GREENGOV.SG

REPORT FOR FINANCIAL YEAR 2022

GREEN GOV SG

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We would like to extend our appreciation to public sector officers from all Ministries and agencies for their support, as well as organisations and individuals who contributed their feedback and suggestions to this report.

ENQUIRIES
For any questions or feedback on the report, please email MSE_Feedback@mse.gov.sg.

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FOREWORD

Teo Chee Hean
Senior Minister
Chairman of the Inter-Ministerial Committee on Climate Change

Climate change is an existential threat for Singapore. As a low-lying island, we are vulnerable to rising sea levels. Our dense urban environment traps heat, increasing stress on both our people and infrastructure. Climate change poses risks to our biodiversity, food and water security, and public health.

The need to act is urgent. The latest report released by the Intergovernmental Panel on Climate Change in March 2023 warns that global average temperatures have increased by at least 1.1°C since the start of the industrial era. If we remain on our current trajectory, the world is likely to breach the 1.5°C threshold by the early 2030s, causing irreversible damage to communities and ecosystems. The window for action is rapidly closing and all countries must take decisive action to scale up climate solutions.

Here in Singapore, we have decisively stepped up our efforts against climate change. Singapore has committed to reduce our emissions to around 60 million tonnes of CO_2 equivalent in 2030 after peaking our emissions earlier, and to achieve net zero emissions by 2050. These are ambitious targets that can only be realised through a whole-of-nation effort.

The public sector will set an example for the rest of Singapore to follow. We aim to achieve net zero emissions around 2045, five years ahead of our national target of 2050. We are also committed to reducing the energy and water we consume, and the waste we generate.

The GreenGov.SG report – this being the inaugural edition – is how we will keep ourselves accountable. The report details the emissions profile and resource footprint of the public sector. It also sets out our key strategies and initiatives to enhance environmental sustainability. Readers will be able to see the progress that we are making, as well as how different Ministries are playing their part to address climate change. To complement this report, our Statutory Boards will publish annual environmental sustainability disclosures, starting in Financial Year 2024.

The public sector's actions are necessary but not sufficient to achieve our national climate goals. Businesses and individuals need to act as well. I hope that the ambition and example of the public sector will encourage all groups in Singapore to join us in our journey to build a greener and more sustainable future for Singapore.

ABOUT THIS REPORT

This report is for Financial Year ("FY") 2022, which runs from 1 April 2022 to 31 March 2023. It covers the Singapore public sector and its assets in Singapore, including office buildings, healthcare facilities, schools, public utilities installations, and public transport infrastructure and vehicles. For comparability, the report format is adapted from leading international frameworks, standards and definitions.[1]

Due to the COVID-19 pandemic, there were reduced economic and social activities in FY2021. Hence, FY2021 performance is not considered representative of the Singapore public sector's business-as-usual operations.

This report excludes performance data for waste. More time is needed to improve the Singapore public sector's data collection processes for waste, as waste disposal is not metered, unlike electricity and water use. In addition, waste tends to be co-mingled at bin centres. This makes it more challenging to attribute the waste disposal to an agency.

There are a number of national reports and sustainability master plans relating to specific industry sectors published by the Singapore public sector. Some Statutory Boards have also produced their own environmental sustainability disclosures. This report complements existing publications, by showcasing the efforts of the Singapore public sector as a whole to become more environmentally sustainable.[2]

[1] Such as the Global Reporting Initiative standards and recommendations by the Taskforce on Climate-related Financial Disclosures.

[2] A list of relevant publications can be found in Appendix B.

3 EXECUTIVE SUMMARY

EXCEL

GREENHOUSE GAS EMISSIONS AND ENERGY

OUR GREENGOV.SG COMMITMENT

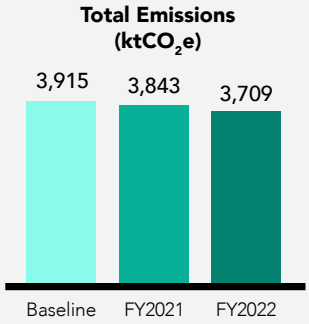
Net zero emissions around 2045, after peaking emissions around 2025

10% reduction in energy use by 2030[3]

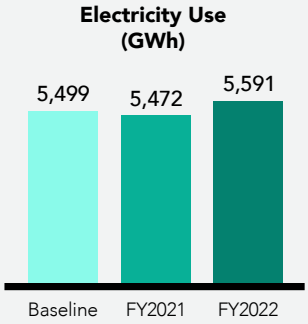
Key takeaways

Public sector emissions were lower in FY2022 compared to the baseline.[4] The decrease in emissions was mainly due to the decommissioning of the Tuas Incineration Plant in early 2022. We expect emissions to increase in the near future, with the completion of new major public infrastructure.

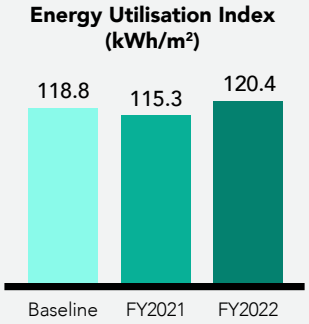
The public sector's total electricity use and electricity used per unit area increased marginally in FY2022 compared to the baseline. This was due to a gradual reopening of the economy and increase in activities, after almost two years of COVID-19 pandemic-related safe management measures.



5.3% decrease in FY2022 from baseline



1.7% increase in FY2022 from baseline



1.3% increase in FY2022 from baseline

OUR GREENGOV.SG STRATEGY

REDUCE

- Design energy-efficient infrastructure
- Harness synergies across operations

REPLACE

- Electrify vehicle fleet
- Deploy solar energy

REMOVE

- Develop innovative carbon removal solutions

HIGHLIGHTS

39 buildings that are at least Green Mark Platinum Super Low Energy

60 cleaner energy public buses

More than 300 MWp of solar energy deployed

[3] Energy use is in terms of electricity used per unit area.

[4] We have referenced FY2020 as the baseline year for emissions, as this was when we began emissions data collection. For electricity use, the average of FY2018-FY2020 was adopted as the baseline because we have historical records, and we want to better reflect hybrid working arrangements post-pandemic.

EXCEL

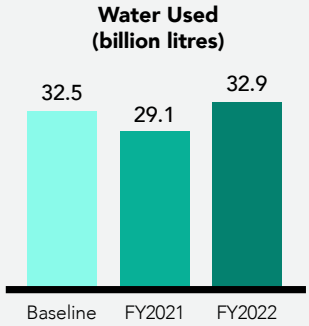
WATER

OUR GREENGOV.SG COMMITMENT

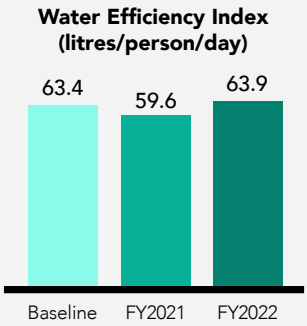
10% reduction in water use by 2030[5]

Key takeaways

The public sector's total water use and water used per person per day increased marginally in FY2022 compared to the baseline.[6] The increase was mainly due to a gradual re-opening of the economy and increase in activities, after almost two years of COVID-19 pandemic-related safe management measures.



1.2% increase in FY2022 from baseline



0.8% increase in FY2022 from baseline

OUR GREENGOV.SG STRATEGY

REDUCE	REPLACE	REUSE
• Improve water efficiency in building design and fittings	• Use non-potable water	• Reuse water across operations

HIGHLIGHTS

More than 300 buildings with Water Efficient Building certification

Replaced fittings with more efficient models

[5] Water use is in terms of water used per person per day.
[6] For water use, the average of FY2018-FY2020 was adopted as the baseline because we have historical records, and we want to better reflect hybrid working arrangements post-pandemic.

ENABLE

OUR GREENGOV.SG COMMITMENT

The public sector aims to promote a **green economy** and **green citizenry**, by embedding environmental sustainability into our core activities. We are doing so through our policies, procurement, and engagement programmes.

OUR GREENGOV.SG STRATEGY

GREEN ECONOMY

Incorporate environmental sustainability considerations into all government procurement by 2028

HIGHLIGHTS

Introduced environmental sustainability considerations for procurement across **nine categories of goods and services**

Announced that **up to 5% of evaluation points** will be set aside for environmental sustainability in **large construction and ICT tenders**

GREEN CITIZENRY

Embed environmental sustainability into public touchpoints and community-based programmes

HIGHLIGHTS

Engaged **800 citizens** in the Green Action for Communities movement to generate ideas for local sustainability initiatives

Supported **close to 200 projects** under the SG Eco Fund, which engaged **more than 300,000 people in total**

EXCITE

OUR GREENGOV.SG COMMITMENT

The public sector aims to build **capabilities** of public officers and a **culture** of sustainability, where public officers understand and are excited to contribute actively to environmental sustainability in Singapore.

