

CHI Innovate 05 July 2024

# ENVIRONMENTAL SUSTAINABILITY

## Environmental Sustainability In SingHealth Operating Theatres

Clinical Professor Benita Tan,  
Co-chair, SingHealth's Committee on Sustainability



*Sustainability as SingHealth's way of life*

PATIENTS. AT THE HEART OF ALL WE DO.®



# Committee On Sustainability

## Elevating the Sustainability Agenda in SingHealth



A/Prof Benita Tan  
Co-chair



Tan Tai Kiat  
Co-chair

### Cluster Decarbonization Plan

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Work with **Institutions and Shared Services** to develop and implement initiatives to **reduce carbon emissions and enhance energy efficiency**

### 5Rs & more

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(Refuse, Reduce, Reuse, Repurpose, Recycle, Rethink, Re-educate)

Partner **Clinical Champions** from each institution **to identify clinical waste** for 5Rs

Develop **guides for different clinical areas including OT, inpatient, outpatient/ clinics** to encourage faster adoption within SingHealth

### Campaigns to Raise Awareness and Drive Culture Change

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Push for adoption of **Environmentally Friendly Events**

Support teams to **implement the 15 ideas from Hackathon**

# SINGHEALTH ENVIRONMENTAL SUSTAINABILITY DECARBONIZATION PLANS

01

## Health Care Delivery

TARGET  
**ZERO HARM**

Good Clinical Practice



Green Building  
and Innovation



Renewable  
Energy



Waste  
Management



Sustainable  
Transportation



Reducing  
Desflurane Use



Water  
Efficiency

02

## Health Care Supply Chain



Sustainable Procurement

03

## Build the Culture of Sustainability



## What is the Impact of Surgery

### My Perspective as a Surgeon

Refuse, Reduce,  
Reuse, Repurpose,  
Recycle, Rethink,  
Research and Re-  
educate

- ❑ Surgery is the most energy-intensive practice, directly contributing to climate change.
- ❑ Complications worsens it
- ❑ Surgical pathways for best outcomes in an environmentally friendly way.
- ❑ Need a **multidisciplinary** perspective: health professionals, patients, companies, health-care managers and governments.
- ❑ The '**5Rs plus 3**' principle

# What is the Impact of Surgery

## Cost of Surgery to the Environment

- Operating theatres represent a small area in the hospital
- More energy intensive than clinical wards
- Generate 50–70% of total hospital clinical waste

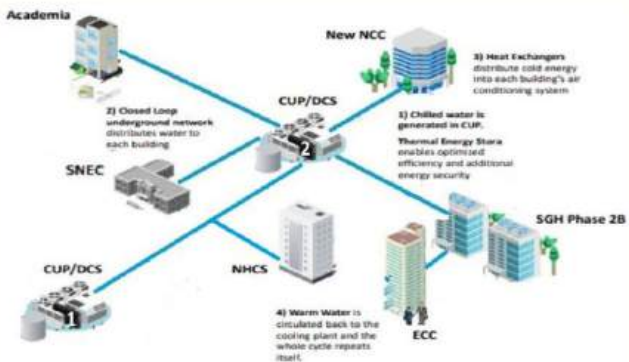
## Importance of Good Clinical Practice

- Patient complications and outcomes
- Cost of treatment to the patient
- Cost to the healthcare system in providing the treatment
- Loss of productivity and impacts to the economy

# Green Building Design and Innovation & Renewable Energy

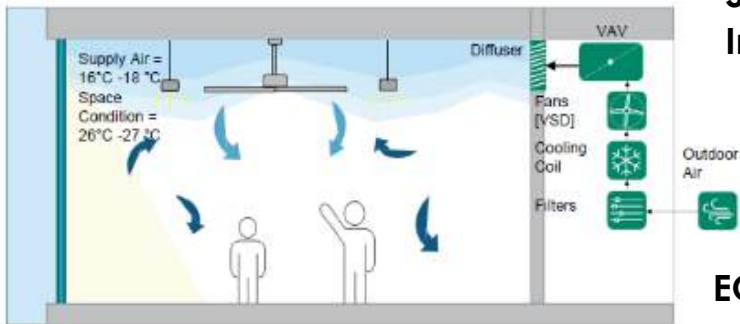


## SGH Campus District Cooling System



## Solar Photovoltaic (PV) system for SingHealth Institutions

## EGH Campus Hybrid Cooling System



## Air-recirculation Pilot

Pilot Study Utilizing recirculation air during non-operational hours for Operating Theaters (30 OTs)

