

Policy-making on Environmental Sustainability in Public Health

Singapore Healthcare Enterprise Risk Management Congress 2022

Mr Chew Ming Fai

National Environment Agency (Singapore)

Deputy Chief Executive Officer and Director-General of Public Health

17 August 2022

Vision and Mission



Our Vision

A Clean Environment, towards a Liveable and Sustainable Singapore

Our Mission

To ensure a Clean and Sustainable Environment for Singapore, together with our partners and community

Overview of NEA's Work Areas – Our Role as Stewards of the Environment



1. High Public Health Standards

2. Safe, Healthy & Conducive Living Environment

3. Sustainable & Resource-Efficient Singapore

4. Timely & Reliable Weather & Climate Services

5. Vibrant Hawker Culture

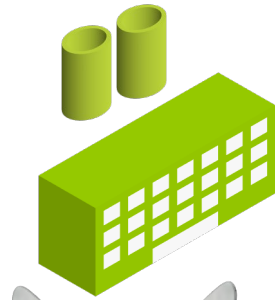
6. Together with our Partners and the Community

- Public Engagement
- Industry Development
- International Relations

7. Enabled by a High Performance and Future-Ready NEA

- Enforcement & Service Delivery
- Technology & Capability Development
- Infrastructure Planning & Development
- Policy & Planning
- Corporate Services

Key Programmes that Underpin our Mission



Solid Waste Management



Prevention and Control of Vector-Borne Diseases



Energy Efficiency



Weather and Climate Services



Public Hygiene and Cleanliness
(Public Toilet Cleanliness, Anti-Littering, Cleaning of Public Areas)



Care for the Dead Facilities



3P (People, Public and Private)
Partnership



Management of Hawker Centres

**Environmental
Sustainability**

**Safeguard
Public Health**



**SG Green Plan &
Towards Zero Waste**

**Environmental
Sanitation & Vector
Control**

**After-death
Services**



Sustainability has always been a part of Singapore's DNA

- Since independence, Singapore has pursued sustainable development by **balancing economic growth with environmental protection and social inclusion**
- Our sustainability plans have evolved over the years to address new challenges, and ensure Singapore remains a green and liveable home



3. Fullerton Road before⁴⁰ and after planting.

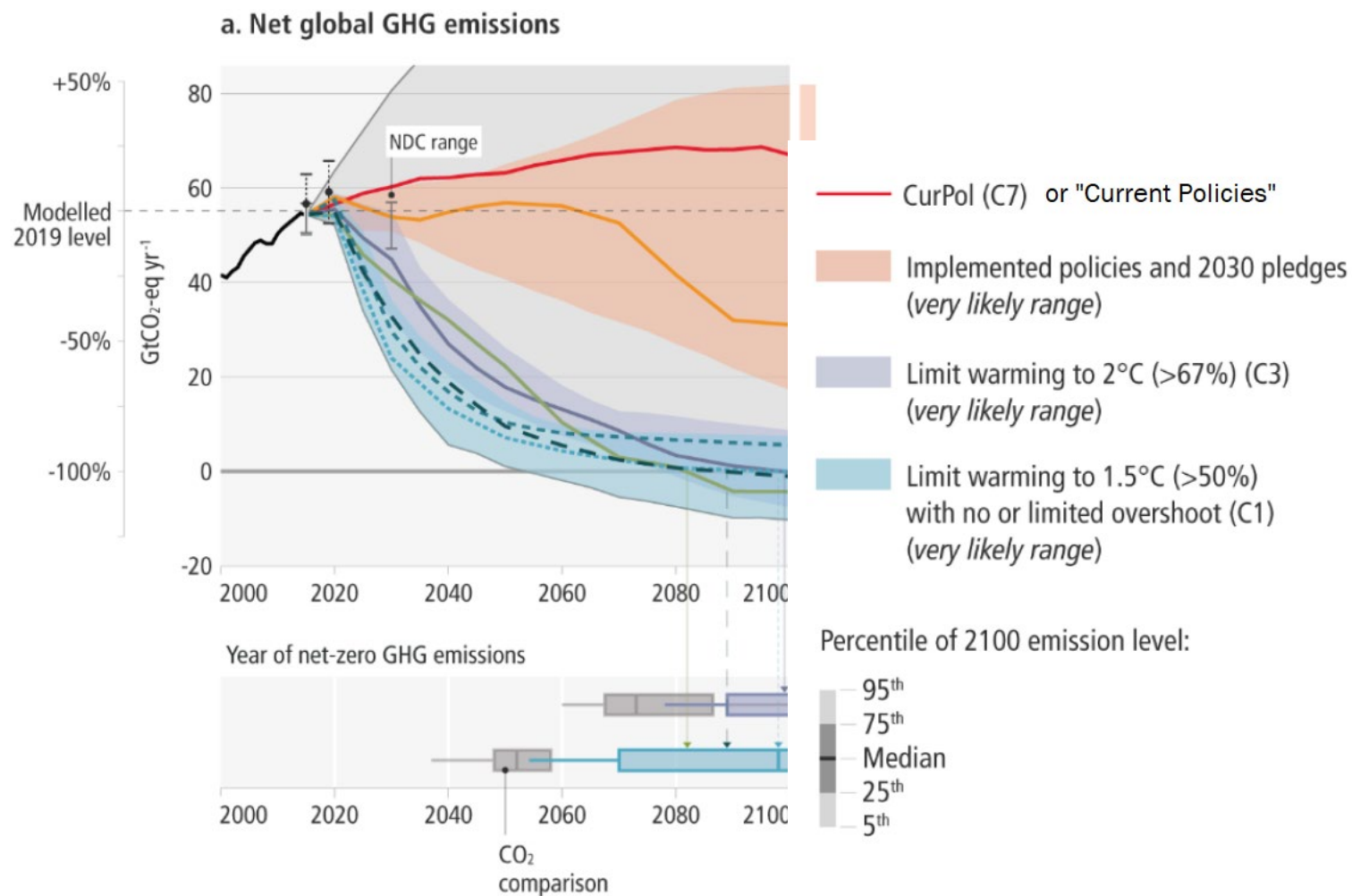


Before and after photos of the Kallang River being naturalised at the Bishan-Ang Mo Kio Park.
Images courtesy of Ramboll Studio Dreiseitl Pte Ltd.



Climate change is a defining crisis of our time, and strong global response is needed

- **2°C increase** above pre-industrial (1900) levels by end of century is acknowledged by scientific community as **“safe limit”**
- However, IPCC AR6 reports we are already experiencing a **~ 1.1°C rise**
- GHG emissions from "Current Policies" **lie squarely outside** of the range needed to limit warming to 1.5 or 2°C



Singapore Green Plan 2030

- A whole of nation effort led by:



Ministry of Education
SINGAPORE



Ministry of Sustainability
and the Environment
— SINGAPORE —



- A **long-term blueprint** that charts **bold and concrete sectoral targets** over the next decade, it is a living document that will evolve, with more ambitious targets and aspirations over time as key technologies mature.
- The 2030 Green Plan will strengthen Singapore's efforts to implement the **Paris Agreement** and the **2030 Agenda for Sustainable Development**.



