Delivering quality care sustainably in Singapore

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Foreword

Singapore's healthcare system is characterised by clinical excellence and high public trust. These achievements have been earned through decades of careful planning, sustained investment, and the dedication of our healthcare professionals. Yet we cannot stand still. As we look ahead, climate change will test our system, affecting how we deliver care, how we safeguard public health, and how we optimise within resource constraints.

There is a wealth of evidence to show that healthcare system improvement and decarbonisation can go hand in hand. Measures that are already being mobilised at scale in Singapore's hospitals and clinics – such as avoiding unnecessary waste, considering sustainability in procurement, and building more efficient and future-ready facilities – free up resources, improve patient experiences, and strengthen resilience against future shocks. Environmental sustainability is about delivering healthcare more effectively and efficiently.

With the release of this report, Singapore takes an important step forward in our response to both climate change and health challenges. Developed through close partnerships between the Ministry of Health, MOH Holdings Pte Ltd. (MOHH), our public healthcare clusters, individual healthcare workers, and the National University of Singapore's Centre for Sustainable Medicine, this report is truly a whole-of-system effort. It provides detailed evidence needed to guide practical action. With data, we can prioritise interventions that deliver health benefits in a way that is not only efficient and cost-effective, but also climate-conscious. In doing so, we can maintain and improve the care standards that Singaporeans have come to expect and deserve.

The work ahead will require stakeholders across the entire ecosystem to play their part. The Ministry of Health will set the direction and enable investments needed for environmental sustainability. MOHH and our public healthcare clusters will operationalise priorities, scaling up solutions that are proven effective. Our industry partners and suppliers are ready to go forward with us, innovating to reduce the environmental impacts of the products and services on which healthcare relies. Academic and research institutions will expand the evidence base, develop new technologies, and train the next generation of climate-health leaders. At the same time, we will engage and empower patients and medical practitioners to understand and support sustainable practices that align with lower-carbon and higher quality care.

I thank everyone who has contributed to this work, from policy teams and research experts to the healthcare professionals who are making sustainability part of their daily practice. The road ahead will demand the same qualities that have brought our healthcare system to where it is today: foresight, hard work, collaboration, and innovation. We can then rise to the climate challenge, safeguard the health of our people, and build a stronger and more resilient system for generations to come.

Mr Philip Ong
Deputy Secretary (Development)
Chief Sustainability Officer
Ministry of Health

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Executive Summary

Singapore's healthcare system is recognised globally for delivering high-quality care, world-class health outcomes, innovation, and pioneering medical research and education. As we continue to strengthen our system to meet the needs of an ageing population, we also face challenges from climate change.

Singapore is warming faster than the global average, which will lead to increasing pressure on population health unless effective measures are put in place to prepare for climate change and to tackle global emissions of greenhouse gases. Around 5% of those global emissions come from the health sector. As a leader in the medical field, Singapore is demonstrating how action to reduce our impact on the planet supports transformational changes that benefit patients and improve the long-term cost-efficiency and resilience of our healthcare system.

Decarbonising healthcare requires coordinated action from across the entire system, all while maintaining the highest standards of patient care. In Singapore, this transformation is already underway, driven by the Ministry of Health (MOH) and supported by MOH Holdings Pte Ltd (MOHH) in partnership with healthcare clusters, hospital leaders, healthcare workers, patients and academia (Box 1).

Box 1: Examples of Singapore's leadership in sustainable healthcare

Singapore is already demonstrating that environmental stewardship and clinical excellence can go hand in hand. Key achievements include:

- **Green building leadership** with new hospitals designed to Building and Construction Authority (BCA) Green Mark Platinum Super Low Energy standards.
- **Near-elimination of refrigerant emissions** in hospitals through rigorous standards and regulation.
- A highly carbon-efficient transport network for healthcare journeys supporting low-emission patient and staff travel and emergency response.
- **Prioritising cost-, care- and carbon-efficient improvements** such as the circular economy approach to MRI machine upgrades across National University Health System (NUHS) that improves diagnoses, saves costs, reduces downtime, and reduces manufacturing emissions.
- **Staff-led action and clinical innovation** such as the National University Hospital (NUH) Nursing Sustainability Committee's 'sort-at-source' scheme, which delivered a 230% increase in plastic recycling rates, and the 90% reduction in desflurane emissions led by anaesthetists at Changi General Hospital who switched to a safe, cheaper, low-carbon alternative.
- **A whole-of-system approach to sustainability** shown in examples like the hospital-wide medication packaging recycling programme that mobilised patients, caregivers, Nursing and Pharmacy teams, research students at National University of Singapore (NUS), and local companies to scale up sustainable waste management at Tan Tock Seng Hospital.
- **Educating future healthcare leaders** through undergraduate teaching and the launch of the world's first MSc in Sustainable Healthcare at the NUS Centre for Sustainable Medicine.
- **International recognition** with NUH being the first hospital globally to receive the Healthcare Sustainability Certification from the Joint Commission International.
- **Developing one of the first comprehensive footprint models of healthcare system emissions in Southeast Asia** that provides a blueprint and adds to the evidence base for partners in the region.

These strengths provide a solid foundation for accelerating action towards the GreenGov.SG target of public sector net zero emissions around 2045, and the national net zero goal by 2050.

This report presents one of the first comprehensive national studies of healthcare system emissions in Southeast Asia. The Singapore Healthcare Emissions Accounting & Reporting Tracker (SG-HEART) model marks a significant step forward in our understanding of healthcare's impact on global warming in our region. The results provide a robust evidence base to guide effective decarbonisation strategies aligned with Singapore's national net zero goal.

The footprint of the Singapore healthcare system in FY2023 (1st April 2023 - 31st March 2024) is estimated at **4.1 million tonnes of carbon dioxide equivalent (Mt CO_2e).** This is comparable to powering every home in Singapore for more than a year.[1] We deliver world-class healthcare at 20% lower carbon intensity than other Advanced Economies.[2,3] Yet, in part due to the unique characteristics of our population and healthcare system, our healthcare emissions intensity is above the global average.[3]

There are clear opportunities for Singapore to continue to lead efforts on healthcare sector decarbonisation across multiple fronts:

- **Medicines and medical products (32% of Singapore's healthcare system emissions):** eliminating waste associated with expired medicines, prescribing responsibly, switching to more clinically effective inhalers and anaesthetics, and prioritising the use of reusable medical products.

- **Construction and maintenance (19%):** new hospital buildings are already using lower-carbon materials, green design standards, and incorporating lifecycle assessments to minimise energy costs and emissions.

- **Non-medical goods and services (17%) and IT equipment and services (13%):** partnering with organisations to supply critical goods and services for the delivery of care in lower-carbon ways, prioritising local suppliers, and considering emissions criteria in purchasing decisions to drive greener procurement.

- **Electricity utilisation, water efficiency and waste disposal from hospital and clinic operations (14%):** investing in energy-efficient equipment and lighting, smart cooling and ventilation systems, cheap solar generation at hospitals and clinics, and responsible management of waste and water, all of which will deliver running cost savings.

- **Transport (5%):** healthcare facilities are already easily accessible by low-carbon transport, but more action can be taken to reduce transport emissions – for example, through electrifying vehicles, smarter appointment scheduling, expanding telehealth where appropriate, and supporting walking, cycling and the use of public transport.

By working together across all levels of the healthcare system, we can continue to deliver care for Singapore's current and future generations in a way that promotes both human health and the health of our planet.

Glossary

Term	Definition
Activity-based modelling	A modelling approach that utilises detailed facility-level data on activities (e.g., kWh of electricity used, or number of inhalers prescribed), and activity-specific emission factors to arrive at an estimate of emissions.
Activity data	Detailed data related to Greenhouse Gas (GHG) emitting activities (e.g., kilograms of waste generated, litres of fuel used).
Base year assessment	A comprehensive assessment of a healthcare system's emissions, covering all facility levels and all provider types. The assessment can be used to identify emissions hotspots and inform decarbonisation strategy and policy.
Carbon dioxide equivalent	The amount of carbon dioxide that would produce the same warming effect as a given greenhouse gas. For example, 1 kg of nitrous oxide is equivalent to 273 kg of carbon dioxide.
Carbon emissions	Used as a shorthand to refer to GHG emissions.
Decarbonisation	The process of continuously reducing greenhouse gas emissions associated with a given industry or activity.
Emissions factors	An estimate of the rate of greenhouse gas emissions per unit of activity or spend (e.g., a certain amount of carbon dioxide equivalent emitted per kWh of electricity used or USD spent on medicines).
GreenGov.SG	The GreenGov.SG initiative is the public sector's sustainability movement. It is a key enabler of the Singapore Green Plan 2030 and demonstrates the public sector's commitment to lead by example in Singapore's environmental sustainability journey.
Greenhouse gases (GHGs)	Atmospheric gases that trap heat and contribute to global warming. Key GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs) and other fluorinated gases. Their cumulative warming impacts are expressed in mass of carbon dioxide equivalent (CO_2e).
Greenhouse gas footprint	An estimate of all greenhouse gas emissions associated with a given industry or activity.
Healthcare system	"All the activities whose primary purpose is to promote, restore and/or maintain health and the people, institutions and resources, arranged together in accordance with established policies, to improve the health of the population they serve, while responding to people's legitimate expectations and protecting them against the cost of ill-health through a variety of activities whose primary intent is to improve health" (World Health Organization).

Glossary

Term	Definition
High-carbon medicines	Medicines or medical devices that release highly warming GHGs such as hydrofluorocarbons, nitrous oxide or desflurane that can be thousands of times more warming than CO_2.
Hotspots	The emission categories that contribute the largest amounts of GHG emissions relative to other categories or to other healthcare systems.
Hybrid model	A model which combines activity-based and spend-based approaches to achieve full coverage of the healthcare system.
Metered-dose inhalers (MDIs)	Medical devices, usually used for asthma and Chronic Obstructive Pulmonary Disease (COPD) management, which utilise and release highly potent GHGs associated with HFC propellants. MDIs are considered high-carbon medicines.
Ministry of Health (MOH)	The government ministry which oversees and regulates the public healthcare system in Singapore.
Net zero	A greenhouse gas emissions goal which can be achieved when human-caused GHG emissions are balanced out by the removal of CO_2 from the atmosphere over a specified period.
Scope 1 emissions	Direct emissions associated with the use and combustion of fossil fuels. Direct emissions of non-CO_2 GHGs come from refrigerant leakage, the release of anaesthetic gases and metered-dose inhaler propellants, or on-site waste treatment.
Scope 2 emissions	Indirect emissions associated with the combustion of fossil fuels by a third-party to generate electricity, heat, cooling or steam used by an organisation.
Scope 3 emissions	Indirect emissions associated with the industry activities but generated from sources outside of the organisation's direct ownership and/or control. In healthcare systems these are usually related to upstream supply chain purchases and downstream waste disposal.
Spend-based modelling	A modelling approach which utilises financial and expenditure data, as well as emissions factors sourced from environmentally extended Multi Region Input Output (MRIO) models, to estimate the total footprint of any given industry or organisation.