From 8pm to 6am and 24 hours



Potential Energy savings

~ 4.5 / 11.25 GWh yearly



CO<sub>2</sub> emission savings<sup>1</sup>

~ 2,363 / 5,906 tonnes CO<sub>2</sub> yearly



Mature rain trees required to offset CO<sub>2</sub> impact<sup>2</sup>

~ 118K / 295K trees yearly

# 01 Healthcare Delivery: Good Clinical Practice

TARGET  
**ZERO**HARM

## Sustainable clinical practice is KEY

- Avoid unnecessary surgery
- Sub-cutaneous medications
- Teleconsultation for PEC to reduce travel
- Disease prevention: vaccination, alcohol, smoking, weight management
- Prevent complications:
  - Optimisation of chronic illness
  - Appropriate antibiotic prophylaxis
  - Good surgery preparation and systems and care pathways
- Expertise and training
- Good post-surgery care and rehabilitation
- Sub-cutaneous medications, Teleconsultation for PEC to reduce travel

### Practices in OT

- Preparation
- Procedure
- Equipment and solid waste
- Waste management

# 01 Waste Reduction



## Preparation for Surgery

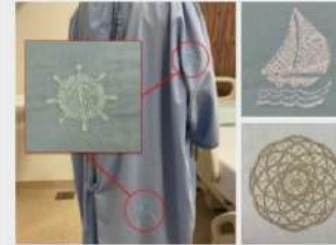
- ❑ Paperless OT: listing to surgery
- ❑ Review of surgical sets to remove unnecessary instruments
- ❑ Avoid unnecessary interventions: non-indicated antibiotics, catheterization by going to toilet before surgery, histology
- ❑ Open gowns and gloves for right number of people



Saves water and hand towel

### Reducing waste in hospitals

Hospital linens such as patient pyjamas, towels and linen wrappers are subject to wear and tear over time. In 2021, SingHealth General Hospital had approximately 13,000 pieces of damaged linens, which typically would have been disposed of as general waste. The staff came up with the idea to repair damaged linen and convert them into smaller linen. This initiative enabled the hospital to reuse approximately 30% of the damaged linen and reduce about 1.25 tonnes of waste, saving an estimated \$47,000 annually.



Examples of embroidery patterns used to repair damaged linen



## Reduction of waste by repairing damaged linen

Linen with small tears in them are repaired by stitching embroidery pieces over the holes; or converted into smaller pieces of linen.

- Reuse approximately 30% of the damaged linen
- Reduce about 1.25 tonnes of waste
- Save estimated \$47,000 annually.



01

# Reducing Desflurane Use (Medical Gases) and Others



- Anaesthetic gases used in Operating Theatres (OTs) are potent greenhouse gases – with global warming potential (GWP) of Desflurane at approximately 40-50x that of sevoflurane
- However, desflurane still has its clinical relevance

## Initiative in CGH in 2020 to 2024



**87% reduction in Desflurane**  
from 2020 to 2024

Cost savings of **\$154,000**

**1,035 tonnes of CO2**

equivalent emissions over 3 years

## Oral vs IV preparations

Oral paracetamol premedication instituted for all elective surgical patients. Reduces IV paracetamol which is more costly, higher environmental impact and not better clinically. 50% reduction achieved. Accepted to BJA for publication