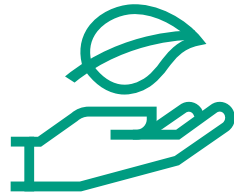
SG GREEN PLAN



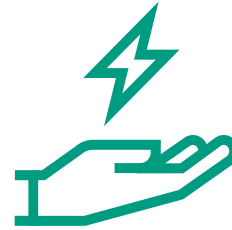
5 Pillars of Singapore Green Plan 2030



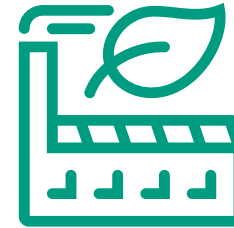
City in Nature



Sustainable Living



Energy Reset



Green Economy



Resilient Future



**Green Government and Green Citizenry
as Key Enablers**

Waste Management (Sewage & Draining)



Sewerage network and treatment facilities to improve sanitation



Braddell Road, December 1978



Newton Circus, December 1969



Rochor Canal, November 1973



Bideford Road, December 1969

Drainage programme to prevent flooding

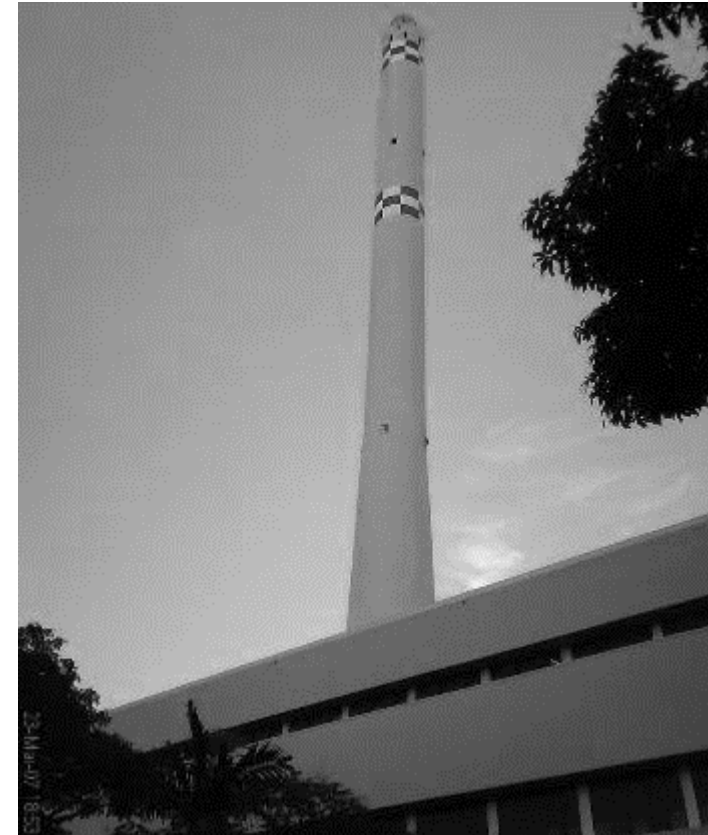
Waste Management (Singapore River, Semakau Landfill & 1st Incineration Plant)



**Cleaning up Singapore River in 1977
A 10-year effort at a cost of \$170
million**



**Building Semakau Landfill in 1994 at a
cost of \$600 million**



**Building Singapore's first modern
incineration plant in 1973
at a cost of \$94 million**

Sustainable Solid Waste Management Strategies



Zero-Waste Nation and Circular Economy

Implement Regulatory Measures for Priority Waste Streams

- Preparing for **Disposable bag charge** in mid 2023
- **E-waste Extended Producer Responsibility (EPR)**
- **Food waste segregation and reporting requirements** under the Resource Sustainability Act (RSA) from 2024
- **Mandatory Packaging Reporting (MPR)** for producers of packaged products

Increase Recycling Rates and Develop Chemical Recycling Capabilities

- Implementing the **Beverage Container Return Scheme** in 2024
- **EPR for packaging beyond beverage containers** targeted by 2025
- Establishing a **Phase 1 Plastic Recovery Facility**



Electronic Waste



Food Waste



Plastic & Packaging Waste

Tuas Nexus

- NEA's Integrated Waste Management Facility (IWMF) will be co-located with PUB's Tuas Water Reclamation Plant (TWRP) to jointly form Tuas Nexus.
- IWMF comprises:
 - 5,800 tpd Waste-To-Energy Facility
 - 250 tpd Materials Recovery Facility
 - 800 tpd Sludge Incineration Facility
 - 400 tpd Food Waste Treatment Facility
- Tuas Nexus synergies would result in:
 - **Carbon savings of more than 200,000 tonnes of CO₂ annually**, equivalent to taking 42,500 cars off Singapore's roads.
 - **Land savings of 2.6ha**, equivalent to about 4 football fields, compared to both IWMF and TWRP being developed as standalone facilities.