OUR GREENGOV.SG STRATEGY

CAPABILITY BUILDING

Elevate environmental sustainability awareness and knowledge across the public sector

HIGHLIGHTS

Trained **more than 9,300 officers** on environmental sustainability topics such as carbon accounting, energy management and green finance

CULTURE BUILDING

Enable public officers to take environmental sustainability action in the workplace and as part of daily living

HIGHLIGHTS

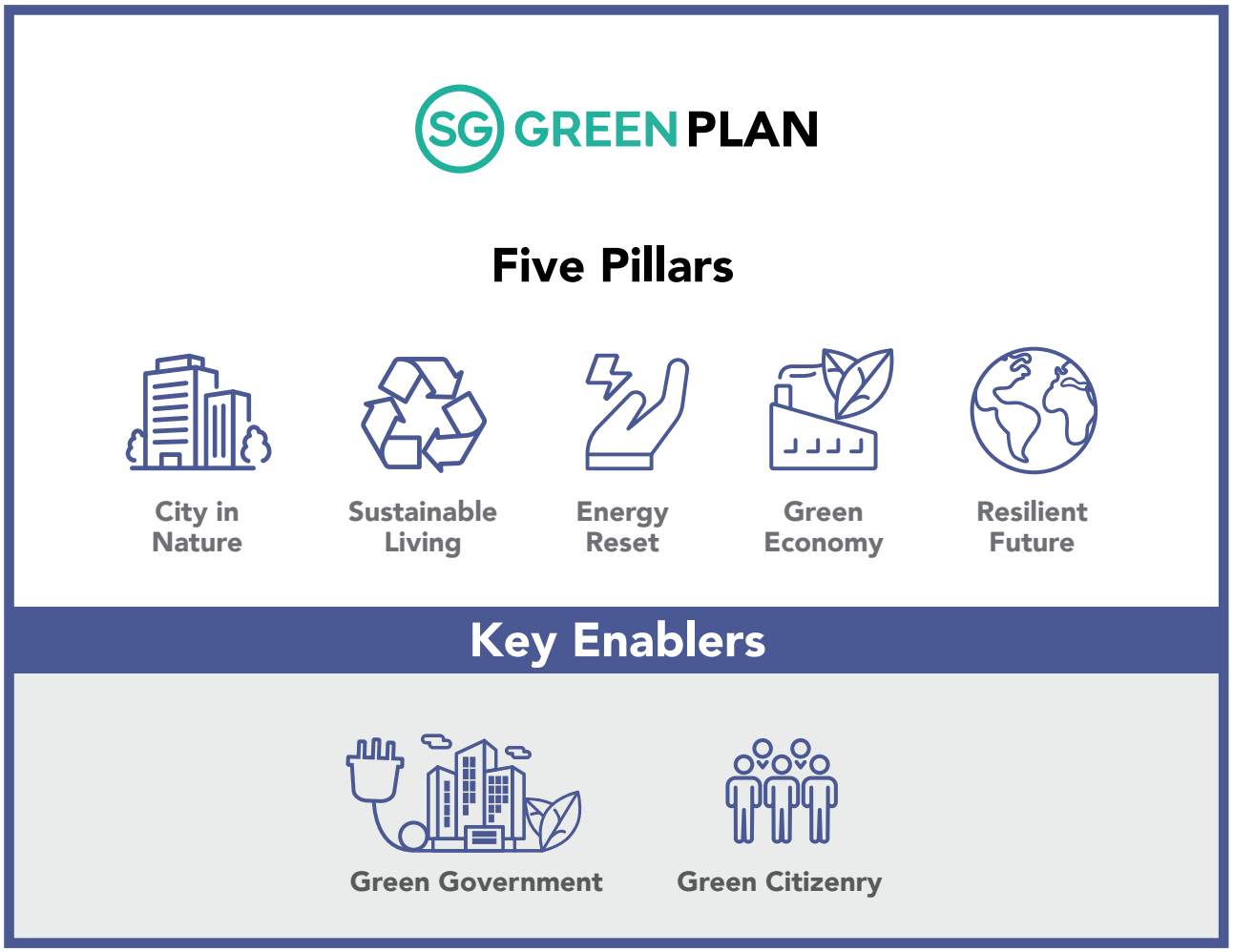
Engaged **more than 12,700 officers** on environmental sustainability through campaigns and events

4 INTRODUCTION

4.1 SINGAPORE'S COMMITMENT TO ENVIRONMENTAL SUSTAINABILITY

Sustainable development is not new to Singapore. We embraced it even before climate change became a global priority. We froze the growth rates for cars and motorcycles, set aside land for greenery in urban planning and closed the water loop by reclaiming used water.

Climate change remains a real and existential threat for Singapore. To strengthen our commitments under the United Nations 2030 Agenda for Sustainable Development and the Paris Agreement, we launched the Singapore Green Plan 2030 ("Green Plan") in February 2021. The Green Plan is a whole-of-nation movement to advance Singapore's national agenda on sustainable development.



APPROACH TO ADDRESSING CLIMATE RISKS

As a low-lying island state located in the tropics, Singapore faces significant risks arising from climate change. We must therefore adopt an anticipatory, effective, and adaptable approach to safeguard Singapore against the effects of climate change.

UNDERSTAND

Conduct climate research to derive insights applicable to Singapore and our region.

PREPARE

Develop plans to address the long-term impacts of rising sea levels, temperatures as well as extreme weather patterns, based on scientific findings.

ADAPT

Design flexible solutions that take into account inherent uncertainties in climate trajectories.

REVIEW

Examine plans regularly and ensure that they take into account the latest climate assessments, best practices, as well as maturity of new technological solutions.

4.2 GREENGOV.SG

The public sector recognises that it is in a good position to empower and enable sustainable change within the communities around us. In support of the Green Plan, we launched GreenGov.SG, our organisational sustainability movement, in July 2021.[7] Through this movement, the public sector strives to attain ambitious environmental sustainability targets in carbon abatement and resource efficiency, and be a positive influence and enabler of our long-term environmental sustainability transition.

Our GreenGov.SG efforts are categorised into three pillars - Excel, Enable and Excite. They are also mapped to the United Nations Sustainable Development Goals, to reflect where we can best create positive impact.[8] The subsequent chapters will elaborate on each of the pillars.

[7] GreenGov.SG builds on earlier efforts under the "Public Sector Taking the Lead in Environmental Sustainability" initiative.
[8] More information can be found in Appendix C.

EXCEL
with ambitious targets and practical strategies

Greenhouse Gas Emissions		Net zero emissions around 2045, after peaking emissions around 2025
Energy		Reduce energy use by 10% from the baseline by 2030[9]
Water		Reduce water use by 10% from the baseline by 2030[10]
Waste		Reduce waste disposed of by 30% from the baseline by 2030[11]

ENABLE
a green economy and green citizenry

Green Economy		Incorporate environmental sustainability considerations into all government procurement by 2028
Green Citizenry		Embed environmental sustainability into public touchpoints and community-based programmes

EXCITE
public officers to contribute actively to environmental sustainability in Singapore

Capability Building		Elevate environmental sustainability awareness and knowledge across the public sector
Culture Building		Enable public officers to take environmental sustainability action in the workplace and as part of daily living

Officers from the Singapore Police Force loosening the soil in preparation for tree-planting

[9] Energy use is energy used per unit area.
[10] Water use is water used per person per day.
[11] Waste disposed of is waste disposed of per person per day.

5 EXCEL

with ambitious targets and practical strategies

The "Excel" pillar sets out our targets to reduce our environmental footprint. We have identified greenhouse gas emissions, energy and water use, as well as waste disposed of, as key parameters for a start. This is given the urgency to address climate change. In addition, energy and water are key resources for our daily operations. It is therefore in our interest to ensure that these resources are used in a prudent and sustainable manner.

In this chapter, we have presented the public sector's performance data as a whole, as well as by categories.[12] We have grouped our assets into three broad categories, to facilitate understanding of how our resources are used.

CATEGORY	EXAMPLES OF PUBLIC ASSETS
Built Environment	Office buildings, schools and healthcare facilities
Mobility	Train stations, bus interchanges, air traffic control towers, public trains and buses
Utilities	Waste-to-energy, water and used water treatment plants

5.1. GREENHOUSE GAS EMISSIONS AND ENERGY

5.1.1. Performance

Singapore has committed to achieve net zero emissions by 2050. The public sector recognises that this transition demands ambitious and collective action. This is why we have taken the lead by committing to achieve net zero emissions earlier around 2045, after peaking emissions around 2025. In setting these targets, it is necessary to factor in the scale of public sector operations to meet the needs of Singapore's population and economy. We have also aligned the targets with key national plans.[13]

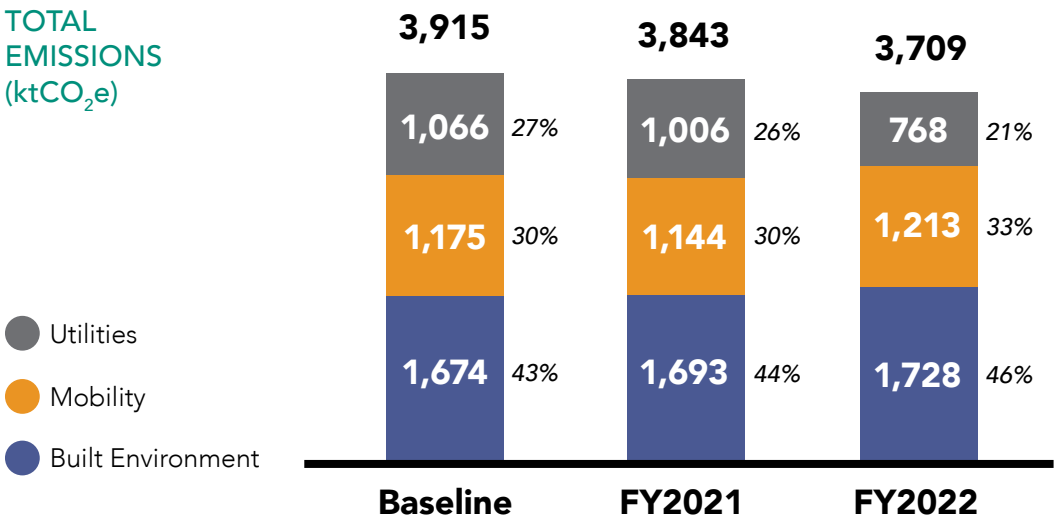
In FY2022, the public sector emitted 3.7 million tonnes of CO_2 equivalent. This comprises both Scope 1 and 2 emissions.[14] This figure was about 5.3% lower than the baseline.