## Ongoing QI project in SKH since 2021

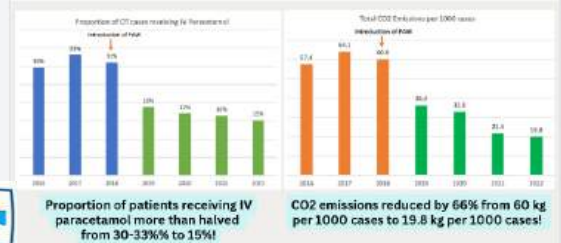


**Reduce use of Desflurane**

**50% reduction**  
in Desflurane usage  
over 1.5 years

**45% reduction**  
in carbon  
emissions

## Department Achievements PARACETAMOL



## Pilot in KKH in 2023



**Reduce Desflurane**

use in OTs through education and awareness, unplugging desflurane vaporisers from anaesthesia machines and audits

Cost savings of **42% in medical gases**  
in OT operations

**80% reduction in CO2**  
equivalent emissions  
over 10 weeks

**~75% of anaesthetists** polled agreed with **removing the Desflurane vaporiser** totally from the anaesthesia machine

## 01

## Waste Reduction



## Intraoperative Equipment

- Surgeon preference list for each surgery with frequent updates
- Separate essential and optional items
- Open sets and equipment: open when needed
- Opt for **Reusable** instead of single use
- Sutures instead of clips



Pour only sufficient lotion  
for skin cleansing  
preparation

*“Don’t open it unless you  
need it!” principle*



Keep within shelf life of 7 days

01

# Waste Reduction F&B in OT



- Buffet with reusable utensils
- Request desired amount
- Only 1 waste bin required



Reusable Lacquer Bento Boxes



01

# REPURPOSE



## OT Scrub Brushes Recycling Project



- Implemented on 28 Aug 19
- Located at MC L8, 9, 10 Collaboration Space



1. Recycled container placed at each scrub sink for disposal of used brush



2. OTCT transfers and collate all brushes into a main recycled container



3. At the end of the day, OTCT collects and brings to ES



4. Used brushes are dried in a laundry bag in the dryer weekly/once bag is full



5. Dried brushes are stacked into recycled container

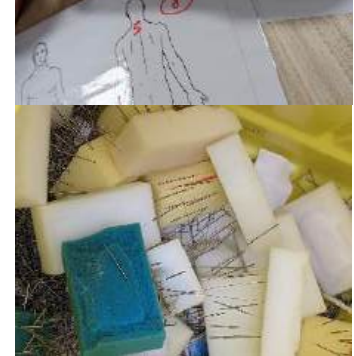
### SCRUB BRUSH RECYCLING PROJECT

**Reduce. Reuse. Recycle.**

- Disposable scrub brushes used by surgeons and nurses to scrub hands and arms before surgery.
- Brown stains are due to disinfectant soap with iodine.
- When worn out, the sponge can be disposed and the plastic brush recycled.
- They can be used around the house for scrubbing the bathroom tile or countertops or even car tyres!

These scrub brushes are safe to use around the home!

**Do your part in saving the planet.**  
You can now pick up these brushes at MC L8 Collaboration Space Pantry. Brought to you by the SKH Green Committee.



