaning services such as street sweeping, there is a growing need to engage all other stakeholders to keep the city clean.

Image from "Our Environment: Safeguard, Nature, Cherish", courtesy of National Environment Agency.

The story of cleaning Singapore links a healthy environment with high quality of life. It also shows the “passing of the baton” between approaches, with a shift in emphasis from state to stakeholder. There has been a steady evolution from predominantly government-led planning, regulation and enforcement between the 1970s and 1990s, to increased collaboration between citizens, community and civil society after 2000.

In the 2010s, a more vocal citizenry emerged, along with demands for higher standards in public amenities. As people became more educated, affluent and well-travelled, their expectations of public cleanliness increased. At the same time, a growing population of new immigrants boosted the size of the population, and brought in people of diverse origins and different understanding of a citizen's rights and responsibilities in terms of public cleanliness. This divergence added complexity and introduced new challenges to the task of keeping the nation clean, and, in some ways, made the role of the state more crucial once again.

To meet changing expectations, the governance of cleaning has been enhanced in various ways to boost efficiency and effectiveness. Over the years, there has been significant consolidation, streamlining and realignment to enhance the way the environment is managed. For instance, in 1999, four environmental acts—the Clean Air Act, Water Pollution and Drainage Act, Poisons Act (for hazardous substances) and Environment Public Health Act—were merged into the Environmental Pollution Control Act.⁹⁶ This change enabled a streamlining of functions across departments of the Ministry of Environment (ENV).

Other legislative changes addressed new and emerging environmental concerns. For example, the Environmental Pollution Control Act was amended to become the Environmental Protection and Management Act on 1 January 2008.⁹⁷ Additional provisions were made to focus on the protection and management of the environment and resource conservation as increased awareness drew concerns towards the long-term idea of sustainability rather than just the shorter-term concept of pollution control.

However, the state can only do so much. Attaining and sustaining higher standards of cleanliness can only be achieved through collaboration and commitment of all other stakeholders.

THE AGENCIES OF PUBLIC HEALTH: WHO'S IN CHARGE?

The institutions of public health themselves have evolved over the years along with changing needs and priorities. From being under the Ministry of Health (MOH) before the 1970s, the mandate of public health was transferred to the ENV in 1972. This was a first in the world at that time, to have a dedicated ministry of the environment that regarded public health as an environmental concern.

“The rationale is very interesting,” explained former Director-General of Environmental Public Health, Mr Daniel Wang. “The government felt that, if you look after the environment well, that you make sure it is clean, that there are good standards of hygiene—no rats running around, no flies in hawker centres and so on—you will end up with high standards of public health.”⁹⁸ It was a new take on the “chicken-and-egg” relationship between people and their environment. The approach was based on the psychology that people would tend not to litter in a place that is clean, whereas if they were in a place that was already dirty, they would be less likely to refrain from littering.

This reflected a characteristic of the Singapore government—getting the hardware right first and foremost, and then nurturing appropriate aspects of the “software” after. With regard to public cleanliness, this manifested in the form of prioritisation on the management of infrastructure and environmental factors such as empowering other stakeholders to take care of the various aspects of public cleanliness.

Cleaning at a “Whole-of-Government” Level

In order to ensure good governance, the state of public services is regularly monitored in order to identify areas of improvement, especially in terms of efficiency and overall coordination. This has given rise to a “whole-of-government” approach to public cleaning.

Previously, the National Environment Agency (NEA) took charge of maintaining the majority of the roads, pavements and public beaches, while other agencies were responsible for the cleanliness of assets under their charge.⁹⁹

However, this system of having any one public area under the charge of different agencies was confusing to the man-in-the-street who wanted to provide feedback on public cleanliness. For example, in playgrounds within landed residential estates, National Parks Board (NParks) was in charge of the cleanliness of the park and playground, but the Public

Utilities Board (PUB) looked after the cleanliness of the drains. Such delineation gave rise to a “silo” syndrome, with stories told of one agency’s cleaning contractor sweeping litter over to an adjacent area looked after by another agency. However, from a resident’s perspective, the maintenance of playgrounds is the responsibility of the government as a single entity, and residents should not need to consider which agency is in charge of which area.

Such incidents highlighted the need for better coordination in the delivery of public service. In light of the Singapore government’s more recent “whole-of-government” (WOG) approach, the Inter-Agency Cleanliness Task Force was formed in May 2008 to serve as a coordinating platform. This paved the way for the formation in 2012 of the Department of Public Cleanliness (DPC) under NEA. The new department is structured to execute better-coordinated plans, such as integrating existing cleaning contracts under various agencies into coherent locality-based cleaning contracts, and will progressively take over all areas to be cleaned except those under the respective Town Councils managing the public housing estates.¹⁰⁰

Exhibit 2 illustrates the public cleaning responsibilities across government agencies as of 2012, that will soon come under the charge of the DPC.