The main reason for the overall decrease was the decommissioning of the Tuas Incineration Plant in early 2022. This reduction in Scope 1 emissions outweighed the increase in Scope 2 emissions that resulted from the normalisation of public sector operations, after almost two years of COVID-19 pandemic-related safe management measures.

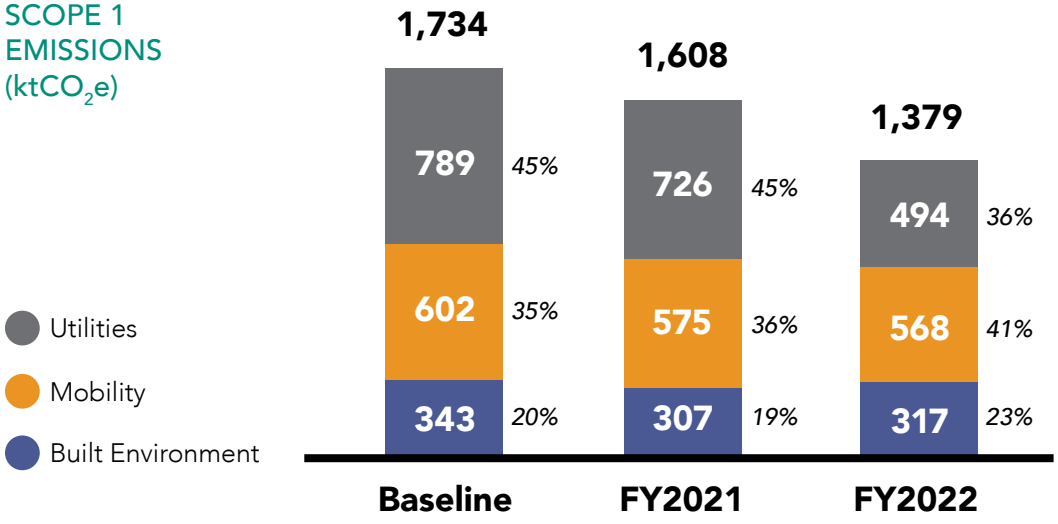
[12] A breakdown of the performance data by Ministry family can be found in Appendix A.
[13] Such as the decarbonisation of the national grid, as well as measures to divert waste from our waste-to-energy plants and landfill.
[14] Scope 1 emissions refer to direct greenhouse gas emissions from sources that are owned or controlled by an organisation, such as petrol and diesel. Scope 2 emissions refer to indirect emissions associated with the purchase of electricity, steam, heating and cooling.

We expect our emissions to increase in the near future and peak around 2025. This is in view that more activities will resume as the economy fully reopens. In addition, there are new major public infrastructure in the pipeline, such as transportation, healthcare, waste management and water treatment facilities. Nevertheless, national policies to improve building efficiency standards and reduce waste, along with low-carbon electricity imports, will lessen the overall impact. In the longer term, further emissions reduction can be achieved when technologies such as carbon capture, utilisation and storage are mature enough for adoption.

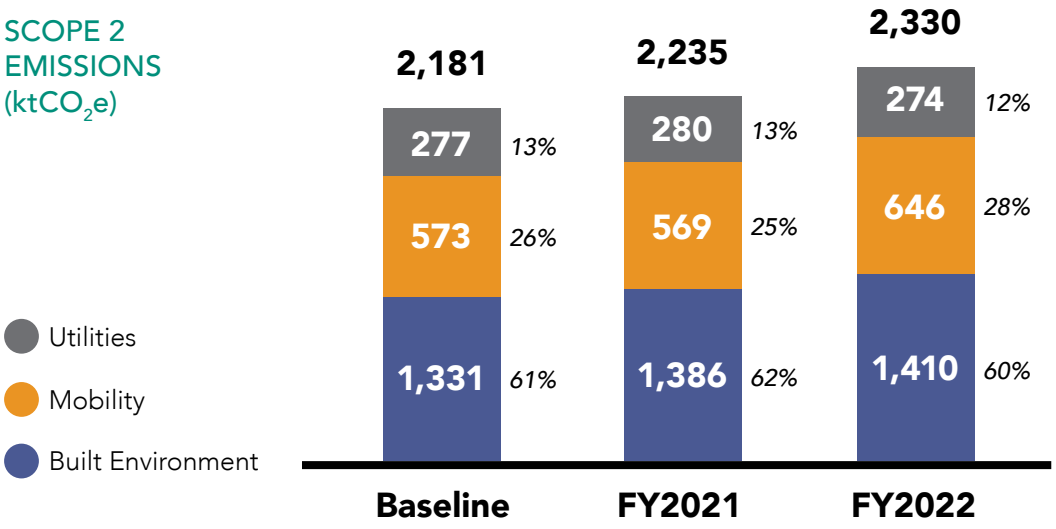
TOTAL EMISSIONS ($ktCO_2e$)



SCOPE 1 EMISSIONS ($ktCO_2e$)

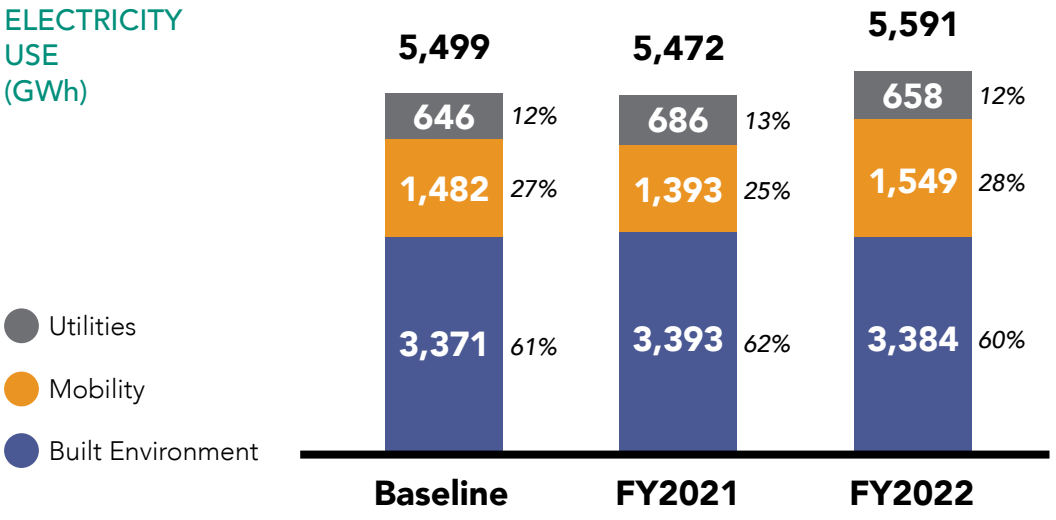


SCOPE 2 EMISSIONS ($ktCO_2e$)



The public sector's energy use refers to electricity use. In FY2022, the public sector used about 5,600 GWh of electricity, which was 1.7% higher than the baseline.[15] This was mainly due to the expansion of our public transport network and healthcare facilities.

ELECTRICITY USE (GWh)

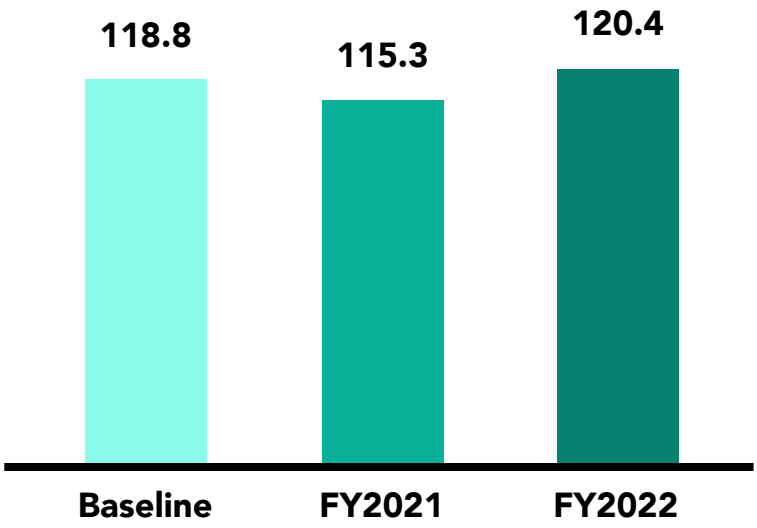


[15] 1 GWh = 1,000,000 kWh

We aim to reduce our Energy Utilisation Index ("EUI") by 10% by 2030, compared against the baseline.[16] This goal demonstrates our commitment to use energy more efficiently, thereby reducing our reliance on fossil fuels and emissions.

In FY2022, the EUI of the public sector was 120.4 kWh/m^2, 1.3% higher than the baseline. This was mainly due to the gradual reopening of the economy and increase in activities in FY2022. Nonetheless, this increase has been moderated by higher building efficiencies of our new healthcare and transport facilities and more solar installation across our premises.

ENERGY UTILISATION INDEX (kWh/m^2)



5.1.2. Strategy

The 3R framework "**Reduce**, **Replace** and **Remove**" underpins our decarbonisation strategy.