### Uses

1. Self collection by staff for personal use
2. Acupuncture clinic for safety measures:
  - Count
  - Injury

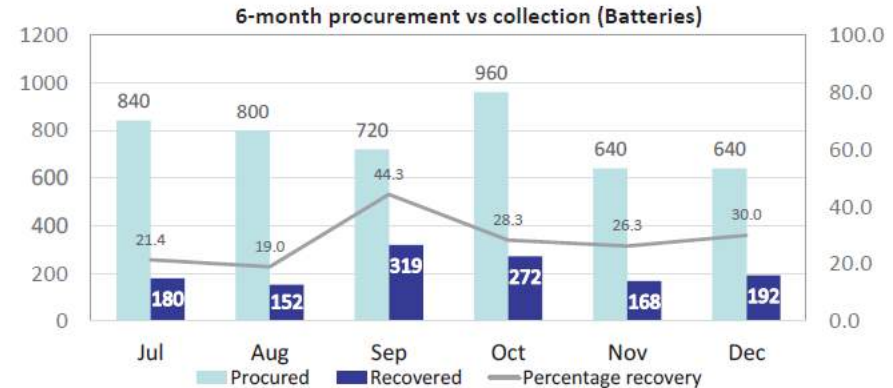
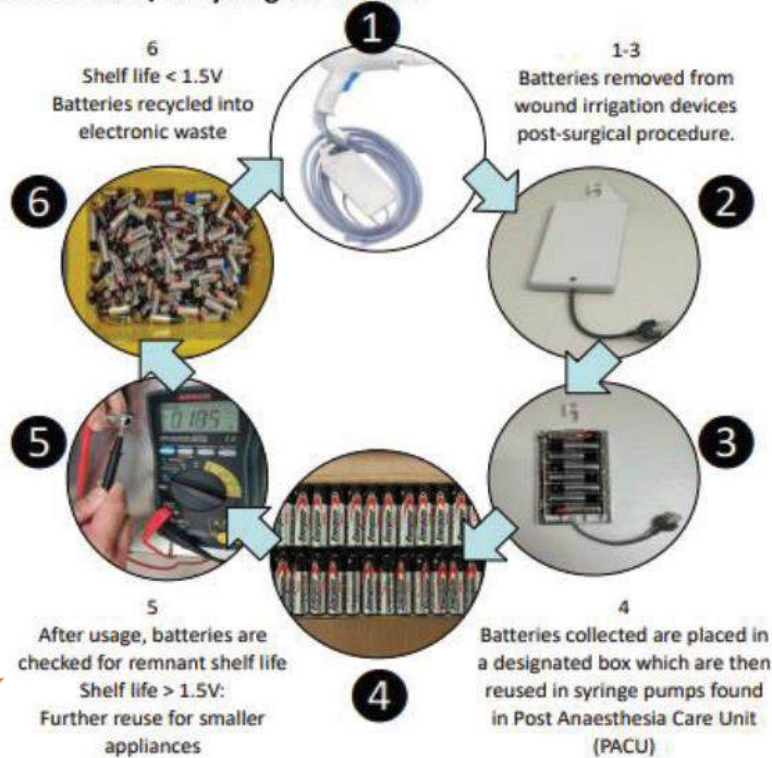


01

# REPURPOSE



## Collection & Reuse / Recycling of Batteries



No. of batteries recovered from recycling 1283 ÷ No. of batteries procured 4600 x 100% = **27.89%**

With this initiative, OT is buying lesser batteries. **Cost savings in 6 months is \$769.80**



# REPURPOSE



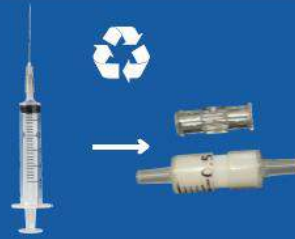
## Why Vi-Cap?

Capnography systems pose the threat of cross contamination between patients.

American Society of Anaesthesiologists (Patient Monitoring Safety Standards)\* requires clinicians to monitor capnography waveform to ensure proper and adequate ventilation of patient undergoing anaesthesia and sedation.

The capnography sampling line should include an anti-microbial filter to prevent cross infection between patients and not contaminating the capnography system.

\* when a capnography system is available.



As advocates of sustainability, N&E has created Vi-Cap by upcycling syringes collected from hospitals in Singapore, thus supporting circular economy.

## What is unique about Vi-Cap?

Vi-Cap represents an advancement in the safe use of the capnography system.

Vi-Cap is a first-in-the-world, standalone, sterile, non-invasive, single use anti-bacterial/viral (N95) filter attached to the side stream monitoring line of the capnography system to reduce cross-contamination between patients, as the capnography system is not routinely changed between cases.

## What are the benefits?:

1. Easily attachable to side stream monitoring system.
2. Prevents cross -contamination between patients.

## Components

N95 Filter, Vikang99, Barrel, Teflon Holder

## Indications for use

To be used on patients who benefit from capnography monitoring.

All patients undergoing surgical procedures with monitored anaesthesia care, and especially when sedative, anxiolytic, or analgesic medications are administered for patients' safety and comfort.

## Duration of effectiveness:

24 hours; One-time use.