Abbreviations

Abbreviation	Full Text
A&E	Accident & Emergency
ALPS	Agency of Logistics and Procurement Services
BCA	Building and Construction Authority
CAPEX	Capital expenditure
CO_2e	Carbon dioxide equivalent
COPD	Chronic Obstructive Pulmonary Disease
CoSM	Centre for Sustainable Medicine
DOS	Department of Statistics, Singapore
DPI	Dry-powder inhaler
GDP	Gross Domestic Product
GHG	Greenhouse gas
GLORIA	Global Resource Input-Output Assessment
HFC	Hydrofluorocarbon
HIPD	Healthcare Infrastructure Projects Division (in MOHH)
ISSB	International Sustainability Standards Board
kg	Kilogram
kt	Kilotonne (metric) = 1,000,000 kg
kWh	Kilowatt-hour
MDI	Metered-dose inhaler
MOH	Ministry of Health
MOHH	MOH Holdings Pte Ltd.
Mt	Megatonne (metric) = 1,000,000,000 kg
NHG Health	NHG Health (public healthcare cluster)
NHS	National Health Service
NParks	National Parks Board
NUHS	National University Health System (public healthcare cluster)
NUS	National University of Singapore
OPEX	Operating expenditure
PHI	Public Healthcare Institution
PUB	PUB, Singapore's National Water Agency
SEFR	Singapore Emission Factors Registry
SGD	Singapore Dollar
SG-HEART	Singapore Healthcare Emissions Accounting & Reporting Tracker
SingHealth	Singapore Health Services (public healthcare cluster)
SLE	Super Low Energy
Solar PV	Solar photovoltaic (often referred to as solar panels)
TCFD	Task Force on Climate-Related Financial Disclosures
WDI	Waste Disposal Index
WHO	World Health Organization

Introduction

Climate change is a global health challenge. Singapore is warming faster than the global average,[4] which will lead to increasing direct impacts on population health unless effective mitigation measures are put in place. Besides heat stress and heat-related illnesses, climate change leads to worsening air quality and a rise in risks of infectious diseases and extreme climate events.[5]

Healthcare systems are responsible for approximately 4-5% of global greenhouse gas (GHG) emissions – more than aviation and shipping industries combined.[6] As significant contributors to climate change, healthcare systems can act on two fronts: resilience – ensuring that the healthcare system can respond effectively to heat, extreme weather, and other climate shocks; and mitigation – demonstrating that dramatic emissions reduction is compatible with providing world-class healthcare in Singapore.

Research on emissions mitigation in healthcare has long been focused on Europe and North America. This, in turn, has led to increasing focus on emerging mitigation technologies that are less relevant in Southeast Asian contexts: for example, research into low-carbon heating has been prioritised over low-carbon cooling and air conditioning. As the populations and economies of our region continue to grow, it is important to draw international attention to the places where healthcare system emissions are growing most rapidly and that are most exposed to climate risks.

Singapore's commitment to climate mitigation takes a whole-of-nation approach (Box 2), driven by our national target to reach net zero emissions by 2050.

The healthcare sector is shaping and contributing to this effort. Healthcare decarbonisation is a challenge that requires system-wide support and must be centred on our patients. It will be delivered through MOH's leadership, effective implementation by MOH Holdings Pte Ltd. (MOHH) and our public sector clusters, direct action from frontline healthcare workers, cutting edge research, and international cooperation and coordination with the organisations who supply our healthcare system.

Box 2: Singapore's whole-of-nation approach to net zero carbon emissions

Singapore's commitment to climate mitigation is anchored in the national target to reach net zero emissions by 2050, supported by the Singapore Green Plan 2030.[7] The plan sets ambitious targets across five strategic pillars:

- **City in Nature:** create a green, liveable and sustainable home for Singaporeans.
- **Energy Reset:** use cleaner energy sources across all sectors.
- **Green Economy:** seek green growth to create new jobs, transform our industries and harness sustainability as a competitive advantage.
- **Sustainable Living:** reduce carbon emissions and embrace sustainability by consuming less, recycling more, and taking public transport, working towards our vision of becoming a Zero Waste Nation.
- **Resilient Future:** build up our national resilience for the future.

These pillars will help us act on our sustainability priorities, which range from expanding green spaces in Singapore to increasing solar energy investment.

Launched in 2021, the **GreenGov.SG** initiative is a key enabler of the Green Plan, guiding the public sector in pursuing its sustainability targets. The GreenGov.SG FY2023 report details the progress of our public sector – which includes public sector healthcare – on Scope 1 and 2 emissions, energy consumption, water use, and waste disposal targets.[8] The goal of GreenGov.SG is for the public sector to achieve net zero around 2045, five years ahead of the national target.

The principle of **Green Citizenry** makes our transition to net zero possible. By engaging and empowering our individual citizens and communities through initiatives such as Go Green SG and the SG Eco Fund, we ensure that the sustainability movement adopts a whole-of-nation approach.[9]

Singapore's climate leadership is reinforced by structural advantages and long-standing policies:

- Singapore has **safeguarded more than 7,800 hectares of green spaces** in the form of nature reserves, nature parks, gardens and parks, and integrated greenery throughout the city.[7]
- We have **ceased the registration of new diesel-run cars and taxis** from 1st January 2025 to support the transition to cleaner energy vehicles[10] and continue to invest in an efficient, low-carbon public transport network.[11]
- **Singapore has closed the water loop**, reclaiming and reusing water at national scale.[7]
- Singapore has **no fossil fuel subsidies** and has implemented the first economy-wide carbon pricing mechanism in Southeast Asia.[7]
- We are a **regional hub for sustainable finance**, and our sustainable debt market accounted for more than 50% of sustainable debt issuances in 2021.[12]

These achievements provide enabling conditions to build a **low-carbon, climate-resilient healthcare system**, using cleaner energy, efficient transport, sustainable infrastructure, and innovative financing to support the sector's decarbonisation.

Singapore is well-placed to be a regional and international leader in healthcare emissions mitigation. Our highly integrated healthcare system, strong governance, and culture of innovation create unique opportunities for implementing and embedding low-carbon, high-quality medical care, benefitting patients and healthcare professionals in the country and the wider region.

This report presents Singapore's first comprehensive system-wide assessment of health sector emissions. This base year assessment highlights the major sources of emissions in the system and provides a strong foundation for evidence-based climate action by our healthcare leaders and professionals.

The SG-HEART model

This study adopts the Singapore Healthcare Emissions Accounting & Reporting Tracker (SG-HEART) model which quantifies the emissions generated from Hospitals, National Centres, Specialist and Outpatient Clinics, primary care, and other healthcare services delivered by all providers in Singapore in FY2023 (1 April 2023 to 31 March 2024). The study boundary includes both public and private providers of healthcare, in line with World Health Organization (WHO) healthcare system definitions and guidance on emissions measurement.[13] The model also covers emissions from national healthcare system capital projects, such as construction of new hospital buildings or the purchase of new medical machinery; key administrative enablers, such as healthcare system administration and head offices; and essential support services, such as blood, laboratory, and ambulance services.

In total, the SG-HEART model uses more than 19,000 Singapore-specific emission factors and more than 2,000 data points to calculate total healthcare emissions in Singapore (Box 3).

An academic methodology report documenting the data sources, model logic, emissions factors, model assumptions and limitations of SG-HEART is in preparation for peer review and publication, led by our technical partners at the NUS Centre for Sustainable Medicine. This report will provide additional transparency and allow comparison with other healthcare system carbon footprinting approaches developed worldwide.

Box 3: The SG-HEART model

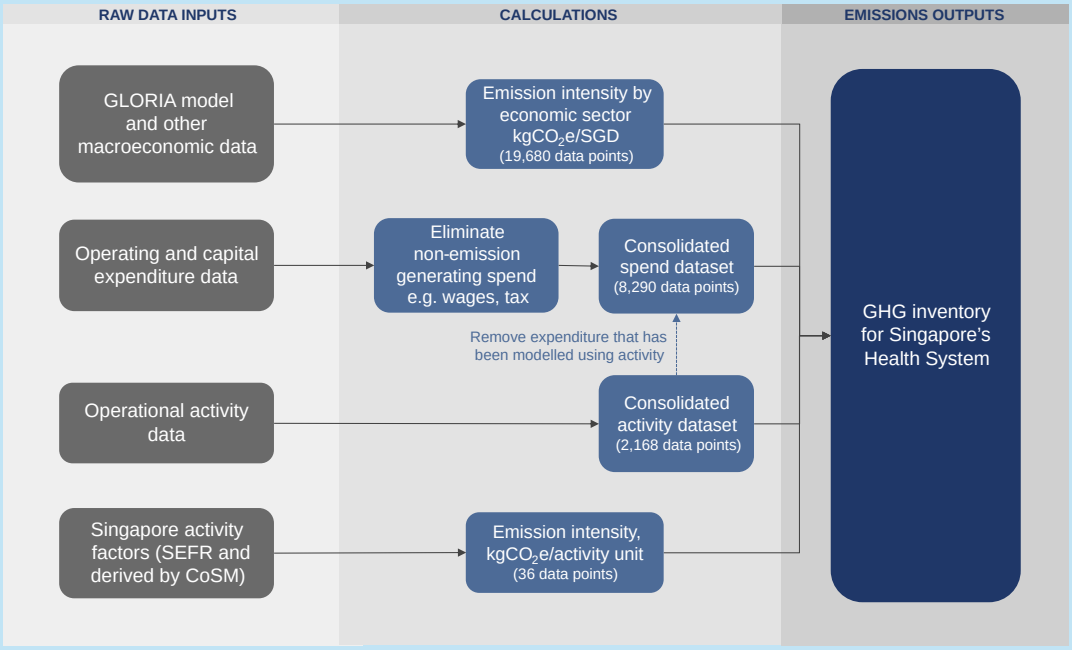
The model utilises a hybrid approach, combining both spend- and activity-based datasets to balance comprehensive coverage with high accuracy. This well-established methodology is consistent with the global examples of best practice from the National Health Service (NHS) in England, as well as World Health Organization (WHO) guidance for emissions measurement in healthcare systems. The SG-HEART model incorporates:

1) Spend-based modelling: Singapore's healthcare expenditure[14] makes up about 5% of national Gross Domestic Product (GDP).[15] To ensure a comprehensive understanding of all emissions in the system, we use spend-based modelling to account for all goods and services used by our hospitals, clinics, and healthcare support services. Healthcare-related spend is converted into GHG emissions using expenditure emission factors (kg CO_2e per SGD) derived from the Global Resource Input-Output Assessment (GLORIA)[16] model. This model tracks emissions associated with the production of goods and services in 120 economic sectors and 164 countries, including Singapore.

2) Activity-based modelling: This method is used for emission sources measurable in physical units (e.g., electricity, fuel, outpatient visits, or anaesthetic gases). Wherever they are available, activity datasets are preferred as they provide more detail and precision. Emission factors are primarily sourced from the Singapore Emission Factor Registry (SEFR)[17] and aligned with national emissions reporting.[18] Where emission factors are unavailable from these sources, which is typically the case for healthcare-specific activities, factors from internationally recognised databases[19,20] or academic sources are used.[21] To ensure no emissions are double-counted, relevant sources of expenditure (e.g., electricity bills) are excluded from the spend-based estimate where the activity counterpart has been used to calculate emissions.
A detailed personal transportation model module uses population distribution and transport survey data from Singapore Department of Statistics (DOS)[22] to calculate the average distance, mode of travel, and emissions associated with staff and patient journeys to healthcare centres, accounting for different travel patterns for commuting, Accident & Emergency (A&E), inpatient, outpatient and polyclinic journeys.

The healthcare system boundary in the model is defined in line with WHO recommendations, which includes all public and private providers of healthcare in Singapore, prescription medication, health infrastructure, and emissions from administrative agencies like MOH Headquarters.