REDUCE

Reduce emissions from our operations

REPLACE

Replace our current energy source with low-carbon alternatives

REMOVE

Remove carbon by exploring new technologies

[16] EUI is energy used per unit area. It is used to assess the energy efficiency of buildings in the built environment.

REDUCE

Buildings account for over three quarters of public sector premises. Under GreenGov.SG, we have made **designing energy-efficient infrastructure** a key priority.

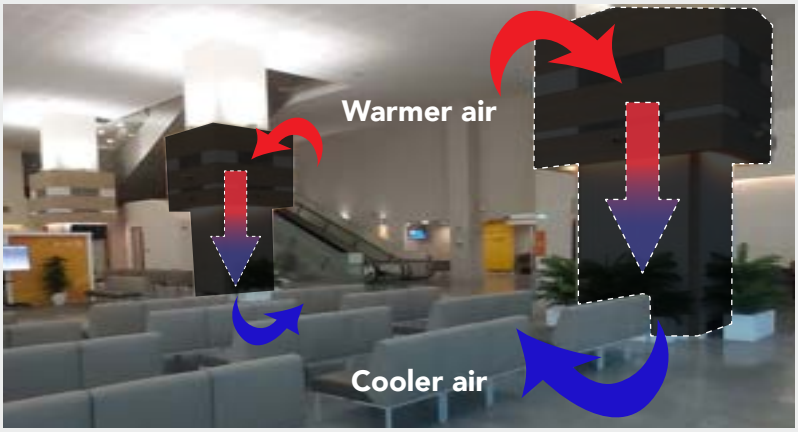
Since 2021, all new and existing public sector buildings that undergo major retrofitting are required to achieve Green Mark Platinum Super Low Energy ("SLE") standard. As of FY2022, 39 buildings have met or exceeded the standard. In doing so, they have achieved at least 60% energy savings when compared to 2005 levels. We expect more buildings to meet Green Mark Platinum SLE standard in the coming years.

In addition, to improve building energy efficiency, agencies have adopted various measures. These include:

- Adopting the Guaranteed Energy Savings Performance contracting model for chilled water plant retrofits.[17]
- Maintaining the ambient indoor air temperature at 25°C as far as possible.
- Reducing the number of lifts in operation during non-peak hours.
- Adopting energy-efficient appliances, such as lighting and air-conditioners.

Designing energy efficient premises

The Ministry of Manpower has deployed a passive displacement ventilation air-conditioning system at the multi-purpose hall and customer service area of their Services Centre. The system uses natural convection processes to channel cooled air directly to the floor level, avoiding the need to cool upper regions of the hall.[18] This system is about 10% to 15% more energy efficient compared to conventional top-throw systems, without any compromise on thermal comfort.



The Services Centre relies on natural convection for cooling

[17] A Guaranteed Energy Savings Performance contract is a framework in which an accredited Energy Services Company will conduct energy audits, implement energy conservation measures, maintain the equipment and guarantee energy savings throughout the contract.
[18] Natural convection processes are based on the principle that hot air rises and cold air sinks.

Designing buildings to meet best-in-class energy efficiency standards

The Building and Construction Authority ("BCA") has designed its Braddell Campus, comprising the Academic Tower, Zero Energy Plus Building and six other blocks to meet Green Mark Platinum SLE standard.

The Academic Tower uses a highly energy-efficient chiller with smart demand-controlled cooling system and lush overhanging vertical greenery to cool the building. With energy savings of up to 35%, the Academic Tower has won the ASEAN Energy Awards as an energy efficient building in the tropics.

Meanwhile, the Zero Energy Plus Building uses a smart hybrid cooling system that optimises the use of air-conditioning and ceiling fans. This allows room temperature settings to be raised from 24°C to 26°C, while maintaining thermal comfort. Lush vertical greenery and deep corridor shade further reduce the building's cooling requirements. Ceiling lights have been replaced by task lighting in the offices, while common areas are illuminated by sun pipes. With these energy reduction measures, rooftop solar panels generate enough electricity to supply more than 120% of the building's needs.

Lush overhanging vertical greenery reduces cooling needs of the Academic Tower

We are also seeking ways to **harness synergies across operations**. One such example is Tuas Nexus, where the co-location and integrated design of water reclamation and waste management systems enable higher energy efficiencies in material handling, energy production and water treatment. When operational from 2026, Tuas Nexus is expected to result in an annual reduction of more than 200,000 tonnes of carbon dioxide, equivalent to the emissions from powering 120,000 4-room Housing & Development Board ("HDB") flats annually.

REPLACE

We are also exploring ways to power our operations **using alternative low-carbon energy sources**.

We aim to have **100% of our cars run on cleaner energy by 2035.** We will switch from internal combustion engine to clean energy vehicles with zero tailpipe emissions for all new cars that are procured and registered, starting from FY2023.

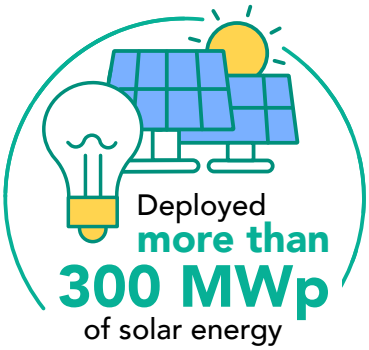
We are greening the rest of our vehicle fleet to the best of our abilities, subject to the availability of clean energy models for medium and heavy-duty vehicles. We will continue to monitor developments in this space and explore ways to spur the market.

Building our Electric Vehicle fleet and infrastructure

The Land Transport Authority ("LTA") is committed to having a 100% cleaner energy bus fleet by 2040. By 2030, electric buses are expected to make up half of our public bus fleet. As of FY2022, 60 buses have already been deployed.

To support the electrification of the public bus fleet, LTA is upgrading our bus infrastructure. Chargers have already been installed at Bulim, Seletar and Loyang Bus Depots, as well as Bedok and Bukit Panjang Integrated Transport Hubs. More bus depots will be progressively completed and commissioned in support of the 2040 target.

LTA is committed to having a 100% cleaner energy bus fleet by 2040



Solar energy is Singapore's most viable source of renewable energy. Our national target is to deploy at least 2 GWp by 2030. The public sector will support the national target, by **deploying at least 1.5 GWp of solar energy** by 2030. As of FY2022, we have deployed in total more than 300 MWp of solar energy, around 50% more than FY2020.

Encouraging solar deployment

The SolarNova programme has been developed to aggregate government demand for solar panels to achieve cost efficiencies. As of FY2022, approximately 3,300 HDB blocks and 161 public sector buildings have been installed with solar panels. Energy generated from the solar panels on HDB blocks is used to power common services such as lifts, lights and water pumps during the day, with excess energy channelled to the grid.

In addition, JTC Corporation ("JTC") has rolled out SolarRoof and SolarLand programmes to encourage solar deployment on Singapore's industrial building rooftops and temporary vacant industrial land respectively. Since the launch of these programmes, more than 60 buildings across JTC estates and 70 hectares of temporary vacant land have been awarded for solar deployment. Companies can participate in SolarRoof with zero capital outlay. In return, they enjoy discounted electricity rates from the power generated from their roof space, or reap a monetary benefit by leasing out their roof space for solar deployment. The SolarRoof Programme, which was initially launched to deploy solar panels on JTC's own properties' rooftops, has been extended to privately leased industrial properties since 2021.

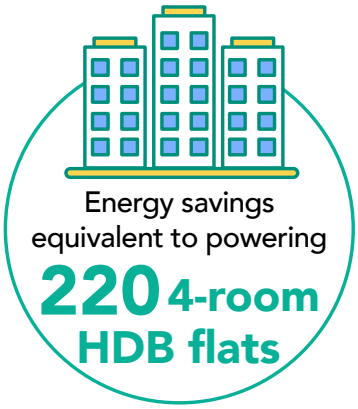
Solar panel installation at Benoi under the SolarLand programme

Leveraging solar energy at hospitals

Hospitals require hot water for sanitation, decontamination, sterilisation, food services and showering. Rather than deploying solar panels to generate electricity to power water heaters, Ng Teng Fong General Hospital and Jurong Community Hospital have installed solar evacuated tube collector systems that convert natural sunlight into a heat source to produce hot water more efficiently.

To date, these two hospitals have achieved more than 900,000 kWh of energy savings per year. These savings are sufficient to power the electricity needs of approximately 220 4-room HDB flats for an entire year.

Solar Evacuated Tube Collector System



More than 900,000 kWh of energy savings annually

Deploying solar-powered generators

Solar powered generators have been used by the Singapore Armed Forces' Maintenance & Engineering Support teams to replace diesel generators to charge equipment. Apart from solar-powered generators being lighter, troops do not need to carry large quantities of fuel. The batteries can be recharged during sunny days when there is no cloud cover.

