



NUHS GREEN PLAN FY2023

OUR SUSTAINABILITY COMMITMENT

At NUHS, we have begun transforming the resource and energy-intensive healthcare model. We are embedding environmental sustainability principles across our direct operations and value chain to deliver care in a manner that ensures the well-being of present and future generations.



FOREWORD

Healthcare is moving beyond its inherent focus on well-being. Delivering exceptional care remains NUHS' top priority, however we must be accountable for managing our substantial environmental footprint.

NUHS aims to provide healthcare that is sustainable, value-driven and innovative. We believe a whole-of-system approach anchored by robust governance is key to advancing our sustainability transformation. Aligning with the national agenda on sustainable development, we have developed the **NUHS Green Plan** to manage our environmental impact. As an academic health system, NUHS synergizes expertise within NUHS' healthcare institutions and NUS health science schools to drive sustainability. We aim for impact beyond NUHS and are working with our value chain partners to pioneer healthcare-specific initiatives to reduce emissions.

Transforming our healthcare model will be increasingly challenging due to growing healthcare demand and the accelerating impacts of climate change. NUHS continually strives to operate more efficiently and sustainably, while managing our climate risks.

We have a duty of care for our patients *and a duty of care for our planet*. We recognise that it cannot be business as usual. We thank our stakeholders for their support on our sustainability journey.



NUHS GREEN PLAN FRAMEWORK

NUHS' Green Plan is a strategic framework that guides us in embedding environmental sustainability across our operations and value chain. Launched in 2022, our Green Plan comprises 4 focus areas – Sustainable Clinical Care, Circular Economy, Energy and Water Sustainability, Green Infrastructure. Our material environment topics support each focus area. To achieve our Green Plan targets, we have identified 3 horizontal enablers.







Good governance is a pre-requisite for successful implementation. We have established the Green Plan Steering Committee (GPSC) to provide oversight and guidance on our Green Plan strategy, initiatives and sustainability risks. The GPSC is chaired by NUHS' Chief Executive and comprises management representatives from Finance, Corporate Infrastructure and our healthcare institution CEOs. The Office of Sustainability supports the GPSC to review our Green Plan strategy, stakeholder feedback and emerging climate or sustainability trends to drive decarbonization projects.



ALIGNMENT WITH THE SINGAPORE GREEN PLAN

NUHS supports the national agenda on sustainable development in our capacity as a public healthcare cluster. The table outlines our material environment topics and targets aligned with the SG Green Plan. To effectively measure and report our progress, we prioritise setting quantitative targets and metrics, referencing industry-best sustainability standards. We are procuring a third-party ESG data management system to enhance data governance and streamline reporting.

Our Material Environment Topics		2030 Targets and Metrics ¹	SG Green Plan	NUHS' Approach
Energy & Water Sustainability <ul style="list-style-type: none"> Greenhouse Gas Emissions Energy Management Water Management Green Mobility 		<ul style="list-style-type: none"> 10% reduction in Scope 2 emissions 10% reduction in EUI and WEI² Install 100 EV charging stations 	Energy Reset, Resilient Future, Sustainable Living	Our operations and workload will continue growing as population demographics shift. Together with our internal and external stakeholders, we are exploring innovative methods to reduce our GHG emissions, improve energy and water efficiency; while meeting evolving healthcare needs.
Circular Economy <ul style="list-style-type: none"> Waste Management Sustainable Procurement and Supply Chain 		<ul style="list-style-type: none"> 60% reduction in waste disposed compared to FY2020 baseline 60% recycling rate Incorporate environmental sustainability criteria in NUHS' procurement evaluation framework 	Sustainable Living, Green Economy	We are implementing policies to reduce disposables and enabling shifts towards a circular economy, in both our direct operations and supply chain.
Sustainable Clinical Care		<ul style="list-style-type: none"> 80% reduction in medical gas emissions 30% reduction in supply chain emissions Identify and reduce unnecessary treatments and procedures Enable clinicians to develop and deliver lower-carbon care pathways 	Green Economy	We are integrating sustainability metrics with clinical pathway reviews.
Green Infrastructure		<ul style="list-style-type: none"> 50% of NUHS buildings meet BCA's Super Low Energy building standards In each healthcare institution: 5.0 green plot ratio In each healthcare institution: Reduced ambient temperature in 18 urban heat island (UHI) hotspots 	Energy Reset, Resilient Future	We assess the impact from our built environment and incorporate strategies to mitigate life cycle carbon, across the planning, design and construction stages. We are greening our built environment to mitigate the urban heat island effect and enhance patient well-being.