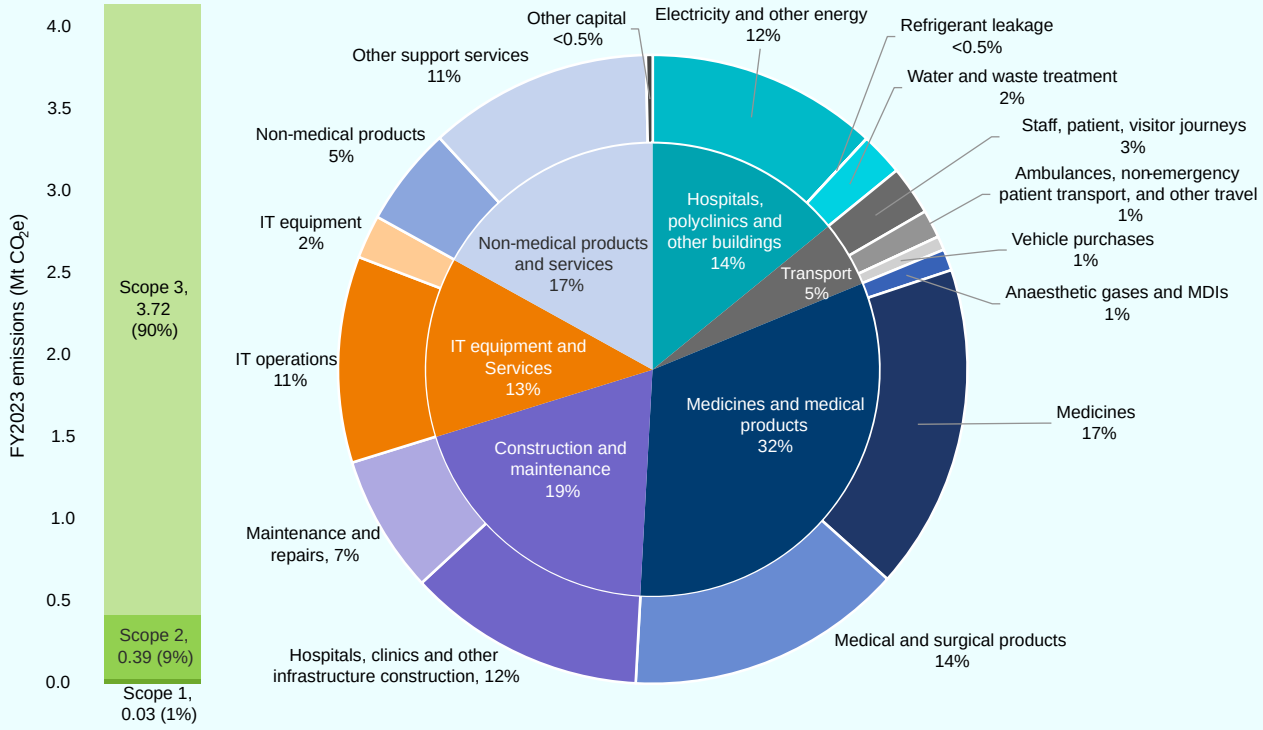
Figure 1: Simplified model diagram of the SG-HEART model



Results

The total greenhouse gas footprint of the Singapore healthcare system was 4.1 Mt CO_2e in FY2023 (1 April 2023 - 31 March 2024) across Scopes 1, 2 and 3 of the public and private healthcare system. To put this into perspective, our healthcare system's emissions are comparable to powering every home in Singapore for more than a year.[23]

Figure 2: FY23 emissions from Singapore's healthcare system, by scope and category



Sources: Spend and activity data collected from across Singapore's healthcare system, including data collected by MOHH, NHG Health, NUHS, SingHealth and ALPS at cluster- and institution-level; emission factors derived from SEFR,[17] GLORIA,[18] international databases, academia and Department of Statistics;[19-22] calculations from the SG-HEART model developed by the NUS Centre for Sustainable Medicine (Box 3).

Hotspots of emissions in Singapore's healthcare system

There are six major hotspots of emissions (Figure 2) in the overall healthcare system footprint in Singapore. The model highlights areas where Singapore is performing well, thanks to our energy-efficient infrastructure, low-carbon clinical practices, and excellent transportation networks:

- **Medicines and medical products (1.33 Mt CO_2e, 32%).** These emissions mostly arise from the manufacture, transportation, and use of medicines and medical devices (e.g., thermometers, bandages, medical gowns, or wheelchairs) for the core delivery of healthcare. Reductions in emissions from high-carbon metered-dose inhalers (MDIs) used for respiratory care and certain anaesthetic gases like desflurane and nitrous oxide used in surgery are a quick-win area for improvements that enhance patient outcomes while remaining equally safe, clinically effective, and affordable. Other reduction opportunities include minimising expired medication through efficient procurement, reducing unnecessary and harmful overprescribing, switching from MDIs to lower-carbon dry powder inhalers where clinically appropriate, replacing leaky nitrous oxide manifold pipes with efficient canister systems, and prioritising safe reusable

medical devices over single-use ones. **Singapore has already achieved significant reductions in the use of desflurane (-45%) and nitrous oxide (-35%) in recent years, driven by the leadership of the anaesthetists, sustainability teams, and procurement experts in our hospitals (Figure 3).** Some hospitals have virtually eliminated the use of desflurane,[24] and achieved greater than 70% reductions in nitrous oxide use by replacing leaky manifolds with efficient canister systems.[25]

- **Construction and maintenance of hospitals, clinics and other buildings (0.80 Mt CO_2e, 19%).** Building construction accounts for 12% of the footprint, driven by major projects such as Woodlands Health Campus and other hospital expansions, with maintenance of medical equipment and facility assets contributing a further 7%. Healthcare construction projects are already prioritising the use of low-carbon materials (e.g., recycled concrete, low-carbon steel), as well as embedding lifecycle carbon assessment and energy efficient design into planning to ensure new buildings minimise emissions over their entire lifecycle, not just their construction (Box 4). **This integration of sustainability into healthcare infrastructure projects positions Singapore as a leader in green hospital design.**

- **Non-medical goods, services and other capital expenditure (0.70 Mt CO_2e, 17%).** This includes a wide range of general procurement and support services, such as laboratory equipment, laundry and cleaning services, catering, or business services. Prioritising local, Singapore-based suppliers and applying emissions criteria in procurement policies can help our suppliers to reduce emissions in this category. **Singapore's highly integrated procurement frameworks provide a platform that is ready to support the implementation of low-carbon supply chains.**

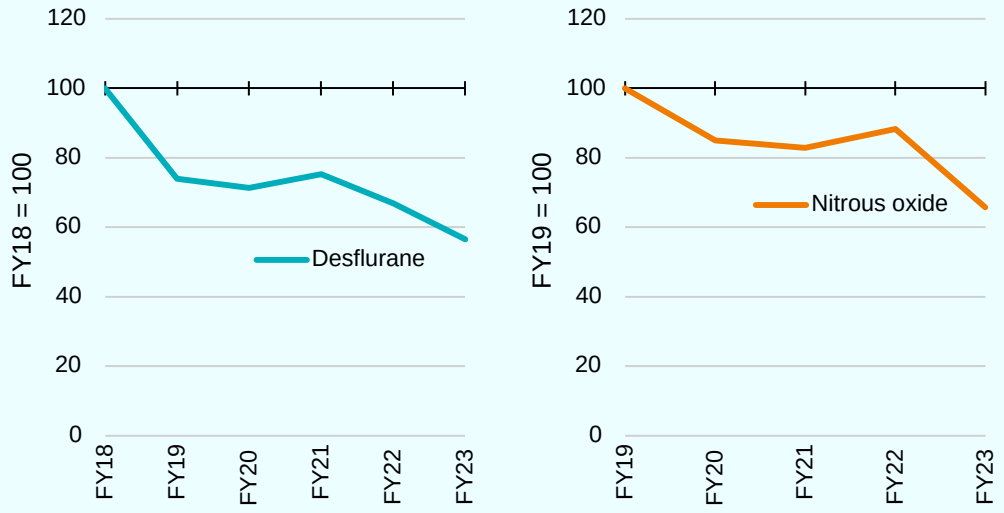
- **IT equipment and services (0.53 Mt CO_2e, 13%).** IT operations take up a significant share of emissions due to the employment of energy-intensive data centres and servers to run Singapore's comprehensive and secure digital health services. Emission reduction strategies include prioritising energy-efficient hardware and services that utilise renewable, or lower-carbon, energy sources. Singapore's healthcare system is dedicated to improving the efficiency of its IT operations as part of its sustainability efforts through adoption of Building Construction Authority (BCA) Green Mark standards for upcoming data centres, advancement of cooling technologies, optimisation of server utilisation, and implementation of energy-efficient hardware. **There are multiple opportunities for infrastructure improvements, and Singapore is already seizing them as we move towards greener energy sources and more efficient IT infrastructure.**

- **Emissions from hospitals, polyclinics and other buildings (0.58 Mt CO_2e, 14%).** Electricity used for lighting, cooling, and powering medical and office equipment in hospitals and clinics is the largest source of emissions, followed by water usage and the transport and incineration of general and clinical waste. Healthcare buildings can reduce these emissions through energy-efficiency measures (e.g., LED lighting, motion sensors, and smart ventilation), on-site renewable energy generation, and enhanced water and waste management strategies such as waste recycling and sub-metering of water. Waste treatment emissions (mostly from incineration) are low (2%), but our waste reduction strategies have a dual benefit as they also lower our upstream footprint by reducing demand. **Singapore's new public hospital buildings already follow stringent energy codes and green building standards, which provide a strong foundation for future emissions reductions. With other existing public hospitals also undergoing upgrades, these savings will grow rapidly in the years ahead.**

- **Transport emissions (0.19 Mt CO_2e, 5%).** This category covers staff commuting, patient and visitor travel (3% of the footprint), as well as ambulance fleets, non-emergency transport in hospital vehicles, business travel, and the emissions to manufacture vehicles owned by the healthcare system. Strategies to lower emissions include phased electrification of cars and ambulances supported by charging infrastructure, efficient appointment scheduling to reduce multiple trips, expanding telehealth where appropriate, and improving end-of-trip facilities to encourage public and active transport options. **Given Singapore's dense urban population and highly efficient public transport system, transport-related emissions in healthcare are already low as a proportion of our total footprint.**

By targeting these sources of emissions with proven and emerging solutions, Singapore can enhance its reputation for innovation in healthcare while accelerating progress towards national and regional climate goals.

Figure 3: Reductions in emissions from desflurane and nitrous oxide driven by waste reduction and switching to safe, cost-effective, low-carbon alternatives



Sources: Operational data from NHG Health, NUHS and SingHealth.
Note: Data are indexed over period for which a comparable time-series is available.

Comparative advantages and international benchmarks

The SG-HEART model represents a step-change improvement to our understanding of Singapore's emissions. By using real and detailed data from our healthcare system, it provides the first accurate picture of emission sources, establishing a stable basis to track progress over time.

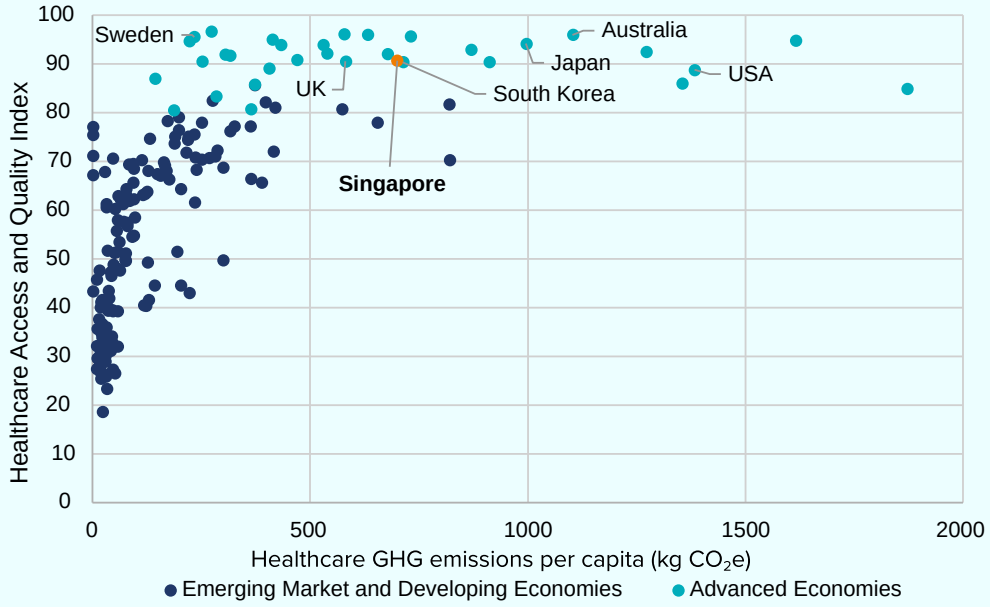
Our study shows that Singapore delivers world-class healthcare at a carbon intensity that is 20% lower than the average of Advanced Economies.[2,3] Yet, our healthcare emissions intensity is the third highest in Asia – comparable to Japan and South Korea – and more than double the global average.[3] This difference is explained by several characteristics unique to Singapore, including our small overall population, ageing population requiring specialised care, as well as high standards of care and a relatively low barrier of access to healthcare.