The Singapore Armed Forces replaced their diesel generators with solar-powered generators to charge medical equipment

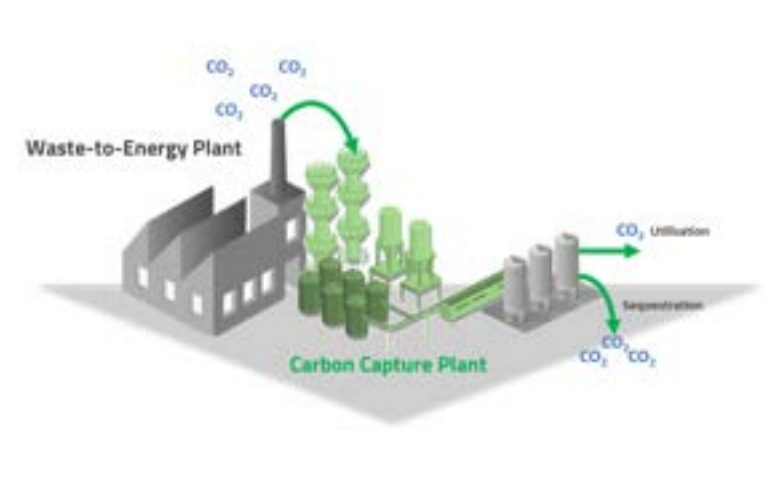
Electricity consumption is one of the major sources of our greenhouse gas emissions today. To reduce the emissions from our grid, we are **exploring low carbon electricity imports and studying emerging low-carbon technologies**, including hydrogen and advanced geothermal systems, as alternative energy sources.

REMOVE

We are **developing innovative solutions** such as carbon capture, utilisation and storage technology. This will address residual emissions from essential public services, such as waste incineration and used water treatment, which cannot be avoided immediately.

Carbon capture at waste-to-energy plants

The National Environment Agency ("NEA"), together with Keppel Seghers, is studying the feasibility of carbon capture at Singapore's waste-to-energy plants. Carbon capture at the plants will enable NEA to achieve net zero and potentially net negative carbon emissions for its waste-to-energy operations. NEA and Keppel Seghers will also explore opportunities for offtake and storage of captured carbon to close the carbon cycle loop, and look into the development of a pilot facility to validate the suitability of carbon capture technologies.



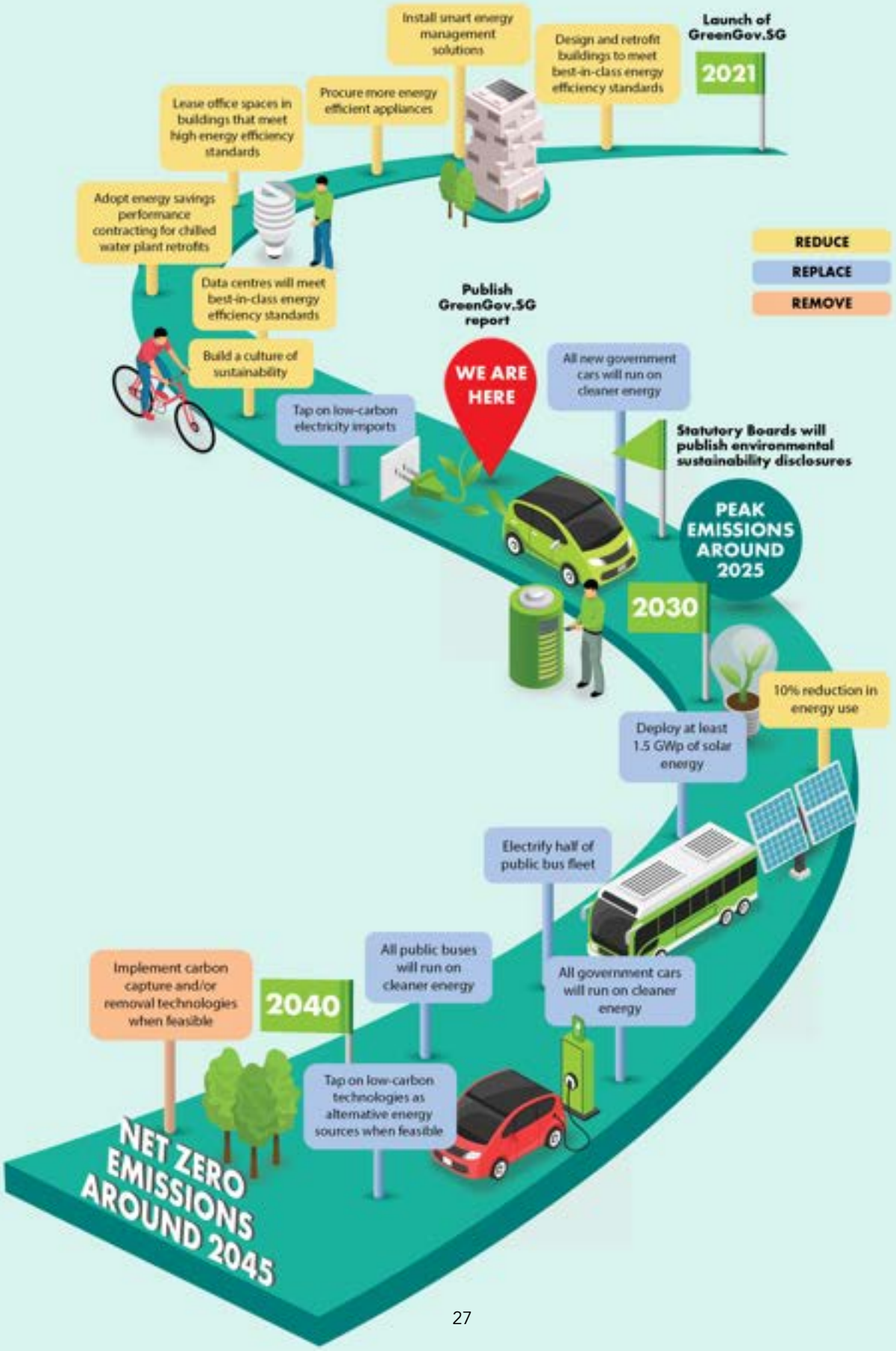
Illustrative process of carbon capture at a waste-to-energy plant

Seeking innovative technologies for carbon removal

PUB, Singapore's National Water Agency ("PUB"), in partnership with Equatic, is exploring desalination-integrated carbon dioxide removal through novel electrolysis technology. The carbonates extracted could potentially be used in applications such as construction. This process also yields hydrogen that can be used to supplement the overall energy requirements of the project.

NET ZERO ROADMAP

As we advance along our decarbonisation journey, we will continue to learn from others and incorporate suitable green solutions and technologies as they emerge.



Net Zero Government Initiative

Singapore is a member of the international Net Zero Government Initiative. Launched by the United States and Canada in 2022, participating countries shall commit to achieving net zero emissions from national government operations no later than 2050.

At this forum, Singapore shares best practices, showcases innovation and learns from other Governments, so that we can collectively adopt effective solutions to accelerate the achievement of net zero emissions.

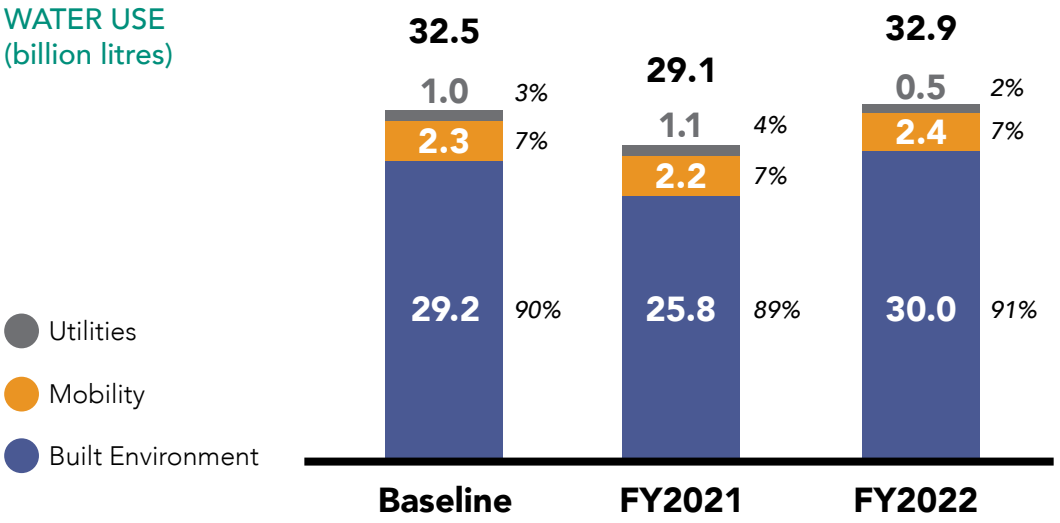
Minister for Sustainability and the Environment Ms Grace Fu at the launch of the Net Zero Government Initiative during the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change

5.2. WATER

5.2.1. Performance

In FY2022, the public sector used around 33 billion litres of water, a 1.2% increase from the baseline. The increase in water use was mainly due to an increase in activities across the public sector as the economy gradually reopened, increased use of school sports facilities by the public, as well as opening of new healthcare facilities.

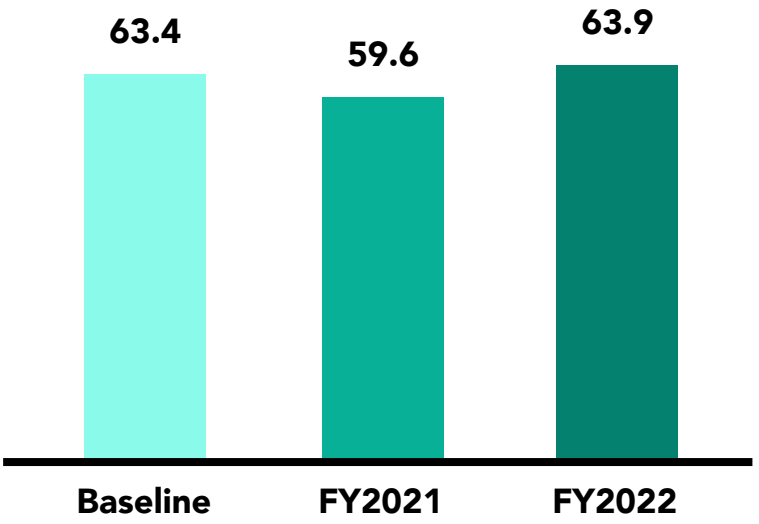
WATER USE (billion litres)



We have set a target to reduce our Water Efficiency Index ("WEI") by 10% by 2030, compared against the baseline.[19] By reducing the amount of potable water used, we not only conserve a finite resource but also minimise the energy needed for water treatment and distribution.