Exhibit 2:

A Whole-of-Government Approach to Cleaning

Cleaning responsibilities that will progressively come under the Department of Public Cleanliness*



Managing by Geography

While public cleaning efforts are being managed and reviewed at a nationwide, “whole-of-government” level, maintaining cleanliness is very much a local exercise. Thus, managing by geography helps to boost efficiencies at ground level. By 2003, NEA had restructured ENV’s six Environmental Health District Offices into five Regional Offices (ROs) with boundaries that matched the Community Development Council (CDC)s . The aim was to leverage on increased partnership with the community to enhance service delivery.

“Clearly, keeping and maintaining Singapore’s clean and green image calls for community and industry participation and support... The government, industry and the community at large each have an important role in this national effort of sustaining Singapore’s high standard of public health.”¹⁰¹

Balaji Sadasivan, former Minister of State for Health and the Environment

This alignment created a win-win situation where the ROs could communicate directly with the CDCs to engage the community in new environmental initiatives. Meanwhile, better on-the-ground understanding of the neighbourhood enabled the ROs to be more responsive to residents’ needs. By tapping the CDCs’ networks and resources, environmental initiatives could be tailored to be more effective at the local level while being rolled out in a more efficient manner. There was also more of a “human touch” when it came to engaging residents to do their part in keeping the neighbourhood clean, whether it was the simple action of helping to maintain cleanliness or reporting maintenance lapses.

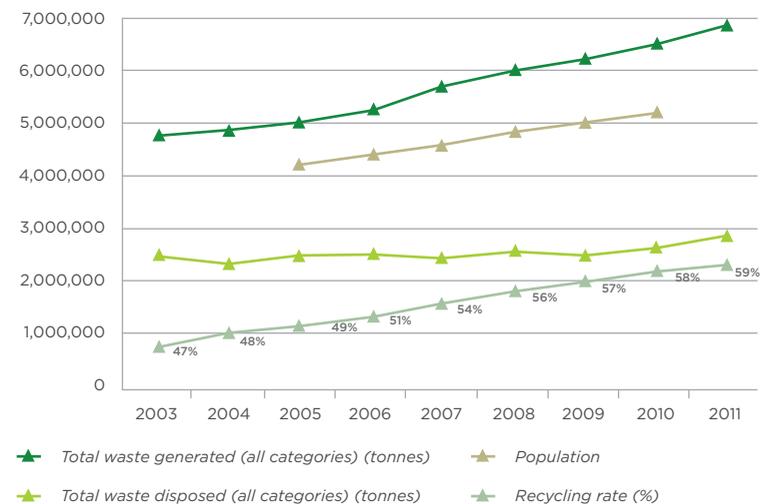
FUTURE CHALLENGES: URBANISATION AND DEVELOPMENT

Singapore’s limited land area puts constant pressure on waste management efforts. The limited “lifespan” of the Semakau Landfill means that there is a pressing need to boost recycling rates and reduce the amount of waste generated. Currently, it is projected that Semakau Landfill will be full in approximately 40 years. By implementing a variety of measures to reduce the amount of waste that goes to landfill, including achieving a 70% recycling rate by 2030, it is hoped that the Semakau Landfill will last a bit longer.

Population growth and increasing affluence are leading to higher material consumption, and the absolute amount of waste disposed has been increasing. Heightened awareness and better participation rates in recycling have meant that the amount of waste disposed has increased at a slower pace compared to the amount consumed. While recycling rates have been rising steadily over the years, (see **Exhibit 3**) there is still room for improvement. In particular, households are still lagging behind businesses in this area.

Exhibit 3: Growth Rates in Recycling, Population and Economic Growth

Despite an increase in recycling, the amount of waste generated is rising just as fast, due to population and economic growth.



The projected increase in Singapore's population density means that residents in Singapore need to take on a higher level of ownership when it comes to the cleanliness of their living environment. They cannot always expect cleaners to pick up after them. The only way to sustain high standards of public health is for every citizen to exercise self-discipline and to chip in with do-it-yourself contributions to cleanliness, wherever possible.