## Certifications:

- 1) Microbial Cleanliness Test (Bioburden) (BS EN 14683:2019 /ISO 1737-1:2018)
- 2) Sub-micron Particulate Filtration Efficiency (PFE) at 0.1 Micron
- 3) SARS Cov-2 Antiviral Activity (ISO 18184:2019)
- 4) Proven Antibacterial Activity (EN 1276:2009) against *Staphylococcus aureus* ATCC 6538, *Escherichia coli* ATCC 10536, *Pseudomonas aeruginosa* ATCC 15442, *Enterococcus faecium* ATCC 4957, *Salmonella typhimurium* ATCC 13311 with more than 5 log reduction

Refer to [www.vikang.com](http://www.vikang.com) for more tests.

## HSA Risk Classification:

Class A

## Wholesale Manufacturer:

N&E Innovations Pte Ltd, Singapore

01

# REPURPOSE



Repurpose the gowns wrappers to line the “Kick about Basin” and the Swab



Repurpose instrument packaging trays as anaesthetic trays

Recycled disposable diathermy quiver used to contain ampoules and act as cushion to deliver the ampoules from Pharmacy to OT and vice versa via pneumatic tube.



To prevent staff from getting injured by the POP Saw Blade. Empty Mikrozid wipes container is used to cover the POP Saw Blade

01

# REPURPOSE



Reusing Ophthalmic Pack's Packaging for patients to store their shoes and clothes.



Plastic covers from Basin set are repurposed for storing documents.



Repurpose OT waste to Good Use



01

# REPURPOSE



Gift Wrappers & Christmas Decorations



Promoting Upcycling Through Competitions  
Nurses Day Decorations



Joy @ Work Activities – Bingo Game 2021



01

# RECYCLING: Waste Segregation

## Make Recycling Accessible



Recycling bins in all pantries



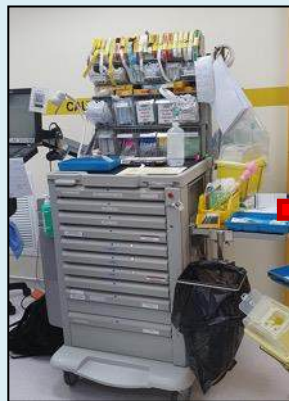
Plastic wrappers      Plastic bottles      Cardboard / Paper

Previously, there was only 1 set of recycling bins for the entire OT floor (very long corridor)

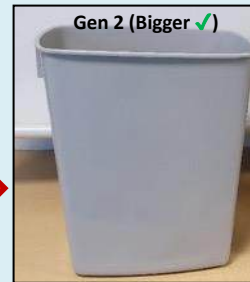
OTS worked with the ES department to create 2 collection points along OT corridor

Previously, there was only one recycling bin to the left of Anaesthetic workstation, which filled up quickly.

OTS worked with the ES department to provide larger bins, reducing trips to empty the bin



Gen 1 (Too Small)



Place a bin on the left side of the Anaesthetic workstation



01

# RECYCLING: Waste Segregation

## Make Recycling Easy with Guide



Reduction of Biohazard waste by 23%



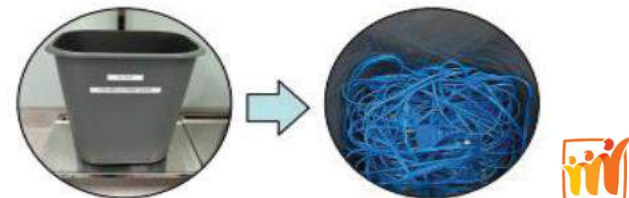
*We have the bins, but we need to be disciplined and USE them appropriately*



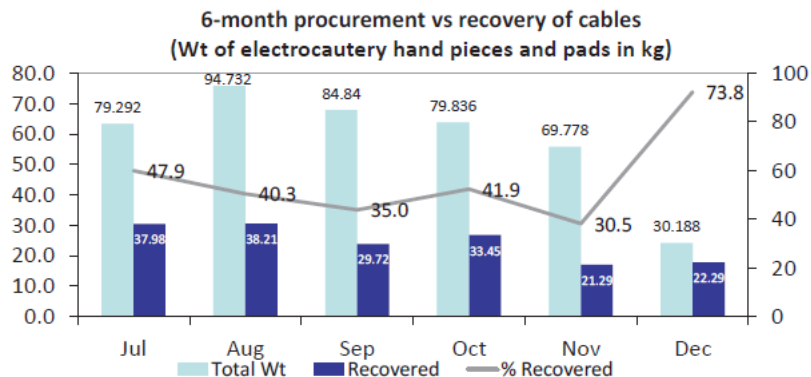
# RECYCLING



## Collection & Recycling of Electrocautery Cables



Electrocautery cables are cut and removed from the hand-pieces and pads respectively, wiped down and placed into the allocated bins before sending to vendor for recycling.