Semakau Landfill

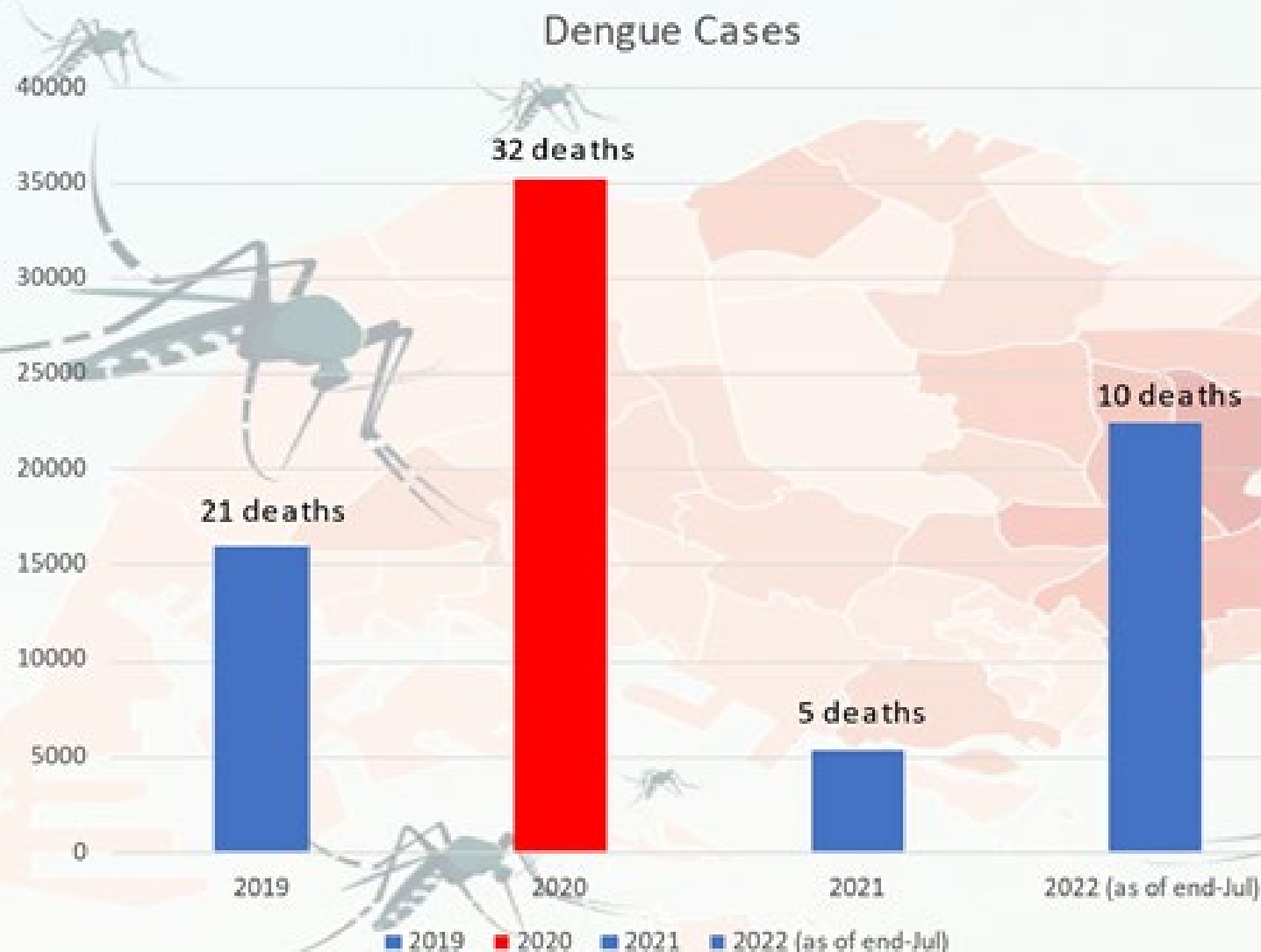


Aerial View of Semakau Landfill

Explore innovative uses of Waste Residues

- **Landfilled Mixed Materials**
 - Explore novel use of landfilled mixed materials as reclamation fill at Tuas Port Finger 4
 - Could extend SL's lifespan by more than 10 years
- **Incineration Bottom Ash**
 - Assess technologies to treat IBA into NEWSand, which could partially replace natural aggregates in non-structural concrete
 - Develop environmental standards for the safe use of NEWSand
 - Study the development of a commercial NEWSand Facility to treat Singapore's IBA
- **Non-Incinerable Waste**
 - Work with industry to develop solutions to reduce and recycle treated toxic waste, sewage sludge incineration ash, and other non-incinerable wastes, which collectively make up 30% of landfilled wastes

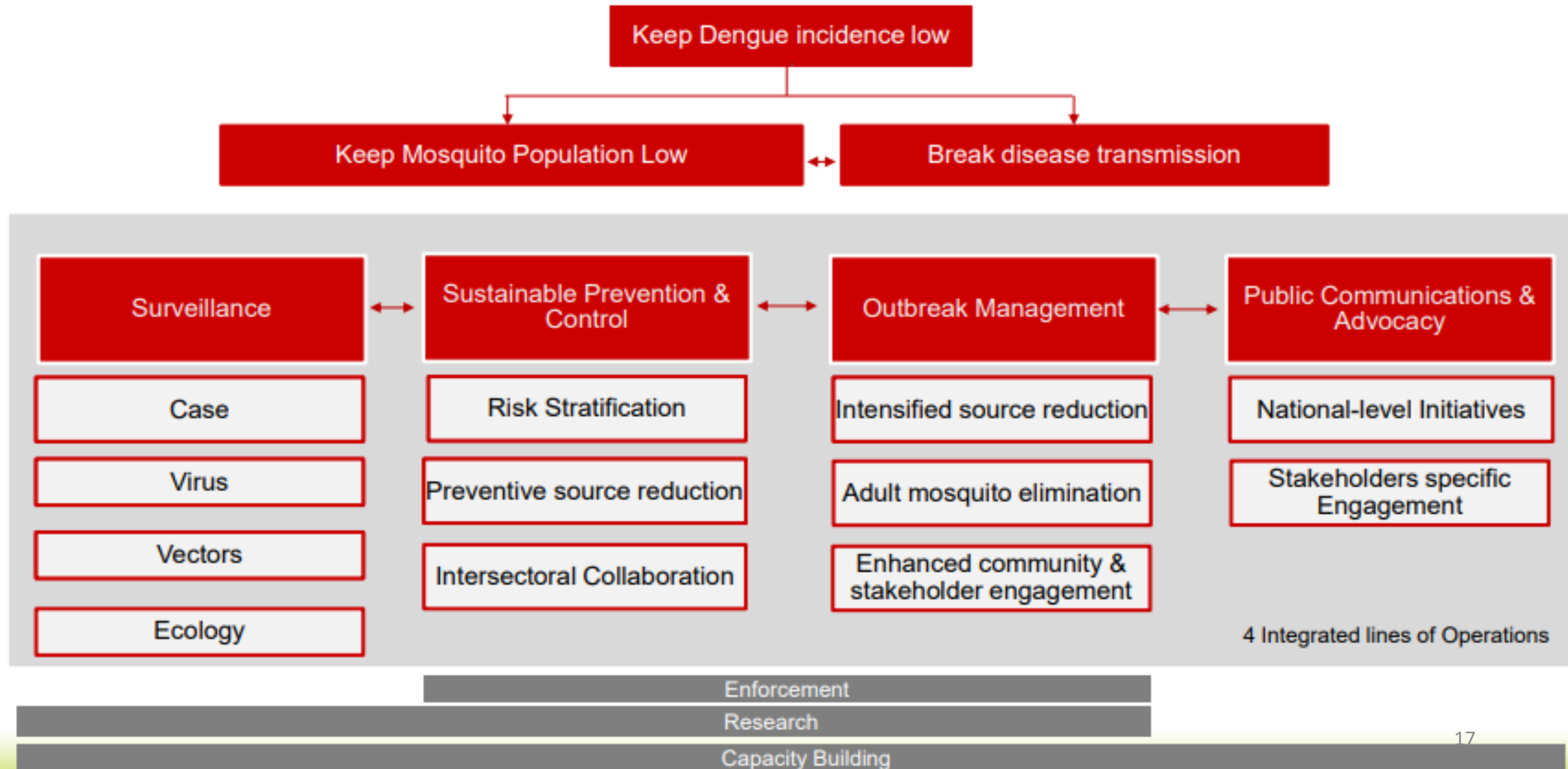
Dengue remains a serious public health threat



Causes for surge in 2020 cases

- Warm and wet weather
- Change in dominant dengue serotype
- Work from home arrangements

NEA's Dengue Control Strategy



Dengue Inspections & Project *Wolbachia*

Further Strengthen Dengue Control and Ops



- Sustaining the **dengue control regime** in Singapore
 - Securing of resources for inspections and Gravitrap surveillance programme
- Review of registration framework for the **vector control industry**