¹ The baseline year for all targets is the average of FY2018-FY2020, unless otherwise stated.

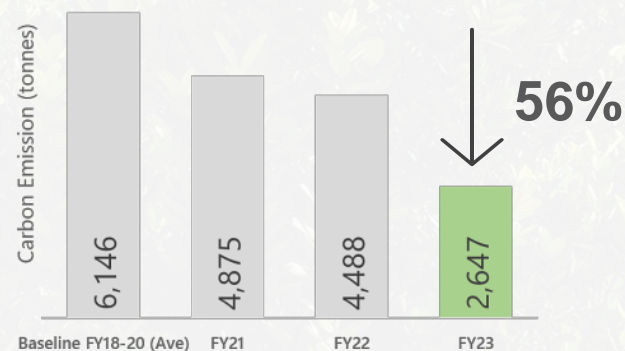
² Energy utilization index (EUI) and water efficiency index (WEI).

TRACKING OUR PROGRESS TOWARDS 2030

We monitor key metrics annually, to assess our progress and identify areas for improvement. Comparing against our 2030 targets ensures we remain on course. Consistent evaluation and reporting will enable us to progress towards our 2030 sustainability vision. We establish our baseline targets in line with GreenGov.SG and aim to reduce our emissions by 25% from our baseline period (FY2018-2020).

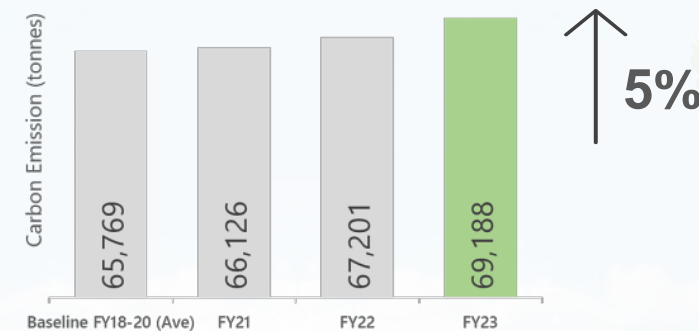
The COVID-19 pandemic created unprecedented strain on healthcare systems globally. To meet the surge in workload, healthcare facilities postponed non-urgent procedures and scaled up operations. Compared to our baseline period, the pandemic response led to increased GHG emissions in FY21 and FY22 by approximately 14.4% and 18.6%, respectively. In FY23, our Scope 1 emissions reduced by approximately 56%. Nonetheless, overall GHG emissions increased by approximately 29% due to workload-driven increases in Scope 2 and Scope 3 emissions.

Scope 1 GHG emissions



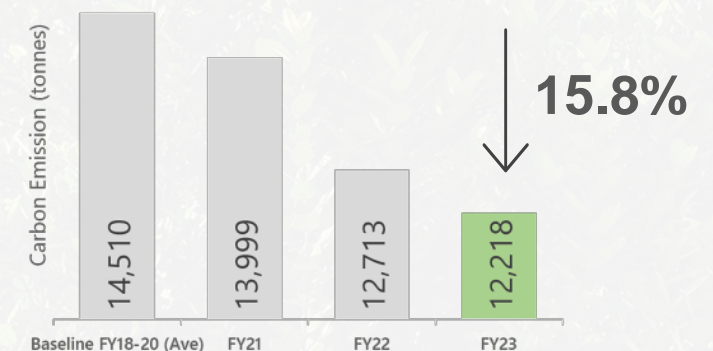
Scope 1 emissions decreased significantly by about 56% from baseline. This was largely due to stopping the use of desflurane in National University Hospital (NUH) and Alexandra Hospital (AH) and switching to greener anesthesia drugs (propofol and sevoflurane). Coupled with successfully switching off nitrous oxide pipelines in AH and NUH Kent Ridge Wing and Medical Centre, we achieved significant reductions in direct emissions.