### 6-month collection (Qty of electrocautery hand pieces 44g/pc and pads 38g/pc)

Month	Jul	Aug	Sep	Oct	Nov	Dec	Total
Hand Piece (in pieces)	935	1165	1030	975	578	104	935
Pad (in pieces)	1004	1144	1040	972	1167	674	1004

Total weight of cables from electrocautery hand pieces and pads: **438.666kg**

Wt. of electrocautery cables recovered from recycling 182.94 ÷ Wt. of electrocautery cables procured 438.67 x 100% = **41.70%**

- Recovered cables will be processed to extract the copper for recycling. Copper can be melted into new copper for various applications such as wires, printed circuit boards (PCB) and copperwares.

# 01 RECYCLING



Disinfected disposable instruments and sold to vendor for recycling since 2019.

Melted metal to make pots and pans.

Done it 4 times

Total weight of 1,200kg

Proceeds go to SKH Patient Needy Fund



SGH now collects, on the average, about 600 kg of single-use steel instruments per month, following repeated publicity to create awareness among the staff from different departments that use disposable steel instruments for their work.

01

# RECYCLING



# Health Care Supply Chain

## Moving Forward



Green Procurement Policy  
11 June 2024

- **Green Procurement** is the practice of procuring goods and services that cause minimal adverse environmental impact (Scope 3).
- **Principal Considerations for Green Products / Services:**
  1. Resource (e.g. energy / water) efficient
  2. Made from raw materials obtained in an environmentally sound, sustainable manner
  3. Manufactured in environmentally-friendly production
  4. Respects the environment with appropriate 3R plan and implementation
  5. Distributed with minimal packaging (consistent with care of the product), preferably made of recycled and/or recyclable materials
  6. Certified by recognised international and/ local organisations like Energy Star, Forest Stewardship Council (FSC), Green Seal, Ecologo, Singapore Environmental Council (SEC) etc.



ALPS will lead the effort to championing environmental stewardship in our sourcing efforts by including green requirements & evaluation criteria in all RFPs, where applicable, including providing choices/ options in RFP:

- i. **Business As Usual - Normal Options**
  - ii. **Green Options** (with Accreditations or without Accreditations, but supported with proof of evidence)
- Incorporate the **Price-Quality-Environmental (PQE) ratio** in evaluating proposal
  - ALPS will be working with vendors to identify and increase opportunities to **reduce, reuse and recycle** – e.gs:
    - Reduce use of plastic packaging e.g. during issuance of uniform, etc
    - Collect back carton boxes for reuse
    - Move potential food supplies to local source



## Building a Culture of Sustainability

- Cluster level – e.g. by Committee on Sustainability and Shared Services, Group Allied Health, etc
- Institutional level – e.g. Green Committees, and departmental level



*Sustainability as SingHealth's way of life*

### Annual Clean & Green Event

Celebrate impact and raise awareness

### Awareness and Education

E.g.s. Hackathons, talks and workshops, EDMs, quizzes, etc

### Green Activities

E.g.s. tree-planting, Earth Day, recycling collections, clean-up events, talks/ symposiums, and workshops, etc

### Green Audits

E.g.s. Employee-engagement audits to assess staff's involvement and awareness about sustainability, green event checklist audits, recycling audit, green-building audit

### Green Champions!

Identify, recognise and celebrate staff who advocate for the cause

### Green Spaces

Create green spaces within the hospitals e.g.s. Green Corridor at SGH, locations of recycling bins, gardens, etc



03

# Building a Culture of Sustainability

*Environmental Sustainability Retreat – 9 May 2024*

*- Around 60 participants from different domains including Medical, Nursing, Finance, Communications, Operations, and strategic partners from SIT, UEMS and ISS*



**Wai Hoe NG** · 1st

Group Chief Executive Officer &  
Neurosurgeon

2h · 🌐

Joined the **SingHealth** Environmental Sustainability Retreat yesterday where clinicians, administrators, and partners came together to chart a greener path for healthcare.