Singapore ranks among the world's best for Healthcare Access and Quality, as well as Life Expectancy at Birth (Figure 4, Figure 5). This has been achieved while keeping our health spending as a proportion of GDP

low compared to other developed economies.[26] This translates into healthier lives at lower healthcare financial burden for Singaporeans.

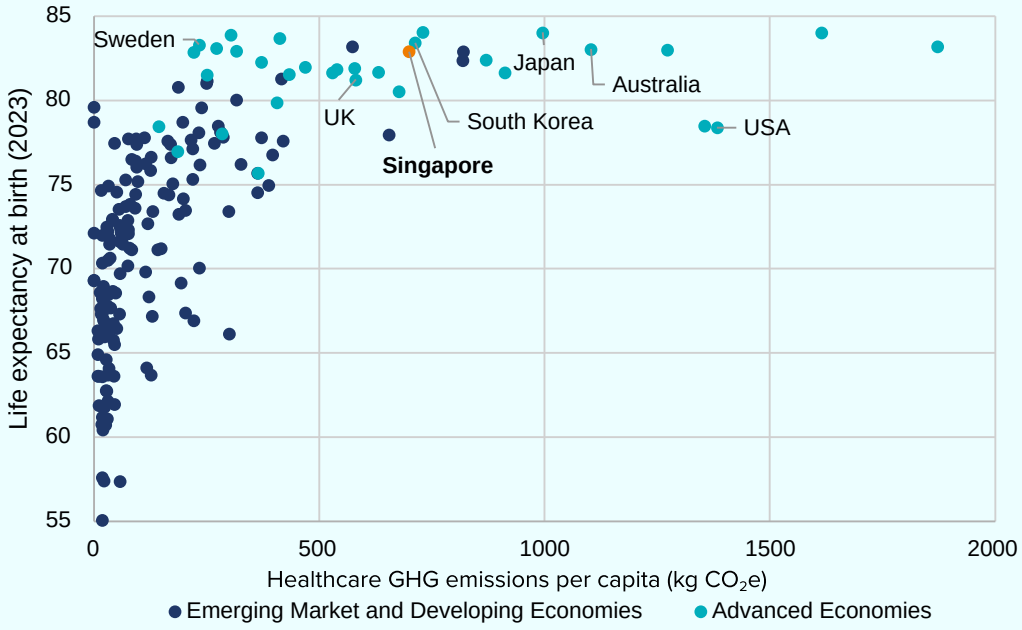
If healthcare is to support a global drive towards net zero, emissions need to be increasingly decoupled from healthcare delivery while enhancing care quality. Decarbonisation is a strategic enabler: a catalyst to advance clinical excellence, strengthen system efficiency, and deliver long-term health gains for our population. Efforts to reduce emissions are fully aligned with our commitment to world-class care. In many cases, they also reduce long-run costs and have positive impacts on population health through cleaner air, more active travel, more efficient and comfortable hospitals, and improved access to healthcare.

Figure 4: Per-capita healthcare GHG emissions and healthcare quality (2024)



Sources: The 2024 report of the Lancet Countdown on health and climate change. Healthcare Access and Quality Index.[27]

Figure 5: Per-capita healthcare GHG emissions and life expectancy at birth (2024)



Sources: The 2024 report of the Lancet Countdown on health and climate change,[3] *World Bank Life expectancy at birth, total.*[28]

When compared against other national-level studies, the distribution of emissions by category in Singapore's healthcare system footprint is broadly consistent. Most healthcare system footprints have similar characteristics: two-thirds or more of emissions are driven by the production of goods and services; a small but significant portion of emissions comes from energy use in hospitals and clinics (approximately 10-20%); around 30-40% of emissions are from the manufacture of medicines and medical devices. These figures are reflected in studies from various countries, including the United Kingdom,[29] France,[30] Australia,[31] Norway,[32] and the Netherlands.[33]

Several key differences emerge in the data that demonstrate Singapore's unique context, infrastructure, and healthcare system design.

- **Singapore's energy use is driven by cooling demand** for air conditioning and refrigeration in hospitals and clinics due to our hot and humid climate, in contrast to healthcare systems in Northern Europe where fossil-fuelled heating is the most pressing source of emissions in healthcare buildings. All healthcare systems face the challenge of balancing the need to provide comfortable environments as part of care delivery while reducing carbon, but Singapore's cooling demand requires other solutions – like smart ventilation – that are different from addressing heating demand in colder environments.

- **Singapore has virtually eliminated emissions from cooling refrigerants.** Most international studies have not been able to quantify emissions from leakage and end-of-life disposal of high-carbon hydrofluorocarbon (HFC) refrigerants from air conditioning and refrigeration units. Thanks to Singapore's rigorous standards, environmental regulations, and data collection, our model demonstrates that HFC refrigerants contribute to less than 1% of the overall healthcare system footprint despite our hot climate – an achievement few healthcare systems in the world can claim.

- **Singapore's share of transport emissions (5%) is half of that of other systems who have estimated their transport footprint.**[29-33,34] Our compact urban setting, widespread access to local healthcare, and well-integrated transport networks promote efficient and low-carbon travel for healthcare. Emissions from ambulances are also low as a share of total emissions, as Singapore's dense population and network of A&E departments result in short journeys and response times of 11 minutes or less.[35]

- **Singapore spends more than other countries on critical healthcare infrastructure development (including construction and IT infrastructure).** This reflects the active expansion of healthcare infrastructure, such as the completion of Woodlands Health Campus. These projects are key to enhancing present and future healthcare capacity and resilience. Construction emissions should not be viewed in isolation; they highlight the value of whole-life carbon assessment to account for the environmental impacts of projects' entire lifespans. Our future-focused approach means that Woodlands Health Campus is 30% more energy efficient by design due to solar photovoltaic (solar PV) panels on rooftops, passive cooling measures, north-south building orientation to limit heat gain, integrated food waste recycling, and close integration with public transport. Singapore's health IT footprint reflects our advanced and secure digital healthcare systems, fixed infrastructure costs relative to our small population, and stringent cybersecurity and availability requirements.

- **Each country faces different electricity futures.** Singapore's grid, less than 1% of which is powered by coal, is cleaner today than that of many other countries. However, it is also more carbon-intense than systems with high penetration of zero-carbon generation, like the UK (driven by offshore wind) or France

(driven by nuclear power).[36] Future energy pathways towards net zero will diverge: the UK is rapidly scaling up offshore wind, but it is less suited for solar generation during winter,[37] while Australia is more suited to large-scale solar generation with battery storage.[38] Singapore is already one of the most solar-dense cities in the world, and the country is pursuing solar projects, energy storage, and regional imports of low-carbon electricity.[39]

- **There are shared global challenges and opportunities in healthcare decarbonisation.** Whilst the composition of emissions differs across countries – and the required scale and nature of solutions vary – the pathways to decarbonisation share common challenges and opportunities. Most of the global footprint of healthcare lies in electricity use (Scope 2) and the goods and services we consume across our supply chains (Scope 3). Healthcare can influence these emissions through responsible and efficient use of energy and resources, but progress also depends on collaboration with partners across sectors and borders to drive global decarbonisation. Rising healthcare demand, driven by global demographic pressures and the impacts of global warming, risks pushing emissions upwards unless they are addressed proactively.[40] Every healthcare system has avoidable waste – from expired medicines and harmful overprescribing to wasted energy – which undermines value for money and generates unnecessary emissions.[41] Tackling these inefficiencies is a huge opportunity to cut carbon while improving the quality and value of care provided. Addressing these challenges through international collaboration, shared learning, and the adoption of proven solutions from a global network of sustainable healthcare experts will accelerate decarbonisation in our field.

Healthcare system emissions, by care provider and funding source

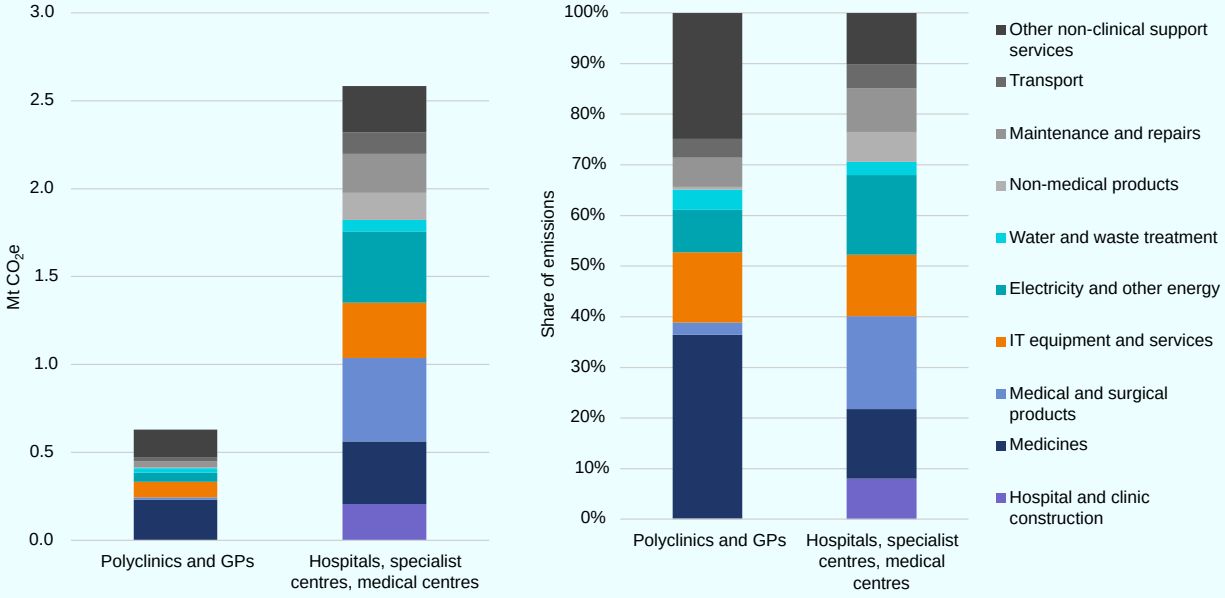
In addition to identifying physical sources of emissions, this study provides insight into where emissions occur in Singapore's healthcare system.

Hospitals, specialist centres, and medical centres are responsible for two-thirds of total healthcare system emissions (Figure 7). This is consistent with results of other healthcare system footprints. It reflects the large scale and highly energy- and resource-intense nature of hospital care, including operating theatres, intensive care, diagnostic imaging, and round-the-clock temperature control and ventilation.

Primary care is a lower-intensity model of care delivery and contributes a smaller share of emissions (Figure 6), despite serving 4-5 times more patients. The emission profiles of hospitals and primary care show structural differences, including in prescribing and purchasing patterns.

For example, emissions from medication contribute comparatively more to the primary care footprint, and medical goods contribute more to the hospital care one. This is driven by high-volume prescriptions for the most common treatments in polyclinics: for example, broad-spectrum antibiotics and medication for chronic conditions such as high cholesterol, hypertension, or diabetes.[42] In primary care, there is also lower need for medical goods like IV infusions, surgical drapes and gowns, catheters, or sterile dressings that are more often used in hospital care.