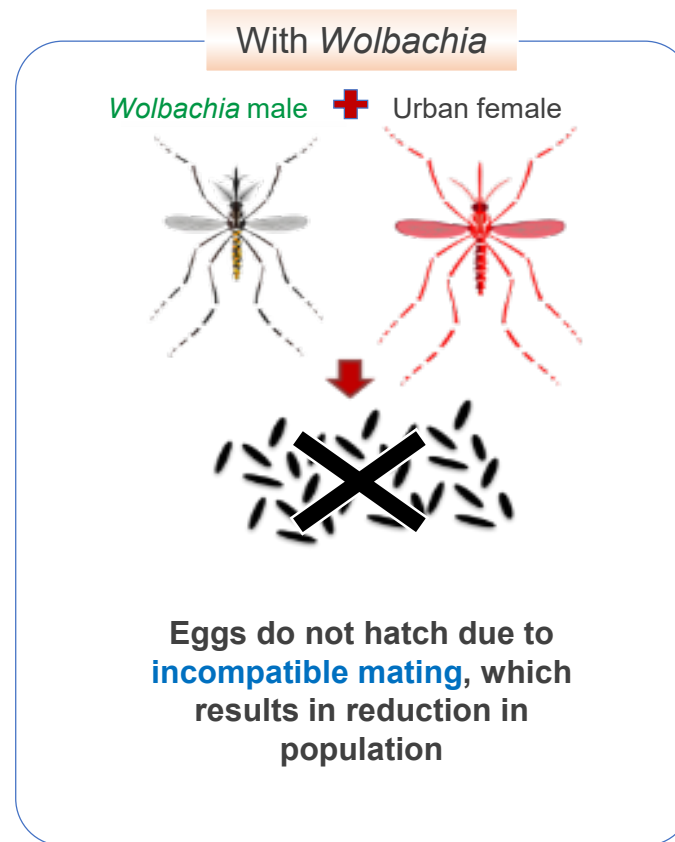
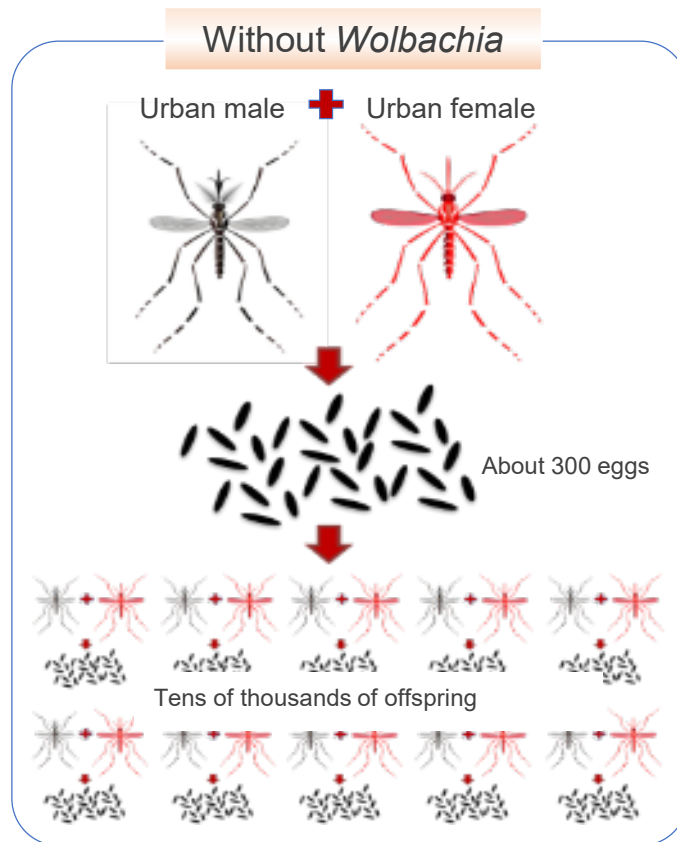
Extend the Use of Wolbachia to Vector Control Ops



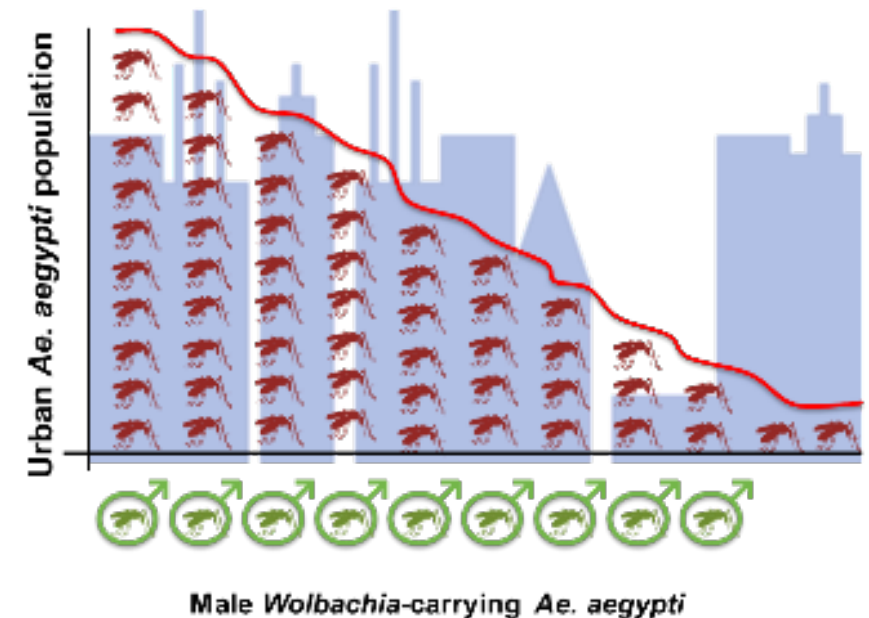
- Operationalise **Wolbachia** in vector control operations
- To increase production and release capacity of **Wolbachia mosquitoes**