Ms Tan Puay Hoon, President of the Restroom Association of Singapore, believes that this need for greater stakeholder ownership can be exacerbated by other factors that might not be obvious now. As demographics continue to change, social behaviour will also evolve. For example, as the population ages and homes continue to shrink in size, more elderly might be inclined to spend time outside of their home to enjoy the space. This could lead to increased use of public toilets by residents, some of whom could be semi-ambulatory.¹⁰²

THE UPHILL TASK OF CHANGING BEHAVIOUR

The current era of vocal citizenry has shown that an increasing segment of the population is more assertive regarding their expectations as to what the state should be doing in terms of public health. Meanwhile, there are those who do not see the need to be considerate and civic-minded about environmental health and cleanliness. For some, there seems to be no immediate negative repercussions of littering and other anti-social actions. Such diversity of opinions is inevitable in a growing society, and these changing social conditions will continue to present new challenges for public health agencies, requiring new methods and approaches.

Habits and mindsets are often hard to change. Measures to minimise littering, whether through "hard" or "soft" approaches, need to be sustained not just by NEA, but by other stakeholders too. Former ENV Permanent Secretary, Mr Lee Ek Tieng, thinks that changing such behaviour will take time. "Eliminating these problems completely is far too idealistic," says Lee. "We have to constantly work at it."¹⁰³

Ultimately, it is the behaviour of every individual that will determine whether Singapore can continue to have a strong culture of cleanliness. Upbringing is critical in shaping the behaviour of the next generation. As Mr Jack Sim, founder of the World Toilet Organisation and the United Nations World Toilet Day, says, "As trees form a forest, individuals form society. We are not alone but part of each other."¹⁰⁴

THE ROLE OF CIVIL SOCIETY

Environmental stewardship is in a stage of transition in Singapore, moving from regulation and enforcement to include a nurturing and empowering civil society to help in building a true culture of cleanliness. The Restroom Association of Singapore, the Waterways Watch Society, the Singapore Environment Council, and the Public Hygiene Council, are some of the organisations championed by civil society, working to identify issues of concern and promote causes linked to cleanliness.

One simple way for government agencies to facilitate the participation of civil society is to make more relevant information available to the public. In recent years, government portal www.data.gov.sg has made environmental data such as the levels of specific air pollutants and pollutant standards index (PSI) levels from the NEA available to the public. Agencies can also support and facilitate the efforts of civil society as they help to sustain Singapore's public cleanliness, shape public mindsets and behaviour towards playing their part in maintaining good public health.

Some passionate individuals have taken the lead and are committed to environmental causes and continue to do good work. Despite the lack of resources, Mr Eugene Heng continues to sustain the Waterways Watch Society by constantly looking out for available support and developing programmes that resonate with the interests of his volunteers.¹⁰⁵ Ms Tan Puay Hoon became an activist for clean toilets after complaining about the cleanliness of public toilets herself. "I learnt that I have to be prepared to do something. Otherwise, don't complain," she shares.¹⁰⁶ The most recent milestone of the Restroom Association of Singapore is the formalisation of building design guidelines to allow for more cubicles in female toilets. In July 2013, Singapore successfully tabled a resolution at the United Nations' World Toilet Day, thanks to the persistence of Mr Jack Sim and the strong support of Singapore's Ministry of Foreign Affairs. The resolution was adopted by consensus and is co-sponsored by more than 100 countries.¹⁰⁷

Can Singapore become like Japan or Korea, where the social norms are such that citizens keep their surroundings clean despite having fewer bins in public places? For this to happen, values must be so ingrained that "when somebody litters, another member of the public actually tells him or her off," says Mr Joseph Hui, Deputy Chief Executive Officer of the NEA. "When that day comes, I think we would have arrived [at being truly a clean city]."¹⁰⁸ The state will continue to do what it can, especially to sustain the infrastructure and conditions conducive for such a culture of public cleanliness, but citizens and civil society will have to play a much larger role in transforming this from simply being a "cleaned city" to a truly "clean city."

TIMELINE: POLICY DEVELOPMENT AND MILESTONES IN CLEANING SINGAPORE

1966

- ▶ Hawkers Resettlement Programme.

1968

- ▶ Island-wide census of street hawkers carried out between December 1968 and February 1969. Street hawkers were licensed and relocated to temporary sites and were subsequently moved into permanent hawker centres.
- ▶ Environmental Public Health Act and Destruction of Disease-Bearing Insects Act enacted.

1970

- ▶ Smoking ban first introduced in buses, cinemas and theatres, and with coverage progressively extended over the years to include air-conditioned restaurants and entertainment outlets.
- ▶ Environmental Public Health (Public Cleansing) Regulations enacted.

1972

- ▶ First hawker centre constructed, from the S\$5 million set aside for HDB to build permanent hawker centres and markets.
- ▶ Clean Air Act passed.