The WEI in FY2022 was 63.9 litres/person/day, which was 0.8% higher than the baseline. This was mainly due to an increase in activities with the gradual reopening of the economy in FY2022.

WATER EFFICIENCY INDEX (litres/person/day)



[19] WEI is water used per person per day. It is used to assess the water efficiency of buildings in the built environment.

5.2.2. Strategy

REDUCE

Improving the water efficiency of our premises is a key priority. All new and existing premises undergoing replacement are to install water fittings that have at least 3-ticks rating under the Water Efficiency Labelling Scheme.

PUB's Water Efficient Building ("WEB") (Basic) Certification encourages adoption of water efficient measures in premises and processes. By installing water efficient fittings and adopting the WEB recommendations, premises can save about 5% of their monthly water consumption.

Agencies are also exploring more ways to enhance their water efficiency. For example, some have adopted practices that are less water intensive, while others have installed smart metering systems to monitor consumption and optimise usage.

Reducing water consumption in hospitals

The Sengkang General Hospital kitchen used to thaw frozen food products under running water four times daily. To reduce water usage, the team pivoted to thawing frozen products with existing chillers in July 2022.

This switch resulted in annual savings of 657,000 litres of water. It also improves food safety control, as temperature is better controlled, and reduces cross contamination risks during the entire food preparation process.

Employing smart utilities metering systems in military camps

Smart utilities metering systems have been installed in Jurong Camp, Paya Lebar Air Base and Changi Naval Base. Real-time utilities data is presented on a dashboard, allowing unit commanders to monitor and assess their unit's consumption levels. Having visibility of their utilities has instilled in officers a sense of ownership and spurred them to take action to reduce their utilities consumption. In addition, the units are able to analyse the data to detect anomalies such as water leaks and intervene more promptly.

Smart utilities metering systems to encourage military units to reduce their utilities consumption

REPLACE

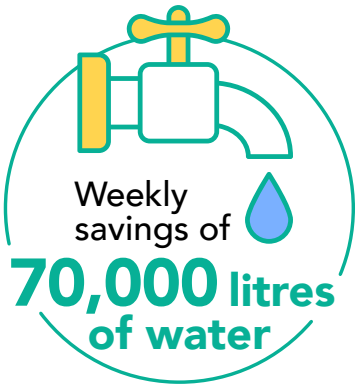
To achieve our water utilisation target, we also look for opportunities to **replace potable water with non-potable water**, such as for irrigation, general washing and cooling.

Use of rainwater collection for irrigation

At the Ministry of Foreign Affairs, smart sensors have been installed and rainwater is collected in special tanks. In the absence of rain, the irrigation systems will be turned on and the collected rainwater will be used to water the plants and trees around the compound.

REUSE

Potable water that is clean enough after one-time use can be reused for non-potable use like manufacturing processes, in cooling towers and toilet flushing. Agencies are exploring ways to **reuse water** across their operations.



Reusing water for firefighting tests

As part of their operations, the Singapore Civil Defence Force conducts routine tests on their pumps, nozzles, and other water delivery equipment. During these tests, water that is discharged from the hydrants goes into the drainage system.

To reduce the amount of water used for such routine tests, they modified Intermediate Bulk Containers which would have been discarded, to store the water that is discharged from the hydrants. The water is then rechannelled back into the fire engine's water tank via a pump.

This is estimated to save about 70,000 litres of water every week. It has also successfully diverted 1,150 kg of plastic waste away from Semakau landfill.

5.3. WASTE

By 2030, we aim to reduce the amount of waste disposed of by 30%, compared against the baseline. By reducing the amount of waste disposed of, we help to extend the lifespan of our only landfill at Semakau Island and reduce the operational load on our waste-to-energy plants, thereby helping to reduce emissions.

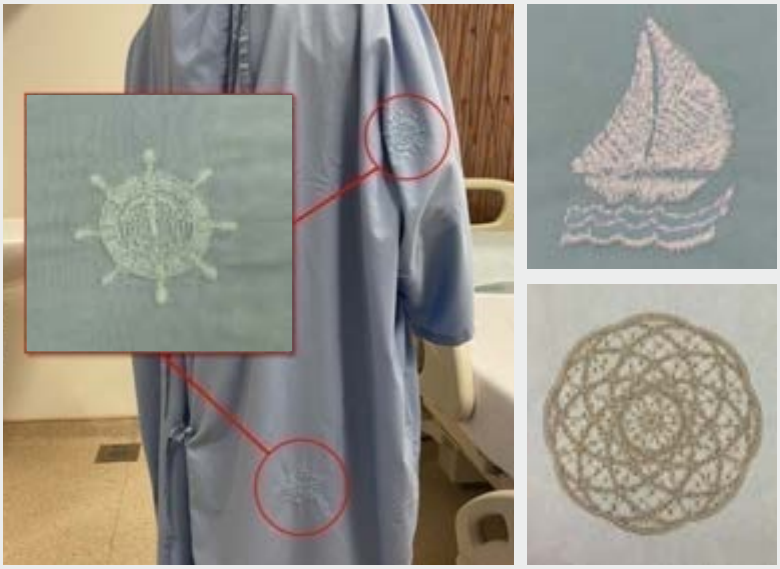
We recognise the importance of implementing upstream measures to manage our waste generation. To that end, we have rolled out several initiatives and operational management policies. These are centred on circular economy principles and limiting waste generation.

REDUCE

To meet our waste reduction target, we are prioritising the **reduction of single-use items**. For example, we are phasing out the use of bottled water for meetings organised within public sector premises. In addition, public agencies have been working with food and beverage outlets in public sector premises to phase out disposables for dine-in meals as far as possible.

Reducing waste in hospitals

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



Examples of embroidery patterns used to repair damaged linen

REUSE

Agencies are also encouraged to **develop new applications** for what would typically have been considered as waste. For example, they may reuse existing items to extend their lifespan and/or donate them to charitable or non-profit organisations. Some are also thinking out of the box and have come up with creative ways to repurpose waste.

Repurposing decommissioned fire hoses and personal protective equipment

The Singapore Civil Defence Force ("SCDF") has been actively repurposing decommissioned fire hoses and equipment. This not only helps to minimise waste, but also inculcates a sense of environmental responsibility. In 2021, a group of officers started a ground-up initiative to upcycle retired fire hoses and personal protective gears, creating exquisite, handcrafted products such as wallets, luggage tags and pouches that are given to delegates and guests of SCDF. The team has also conducted introductory workshops for over 200 participants, spreading the sustainability message and imparting practical skills across the organisation.

SCDF also collaborates with local and overseas organisations to repurpose decommissioned fire hoses into park fences and enrichment devices for animals. Their partners include National Parks Board, S.E.A. Aquarium at Resorts World Sentosa, Mandai Wildlife Reserve and the Sumatran Orangutan Conservation Programme. These partnerships not only amplify SCDF's sustainability efforts but also foster a sense of unity and shared responsibility in the community.

Repurposed fire hoses as fences at Coney Island

Retired fire hoses have been repurposed into enrichment devices for animals and donated to Mandai Wildlife Reserve

RECYCLE

Recycling is also an important part of our waste management strategy. All building owners are required to **implement recycling programmes** and ensure that there are recycling bins in their premises or in the vicinity. In addition, starting from 2024, all building owners are to ensure that food waste is separated and treated.

Deployment of onsite food waste digesters at Pasir Panjang Wholesale Centre

The Singapore Food Agency has deployed five units of onsite food waste digesters at Pasir Panjang Wholesale Centre. These digesters convert organic waste (food and horticulture waste) into compost for landscaping needs, therein recycling around 16,800 tonnes of waste annually.

The use of onsite digestors have also helped to cut down the food waste haulage frequency and tonnage, leading to cost and manpower savings.

Food and horticulture waste is converted into compost through a food waste digester at Pasir Panjang Wholesale Centre

6 ENABLE

a green economy and green citizenry

6.1. GREEN ECONOMY

Under the Enable pillar, the public sector aims to promote a **green economy** and **green citizenry** by embedding environmental sustainability into our core activities. This contributes to the building of our green social compact where everyone plays an important role in our shared mission to build a greener and more sustainable Singapore. We are doing so through our policies, procurement and engagement programmes.

Given that the public sector is a major purchaser of goods and services for some sectors, we can play a key role in encouraging industries to provide greener solutions.

Since 2007, the Government has introduced resource efficiency and environmental sustainability requirements for the goods and services we buy. We have done so for purchases across nine categories:

a. Accommodation and event venues
b. Building design and building products
c. Electrical and electronic equipment
d. Information and communications technology ("ICT") equipment
e. Landscaping
f. Printing paper
g. Public waste collection and cleaning services
h. Vehicles
i. Water fittings and equipment

Our goal is to **include environmental sustainability considerations in all Government procurement by 2028**. For example, we may consider whether the suppliers have used a higher proportion of recycled material in the packaging, or if they have disclosed their emissions footprint. In FY2024, large construction and ICT tenders will set aside up to 5% of evaluation points for environmental sustainability. These sectors make up more than 60% of the value of Government procurement contracts. We will continue to include additional environmental sustainability considerations for purchases in other sectors, where applicable.