Project *Wolbachia* – Singapore: Novel Dengue Control Tool

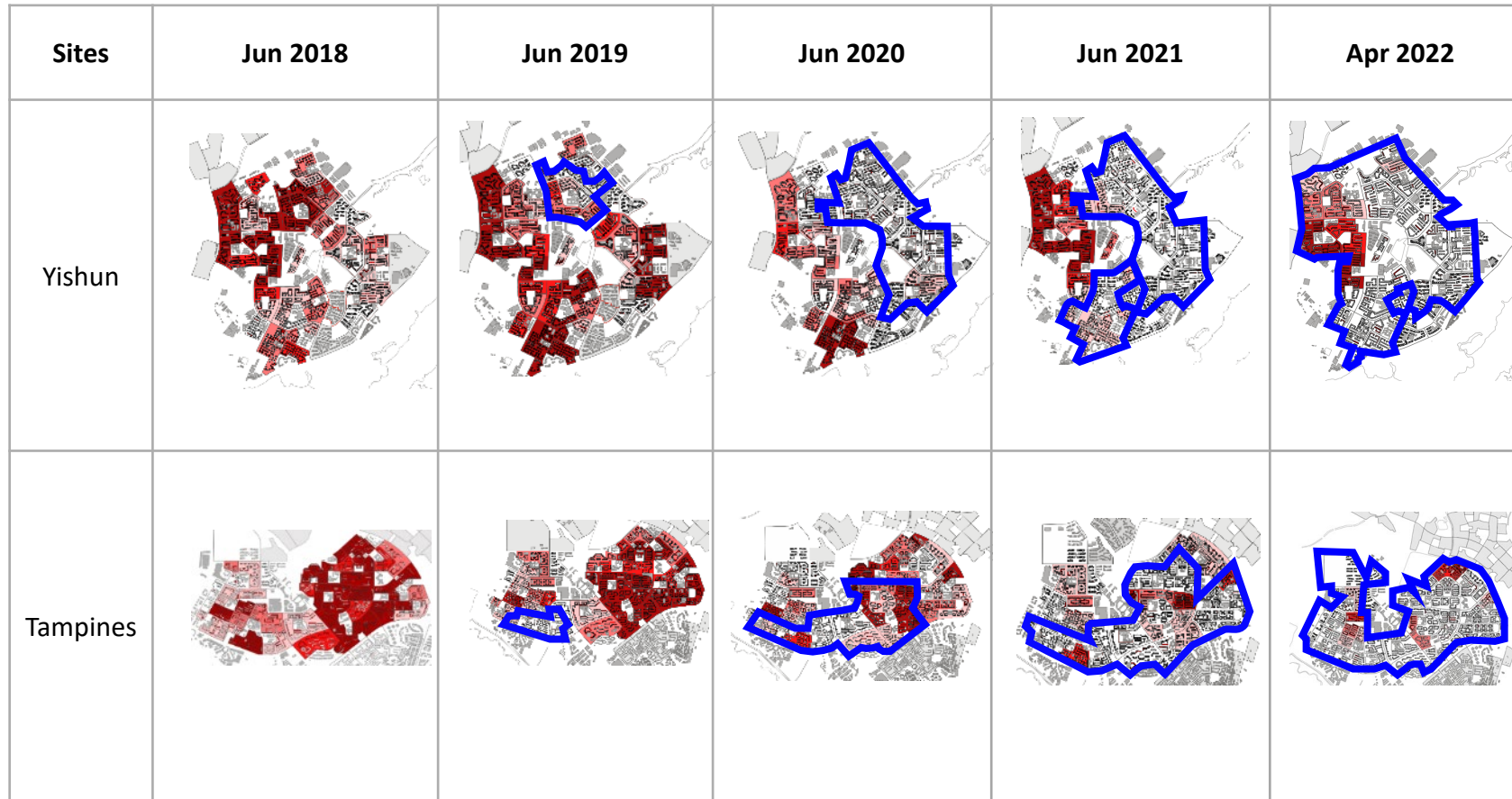
Release of male *Wolbachia*-carrying *Aedes aegypti* to reduce dengue vector population



Continuous release of *Wolbachia*-carrying *Aedes aegypti* expected to lead to the suppression of urban *Aedes aegypti* in the community



“Eraser” Effect on *Aedes aegypti* Population



Legend:

Risk of large dengue cluster formation			
Risk	Low	Moderate	High
GAI ¹	<0.05	0.05-0.1	>0.1
Increase in risk	1X	4X	10X

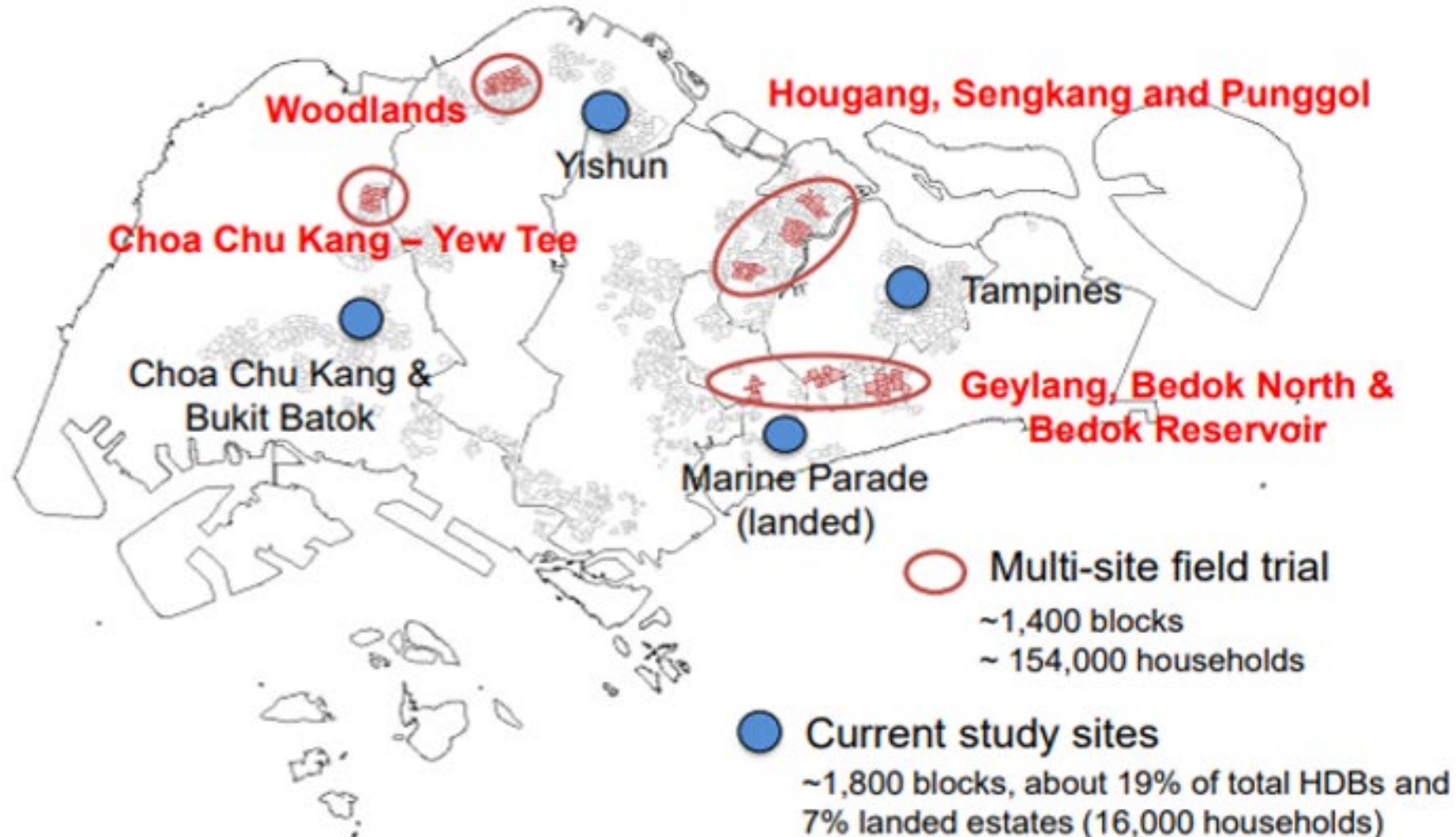


Release area (weekly releases since Jul 2018 in Yishun and Sep 2018 in Tampines)

1: Gravitrap *Ae. aegypti* index (GAI, average number of female *Aedes aegypti* caught per functional Gravitrap)

Multi-site field study to demonstrate the impact of the Project on dengue cases

Additional 1,400 HDB blocks from July 2022, bringing total coverage of the project to 31% of all HDB blocks in Singapore and more than 300,000 households.