Figure 6: Scale and share of FY23 emissions between primary and hospital care in Singapore

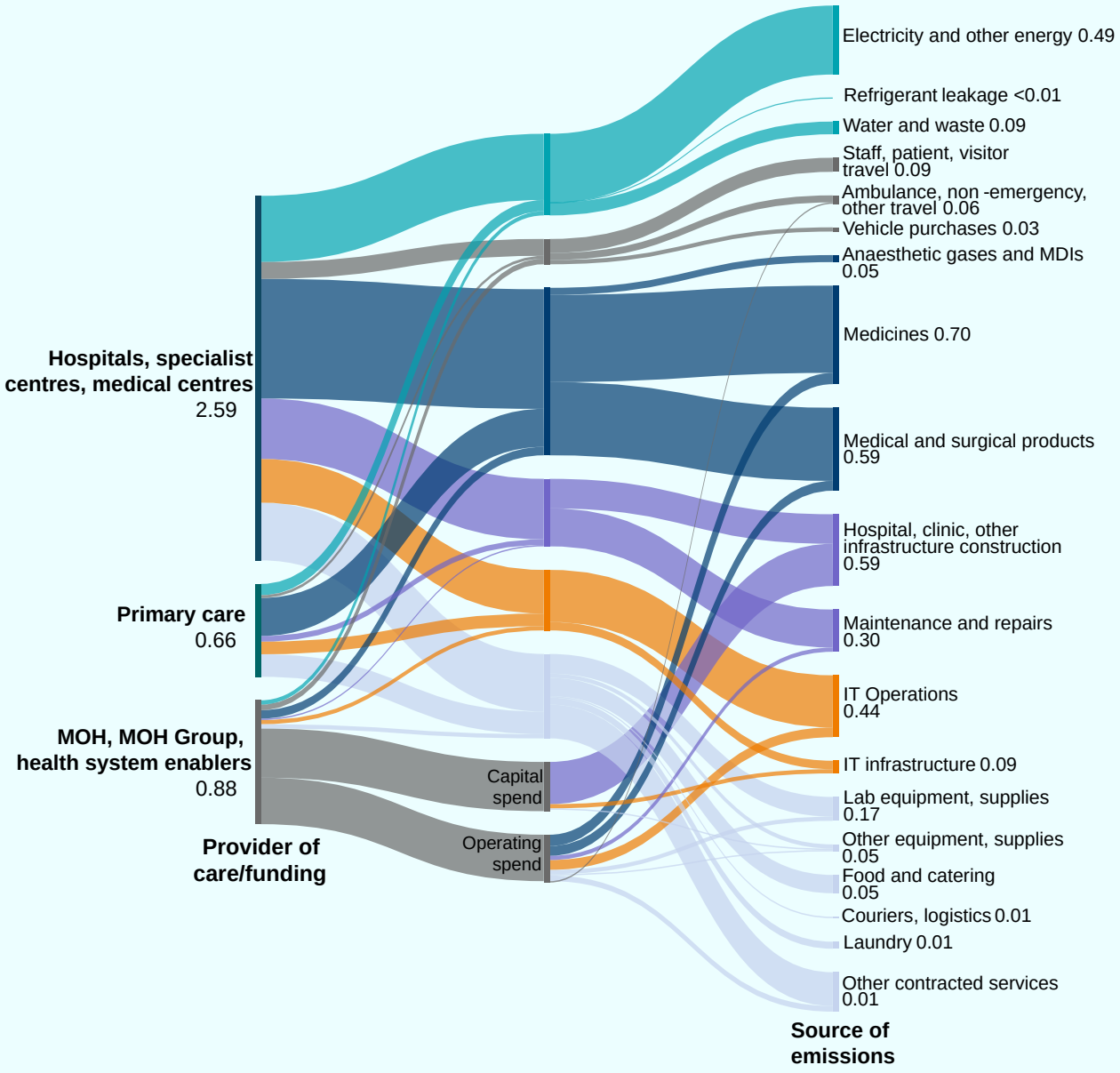


Sources: Spend and activity data collected from across Singapore's healthcare system, including data collected by MOHH, NHG Health, NUHS, SingHealth and ALPS at cluster- and institution-level; emission factors derived from SEFR,[17] GLORIA,[18] international databases, academia and Department of Statistics;[19-22] calculations from the SG-HEART model developed by the NUS Centre for Sustainable Medicine (Box 3).

As we continue to expand access to primary care with key initiatives like Healthier SG, many of our polyclinic buildings have been designed and certified as green facilities under the BCA Green Mark scheme.[43,44,45] These investments ensure that our infrastructure supports better care delivery while also meeting higher standards of environmental sustainability. By embedding such considerations into our capital planning, we are aligning the future of healthcare with Singapore's broader climate and resource efficiency goals.

Regardless of the source of healthcare provision and funding, the manufacturing and distribution of medicines, medical equipment, and other products is consistently the largest source of emissions across all organisations (Figure 7). This highlights the need for a comprehensive and coordinated approach to procurement decarbonisation developed in partnership with our suppliers – an area where Singapore's Agency of Logistics and Procurement Services (ALPS) is well-placed to deliver coordinated action across our public healthcare system.

Figure 7: Contribution to system-wide FY23 emissions, by provider and emission category (all values in Mt CO_2e)



Sources: Spend and activity data collected from across Singapore's healthcare system, including data collected by MOHH, NHG Health, NUHS, SingHealth and ALPS at cluster- and institution-level; emission factors derived from SEFR,[17] GLORIA,[18] international databases, academia and Department of Statistics;[19-22] calculations from the SG-HEART model developed by the NUS Centre for Sustainable Medicine (Box 3).

Singapore's sustainable healthcare efforts

While MOH sets the Ministry-wide direction to meet GreenGov.SG targets, we collaborate with our partners, MOH Holdings Pte Ltd. (MOHH), the public healthcare clusters, NHG Health, National University Health System and Singapore Health Services, and Agency of Logistics and Procurement Services to identify implementation strategies for sustainable healthcare efforts. This section covers the sustainability efforts undertaken by our partners.

MOH Holdings Pte Ltd. (MOHH)

MOH Holdings plays a pivotal role in driving sustainability across Singapore's public healthcare ecosystem. As the holding company for Public Healthcare Institutions (PHIs), MOHH provides strategic coordination, data consolidation, and policy alignment to support national decarbonisation goals amongst the PHIs. In collaboration with the Centre for Sustainable Medicine, MOHH facilitated data sharing for this study across public healthcare clusters and ALPS.

At the core of MOHH's sustainability drive, the MOHH Sustainability Office tracks environmental performance across PHIs, covering energy, water, waste, and other carbon metrics. The Sustainability Office also facilitates the MOH Sustainability Steering Committee, coordinates annual submission of Resource Management Plans by PHIs to MOH, and supports feasibility studies for infrastructure improvements. Beyond operational metrics, MOHH is preparing for International Sustainability Standards Board (ISSB) aligned sustainability reporting, which will require disclosures on climate-related risks, governance structures, and Scope 1-3 emissions. This further reflects MOHH's commitment to embedding sustainability into financial and operational decision-making across its group entities.

Green Frontiers: MOHH's Sustainability Framework for New Infrastructure Development

The Green Frontiers Framework is MOHH's dedicated initiative for embedding sustainability into healthcare infrastructure development. Led by the Healthcare Infrastructure Projects Division, it focuses on achieving high-performance, low-carbon healthcare buildings through strategic design, technology adoption, and prevailing BCA Green Mark standards. Key efforts include:

- Standardisation of sustainable design parameters across all new developments, with a mandate for Green Mark Platinum Super Low Energy (SLE) certification along with attaining Maintainability and Health & Well-being badges.
- Optimisation of energy savings by leveraging on passive and active design strategies.
- Deployment of proven smart technologies and solar photovoltaics yield to reduce energy use intensity to meet SLE requirements.
- Piloting carbon accounting for nursing home projects with reference to BCA Carbon Technical Guide for computing the Whole of Life Carbon (Minimum Scope).
- Development of the Green Frontiers Guidebook and Checklist which provides practical guidelines for integrating sustainability into project planning and execution.
- Continuous learning and innovation through study trips, training programmes, exploration of emerging technologies and low-carbon construction materials.

Green Frontiers operates through a structured committee framework that ensures alignment with national sustainability goals, facilitates stakeholder engagement, and promotes contextualisation of proven technologies for healthcare settings. Its approach is mapped to both BCA Green Mark technical badges and the United Nations Sustainable Development Goals, reinforcing MOHH's commitment to develop future-ready healthcare infrastructure.

NHG Health

NHG Health is an integrated healthcare system, which spans primary care, hospitals, and national specialty centres, includes Tan Tock Seng Hospital (TTSH), Khoo Teck Puat Hospital (KTPH), Woodlands Health Campus (WHC), Yishun Community Hospital (YCH), NHG Polyclinics (NHGP), the Institute of Mental Health (IMH), National Skin Centre (NSC), and the National Centre for Infectious Diseases (NCID).

Together with academic and industry partners, NHG Health advances medical education, research, and healthcare innovation in Singapore, addressing areas that are critical to Singapore's population needs. As the Regional Health Manager for Central and North Singapore, NHG Health partners with general practices, as well as health and social care agencies to ensure the physical, mental, and social well-being of residents in the community.

Governance and resourcing

NHG Health's journey towards environmental sustainability is driven by a comprehensive governance structure that ensures effective implementation across its healthcare network. At the helm of this effort is the NHG Environmental Sustainability Workgroup, which brings together diverse expertise from clinical leaders, infrastructure specialists, and institutional CEOs. This strategic leadership team sets the sustainability direction and oversees its execution.

Supporting this vision is the NHG Health Sustainability Office, which serves as the operational backbone of NHG Health's environmental initiatives. This office manages multiple portfolios, including carbon accounting, sustainability research, new green projects, and staff development programmes. Through this integrated approach, NHG Health ensures that sustainability becomes deeply embedded in organisational culture and daily operations.

Key actions and highlights

NHG Health is committed to delivering sustainable healthcare while reducing its environmental impact across its network of institutions. NHG Health's sustainability strategy centres on ambitious targets under the 10/10/30 by 2030 initiative: aiming to achieve a 10% reduction in energy consumption per square metre, a 10% reduction in water usage per person per day, and a 30% reduction in waste generation per person per day. These targets are supported by a focus on developing green infrastructure and fostering a culture of environmental stewardship throughout the organisation. Key achievements are listed below.

1) The 10/10/30 initiative:

- IMH is leading the way in healthcare sustainability with Singapore's largest solar energy system among healthcare institutions. The new solar PV installation, with a powerful 3.2MWp capacity, will significantly reduce IMH's reliance on traditional power sources. This green initiative is expected to cover 15-20% of the campus's total electricity needs, resulting in approximate annual savings of $0.5 million in electricity costs and reducing carbon emissions by about 1,438 tonnes per year.
- TTSH has implemented an innovative Mini-Chiller Heat Recovery system in 2023, which captures and

reuses waste heat from air conditioning processes. This smart system delivers impressive results: annual energy savings of 1,600,000 kWh, cost savings of $320,000, and a reduction of 680 tonnes in carbon emissions yearly. This upgrade demonstrates TTSH's commitment to sustainable healthcare.

- NHGP demonstrates its commitment to water conservation with all nine of its polyclinics achieving the PUB (Singapore's National Water Agency) Water Efficient Building certification.
- NHG Health has achieved a significant milestone in waste reduction, decreasing its Waste Disposal Index (WDI) by more than 20% compared to a 2022 baseline. This success stems from a strong emphasis on reducing, reusing and recycling waste across all operations.

2) Green Buildings:

- NHG Health has achieved significant milestones in its green building journey, with YCH leading the way as the first healthcare institution to receive the prestigious Green Mark Platinum Super Low Energy (SLE) accreditation in 2023. Following this achievement, TTSH became the first acute hospital to earn the same Green Mark Platinum SLE certification.
- Building on these successes, NHG Health has set an ambitious target to achieve Green Mark certification for all facilities by 2030.
- KTPH and WHC exemplify NHG Health's commitment to environmental sustainability through their innovative design-first approach. From their initial conceptualisation, both healthcare facilities incorporate cutting-edge sustainable architecture and smart building technologies. Key features include energy-efficient building orientation to maximise natural lighting while minimising heat gain, advanced building management systems for optimal resource utilisation, and rainwater harvesting systems. The park integration at WHC also enabled a pedestrianised floor, creating a safe environment to encourage active mobility while effectively reducing urban heat island effect.