Embedding green procurement within the public sector

To enjoy economies of scale, the public sector establishes demand aggregation contracts to facilitate collective purchases of common goods and services. These contracts are awarded to multiple suppliers and are a useful vehicle to signal to suppliers our demand for greener goods and services.

We have set aside evaluation points for environmental sustainability in some of these demand aggregation contracts. For example, for event venues, furniture and cleaning services contracts, up to 10% of evaluation points was set aside for tenderers who have done sustainability reporting, met sustainability standards, or are able to provide products with environmental sustainability certification.

6.2 GREEN CITIZENRY

The public sector will enable a green citizenry by **embedding environmental sustainability into our public touchpoints and community-based programmes**. We are doing this in partnership with the community, with the larger goal to co-create community touchpoints and events, and rally citizens to make environmental sustainability a way of life.

Environmental sustainability in public libraries

Choa Chu Kang Public Library has incorporated environmental sustainability features into its space and programmes. These include:

a. Green Grove: Hydroponics Showcase

This is a corner designated to help build environmental sustainability knowledge. It consists of the Hydroponics Showcase and the Climate Action Corner, which displays climate-related information aimed at inspiring viewers to take climate action.

The Hydroponics Showcase aims to foster interest in food security issues and inspire urban farming solutions among patrons

b. Nature Wall

This area features an array of natural history books, botanical prints and plantation photographs from the National Library, Singapore, and the Muséum national d'Histoire naturelle, Paris.

c. Green Market

This annual family-friendly event aims to promote sustainable living at a community level, by connecting the community to green groups and showcasing initiatives which they can support.

Families learning about environmental sustainability at the Green Market

Eco Stewardship Programme

The Eco Stewardship Programme is designed to nurture generations of Singaporeans to be stewards of the environment. Through this programme, schools adopt an integrative, whole-school approach towards environmental sustainability education via the 4Cs – Curriculum, Culture, Community and Campus. This strengthens existing efforts in schools.

Curriculum

The Humanities, Science, Food and Consumer Education, and Character and Citizenship Education curricula have been refreshed to enhance the teaching and learning of environmental sustainability concepts. Digital and hands-on learning resources have been developed to make learning more authentic.

Culture

Students are encouraged to adopt sustainability practices such as saving energy and water, and reducing food waste, as daily habits in schools. To facilitate the sharing of good practices, an Eco Stewardship Programme Toolkit has been developed.

Community

MOE has curated and forged industry and community partnerships to increase opportunities and enhance learning experiences of students and educators in environmental sustainability education through community action. For example, educators have the opportunity to attend industry sharing sessions and learning journeys relating to the green economy and bring back relevant knowledge to the classroom.

Campus

School campuses have been progressively enhanced with environmental sustainability features such as solar panels and energy-efficient LED lights.

Schools use solar educational kits to help students learn about solar energy and electricity generation

Students are encouraged to practise eco-friendly habits such as reducing and recycling food waste, as part of their daily activities in schools

Promoting natural climate solutions and biodiversity

In 2021, Gardens by the Bay launched the new Kingfisher Wetlands, which connects two existing water bodies - the Lotus Pond and Kingfisher Lake. This integration saw an improvement in water quality and circulation that created new microhabitats for biodiversity to flourish. Over 200 mangroves were also planted to offer Kingfisher Wetlands as a living and learning space for studying the potential of nature-based climate solutions and biodiversity supported within an urban landscape.

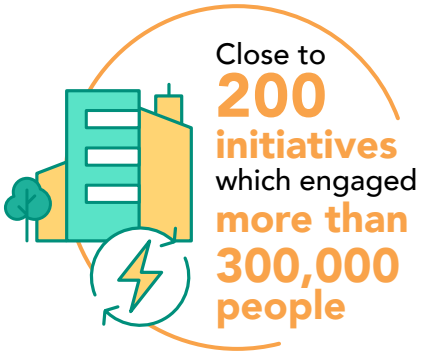
Activities such as mangrove planting sessions, citizen science monitoring activities and public lectures were organised to raise public awareness on blue carbon capture and the potential of nature-based solutions. These activities helped to foster a sense of community ownership in advancing environmental sustainability.

Students and members of public were involved as citizen scientists in collecting data to monitor the health and growth of planted mangroves

Co-creating solutions with citizens

To promote greater community ownership, the Ministry of Sustainability and the Environment, Ministry of National Development and Ministry of Culture, Community and Youth, with support from People's Association and other Green Plan agencies, launched the Green Action for Communities ("GAC") movement in 2022. This nationwide movement brought together community leaders and residents to plan, organise and co-implement sustainability initiatives in local communities, in support of the Green Plan. Through a nationwide series of capacity building workshops and deep dives, 800 GAC group members developed community action plans in neighbourhoods across Singapore. They came up with initiatives such as engaging students to promote townwide composting of food waste in Choa Chu Kang, involving Nee Soon East residents to build a community playground using discarded materials, and setting up a sustainability hub at Kampong Chai Chee to engage residents.

GAC deep dives brought together residents and volunteers to spark green ideas for their communities



SG Eco Fund

The SG Eco Fund was set up in 2020 to support projects that advance environmental sustainability and involve the community in Singapore. The Fund enables eligible individuals, community groups and organisations to build an environmentally sustainable Singapore together. As of FY2022, the SG Eco Fund has supported close to 200 environmental sustainability initiatives across a broad range of topics, such as waste reduction and recycling, community growing of food and conservation of nature and biodiversity. Through these initiatives, more than 300,000 people were engaged on environmental sustainability.

One example of an SG Eco Fund project is the "I Love Tampines" project by Semula Pte Ltd. The project involves conducting plastic collection drives and hands-on plastic upcycling workshops to educate and engage residents in converting plastic waste into usable items.

Participants at Semula's plastic upcycling workshop at a senior activity centre

7 EXCITE

public officers to contribute actively to environmental sustainability in Singapore

Public officers are the building blocks of the public sector. To achieve our GreenGov.SG targets, we have been on a journey to educate and empower all public officers. Through our efforts, we aim to build **capabilities** of public officers and a **culture** of sustainability, where public officers understand and are excited to contribute actively to environmental sustainability in Singapore.

7.1 CAPABILITY BUILDING

The public sector aims to **elevate environmental sustainability awareness and knowledge among public officers**. We organise regular Communities of Practice sessions where subject matter experts share their knowledge on a variety of topics, ranging from building energy management and carbon accounting to food waste management and solar energy. These sessions promote a learning culture within the public sector, where ideas and knowledge can be shared between public officers from various job functions.

In addition, we encourage public officers to attend environmental sustainability-related training. We have trained more than 9,300 public officers on topics such as building energy management, water efficiency, carbon accounting and sustainability reporting. We have also worked with various training partners to design courses on environmental sustainability.

Environmental sustainability course for public officers

In 2022, the Ministry of Sustainability and the Environment, and the National Climate Change Secretariat partnered the National University of Singapore Centre of Nature-Based Climate Solutions to pilot an executive-level environmental sustainability course. This course aims to equip relevant public officers with the necessary skill sets to develop and implement policies related to environmental sustainability.

Participants are required to work on case studies on environmental sustainability and present their proposals

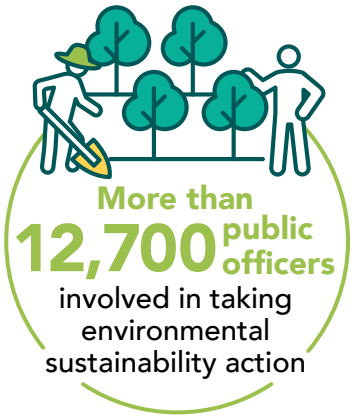
Building capabilities on emissions management

The Singapore Arts Museum is the first cultural institution in Singapore to have participated in the LowCarbonSG programme. LowCarbonSG is an 18-month capability building programme led by Carbon Pricing Leadership Coalition Singapore. Through this programme, participants learn how to measure, monitor and reduce their emissions.

7.2 CULTURE BUILDING

On top of building competencies, the public sector also aims to **enable public officers to take environmental sustainability action in the workplace and as part of daily living.**

In 2021, the public sector organised a month-long Bring-Your-Own campaign. The aim was to demonstrate how going green could be as simple as refusing single-use disposables. The campaign educated public officers on the amount of waste generated in Singapore and why there was an urgent need to tackle it.



In 2022, we set up the Sustainability Ambassadors Network. This is a platform for public officers to come together, learn more about environmental sustainability and take action. Some of the topics that have been discussed include how they can go car-lite, adopt a plant-based diet, or upcycle unwanted items.

To further encourage public officers to incorporate environmental sustainability into their work environment and adopt daily habits, agencies have embarked on creative ways to engage their officers and build a sustainability culture, involving more than 12,700 public officers in total.

Engaging employees through environmental sustainability activities

The Singapore Police Force ("SPF") units are encouraged to participate in at least one environmental sustainability activity annually. This could be coastal or park clean-ups, upcycling workshops, tree-planting and recycling drives. Through these activities, SPF officers learn about the importance of environmental sustainability and get to play an active role in caring for the environment. As a bonus, these activities also help to boost employee engagement.