Beyond cultural shifts and programmes, fostering public-private collaborations is key to sustainable progress. Together, let's continue innovating and working together to create tangible benefits for our patients and the community.



03

# Building a Culture of Sustainability

## Environmental Shared Service

**SINGHEALTH ENVIRONMENTAL SUSTAINABILITY DRIVE**

**Say NO to Plastics**  
3 Jul 23, 11am to 4pm  
SingHealth Tower, 12 FRI & FR2

Join the talk and enjoy a free coffee on us. Scan to register now!

We have lined up a series of educational talks and interesting booths on how you can reduce waste to save our Earth!

11am to 12pm Waste, Climate Change and You  
**Zero Waste SG**

12pm to 1pm Recycle Right with SembWaste  
**SembWaste Pte Ltd**

No disposables will be provided so please bring your own cups and shopping bags to the event!

**Plastic Awareness Program:**  
Do you know what's Singapore's plastic recycling rate?  
5 Jul 23, 12:30pm - 1:30pm  
Zoom Talk

Join us to learn about how we transform plastic waste (including masks) into reusable goods and close the plastic loop!

**The Waste(less) Cafe Exhibition**  
30 Jun to 31 Jul 23

Learn the simple actions you can take to Say YES to Waste Less!

**LESS PLASTICS FANTASTIC**

**Bye Plastic! Photo Contest**  
1 Jul to 14 Jul 23

Capture 2 photos depicting plastic-less initiatives @ home or office and stand a chance to walk away with attractive vouchers!

**MORE INFO**

**PACE**  
An initiative by PACE Committee (Single-Use)

## SingHealth Polyclinic

**War Against SINGLE-USE Plastic**

**If you are Event Organiser**

Organise Eco-Friendly Events to minimize impact to the environment.

Scan QR code or click HERE to access the guidelines in FormSG for organising environmentally friendly events. Take mindful steps to make your event sustainable!

Complete the FormSG and submit to PACE Committee before the start of your event to receive Green Event Certification.

Get recognised and demonstrate your commitment to sustainability!

**CERTIFIED GREEN EVENT**

**If you are Participant**

**Bring Your Own CUTLERIES**  
Practice sustainable living at Events

Bring your own reusable cutlery. Better still, bring your own reusable plates/containers/water bottles!

**Together, let us work towards reducing plastic waste!**

**PACE**  
An initiative by PACE Committee (Single-Use)

## Environmental Shared Service

**HOW TO ORGANISE ENVIRONMENTALLY FRIENDLY EVENTS**

Did you know that you can 'go green' when organising events by adopting environmentally friendly practices? Here are some ways to make your events more sustainable!

**Venue Selection & Event Invitation**

- Select venues near public transport nodes such as MRT stations or bus stops
- Provide public transport or carpool instructions to the invitee
- This decreases the number of vehicles emitting pollutants for improved air quality and lower greenhouse gas emissions.

**Catering**

- Order for 90% of expected attendees and avoid too much waste like noodles and rice
- Request participants to bring their own reusable crockery and cutlery
- This helps to reduce the amount of waste being sent to landfill and encourages sustainable habits.

**Event Materials & Collaterals**

- Adopt paperless registration and opt for e-inviting instead of printed posters
- Minimise the distribution of brochures or inserts, brochures or booklets
- Reusing paper can help to conserve valuable resources and reduces the environmental impact associated with their extraction and processing

Scan the QR code to learn more about the guidelines by Ministry of Sustainability and the Environment (MSE), in organising environmentally friendly events. Remember, every action, no matter how small, can contribute to a healthier and more sustainable planet!

**Brought to you by the Environmental Sustainability Shared Service**

Stay tuned for our upcoming ESDS event on how to bring your own reusable and environmentally friendly items!