3) Environmental stewardship:

- Launched on the 4 July 2024, the Centre for Healthcare Innovation’s Sustainability Academy aims to build thought leadership, culture, and capability to enhance the resilience and reliability of healthcare systems, communities, and the environment.
- NHG Health believes that building a sustainable future requires active community participation and a strong environmental culture. Through SG Eco Fund-supported projects in the central-north region, NGH Health is bringing together staff, patients, and the public in creative sustainability initiatives. These include the "Healthier Earth, Healthier Me" event at Sembawang Polyclinic, the innovative "Plastify Our Waste" project that transforms medical waste into useful products such as a sitting bench at WHC and Office Stationery at KTPH, and patient/community-driven initiatives like the t-shirt upcycling programme. These efforts will culminate in various Green Events, such as TTSH’s Earth Day, IMH’s ECO Fest, and KTPH’s Clean & Green Week, demonstrating a commitment to building an environmentally conscious healthcare community.

Box 4: Spotlight Case Study: Woodlands Health Campus as a blueprint for sustainable healthcare

The Woodlands Health Campus (WHC), which officially opened in July 2024, is poised to form a new benchmark for the delivery of healthcare, shifting the model of care from operating within a hospital to a systems-wide approach, in partnership with the community.

Woodlands Health (WH) adopts a triple-bottom-line approach to measure environmental, social and financial impact while balancing patient and population outcomes. Its key sustainability efforts in infrastructural design, process innovation, and culture building showcase a holistic approach to

environmental stewardship.

WH's design embraced biophilic design, incorporating natural elements to create a therapeutic environment for contemplation, healing, sensory stimulation and active recovery. Passive strategies include a north-south building direction to minimise direct solar heat gain and maximise wind flow, as well as active living staircases to reduce energy consumption from vertical transport systems and, at the same time, encourage healthy habits. WHC's collaboration with the National Parks Board (NParks) to include the Woodlands Healing Garden enabled a pedestrianised ground floor, creating a safe environment for active mobility while effectively reducing the urban heat island effect.

WH incorporated a photovoltaic system to harness solar energy and implemented sensor-operated lights and motion-sensor escalators for efficient energy management. Two rain gardens collect rainwater for campus-wide irrigation and achieve an estimated savings of 87% against the projected irrigation demand. Its food waste digester system converts up to 2 tonnes of food waste into non-potable water daily.

WH has integrated environmental considerations into quality improvement projects through its Sustainable Quality Improvement framework, which provides staff with carbon calculation tools and project savings guidance.

Some of the initiatives that demonstrate this approach include:

- The Ophthalmology Department replaced bulk retinal gases (C_3F_8 and SF_6) storage with prefilled syringes, reducing greenhouse gas emissions by 86% per syringe and improving operational efficiency by reducing the duration across procedures, in addition to cost savings.
- The Pharmacy Department replaced single-use bubble wrap with reusable sponges for medication transport, resulting in cost and carbon savings with 100% sponge return rates. This project received the Promising Award at the WH Quality Festival 2025.
- With support from the SG Eco Fund, WH partnered with Plastify to convert operating theatre plastic waste into community benches and workshop materials for community engagement at sustainability festival organised by People's Association.
- The horticulture compost project transforms landscape waste on-site, converting landscape waste into usable compost and eliminating CO_2e from disposal transport. The project has earned the Merit Award at Singapore Healthcare Management 2025.

These initiatives reflect WH's efforts to deliver healthcare with positive clinical outcomes whilst working to minimise environmental impact and foster community engagement.

WH also seeks to promote staff and public awareness on sustainability agenda through an accessible and engaging approach. During the first Christmas post-opening, the campus was fitted with sustainable Christmas decorations co-created with the community. Displays were subsequently re-purposed into reusable bag racks to enable staff and visitors to donate and collect reusable bags for their retail purchases. Educational talks and interactive workshops to raise awareness and encourage behavioural change were curated to be accessible. Sustainability knowledge is regularly shared through new hire orientation, electronic direct mail, and Townhall meetings.

Through thoughtful infrastructural design optimised by data trend analysis and system monitoring, process innovation validated by operational insights from clinical teams, and organisation-wide culture-building to foster awareness and influence behavioural change, WH managed to achieve energy reductions and financial savings, all while the hospital continues to ramp up to serve more patients. WH illustrates how healthcare facilities can save costs, reduce carbon, and improve efficiency whilst preserving their primary commitment to patient care and community well-being.

Figure 8: Woodlands Health Campus

Source: Woodlands Health Campus

National University Health System (NUHS)

The National University Health System (NUHS) is a public healthcare cluster serving the western region of Singapore. NUHS comprises tertiary, acute, and community hospitals, including National University Hospital (NUH), JurongHealth Campus (JHC) comprising of Ng Teng Fong General Hospital (NTFGH) and Jurong Community Hospital (JCH), Alexandra Hospital (AH), and the Tengah General and Community Hospital (TGCH) due to open in early 2030.

Beyond hospitals, the NUHS network includes three National Centres, seven National University Polyclinics (NUP), Jurong Medical Centre (JMC), NUHS Diagnostics & Pharmacy, and three academic entities: the NUS Yong Loo Lin School of Medicine, NUS Faculty of Dentistry, and NUS Saw Swee Hock School of Public Health.

Governance and resourcing

NUHS has established a governance structure to address climate-related risks and opportunities. The NUHS Board recognised climate change as a priority, and the Board's Infrastructure Development Committee provides oversight. The Green Plan Steering Committee, chaired by the Chief Executive, shapes sustainability policies and manages related risks. The NUHS Office of Sustainability (NUHS OS) plans strategy and implementation, risk management, and progress monitoring for the NUHS Green Plan, drawing on external advisors for guidance. The Chief Sustainability Officer, reporting directly to the Chief Executive, leads NUHS OS. NUHS OS also conducts research on innovative interventions and works closely with the various taskforces to implement sustainability projects across key domains.

NUHS Sustainability Masterplan 2030

The NUHS Sustainability Masterplan 2030 outlines a strategic approach to reduce carbon emissions by 25% by 2030 (across all scopes). NUHS has identified seven high-impact focus areas to achieve this goal.

The carbon inventory and baseline emissions project for NUHS, established in 2022, provides a baseline for tracking decarbonisation progress. Scope 2 emissions from energy use are now monitored quarterly across all institutions and are a key performance indicator in the NUHS corporate Balanced Scorecard.

In 2023, NUHS introduced a cluster-wide Green Policy, establishing mandatory measures for all institutions and staff to minimise environmental impact and drive sustainability. In 2024, NUHS published its inaugural sustainability report, referencing the Task Force on Climate-Related Financial Disclosures (TCFD) framework.

NUHS's efforts have been recognised with the Singapore Green Building Council BCA Award for Leadership in Sustainability (Transformation) in 2024. In 2025, NUH became the world's first hospital to achieve Healthcare Sustainability Certification from the Joint Commission International and the International Hospital Federation Geneva Sustainability Centre.

Building on this foundation, NUHS continues to deliver tangible carbon reductions through initiatives in the built environment, energy efficiency, waste and recycling, mobility, care delivery, supply chains, and workforce engagement.

Key actions and highlights

1) Greener, more efficient, and climate-resilient built environment. NUHS is building a sustainable, climate-resilient healthcare environment by adopting green infrastructure standards and expanding vibrant green spaces across its campuses:

- **Sustainable healthcare infrastructure and facility standards.** NUHS collaborates with the Ministry of Health and ecosystem partners to shape and adopt sustainable standards for both new and existing healthcare facilities. Initiatives include façade optimisation for improved energy efficiency and climate resilience, and the selection of building materials based on lifecycle and carbon assessments.
- **Enhancing adaptive capacity and climate resilience.** Infrastructure is designed for operational flexibility and resilience under adverse weather or environmental conditions. Risk mitigation strategies that address climate-related challenges such as wind, flooding, thermal stress, and air quality are firmly embedded in core infrastructure development processes in NUHS.
- **Expanding green spaces.** NUHS is intensifying greening efforts across its hospitals and polyclinics to support health, wellbeing, and reduce the Urban Heat Island effect. In FY2024, NUH, AH, and JHC saw increased Green Plot Ratios, with over 280 trees and 1,200 shrubs planted. Rewilding at AH and NUH is boosting native biodiversity, while community gardens at NUH and AH offer relaxing spaces and have received positive feedback. To further reduce heat stress, cool paint and solar film have been applied at key hotspots, with more cooling projects planned for FY2025.

2) Energy efficiency measures. These measures save running costs while reducing carbon:

- **LED lighting upgrades.** A cluster-wide transition to energy-efficient LED lighting is underway, with completion targeted for 2027. This upgrade is projected to improve overall energy efficiency by 3.1%.
- **Optimised lift usage.** Weekend lift operations have been reduced to minimise unnecessary energy use.
- **Temperature management.** Room temperatures in suitable areas are maintained at 25°C to lower cooling demands.
- **Efficient cleaning processes.** At NUHS Tower Block, after-hours cleaning now follows a staggered, floor-by-floor approach, ensuring lights are only on where cleaning is in progress, significantly reducing energy wastage.
- **Operating Theatre air change optimisation.** Air change rates in 29 operating theatres at NUH are being optimised, with completion expected by 2026. This will cut energy use during non-operational periods while maintaining strict indoor air quality conditions.
- **Innovative technology deployment.** Advanced digital platforms – including digital twins, integrated systems, and artificial intelligence – are deployed to identify energy savings and optimise resource use. Insights from the NUH Medical Centre's Integrated Data Platform inform ongoing and future projects.

- **Renewable energy deployment.** By 2026, NUHS will install 1,550 solar panels across its facilities, supplying approximately 0.54% of total energy needs and reducing reliance on non-renewable sources.
- **Sensors and automation.** NUHS is progressively installing sensors throughout its facilities to automatically control lighting and ventilation systems based on occupancy levels, further reducing energy waste in unoccupied spaces.

3) Green Mobility. NUHS is advancing sustainable transport solutions.

- **Electric Vehicle charging stations.** NUHS aims to install 100 EV charging stations by 2030, with 22 already installed as of 2024.

4) Sustainable commuting. Staff are encouraged to take greener commuting options, including cycling, public transport, carpooling, and teleconferencing.

5) Action on the supply chain. NUHS is advancing sustainability across its supply chain.

- **Carbon Disclosure Platform (CDP) for transparency.** Launched in 2023, this platform benchmarks and monitors suppliers' sustainability practices. Key suppliers are engaged to disclose sustainability performance annually. NUHS targets to achieve 50% supplier participation in the CDP platform by 2025.
- **Enhanced Green Procurement Policy.** In 2023, NUHS became Singapore's first public healthcare cluster to include environmental criteria in its procurement. In 2025, this policy was further strengthened by assigning an independent weightage to environmental considerations in supplier assessments.
- **Circular Economy initiatives.** Refurbishing MRI scanners reduces environmental impact by reusing material, improving energy efficiency, and reducing site preparation construction work.
- **Green IT.** The Green IT taskforce is working to reduce the carbon footprint of data centres, IT products, and device and software use. Key actions include emissions tracking, green procurement, server consolidation, and vendor engagement.

6) Sustainable Clinical Care. NUHS aims to deliver high-quality patient care while reducing its environmental impact.

- **Switching to eco-friendly inhalers.** Lower-carbon Dry Powder Inhalers are prescribed for adult patients instead of Metered Dose Inhalers when clinically appropriate.
- **Anaesthetic gas transition.** NUHS is phasing out desflurane and nitrous oxide in favour of low-GWP alternatives that maintain the same level of patient care while significantly reducing carbon impacts and improving air quality within operating rooms.
- **Appropriate care.** Focusing on appropriate testing and prescribing and reducing unnecessary investigations or treatments.