1973

- ▶ Decision made to build Singapore's first incineration plant at Ulu Pandan.

1974

- ▶ First water reclamation plant constructed in Jurong.

1975

- ▶ Water Pollution Control and Drainage Act passed.

1976

- ▶ Control of fuel quality for vehicles commenced. Limits set for sulphur content in diesel.

1977

- ▶ Trade Effluent Regulations introduced.
- ▶ Singapore River clean-up launched.

1979

- ▶ Ulu Pandan Incineration Plant commissioned.
- ▶ Bedok Water Reclamation Plant commissioned. This was followed by Kranji Water Reclamation Plant in 1980, and the Seletar and Jurong water reclamation plants in 1981.

1960

1970



1982

- ▶ Pig farming and open duck rearing phased out from all water catchment areas.

1983

- ▶ Water Catchment Policy introduced to control development within unprotected catchment areas.

1984

- ▶ Vehicular exhaust emissions standards introduced for petrol-fueled vehicles.

1986

- ▶ Tuas Incineration Plant and Kim Chuan Transfer Station commissioned.

1987

- ▶ The Poisons Act was amended to include regulation of hazardous chemicals.
- ▶ Singapore River clean-up successfully completed.

1989

- ▶ Acceded to the "Vienna Convention on the Protection of the Ozone Layer". In 1995, Singapore successfully phased out all CFCs and halon products.
- ▶ Licensing for General Waste Collectors introduced.

1991

- ▶ Unleaded petrol introduced. Use of unleaded petrol promoted through a differential tax system which made unleaded petrol about 10 cents per litre cheaper than leaded petrol.
- ▶ Vehicular exhaust emissions standards introduced for diesel-fuelled vehicles and motorcycles.

1992

- ▶ Senoko Incineration Plant commissioned.
- ▶ Sale or advertisement chewing gum prohibited. Contraveners liable upon conviction to a fine not exceeding \$2,000.
- ▶ Corrective Work Order introduced in November.
- ▶ The Amalgamated Union of Public Daily Rated Workers (AUPDRW) formed.
- ▶ Lim Chu Kang Dumping Ground closed.

1994

- ▶ Code of Practice on Pollution Control published.
- ▶ Development of Semakau Landfill approved by Cabinet.
- ▶ Telemetric air quality monitoring and management system introduced to facilitate enforcement against air pollution.

1995

- ▶ Import of chewing gum into Singapore prohibited, except if (a) in transit to or from Peninsular Malaysia, or (b) as a transshipment to any country.

1996

- ▶ Acceded to the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal."

1997

- ▶ Singapore 100% served by modern sanitation system.
- ▶ Hazardous Waste (Control of Export, Import and Transit) Bill passed by Parliament in November to ensure sound and effective management, transportation and disposal of hazardous wastes. Under the Act, any person who wishes to export, import, or transit hazardous wastes will require a permit from Pollution Control Department, NEA.

1998

- ▶ Leaded petrol phased out. Oil companies stop sale of leaded petrol on 1 July due to significant drop in demand.
- ▶ Control of Vectors and Pesticides Act passed, replacing the Destruction of Disease-Bearing Insects Act.

1999

- ▶ Lorong Halus Landfill closed on 31 March. Semakau Landfill commenced operations on 1 April.
- ▶ 1983 Water Catchment Policy's urbanisation cap and population density limit lifted.
- ▶ Water Pollution Control and Drainage Act repealed; relevant powers streamlined into Sewerage and Drainage Act and Environmental Pollution Control Act.

1980

1990



2000

- ▶ Tuas South Incineration Plant commissioned.
- ▶ Emissions cap on major sulphur dioxide (SO₂) emitters imposed (phased implementation).

2001

- ▶ Hawker Centres Upgrading Programme launched.
- ▶ Stringent standards for dioxins introduced in the Environmental Pollution Control (Air Impurities) Act. Regulation ensures that incineration plants comply with permissible dioxin levels.
- ▶ Waste Management and Recycling Association of Singapore (WMRAS) established.

2004

- ▶ Sale of specific chewing gum products licenced under the Medicines Act allowed.

2005

- ▶ Semakau Landfill officially opened to the public for recreational activities on 16 July, with activities organised by Raffles Museum of Biodiversity Research, Nature Society (Singapore), and the Sport Fishing Association.
- ▶ Ultra-low sulphur diesel introduced.

2006

- ▶ Private Sewer Rehabilitation Programme commenced.
- ▶ Euro IV standards adopted for new diesel-fuelled vehicles.
- ▶ Smoking restricted to designated areas at nearly 7,300 non air-conditioned food outlets and 121 hawker centres from 1 July.