## SingHealth Community Hospitals

**SCH TOWN HALL**  
**SUSTAINING OUR FUTURE: BUILDING A GREEN COMMUNITY**

**THURSDAY**  
**14 SEP 2023**

**12:30 PM - 1:30 PM**  
**SKCH AUDITORIUM**

Buffet lunch for staff starts at 11:45am! (First-come-first-served)

**THE GUEST SPEAKER**  
**MR ANG CHEE CHIANG**  
Senior Vice President,  
Centre Management, Constellar

Covering Centre Management at Singapore's EPH, Chee Cheong practices sustainable individual and organisational behaviour across his work as a leader. He has also championed a number of sustainability initiatives, including becoming a net-zero carbon NICE venue.

Chee Cheong is an experienced organisational management, strategy national ecosystem and sustainability careers from his previous tenure at Parkway Healthcare, National Healthcare Group, SingHealth and Temasek CARE with National Environment Agency.

**DO YOUR PART...**

Bring your own cutlery and food containers for the buffet and redeem special goodies\* from us!

Support SCH's sustainability efforts by coming in your best green outfit!

\*Took till 1st Sep 2023 only.



03

# Building a Culture of Sustainability



Clean and Green Day 2023



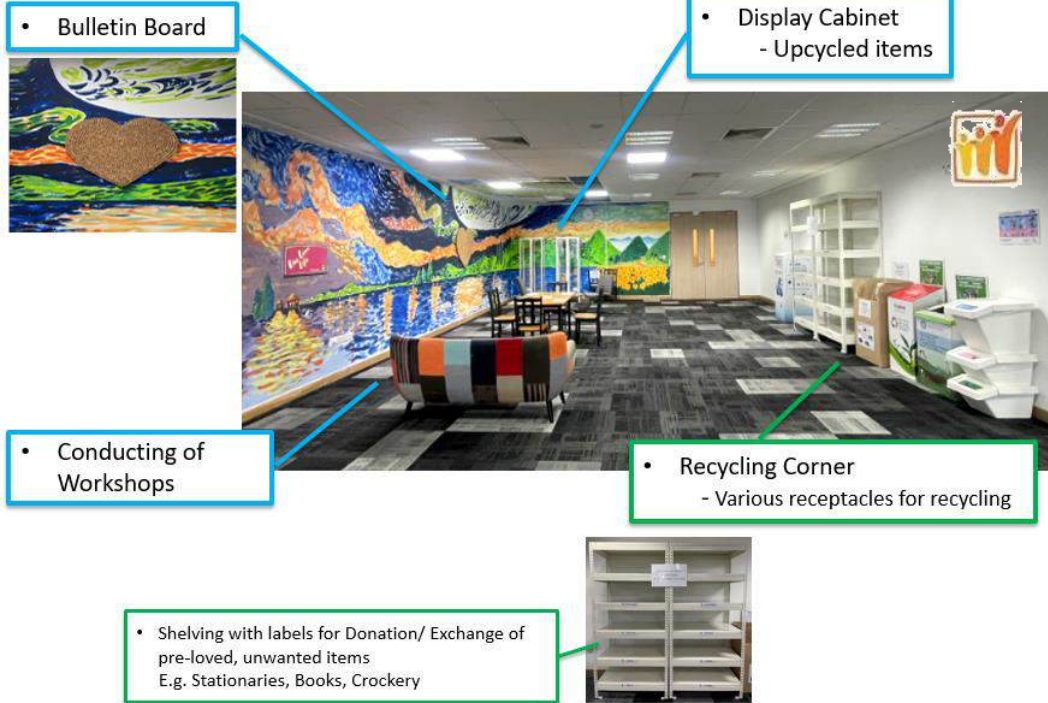
Follow the SK Frog

Cover: Why so serious?  
Singapore Health  
May to Jun 2022



03

# Building a Culture of Sustainability



03

# Building a Culture of Sustainability



24-25 March 2023



15 teams, 69 participants

3 Challenge Statements

15 Great Ideas

4 Wining Teams





*Think Green, Define Sustainability*