7) Waste - 60% recycling rate and 60% waste reduction by 2030. NUHS is advancing waste management through a range of innovative recycling initiatives.

- **Sustainable meals and appropriate portions.** AH and NUH have developed enhanced patient meal services. Patients at AH now have the option to select plant-based options, and both hospitals have introduced smaller portion sizes. These changes support diverse dietary needs, reduce food waste, and promote healthier, more sustainable eating habits for patients.
- **Bio-digesters to manage food waste.** The installation of a bio-digester at NUH in 2023 has diverted 62 tonnes of food waste from general waste, with up to 15 tonnes processed monthly. This system reduces landfill waste and carbon emissions by converting food scraps into compost or biogas.
- **Action on packaging and plastic.** NUHS has taken significant steps to reduce packaging and plastic waste. Nurses now use reusable canisters for wet wipes instead of single-use packs, and plastic bags have been phased out, with charges introduced for single-use bags at pharmacies. Bottled water and packaged beverages are no longer provided at meetings, further cutting single-use plastic waste.

- **Plastics-to-NEWBitumen.** In 2022, NUH generated 4.5 million kilograms of waste, much of it from single-use plastics. Partnering with a Singapore-based startup, NUH recycles non-recyclable plastics – such as syringes, surgical packaging, and Personal Protective Equipment – into NEWBitumen, an alternative road-paving material now used around NUH, reducing reliance on fossil-fuel-derived bitumen.
- **Innovative healthcare waste recycling solutions.** NUH and AH recycle about 300 kg of stainless-steel surgical instruments and trays each month, excluding those from infectious cases. This reduces landfill waste and new steel demand. Since mid-2023 NUHS collect general textile waste for resale, donation, or upcycling. Used uniforms are converted overseas into fuel or new materials. The Sort-at-Source initiative, launched in May 2025, enables nurses to separate waste at medication trolleys, boosting paper recycling by 47% and plastic recycling by 230%. Expansion to all 44 wards is expected to recover nearly 24,000 kg of recyclables annually, embedding sustainability into daily clinical practice.

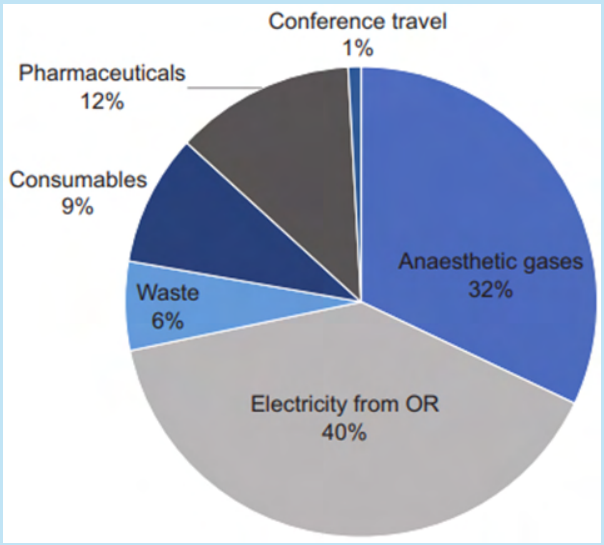
8) Staff education and enablement. NUHS enables staff through education and change management.

- **New staff onboarding.** All new employees receive a 'Care for the Environment' briefing during onboarding, ensuring early awareness of sustainability goals.
- **Sustainability Champions Network and Sustainability Portal.** A network of sustainability champions across key departments advocates for green practices and serves as change agents. An internal sustainability portal provides ongoing updates, reminders, and resources to keep eco-friendly practices top of mind.
- **Capacity building and training.** To build capacity, NUHS invests in staff training and industry engagement. In 2025, a collaboration with Republic Polytechnic launched a two-day Green Procurement training, with 66 procurement staff trained to date.

Box 5: Spotlight Case Study: Decarbonising Anaesthesia Practices & Sustainable Care

In 2022, the Department of Anaesthesia at NUH, undertook a carbon footprint assessment to guide its sustainability initiatives. This assessment quantified greenhouse gas emissions across key operational areas (anaesthetic gases, electricity consumption, waste, consumables, pharmaceuticals, and conference travel). Guided by the 'reduce first' principle, the department focused on high-impact and controllable sources of emissions. Interventions that would yield the greatest environmental benefit (e.g., solid waste recycling and the use of anaesthetic gases) were prioritised.

Figure 9: NUH Department of Anaesthesia carbon footprint in 2022



Source: Foo DY et al. Going green in Singapore: insights and challenges in working towards achieving net zero in anaesthesia.[46]

The department takes a multi-faceted approach to reduce its carbon footprint.

Anaesthetic gas management:

- Stop the use of desflurane and use alternative drugs with much lower carbon footprints.
- Reduce the use of nitrous oxide. Change supplies to small portable N_2O cylinders, turn off the N_2O pipeline systems.

Waste reduction and recycling:

- Partner with local companies to recycle plastic waste and reprocess uncontaminated syringes, diverting these materials from incineration.
- Reuse anaesthesia breathing circuits.
- Effective recycling required segregation at source, extra receptacles and storage space. Due to space limits, efforts targeted the highest-impact waste streams.

Energy conservation:

- Implement protocols to switch off anaesthesia gas scavenging systems (AGSS) and reduce air changes per hour (ACH) during non-operational hours of the Operating Theatres.
- Adopt energy-efficient LED lighting.

Education and awareness:

- Deliver continuous staff educational campaigns to raise staff awareness about the environmental impact of anaesthetic gases and to promote sustainable practices.

Travel reduction:

- Use virtual meetings and teleconferencing to minimise commuting and business travel.

Outcomes and impacts:

The department's interventions led to clear measurable improvements in emissions:

- Desflurane use was reduced by over 95% within 3 years.
- While precise energy savings data from individual interventions are unavailable due to the absence of submeters, implemented conservation measures – such as switching off equipment during downtime – contributed to overall reductions across the hospital.
- Increased staff awareness has fostered a culture of sustainability, influencing daily practices and decision-making throughout the department.

Targeted, data-driven interventions, supported by education and staff engagement; can yield substantial progress in healthcare sustainability. By focusing on high-impact areas, the department has made significant strides toward NUHS's carbon reduction goals.

Singapore Health Services (SingHealth)

SingHealth has a network of acute hospitals, national specialty centres, polyclinics, and community hospitals offering over 40 clinical specialties, that delivers comprehensive, multidisciplinary, and integrated care. Beyond hospital walls, SingHealth partners with community care providers to enable the population to keep well, get well, and live well. As part of the SingHealth Duke-NUS Academic Medical Centre, SingHealth also focuses on advancing education and research to continuously improve care outcomes for patients. The members of the SingHealth Group are:

- **Hospitals (Tertiary Specialty Care):** Singapore General Hospital (SGH), Changi General Hospital (CGH), Sengkang General Hospital (SKH), KK Women's and Children's Hospital (KKH), and Eastern General Hospital (EGH, expected completion around 2029-2030).
- **National Specialty Centres (Tertiary Specialty Care):** National Cancer Centre Singapore (NCCS), National Dental Centre Singapore (NDCS), National Heart Centre Singapore (NHCS), National Neuroscience Institute (NNI), and Singapore National Eye Centre (SNEC).
- **Community Hospitals (Intermediate and Long-term Care):** Sengkang Community Hospital (SKCH), Outram Community Hospital (OCH), and Eastern Community Hospital (expected completion around 2029-2030).

- **Polyclinics (Primary Care):** Bedok, Bukit Merah, Eunos, Marine Parade, Outram, Pasir Ris, Punggol, Sengkang, Tampines, Tampines North and Kaki Bukit (upcoming).

Governance and resourcing

Environmental sustainability at SingHealth is guided by a multi-tiered governance structure. Its approach is supported by the Environmental Sustainability Shared Service, Committee on Sustainability, and the newly established SingHealth Office for Sustainable Health, which together form a cross-functional leadership network that unites clinicians, nurses, allied health professionals, pharmacists, and administrative and operations leaders from across its institutions. Supporting the cluster are multiple committees and platforms for green and sustainable healthcare at service-, hospital- and cluster-level. These interconnected teams operate as specialised working groups, each focusing on distinct sustainability domains. Through this framework, green and sustainable practices are embedded in every aspect of SingHealth's operations, from patient care protocols to operational practices.

Key actions and highlights

1) Greener, efficient and climate-resilient built environment. SingHealth has established a comprehensive framework for sustainable infrastructure development that combines green building certification, smart technology integration, energy efficiency, research collaboration, and green space creation. This systematic approach is being implemented across all institutions with adaptations to suit local contexts and requirements.

The infrastructure sustainability framework centres on achieving Green Mark Platinum Super Low Energy (SLE) certification for new constructions and major retrofits, supported by the Infrastructure Development Team. Smart building transformation follows a unified blueprint for Building Management Systems, with input from Chief Information Security Officers and Infrastructure, Facilities Management, and IT teams. This approach reviews existing capabilities, defines technical requirements, develops system architecture, conducts market assessments, and implements progressive trials before network-wide deployment.

Energy conservation initiatives demonstrate how institutions adapt common efficiency principles to their specific environments. The SGH lux motion lighting control trial in 2024 demonstrated this systematic approach to testing and scaling energy-saving technologies before deploying them across the network. Research partnerships strengthen the evidence base for sustainable infrastructure decisions, with SGH leading microclimate studies in collaboration with NUS whilst exploring partnerships with the Singapore University of Technology and Design on evaporative cooling and solar heat gain reduction that can inform network-wide planning.

Green infrastructure initiatives show how healthcare institutions can transform underutilised spaces into climate-resilient assets. The Rooftop Food Gardens at SGH produce 2,242 kg of vegetables monthly, directly reducing our food import dependency. The community garden at NHCS extends this farm-to-table approach across the network, enabling carbon reduction, urban heat mitigation, and energy efficiency whilst strengthening food security. The gardens function as therapeutic and educational spaces and have engaged over 1,000 participants.

2) Green mobility. SingHealth has implemented a coordinated Electric Vehicle (EV) infrastructure strategy across its healthcare network, establishing charging capabilities that support sustainable transportation for staff, patients, and visitors. This network-wide approach ensures consistent EV support whilst accommodating the specific spatial and operational requirements of different institutions and has resulted in

79 EV chargers operational by end-January 2025, strategically distributed across key institutions including SGH, SingHealth Tower, NHCS, NCCS, SNEC, CGH, and KKH.

3) Supply chain action. SingHealth has developed a circular economy strategy that transforms traditional procurement and waste streams into sustainable resource cycles. This network-wide approach combines innovative material sourcing and strategic recycling partnerships, with institutions adapting these frameworks to their specific operational contexts and material flows. The circular economy framework emphasises material innovation and closed-loop systems across institutions. The new Eastern General Hospital is collaborating with Plastify to develop signage from recycled plastics to achieve 49% carbon savings compared to traditional materials.

4) Sustainable clinical care. SingHealth has implemented a systematic approach to reducing the environmental impact of clinical practices whilst maintaining high-quality patient care. This framework focuses on anaesthetic gas reduction and medication optimisation, with institutions adapting these strategies to their specific clinical contexts and patient populations.

Anaesthetic gas reduction is a coordinated network-wide initiative. CGH achieved 90% desflurane reduction by the end of 2024, with desflurane comprising only 12% of total inhalational volume, resulting in an 1,800 t CO_2e of emissions savings. The hospital's systematic investigation of nitrous oxide manifold systems revealed 73% leakage rates, prompting decommissioning and a transition to portable cylinders with potential elimination of 804 t CO_2e over two years. SGH implemented the same reduction strategies in parallel, decreasing desflurane consumption from 1,064 bottles in 2022 to 237 bottles in 2024, showing how common approaches deliver results across different contexts and surgical caseloads.

Medication optimisation initiatives follow network-wide principles adapted to specific clinical settings and patient needs. Implementation of oral paracetamol premedication for elective surgical patients in CGH achieved a 50% reduction in intravenous paracetamol usage.