Development of Automated System to Increase Capacity for Large-Scale Production of Male *Wolbachia*-*Aedes*

NEA produces and releases mosquitoes internally, using automated devices

Concept of sustainability were incorporated into devices design and processes optimization



Larvae counter



Larvae feeder



High density larvae rack



Pupae sex sorter



Automated pupae counter



Mosquito launcher

Production & releases

- **Water efficient:**
 - ✓ Automated machines equipped with internal water recycling and filtration system to reduce water usage by up to 90%
 - ✓ In-house RO-waste recycling system to reuse water from larvae rearing
- **Work efficiency:**
 - ✓ Reduce reliance on manpower and increase productivity by at least 6-fold through process automation
 - ✓ Free up officers to carry out other necessary work
- **Space efficient:**
 - ✓ Improved designs for maximum space utilization, production capacity increased by more than 10-fold with a similar footprint

Environmental Sanitation (ES) Regime

Instill a National Habit of Cleaning and Foster a Culture of Cleanliness
 Where everyone plays a part



THE STRAITS TIMES
 Parliament: Schools, hawker centres, eldercare facilities to raise sanitation standards



1. Public Sector Transformation: Shifting from Government to **co-regulation** of environmental sanitation regime
2. Adopting a **proactive** approach to uphold a high standard of public hygiene
3. Strengthening process and outcome-based **standards**

THE STRAITS TIMES
 Stricter cleaning regime in S'pore for premises with more vulnerable occupants or high footfall from July 30

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Singapore

Technical guide to be introduced ahead of upcoming environmental sanitation regime

Environmental Sanitation (ES) Regime

Progressive Roll-out* of the Environmental Sanitation Regime

from 30 July 2021

- More than 3,000 specified premises are expected to implement the regime by 1 March 2022
- First six months will be an advisory period

Date	Facilities
30 July 2021	Eldercare, youth and social service facilities
1 November 2021	Preschools
1 December 2021	Food centres and markets
1 February 2022	Schools
1 March 2022	Coffeeshops

* The initial roll-out involves sectoral leads from NEA, ECDA, HDB, MOE, MOH, MND, MSF, SFA and SLA.

For more information, please visit www.nea.gov.sg/our-services/public-cleanliness/ESR

IMPLEMENTING AN EFFECTIVE PROGRAMME

Routine cleaning and disinfection

pest management plan

Protocol to deal with incidents involving bodily discharge

Thorough periodic cleaning and disinfection

SPECIFIED PREMISES

Markets, food centres and coffeeshops

Preschools

Youth and social service facilities

Schools

Eldercare Facilities

Clean Tables (Overview)



Clear your table to avoid a fine.

It is an offence to leave litter on the table. Enforcement action will be taken progressively, starting at hawker centres from 1 September 2021.

-  **Keep the table clean** for the next diner
-  **Clear your disposable** crockery, tissues and wipes
-  **Return your trays** and crockery