2007

- ▶ Recycling bins placed in common areas of all HDB estates from August, to complement fortnightly door-to-door collection of recyclables so residents can recycle anytime.
- ▶ Smoking ban extended to entertainment outlets.
- ▶ More stringent chassis dynamometer smoke test during mandatory periodic inspection of diesel-fuelled vehicles adopted from 1 January.

2008

- ▶ Kim Chuan Water Reclamation Plant phased out.
- ▶ Inter-agency Cleanliness Task Force (IACTF) formed in May.
- ▶ Management councils of condominiums/private apartments required to provide receptacles within estates for the collection of recyclables and to send for recycling from 1 November.

2009

- ▶ Ulu Pandan Incineration Plant closed.
- ▶ Smoking ban extended to cover children's playgrounds, markets and exercise areas.
- ▶ Senoko Incineration Plant divested.
- ▶ Keppel Seghers Tuas Waste-to-Energy Plant commissioned.

2010

- ▶ NEA Clean Mark Accreditation Scheme (formerly known as Voluntary Accreditation Scheme) for the Cleaning Industry launched on 21 July.

2012

- ▶ Department of Public Cleanliness formed on 1 April; NEA begins to progressively take over all duties for public cleaning except for housing estates.

2013

- ▶ Smoking ban further extended to common areas within residential buildings, covered walkways/linkways, pedestrian overhead bridges, outdoor compounds in hospitals, and within a 5-metre radius around bus stops.

2000

2010

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APPENDIX A

Governance Tools for Cleaning Singapore

(I) Legal Instruments

Tool	Description
Environmental Public Health Act and Control of Vectors and Pesticides Act	Passed in 1968 as the Environmental Public Health Act (EPHA) and the Destruction of Disease-Bearing Insects Act. EPHA ensures a high level of public health and cleanliness. It covers areas such as public cleaning, refuse disposal, industrial waste, food establishments, hawker centres and sanitary conditions. In 1998, the Control of Vectors and Pesticides Act replaced the Destruction of Disease-Bearing Insects Act.
Clean Air Act	Passed in 1971. Provision was made for the prevention and reduction of air pollution arising from industrial or trade premises. Emission standards for industrial and trade premises were also specified. It has since been repealed and comes under the Environmental Protection and Management Act (EPMA).
Environmental Protection and Management Act (EPMA)	The Environmental Protection and Control Act (EPCA) came into effect in 1999 and consolidated previous laws on air, water, and hazardous substance control. In 2008, it was amended and renamed EPMA to include additional provisions on protection and management of the environment and resource conservation.
Water Pollution Control and Drainage Act	Passed in 1975, it consolidated the 1970 Local Government (Disposal of Trade Effluents) Regulations and the 1971 Environment Public Health (Prohibition of Discharge of Trade Effluent) Regulations.
Sewerage and Drainage Act	Formerly part of the Water Pollution Control and Drainage Act which disaggregated into the Sewerage and Drainage Act (SDA) and Environmental Protection Control Act (ECPA) in 1999. Administered by ENV with stipulations on the control of discharge of used water and trade effluent into the public sewers and watercourses respectively.
Poisons Act	First gazetted in 1939 under the Ministry of Health, it was amended in 1987 to regulate hazardous chemicals, which would be overseen by ENV. The Act has since been subsumed under the EPMA.
Hazardous Waste (Control of Export, Import and Transit) Act	Passed in 1997 to ensure sound and effective management, transportation and disposal of hazardous wastes in Singapore. Under this Act and its regulations, any person who wishes to export, import, or transit hazardous wastes will require a permit from the Pollution Control Department, NEA.