5) Waste management. SingHealth has established a comprehensive waste reduction and resource recovery framework that addresses multiple waste streams through systematic approaches adapted to each institution's operational context and waste generation patterns. This coordinated strategy encompasses recycling systems, food waste management, medical waste recovery, textile recovery, and innovative waste solutions that transform traditional disposal practices into resource recovery opportunities:

- **Food waste.** SGH processes waste from 1,970,000 annual meals, processing 640,000 tonnes through upcycling and vermicomposting, converting output into garden compost. SKH introduced segregation stations enabling diners to sort leftovers for on-site digestion into liquid discharge, whilst capturing behavioural data for broader public facility applications.
- **Medical waste.** SGH collects 600 kg of single-use stainless steel surgical instruments monthly, up from initial 50 kg collections in 2019. SKH achieved a 23% reduction in biohazardous waste from operating theatres through proper waste segregation protocols.
- **Paper waste.** KKH eliminated 9,000 monthly paper passes through digitalised workflows, whilst SKH's digitalised audit systems save 500 sheets of paper annually.
- **Pharmaceutical waste.** NCCS identified and targeted $2,047,949 of drug wastage from June 2021 to February 2022, whilst SGH's near-expiry medication redistribution pilot successfully redirected medications to community clinics.
- **Water conservation.** SGH repurposes Reverse Osmosis reject water from the Renal Dialysis Centre for housekeeping operations, whilst SKH uses 250m^3 of air-conditioning and mechanical ventilation condensate for cooling systems per day.

- **Innovative waste solutions.** SKH eliminated over 112,000 disposable bags annually by introducing reusable laundry bags for mop pads. Additionally, the hospital's repair and conversion programme for damaged linen enabled reuse of 30% of items, saving $47,000 annually. At SGH, the Linen Supplies Unit achieved 22% upcycling of disposed linen into laundry bags, while NCCS collected 188 kg of uniforms for upcycling into accessories through The Circular Classroom. The Green Corridor in SGH processes approximately 500 kg of textiles and shoes plus 600 kg of e-waste monthly through recycling collection bins and donation facilities. SGH has developed innovative partnerships for specific waste streams such as CLOOP (11,000 kg of recycled textiles since November 2022), ALBA and KGS (800 kg e-waste per month), and ChopValue (100 kg of chopsticks since September 2021 with NHCS).

6) Staff education and culture building. SingHealth has developed a systematic approach to embedding sustainability culture throughout the organisation through comprehensive engagement programmes, systematic assessment frameworks, community outreach, and recognition initiatives.

The Clean & Green Week at SKH attracted 360 participants including staff and public members across 30 workshops, repurpose stations, information booths, and interactive activities, with 88 preschool children participating in sustainability education games. The launch of the "Greening Oncology Up and Down" (GROUND) Sustainability Office at NCCS attracted over 200 staff members, SGH has organised Green Week events since 2024, and SingHealth Community Hospitals organised the 3X7 Green Challenge encouraging staff to document green habits over three consecutive weeks.

Systematic assessment frameworks provide network-wide consistency in measuring and improving sustainability performance whilst accommodating institutional variations. The ECO Check-up framework developed by SingHealth Community Hospitals evaluates sustainability practices across Green Culture, Energy Conservation, Water Conservation, and Waste Management. Pilot audits across four institutions established a 72% baseline compliance rate, with the framework subsequently adopted across various SingHealth institutions.

Community engagement initiatives extend sustainability education beyond healthcare settings. The SGH partnership with Learning Vision Childcare for student education on food waste and recycling, and SingHealth Polyclinics' Coney Island beach cleanups involving 64 participants collecting 270 kg of debris, show how institutions can implement meaningful community outreach programmes.

Plastic reduction efforts also provide an opportunity to engage staff and the public. SingHealth Pharmacies discontinued issuing plastic bags for discharge medication, establishing "Share a Bag" corners where public and staff donate used bags for reuse. This initiative not only reduces plastic consumption but also serves as an educational tool for patients and next-of-kin, demonstrating how healthcare institutions can integrate sustainability messaging into direct patient interactions whilst maintaining service quality.

The NCCS uniform project achieved top-three placement at the Centre for Healthcare Innovation x Singapore Institute of Technology Innovation Challenge 2024, whilst CGH's anaesthetic gas initiatives led to journal publications and poster awards. Recognition and celebration of these innovations encourages continued improvement across the system.

Box 6: Spotlight Case Study: Reduction in Surgical Consumables

SingHealth has implemented a comprehensive approach to reduce the environmental impact of surgical consumables through innovative recycling programmes across its hospital cluster, particularly through the recycling of metals from surgical instruments, soft plastic bags from used IVs and irrigation soft bags. These initiatives address the significant environmental challenges posed by single-use medical devices whilst maintaining the highest standards of patient safety and infection control.

In 2019, SGH began to use disposable single-use stainless steel surgical instruments. This leads to a high volume of biohazard waste and carbon footprint generated from incineration. A workgroup was formed involving various stakeholders, including Nursing and other hospital staff from inpatient wards, Specialist Outpatient Clinics, Operating Theatres, Department of Emergency Medicine, Infection Prevention & Epidemiology Dept and Environmental Services, to discuss how best to decontaminate the to-be-disposed surgical instruments for safe handling for recycling purpose. While the initiative started with recycling about 50 kg of metal every month, 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. Metal can be recycled continuously without losing its properties.

CGH has implemented recycling programmes for intravenous fluid bags and lines from operating theatres, whilst SKH has developed sophisticated segregation processes for used intravenous and irrigation soft bags. These bags are categorised according to their plastic recycle codes, enabling appropriate recycling pathways and maximising material recovery.

These initiatives exemplify how healthcare institutions can balance clinical excellence with environmental stewardship. They also show that rigorous infection control standards and sustainability goals are not mutually exclusive but can be achieved through innovative approaches and collaborative problem-solving.

Figure 10: Recycling collections at Singapore General Hospital, Changi General Hospital, and Sengkang General Hospital

Agency of Logistics and Procurement Services (ALPS)

ALPS Pte. Ltd. is a national integrated supply chain management agency that is an integral part of Singapore's healthcare system, acting as a central hub for procurement and logistics management. Its core function is to streamline the procurement, logistics, and distribution of pharmaceutical medications, medical supplies, equipment, and services to healthcare institutions across the country. By centralising these critical processes, ALPS ensures that hospitals, specialist centres, and polyclinics have consistent access to the resources they need to deliver quality patient care.

This centralised model improves efficiency and reduces the administrative burden on individual healthcare facilities, allowing them to focus on their primary mission of providing medical services. ALPS' role is vital in

maintaining a reliable, innovative, and trusted supply chain partner to deliver dynamic and value-based supply chain solutions to the public healthcare network in Singapore.

By embedding sustainability into procurement, ALPS is helping transform the healthcare supply chain into a more environmentally responsible system. This will lower the healthcare sector's carbon footprint, promote innovation and adoption of sustainable practices, and contribute to better long-term patient and community outcomes.

Supporting Singapore's decarbonisation goals

ALPS is uniquely positioned to support national decarbonisation efforts through its oversight of procurement and logistics. In the coming years, ALPS will collaborate closely with public healthcare clusters to:

- Reduce Scope 3 emissions by working with vendors to decarbonise.
- Implement systems to measure and reduce environment impact.
- Encourage the use of sustainable products and services in healthcare operations.

Key actions and highlights

1) The Price-Quality-Environment (PQE) Framework. To drive sustainable procurement, ALPS is introducing a Price-Quality-Environment (PQE) evaluation framework. This expands traditional procurement by factoring in environmental impact alongside price and quality.

Through PQE, ALPS incentivises suppliers to adopt sustainable practices and offer products & services with lower carbon footprints. The framework considers:

- Energy and water consumption.
- Waste generation and circularity.
- Use of sustainable materials.
- Transportation modes and emissions.

2) Building an 'E' Ecosystem. The PQE framework requires the development of a complementary 'E' ecosystem that promotes sustainability internally and externally:

- Internally: Enhancing e-procurement systems, deploying digital solutions, aligning with global standards, and training staff to integrate sustainability into decision-making.
- Externally: Partnering with learning hubs and academies to upskill vendors, especially small and medium enterprises on sustainability practices.

The aim is to build vendor-wide awareness and capability while maintaining a fair and competitive procurement landscape.

3) Partnering with vendors. Sustainability in healthcare cannot be achieved alone. ALPS also actively engages vendors to identify opportunities for sustainable products and practices across the supply chain.

Through regular discussions, vendors are encouraged to explore ways such as:

- Retrofit medical devices to extend their lifecycle and reduce waste.
- Improving logistics efficiency to reduce transport emissions.
- Supporting circular initiatives, like recycling or take-back programmes.

These conversations not only raise awareness but also build strong partnerships where vendors become co-creators of sustainable solutions. Every small improvement — from packaging to delivery methods, adds up to reduce waste, save resources, and lower emissions.

4) Staff upskilling. To effectively implement sustainability strategies, ALPS recognises the importance of upskilling its internal staff. This involves providing comprehensive training programmes that equip employees with the knowledge and skills necessary to understand and apply sustainable practices in their daily operations. By fostering a culture of sustainability within the organisation, ALPS can ensure that all staff are aligned with environmental goals and can provide insights that contribute to reducing the carbon footprint of the healthcare supply chain.

The upskilling process includes collaboration with HR for development of internal e-learning modules, as well as partnerships with academies for external courses through a structured learning needs analysis programme. Employees will learn about the significance of sustainability in the healthcare sector, the impact of their roles on environmental outcomes, and how to evaluate suppliers based on their sustainability practices.

5) Using technology to support sustainability. At ALPS, innovation goes beyond procurement – it includes creating digital tools that make sustainability part of everyday work. To support staff, ALPS partners with Synapxe to adopt GenAI solutions, such as Tandem, and enhance the digital assistant that helps explain and validate sustainability-related questions quickly and accurately.

By giving staff easy access to information, Tandem empowers them to:

- Understand sustainability concepts.
- Apply sustainable practices in their daily work, e.g., choose products with eco-labels, recyclable packaging, or lower carbon footprints.
- Help staff with sustainability-related evaluation criteria that can be used when evaluating products or services.

This tool not only builds awareness but also creates a culture where sustainability knowledge is shared and accessible to all.

Summary

The completion of Singapore's first national healthcare system emissions base year assessment marks a new milestone in our sustainability journey. The SG-HEART model provides the robust evidence needed to target emissions reduction where it matters most, while safeguarding and enhancing patient care.

Singapore starts from a position of strength, with high-performing infrastructure, a carbon-efficient transport network, rigorous environmental regulations, and a culture of clinical excellence. Building on this foundation, the health sector is better placed to:

- **Support whole-of-nation action in the public sector** under the GreenGov.SG framework. We will share our insights and learning from this study with other agencies as we work towards net zero.

- **Identify and scale examples of clinical excellence**, taking the best solutions from our world-class health workers and implementing them across to the entire system to achieve immediate emissions reductions and direct patient benefits.

- **Build new Super Low Energy hospitals and clinics** to BCA Green Mark Platinum standards, embedding whole-life carbon assessments from design through to operation.

- **Empower public healthcare clusters** to implement their ambitious plans, integrating sustainability objectives into operational frameworks.

- **Collaborate with academic partners,** including the NUS Centre for Sustainable Medicine, to drive innovation, expand the research base, and equip the next generation of doctors and healthcare workers with critical sustainability skills.

- **Maintain and advance the SG-HEART model** with improved datasets and methodologies, ensuring an accurate and up-to-date evidence base for decision-making.

Through decisive action and coordinated leadership, Singapore will demonstrate that world-class healthcare and environmental sustainability go hand in hand, setting a standard for the region and beyond. By acting now, we will safeguard the health of our people, optimise system efficiency, and strengthen resilience against the growing impacts of climate change.

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