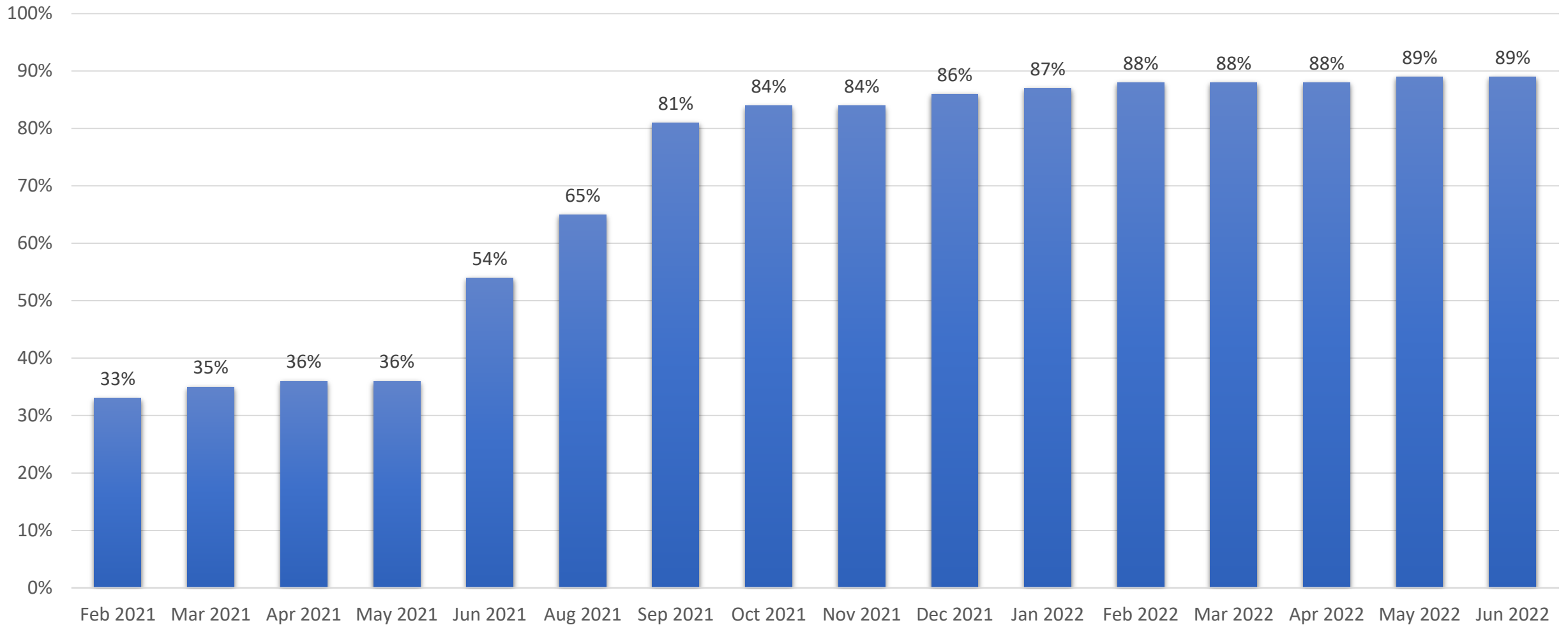
www.go.gov.sg/cleantables

National Environment Agency 



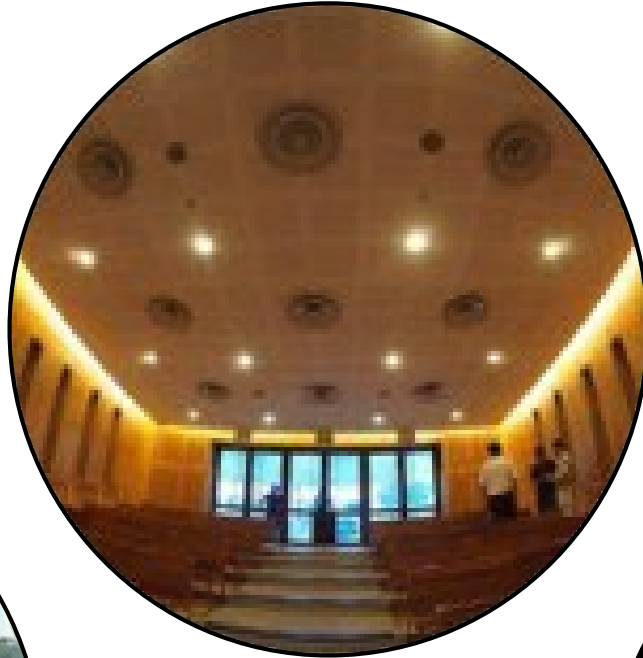
Clean Tables (Tray & Crockery Return Rate)

Average TCRR across all Hawker Centres (Feb 2021 – Jun 2022)



After-Death Facilities in Singapore

Cemeteries



Crematoria

Columbaria



Other Facilities

Insufficient Cremation & Burial Capacities Globally during Covid-19 Peak Periods

Pandemic shortages affect Arizona funeral homes, cemeteries

By Greg Hahne
Published: Wednesday, October 6, 2021 - 7:02pm

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Funeral supplies

Download mp3 (1.13 MB)

The pandemic has led to supply struggles for almost every industry. That is no different for funeral homes and cemeteries.

The troubles with supply chains and higher demands for burials has led to problems for those who had to plan funerals during the pandemic.

Italy's Muslims cope with burial space shortage in pandemic

Imams and Muslim community leaders call for more Islamic cemeteries, or additional space in Italy's existing graveyards.



Moulay buried his wife in the Muslim section of Ravazzano's Roman Catholic cemetery. (Minnel)

Orange County crematoriums at capacity, owners blame COVID

'We're in a business where we're not accustomed to turning people away,' crematorium owner says

Louis Bolden, Investigative Reporter

Published: August 19, 2021, 5:13 PM
Updated: August 19, 2021, 6:05 PM


Tags:

Coronavirus: Hong Kong facing shortage of coffins, funeral offerings from mainland China as Shenzhen lockdown restricts cross-border traffic

- Industry leaders in Hong Kong worry this will increase costs for coming funerals and slow down afterlife care services
- Food and Environmental Hygiene Department says it has ordered about 180 coffins from the mainland to be delivered in the coming days

Crematoriums Overflow in Myanmar's Biggest City as COVID Deaths Spike Amid Oxygen Shortage

1 year ago




Dead bodies are being lined up, head to toe, awaiting cremation at Yangon's crematoriums—the result of COVID-19 patients in Myanmar's biggest city being turned away in increasing numbers by hospitals that are overwhelmed and

A mass COVID grave in Peru has left families bereft — and fighting for reburial

December 4, 2021 - 7:44 AM ET
Heard on All Things Considered


JASON BEAUBIEN

5-Minute Listen



Shocking pictures show mass COVID cremations in India as bodies pile high

Rebecca Speare-Cole
28 April 2021 - 4-min read



Burning funeral pyres of those who died from the coronavirus during a mass cremation in New Delhi. (Reuters)

Shocking photos have captured mass cremations in India as bodies pile high from a deadly wave of coronavirus ripping through the country.

Pictures show rows of bodies and pyres

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Back in Singapore

NEA developed a cremation/burial contingency plan way back in 2016, to cater up to 1,400 dead a week at the peak during a pandemic.

To cope with increased death rates in Oct 2021, NEA undertook the following measures:

- Working with private crematorium to provide additional cremation slots
- Internally channelled officers to increase burial slots

After-death Landscape (Provision of Adequate After-Death Facilities)



Burial in Singapore



Choa Chu Kang Chinese Cemetery



Choa Chu Kang Hindu Cemetery



Choa Chu Kang Muslim Cemetery



Choa Chu Kang Lawn Cemetery



Choa Chu Kang Parsi Cemetery



Choa Chu Kang Bahai Cemetery



Choa Chu Kang Christian Cemetery



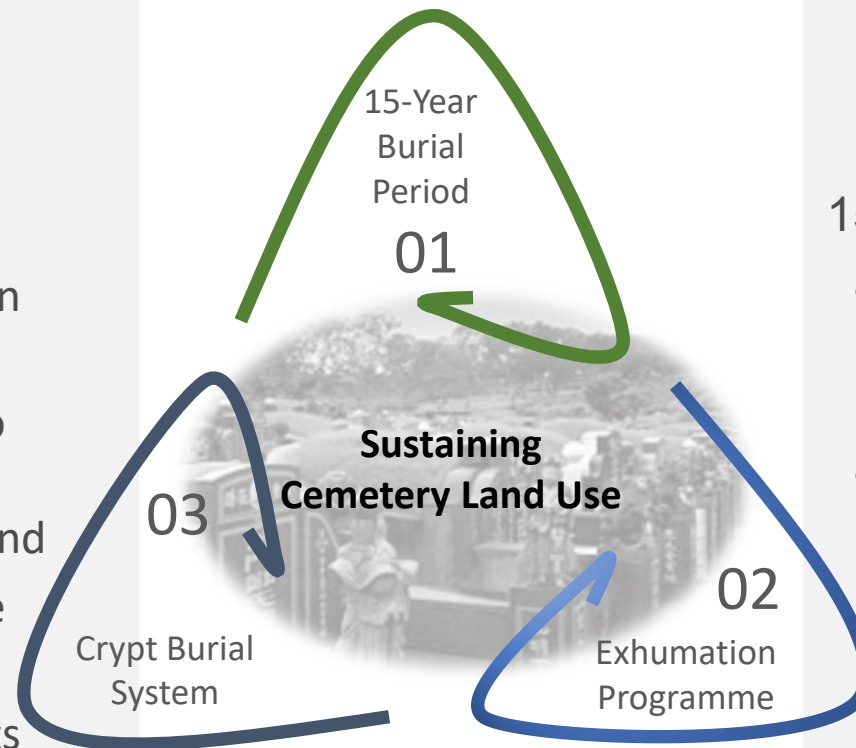
Choa Chu Kang Jewish Cemetery

Crypt Burial System (CBS) Overview



CRYPT BURIAL SYSTEM

- Engineered concrete crypt design
- An improvement in burial operations, by removing need to manually dig a grave before coffin/body is lowered into ground
- Intensifies land use (plots can be placed closer together)
- Facilitates recycling of grave plots
- Prevents problems caused by soil movement



15 YEAR BURIAL & EXHUMATION

- In 1998, all graves are limited to 15-year buried in period at Choa Chu Kang Cemetery
- Exhumation is carried out progressively & in phases

Crypt Burial System (CBS) Details

What is the Crypt Burial System?