(II) Executive Policies

Tool	Description
Chewing gum ban	Beginning 1992, the sale or advertisement of all chewing gum is prohibited. Upon conviction, contraveners will be liable to a fine not exceeding S\$2,000. In 1995, all imports of chewing gum into Singapore are prohibited, except those (a) in transit to or from Peninsular Malaysia, or (b) on transshipment to any country. From 2004, chewing gum licensed under the Medicines Act (i.e. has therapeutic value) is also exempted.
Clean and Green Singapore	First launched on 1 October 1968, the annual "Keep Singapore Clean" campaign aimed to raise awareness of the importance of cleanliness in Singapore. This evolved to become the "Clean and Green Week" in 1990. From 1995, the Cleanest Estate Competition ran as part of the Clean and Green Week until 2002. The "Clean and Green Week" was then rebranded as "Clean and Green Singapore" in 2007. (See Appendix A for a list of themes over the years.)
Smoking ban	First introduced in 1970, on buses, in cinemas and theatres, the smoking ban was progressively extended to other outlets over the years, e.g. air-conditioned restaurants in 2006 and entertainment outlets in 2007. In 2009, the ban was extended to cover children's playgrounds, markets, and exercise areas, and further extended in 2013, to cover common areas within residential buildings, covered walkways/linkways, pedestrian overhead bridges, hospital outdoor compounds, and within a 5-metre radius around bus stops.
Corrective Work Order	Introduced in November 1992.
Vehicular exhaust quality	Control of fuel quality for vehicles commenced in 1976, with limits set for sulphur content in diesel. Vehicular exhaust emissions standards introduced for petrol-fuelled vehicles in 1984, and for diesel-fuelled vehicles and motorcycles in 1991. Unleaded petrol was also introduced in 1991. The use of unleaded petrol was promoted through a differential tax system, which made unleaded petrol about 10 cents cheaper per litre than leaded petrol. In 2006, Euro IV standards were adopted for new diesel-fuelled vehicles. In addition, a more stringent chassis dynamometer smoke test was adopted as part of the mandatory periodic inspection of diesel-fuelled vehicles from 1 January 2007 onwards.

(III) Institutions

Tool	Description
Anti-Pollution Unit (APU)	Set up in 1970 under the Prime Minister's Office to look into air pollution. In 1983, the APU was transferred to the Ministry of Environment.
Ministry of Environment and Water Resources (MEWR)	Formed as the Ministry of Environment (ENV) in 1972 to tackle air and water pollution, environmental health and waste-disposal issues. Departments under the Ministry of Health (MOH) and Ministry of National Development (MND) which had dealt with pollution control, sewerage, drainage and environmental health issues were transferred to the new Ministry of Environment. In 2004, ENV was renamed the Ministry of Environment and Water Resources (MEWR). Its operational functions were taken over by its two statutory boards, the National Environment Agency (NEA) and the Public Utilities Board (PUB), the national water agency.
National Environment Agency (NEA)	Formed as a statutory board under ENV in July 2002, NEA safeguards the environment and environmental health by planning, developing and operating solid waste disposal facilities, controlling air and water pollution, hazardous chemicals and toxic wastes, and providing environmental public health services and public health education.
Singapore Environment Institute (SEI)	Formed as the Centre for Environmental Training in 1993 to be the knowledge and training division on Singapore's environment. In 2003, it became the Singapore Environment Institute.
Environmental Health Institute (EHI)	Established in 2002 as a public health laboratory to conduct research, surveillance and evidence-based risk assessment on infectious diseases of environmental concern.
Environment and Water Industry Development Council	Set up in May 2006 to spearhead the development of the water and environment industry.
Inter-Ministerial Committee on Sustainable Development (IMCSD)	Set up in 2008 to formulate a national strategy for Singapore's sustainable development in the context of emerging domestic and global challenges. This led to the development of the Sustainable Development Blueprint in 2009. Upon the completion of the blueprint, a Sustainable Development Policy Group, co-chaired by MEWR and MND, was set up to monitor the implementation and progress of the blueprint.
Department of Public Cleanliness (DPC)	Formed on 1 April 2012 from the Inter-agency Cleanliness Task Force (IACTF) which was formed in May 2008. Instituted as a department under NEA and as a one-stop centre for cleanliness-related feedback, the DPC coordinates with other agencies to ensure that public feedback is resolved.

APPENDIX B

Civil Society Initiatives Contributing to a Clean Singapore

This table lists some of the civil society initiatives relating to the cleanliness of Singapore covered in this case study.

Initiative	Description
Amalgamated Union of Public Daily Rated Workers (AUPDRW)	Formed in 1992 to look after the welfare of public daily-rated workers.
Singapore Environment Council (SEC)	The SEC is an independently managed, non-profit, non-governmental organisation, and an institution of public character that nurtures, facilitates and coordinates environmental causes in Singapore. It was established in 1995. SEC and NEA support private sector and community initiatives such as "Bring Your Own Bag Day" held by major supermarkets in 2008.
Waterways Watch Society (WWS)	A volunteer group tasked to bring people together to monitor, restore and protect the aesthetics of Singapore's waterways. It was launched in 1997.
Water Pollution Control and Drainage Act	Passed in 1975, it consolidated the 1970 Local Government (Disposal of Trade Effluents) Regulations and the 1971 Environment Public Health (Prohibition of Discharge of Trade Effluent) Regulations.
Waste Management and Recycling Association of Singapore (WMRAS)	Established in 2001, it aims to professionalise and develop a leading waste management and recycling industry in Asia.
Project Semakau	A research and outreach programme that surveys and documents biodiversity at Semakau. The project started on 14 November 2008 and is led by the Raffles Museum of Biodiversity and funded by HSBC Bank.
Public Hygiene Council (PHC)	Launched on 27 September 2011 to promote good hygiene practices and to improve personal and public hygiene standards in Singapore.