Scope 2 GHG emissions



Despite our efforts in implementing energy efficiency projects, our Scope 2 emissions saw an increase by 5% compared to the baseline period. This was due to the increase in healthcare workload post-COVID, and increased energy consumption in our healthcare facilities. NUHS is developing a new methodology to relate workload with carbon emissions. This will enable us to better understand and manage our resource and energy efficiency.

Scope 3: Category 5 GHG emissions



Despite the increase in workload post-Covid, our FY2023 waste performance saw a remarkable improvement of 15.8% against the baseline years. Contributing factors include intensification of internal staff communications and engagement as well as the broadening of recycling efforts. We continue to push towards producing less waste, with initiatives to go 'plastic-lite' and reduce the amount of food waste generated.

SUSTAINABLE CLINICAL CARE

As much as 20% of global healthcare is low-value care*, offering minimal or no patient benefit.

To reduce our environmental impact, NUHS has implemented a new value-based care programme. ‘Appropriate Care’ aims to identify and eliminate unnecessary medical treatments while empowering clinicians to develop lower-carbon care pathways. This aims to align manpower, financial and environmental sustainability.

Switching to more environmentally-friendly medical gases

At NUHS, switching to medical gases with lower global warming potential is a key emissions reduction strategy. Most of our Scope 1 emissions arise from medical gas usage. For example, the inhaled anaesthetic desflurane's carbon footprint is about 50 times that of sevoflurane and 100 times that of propofol, per hour of use. As sevoflurane and propofol have similar efficacy to desflurane and are more cost-effective, NUH and AH have reduced their use of desflurane by 97% and 100% respectively.

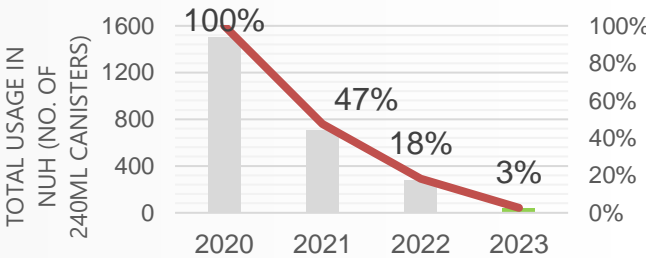
3,913 tCO₂e

Projected annual Scope 1 emissions reduction in NUH and AH

* Verkerk, E.W. International Journal for Quality in Health Care, 2018



Dr Poh Pei Kee, Consultant Anaesthetist at NUH, who led the desflurane project



Reduction in desflurane use in NUH from 2020 to 2023

Shutting down our nitrous oxide pipeline systems

The anaesthetic gas nitrous oxide (N₂O) has a global warming potential 298 times that of carbon dioxide. 75%-95% of N₂O “used” in hospitals never reaches the patients, it is lost through pipeline system leakages. To reduce our Scope 1 emissions, we are shutting down operating theatres’ pipeline supply systems. Residual clinical needs will be supplied from small pin indexed cylinders directly mounted on anaesthesia machines, to prevent system leaks.

Following extensive education and communication efforts, we have successfully shut down the N₂O pipeline supply in NUH Medical Centre and Kent Ridge Wing’s operating theatres. The N₂O pipeline in AH was also shut down. We have reviewed pipeline requirements in new hospital buildings. The redeveloped AH and NUH will not build N₂O pipeline systems.



Dr Ang King Sin (left), Consultant, NUH Dept of Anaesthesia and Nay Myo Htet, Snr Engineer, NUH OSS-GFM, leading the N₂O pipeline shutdown project in NUH



N₂O pipeline supply switched off in NUH Medical Centre OT

2,700 tCO₂e

Projected annual Scope 1 emissions reduction from the pipeline shutdown in AH and NUH

ENERGY AND WATER MANAGEMENT

Energy and water play a crucial role in NUHS' direct operations. As our workload grows, we strive to continue balancing our energy use and water consumption with environmental stewardship. We are committed to improving energy and water-use intensity by monitoring consumption and implementing efficiency initiatives across our operations.