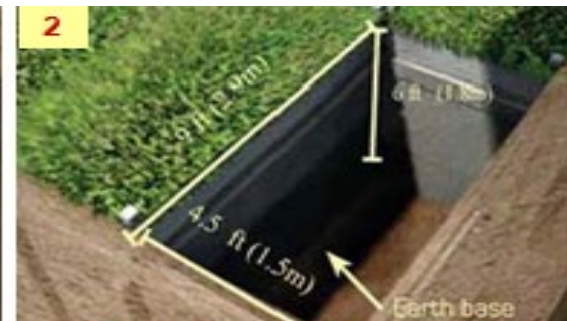
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Why is CBS appropriate for Singapore?

- Respects religious beliefs
- Continues traditions
- Ensures sustainability



View of preinstalled CBS crypts



Interior of CBS crypts



Lowering of coffin/body into the crypt



Backfilling of occupied CBS crypt



Closing of occupied crypt



Above ground, CBS looks the same as normal burial ground & blend seamlessly into surrounding landscape.

Inland Ash Scattering Garden

SINGAPORE

27
NUMBER OF FOOD POISON
OUTBREAKS IN JUST FOUR
MONTHS THIS YEAR: 66



Left: The Garden of Peace at the Choa Chu Kang Cemetery Complex adopts an open garden concept, with designated lanes for walkways and ash scattering.

Above: An NEA officer demonstrating the scattering of ashes – sand was used in this demonstration – at the Garden of Peace. The facility was developed in response to interest expressed by the public for such practices to be made available in Singapore. ST PHOTOS: NG SOR LU



First inland ash-scattering garden to open here on Monday

Facility offers another option for cremated human remains, caters to all religious faiths

Deepa Sundar

Singapore's first inland ash-scattering garden, Garden of Peace, will be operational from next Monday.

Developed by the National Environment Agency (NEA), the 9,500 sq m garden will provide another option for the management of cremated human remains in land-

scarce Singapore. Garden of Peace was developed in response to interest expressed by the public for such practices to be made available here. Mx Khoo Siew Eng, a volunteer at Green Burial Movement, said: "Everyone chooses to store the ashes in a columbarium, more of them will have to be built. Meanwhile, the ash-scattering garden takes up only a single plot of land."

The ash-scattering garden at the

Choa Chu Kang Cemetery Complex is a secular facility open to all religious faiths and adopts an open garden concept, with designated lanes for walkways and ash scattering.

NEA had conducted extensive consultations and engagements with religious groups and the funeral industry during the development of the garden. Similar dedicated facilities are also found in New Zealand, Taiwan and Hong Kong. Mr Chew Ming Fai, NEA deputy chief executive officer and director-general of public health, said: "There was an emphasis that the facility should adopt a serene garden

feel, where family and friends would be accorded privacy during the act of ash scattering."

Boundary shrubs and vegetation have been planted to clearly demarcate the garden boundary and provide sufficient privacy for visitors, a feature suggested by religious leaders during the consultation.

There are four ash-scattering lanes in the garden, designed intentionally to accord families with privacy. The lanes are designed to allow ashes to naturally percolate into the soil underneath.

Bishop Terry Kee, vice-president of the National Council of

Churches of Singapore, who was involved in the consultation process, said: "We are very happy that all feedback was graciously received. We appreciate the efforts taken to provide this additional option."

Venerable You Guang, chairman of the general affairs committee at Singapore Buddhist Federation, said: "Inland ash scattering is a pragmatic alternative supporting bereaved families who wish to have a green and logistically friendly manner towards closure after completing their loved one's journey."

Mr Calvin Tang, president of the Association of Funeral Directors

Singapore, said: "People may prefer to scatter ashes inland as, sense, they will know the exacting place of their loved ones can drop by to pay respects. It's not the case when you scatter ashes in the sea."

Religious ceremonies or rites not be permitted in the garden, visitors may use the prayer facade near the north gate of the garden to conduct simple rites.

Those who wish to scatter at the garden will have to pay \$320 fee which covers the cost of pulverisation of cremated human remains into fine ashes, a casket to store the ashes and a two-hour session at the garden. Under current Covid-19 restrictions, no more than five people are allowed per session, excluding funeral directors. A second inland ash-scattering facility, Garden of Serenity, at Mandai Crematorium Complex is expected to be operational next year. Those who wish to apply for inland ash scattering may do so at www.eportal.nea.gov.sg

deepa@sph.com.sg



Design of the ash scattering lane

- Low wall built between ash scattering lane and platform to prevent ashes from flying to the platform
- Ashes scattered will fall easily onto the soil layer, returning to the earth
- Auto-sprinklers installed at every lane will be activated at the end of the day

Garden of Peace at CCK was introduced in May 2021

Closing Remarks

Our Environment
Safeguard • Nurture • Cherish

Implant Removal: Info on Pacemakers (I)

Pacemaker

- A medical device which uses electrical impulses, delivered by electrodes contracting the heart muscles to regulate the beating of the heart. Such devices have been typically lithium-powered, and are implanted in the chest or abdomen just underneath the skin surface.
- With recent development in the medical technology, leadless pacemaker is now designed to achieve the pacing results without open surgery.
- The Micra pacemakers have been evaluated and registered by HSA and are currently available on the market.
- The Nanostim pacemakers were authorised by Special Access Route (SAR) earlier but St Jude Medical stopped marketing these implants around 2016/2017.

Implant Removal: Info on Pacemakers (I)

Waiver of requirement for the removal of leadless pacemakers from the body of deceased persons before burial/cremation

- In 2016, through HSA received requests from 2 companies i.e. Medtronic and Abbott/St Jude for waiver of requirement to have their respective leadless pacemakers removed from deceased body and to be allowed for burial/cremation in Singapore.
- Under NEA's Radiation Protection (Ionising Radiation) Regulation 39(5), *“Any temporary implant of a sealed source, including a nuclear battery used to power a cardiac pacemaker, shall be removed from a corpse before such corpse is disposed of.”* Here, “sealed source” is defined as “any radioactive material that is firmly bonded within material or sealed in a capsule of adequate mechanical strength so as to prevent the escape of any part of the radioactive material under foreseeable conditions of use and wear but so designed as to allow the emission of ionising radiation for use as required”.
- Then RPNSD assessed that modern pacemakers, which do not make use of radioactive source, are not associated with radiological risk. With this, LD advised that non-radioactive leadless pacemakers are not considered “sealed source” under the regulation, and hence, they do not need to be removed from a corpse before such corpse is disposed of.

No removal of pacemaker for burial but requires for cremation

- Former CEO's approval was sought to waive the requirement under the Permit to Bury (PTB)/ Cremation (PTC) to remove the leadless pacemaker device from the body of the deceased.
- In the same submission, former CEO **approved the proposal that such leadless pacemakers need not be removed for burial.**
- However, for cremation, NEA still requires the removal of pacemakers for cremation given the risk of “explosion” in the furnace at high heat, and may result in potential occupational injury risk to our cremator operators and potential damage to our cremators.