APPENDIX C

Campaign Themes over the Years

The first environmental campaign in Singapore began as the “Keep Singapore Clean” campaign in 1968. Then Prime Minister Lee Kuan Yew said:

“We have built, we have progressed. But no other hallmark of success will be more distinctive than that of achieving our position as the cleanest and greenest city in South Asia.”

In 1990, the “Clean & Green Week” replaced the annual “Keep Singapore Clean” campaigns. The mascot was a frog called Captain Green. As then Deputy Prime Minister Goh Chok Tong said:

“It marks a shift in emphasis from just greening Singapore and cleaning Singapore to a total approach to shape and change our attitude towards the environment.”

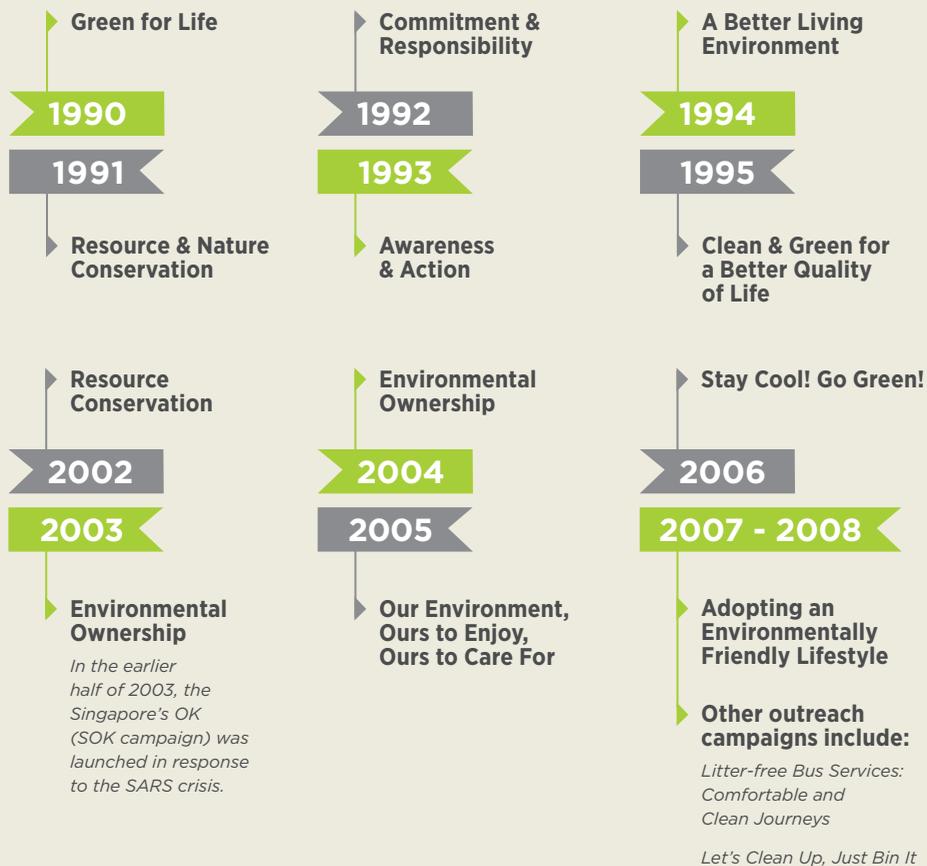
The following pages show the evolution of the themes of the “Clean & Green Week” since 1990. It is a reflection of the changing environmental concerns facing Singapore. For example, resource conservation emerged as a theme in the early 2000s and dominated the campaigns then.

A more decentralised approach manifested in the late 2000s with various events held in parallel. The “Clean & Green Week” was rebranded as “Clean & Green Singapore”, so that, in Prime Minister Lee Hsien Loong’s words:

“... we will have clean and green activities throughout the year, because this is something that we want people to remember all the time. And we want to encourage Singaporeans to adopt environmentally friendly actions and lifestyles.”