Measuring our energy and water consumption

To promote greater transparency and accountability on institutions' energy and water consumption, we have installed sub meters with interactive utility dashboards. For a start, these have been installed in Ng Teng Fong General Hospital's (NTFGH) key services areas and provide real time data on energy use, water consumption and their associated emissions. We plan to install similar sub meters across our healthcare institutions to encourage behavioural change.

Harnessing renewables

We aim to transit away from fossil fuel-based energy. As of FY2023, NUHS has installed 550 solar photovoltaic panels on our rooftops. An additional 1,550 panels are being installed to further expand our solar energy generation capacity.

Optimizing building operations

We are exploring leveraging smart building technologies and Internet of Things (IoT) across our facilities to optimize and reduce energy usage.

Weather sensors provide real-time data on temperature, humidity, and rainfall to our intelligent building management system, which automatically adjusts cooling, ventilation, and lighting to maintain comfort and efficiency.

Every drop of water matters

We have installed water-efficient fittings in washrooms, such as conventional flush sensors with smart sensors. To reduce reliance on non-potable water sources, we harvest rainwater for reuse in landscaping our campuses.

Solar evacuated tube collectors have also been implemented to harness solar power for heating water, supplying 100% of NTFGH and Jurong Community Hospital's (JCH) hot water needs.



A "water-wise" poster on JCH campus

SUSTAINABLE PROCUREMENT AND SUPPLY CHAIN

Our supply chain is the largest contributor to our Scope 3 emissions. Addressing the environmental impact from our supply chain is integral to achieving our emissions reduction targets. We are implementing environmental standards for vendors, comprehensive guidelines and training for staff, use of emissions tracking tools, carbon footprint analysis, and usage optimization.

Pioneering sustainability disclosures across our supply chain

NUHS is Singapore's first healthcare organisation to join CDP (formerly Carbon Disclosure Project), a leading sustainability disclosure platform. Leveraging CDP's disclosure system, we gain visibility into environmental risks and opportunities across our supply chain. This enables more informed procurement decisions which contribute carbon footprint reduction.

Based on FY2023 CDP disclosures, we have identified and engaged our top 5 suppliers to develop our FY2024 workplans for Scope 3 emissions reduction. Such partnerships drive collective action and enables NUHS to influence positive change throughout the supply chain.

Procuring with purpose: PQE supplier evaluation launched

In April 2023, an interim Price-Quality-Environment (PQE) supplier evaluation framework was launched, making NUHS the first healthcare cluster in Singapore to incorporate sustainability criteria in procurement processes. Through PQE, NUHS aims to source from greener suppliers and reduce its supply chains' impact on the environment. We are working towards full PQE supplier evaluations, with the aim of fully embedding sustainability in healthcare procurement.

Building green procurement capability

To enable greener sourcing practices, NUHS has organised various training and capacity-building programmes to upskill our procurement teams. In FY2024, we will continue increasing efforts to equip buyers with sustainability knowledge and skills.

Key training areas covered include ESG fundamentals, sustainability risk assessments, circular economy principles, life cycle analysis and carbon management.

By building green procurement expertise across the organization, we aim to drive systematic change in how we evaluate and select suppliers.

2023

2024

GREEN INFRASTRUCTURE

NUHS adopts a holistic approach by integrating energy efficient systems, green materials and technological solutions with building design to manage our built environment's embodied carbon and life cycle footprint.

Meeting the challenges of climate change

NUHS' built environment strategies are focused on strengthening our climate resilience. Where feasible, climate mitigation and adaptation strategies are integrated in the design process of critical healthcare infrastructure.

Lowering embodied carbon in our facilities

In FY2023, the new AH Cocoon achieved significantly lower embodied carbon during construction by optimising construction material use, selecting low-carbon alternatives and incorporating energy efficiency measures.



AH Cocoon incorporated design standards tailored for sustainable healthcare facilities

Integrating environmental sustainability in building design



Environmental sustainability is integrated in the future AH Integrated General Hospital's (IGH) design, focusing on energy efficiency and lowering embodied carbon. The AH IGH team took reference from the Building and Construction Authority's (BCA) 2005 Code on environmental sustainability of buildings and BCA's Green Mark 2021 framework.