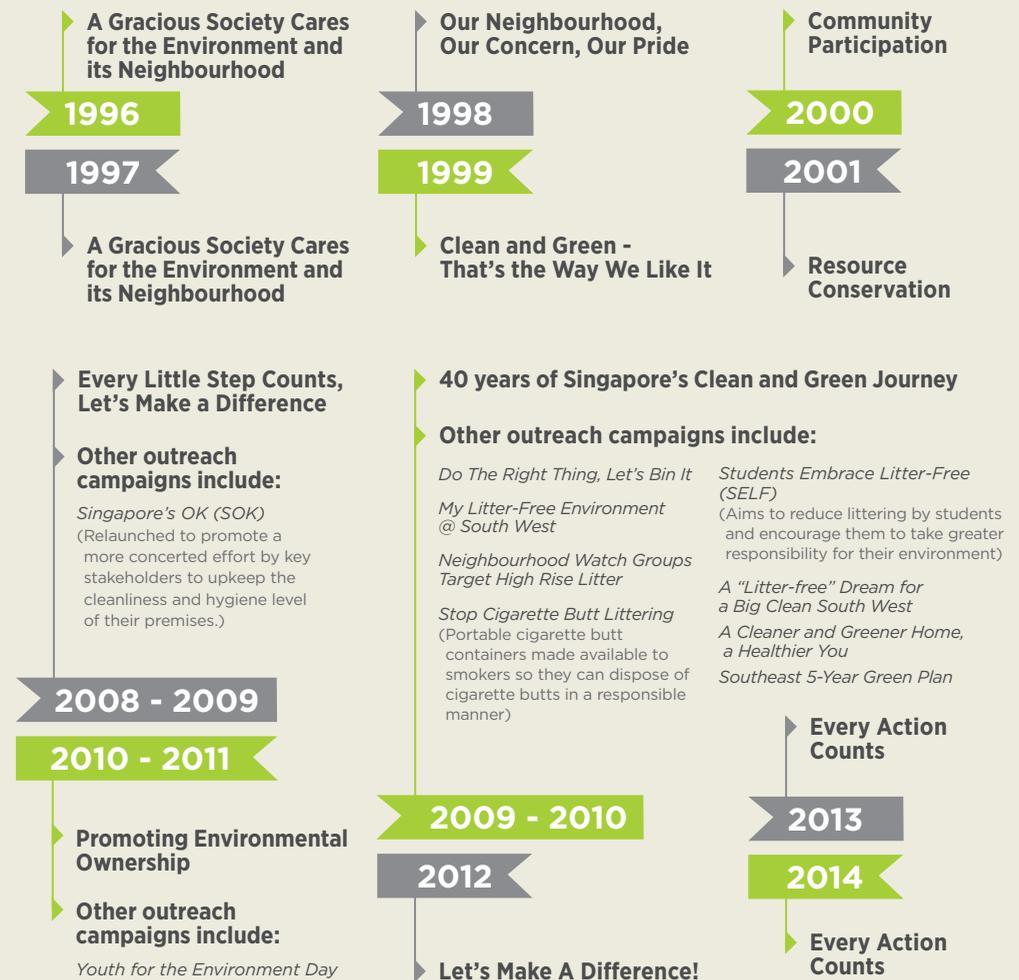
Throughout the years, these environmental campaigns have received the highest level of political support:

CLEAN AND GREEN



*From 2007 onwards, there was a concerted national endeavour to inspire Singaporeans to care for and protect the environment by adopting an "environmentally-friendly" lifestyle and enjoying its benefits. It targeted aspects of a Singaporean's life, instead of relying only on the annual Clean and Green Singapore event.

CAMPAIGN THEMES





CLEANING A NATION: CULTIVATING A HEALTHY LIVING ENVIRONMENT

The story often told about the cleaning and greening of Singapore is that it was done mainly for the purpose of attracting international business and investments. In the city-state's early days as a newly independent country in the late 1960s, Singapore's rapid industrialisation and economic development plans were carried out in conjunction with its cleaning and greening efforts. However, it is less well-known that the political leadership prioritised public cleanliness for the well-being of citizens, so that they could enjoy a higher quality of life. The simple wisdom that health leads to happiness had been applied to the entire nation.

"Most people expect a newly independent state might focus on nation-building priorities like the economy and defence. However, Singapore's leaders in 1965 displayed the vision and commitment to also protect the environment, proving it can and should be a priority among the country's top goals. Cleaning a Nation: Cultivating a Healthy Living Environment charts Singapore's environmental evolution, highlighting the key actors and thoughtful planning that transformed slums to a liveable city. It is a must-read for city leaders, urban planners and environmentalists."

Edwin Seah, Executive Director, Singapore Environment Council