The sustainability features include:

1. High performance building envelope and glazing to minimize heat gain and energy consumption, while optimising indoor thermal comfort
2. Use of energy-efficient LED lighting controls and building management system to optimize and monitor energy performance
3. Water-efficient sanitary fittings and rainwater harvesting system
4. Selecting materials with low embodied carbon e.g., low-carbon concrete and recycled steel.



At NUHS, we recognise the potential of urban greenery in helping us adapt to climate change. We are incorporating natural elements in existing buildings and in design of new buildings to reduce the urban heat island effect.

Mitigating the urban heat island effect

In FY2023, we deployed green mats on top of covered walkways within NUH to improve outdoor thermal comfort. Similar green mats will be deployed across other campuses in subsequent years. We have also applied heat reflective paint (or "cool" paint) on metal roofs in NUH.

Green spaces have been shown to positively impact patients' well-being. We are assessing how new hospital developments can integrate biophilic design and green spaces with therapeutic functions, where feasible.



Green mat installed on a covered walkway in NUH

WASTE MANAGEMENT

As a major public healthcare cluster, NUHS produces significant volumes of hazardous and non-hazardous waste, accounting for over 4% of our carbon footprint. Increased volumes of waste generated could pose risks to the environment and public health. We adopt a comprehensive approach to waste management, focusing on minimising waste and maximising resource efficiency.

NUHS has taken first steps towards transitioning out of the traditional linear waste model; through policies to reduce disposables and leveraging education and training tools to enable our circular economy transformation. Broadly, our initiatives aim to:

1. Segregate more waste at the source to improve recycling rate
2. Reduce waste generated while increasing the amount of waste diverted from landfills (e.g. through reusing, recycling)
3. Integrate sustainability into design principles at planning and construction stage.

Large medical equipment refurbishment

Prioritising refurbishment is a key strategy to reduce waste generated and lower operating costs, while enhancing our clinical capabilities.

In FY2023, we refurbished two Magnetic Resonance Imaging (MRI) machines in NUH Department of Diagnostic Imaging. The refurbished machines had clinical capabilities equivalent to a new machine and an extended operational lifespan of 10 years. As no site preparation work was required, there were significant downtime savings



THINK GREEN, ACT GREEN

Embedding sustainability across our organisation and value chain requires a fundamental transformation in mindsets and behaviours. It also necessitates engagement with both internal and external stakeholders. Through various educational and engagement initiatives, we encourage our stakeholders to make small, daily choices that collectively support NUHS' broader sustainability vision.



Going green in June: World Environment Month kicked off with NUH's inaugural Green Day, an event that saw staff sustainability activities and an upcycling drive that collected over 300kg of old uniforms.

No to plastics: NUH Pharmacy launched a campaign to eliminate plastic bags, cups and spoons, with the potential to reduce 480,000 bags in NUH annually. **BYOB - Bring your own bag!** Patients were encouraged to use reusable bags through a patient education campaign.

Dishing out less waste! NUH kitchen cut the default carbohydrate serving from 180g to 150g per meal, saving 2,000kg of rice annually while maintaining nutrition.

Cutting down on paper: AH engaged staff in reducing paper usage by 35% through digitization and a 'No Hardcopy Bills' policy.

Vegging out for the planet: Plant-based meat options have been introduced for patient meals, staff meals and catering in AH and NTFGH as an alternative to beef and mutton, which have high carbon footprint.

Small doses of sustainability: Interactive workshops were held as part of staff education on key issues such as waste management.

Cleaning green: AH nursing teams started a campaign to swap out individually-packed alcohol wipes with wipes in canisters to reduce packaging waste.

Growing a greener future: Over 70 new trees were planted across AH and NUHS campuses.

Giving cardboard new life: At the 2023 Arts & Health Festival, NTFGH collaborated with contemporary artist and NTFGH caregiver Anja Elstner to exhibit her artworks. Made of recycled cardboard boxes, these artworks were gifted to donors of the hospital's Needy Patient Fund.

Skip the plastic, use our bag: NTFGH pharmacists designed reusable bags to reduce the use of single-use plastic bags.