SPF officers doing their part for the environment through activities such as tree-planting and litter picking

Encouraging daily environmental sustainability practices

To build a sustainability culture, the Ministry of Social and Family Development ("MSF") introduced the following initiatives:

a. Stipulated the use of non-disposable ware at events

b. Encouraged BYO (bring-your-own) mugs

c. Encouraged e-copies and e-name cards, instead of printing these items

d. Implemented an e-orientation programme to guide new officers on green practices

e. Implemented timer switches to automatically switch off equipment such as televisions and laptops

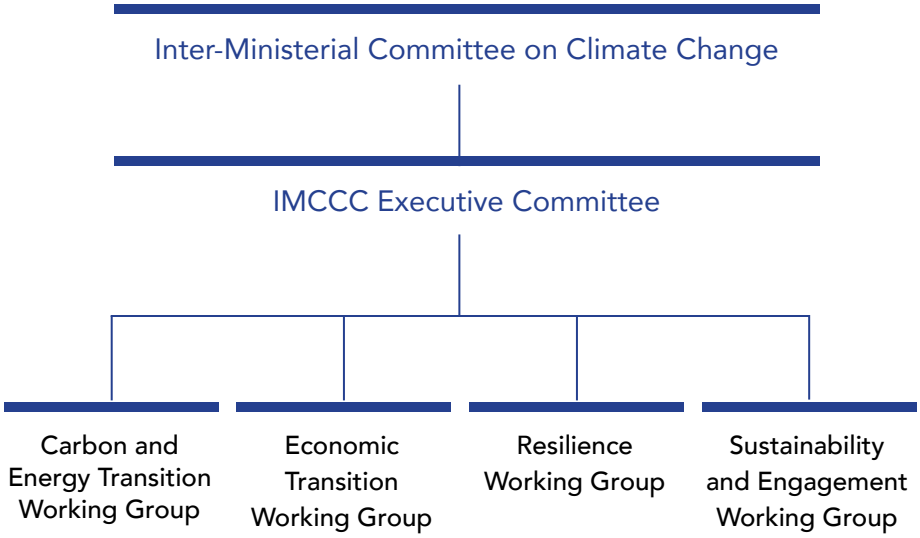
f. Sent regular reminders and electronic direct messages to educate staff on the importance of environmental sustainability and the best practices to adopt to make the workplace greener

As part of the MSF Nature Walk Challenge 2022, MSF officers created maps of nature trails to encourage fellow colleagues to appreciate nature

8 GOVERNANCE

Given the scale of our operations, spearheading sustainability across the public sector requires a coordinated approach that is supported by strong leadership. This is important, as good governance provides strategic direction and ensures accountability across our agencies towards the realisation of the targets set.

The Inter-Ministerial Committee on Climate Change ("IMCCC") enhances coordination on climate change policies across the public sector to ensure that Singapore is prepared for the impacts of climate change.



The IMCCC was established in 2007. It currently comprises the following members:

- **Mr Teo Chee Hean (Chair)**
  Senior Minister and Coordinating Minister for National Security
- **Mr Lawrence Wong**
  Deputy Prime Minister, Minister for Finance and Minister-in-charge of Strategy Group
- **Dr Vivian Balakrishnan**
  Minister for Foreign Affairs
- **Mr Gan Kim Yong**
  Minister for Trade and Industry
- **Ms Grace Fu**
  Minister for Sustainability and the Environment
- **Mr Desmond Lee**
  Minister for National Development
- **Ms Indranee Rajah**
  Minister, Prime Minister's Office, Second Minister for Finance and Second Minister for National Development

To support the IMCCC's work, the IMCCC Executive Committee ("Exco") and various Working Groups have been established. The IMCCC Exco comprises the Permanent Secretaries, Managing Directors, Chairmen and Chief Executives of the relevant Ministries and Statutory Boards.

The IMCCC Exco oversees the Working Groups. The Working Groups and their responsibilities are as follows:

Carbon and Energy Transition Working Group

The Carbon and Energy Transition Working Group oversees mitigation measures and develops plans to enable Singapore's transition to a low-carbon and clean energy future.

Economic Transition Working Group

The Economic Transition Working Group oversees plans to transform Singapore's economy and develop new green growth areas.

Resilience Working Group

The Resilience Working Group studies Singapore's vulnerability to the effects of climate change and develops long-term plans aimed at safeguarding the nation's resilience to future environmental changes.

Sustainability and Engagement Working Group

The Sustainability and Engagement Working Group develops plans to drive the national sustainability agenda. This includes GreenGov.SG, capability building efforts, as well as domestic and international engagement programmes.

We have also established the position of Government Chief Sustainability Officer ("GCSO") to better drive our governmental sustainability efforts. The GCSO works with public agencies to develop plans aimed at realising a sustainable, resource-efficient and climate-resilient Singapore, and spearheads the Government's partnership with various stakeholders, including businesses, civil society partners and individuals. The GCSO also partners the Chief Sustainability Officers of public agencies to develop and coordinate strategies for GreenGov.SG.

9. APPENDIX A – Performance Data

9.1. GENERAL INFORMATION

9.1.1. Boundaries

The performance data presented in this report includes all Ministries, Organs of State and Statutory Boards. The current year is defined as FY2022, which runs from 1 April 2022 to 31 March 2023. The assets in scope are limited to those located in Singapore, and includes premises funded and/or managed by Government agencies.

In this appendix, we have provided a breakdown of the performance data by the following Ministry families:

- Ministry of Communications and Information ("MCI")
- Ministry of Culture, Community and Youth ("MCCY")
- Ministry of Defence ("MINDEF")
- Ministry of Education ("MOE")
- Ministry of Finance ("MOF")
- Ministry of Foreign Affairs ("MFA")
- Ministry of Health ("MOH")
- Ministry of Home Affairs ("MHA")
- Ministry of Law ("MINLAW")
- Ministry of Manpower ("MOM")
- Ministry of National Development ("MND")
- Ministry of Social and Family Development ("MSF")
- Ministry of Sustainability and the Environment ("MSE")
- Ministry of Trade and Industry ("MTI")
- Ministry of Transport ("MOT")
- Prime Minister's Office ("PMO")
- Organs of State[20] ("OOS")

9.1.2. Utilities Consumption Data

All utilities consumption by public sector agencies is generally accounted for. If a public sector building is occupied by multiple public sector agencies, the consumption is generally attributed to the public sector agency which is the building landlord. Where feasible, the consumption of private sector tenants is excluded, as they do not fall under the scope of GreenGov.SG. If a public sector agency is located in a private sector building, the consumption is generally accounted for, if measured data of the utilities can be obtained.

9.1.3. Data Verification

As part of the preparation of data for GreenGov.SG environmental performance indicators, we engaged a consultant to provide recommendations on our data consolidation process and calculation methodologies.

[20] Includes the Judiciary, Parliament, the Attorney General's Chambers and the Auditor-General's Office.

9.2. GREENHOUSE GAS EMISSIONS AND ENERGY

9.2.1. Baseline

The public sector aims to peak our emissions around 2025 and achieve net zero emissions around 2045. We have taken FY2020 to be the baseline year for emissions, as this was when we began to systematically collect emissions data.

The public sector has set a target to improve EUI by 10% by 2030 from the average of FY2018 to FY2020. This baseline was chosen because we have the historical records and we want to better reflect hybrid working arrangements post-pandemic.

9.2.2. Total Emissions (Scope 1 and 2)

The public sector's total Scope 1 and 2 emissions for FY2022 was 3,709,041 tCO_2e. There was a 5.3% decrease compared to the baseline, mainly due to the decommissioning of the Tuas Incineration Plant. This reduction outweighed the increase in emissions seen across other Ministry families, with the gradual reopening of the economy and increase in activities in FY2022.

Table 1: Scope 1 and 2 emissions by Ministry family

Ministry family	Baseline (tCO_2e)	FY2021 (tCO_2e)	FY2022 (tCO_2e)	Change from baseline to FY2022
MCI	13,815	14,839	14,874	7.7%
MCCY	56,634	64,895	64,876	14.6%
MINDEF	512,534	472,590	478,592	-6.6%
MOE	410,387	432,059	441,501	7.6%
MOF	17,425	15,851	17,301	-0.7%
MFA	2,973	3,043	2,943	-1.0%
MOH	274,499	290,546	291,247	6.1%
MHA	156,619	161,854	159,549	1.9%
MINLAW	3,177	3,402	3,447	8.5%
MOM	8,336	7,995	8,607	3.3%
MND	47,911	48,163	51,840	8.2%
MSF	6,923	7,043	6,966	0.6%
MSE	1,089,595	1,031,421	793,722	-27.2%
MTI	99,817	104,254	115,891	16.1%
MOT	1,185,802	1,155,258	1,225,684	3.4%
PMO	19,028	20,447	22,847	20.1%
OOS	9,432	9,610	9,154	-2.9%
TOTAL	**3,914,907**	**3,843,270**	**3,709,041**	**-5.3%**

9.2.3. Scope 1 Emissions

The public sector's total Scope 1 emissions for FY2022 was 1,378,838 tCO_2e, a 20.5% decrease compared to the baseline. This was mainly due to the decommissioning of the Tuas Incineration Plant. The large drop in emissions outweighed the increase seen across Ministry families, as the economy gradually reopened and activities increased in FY2022.

Table 2: Scope 1 emissions by Ministry family

Ministry family	Baseline (tCO_2e)	FY2021 (tCO_2e)	FY2022 (tCO_2e)	Change from baseline to FY2022
MCI	15	17	15	<0.1%
MCCY	1,123	1,052	1,149	2.3%
MINDEF	290,863	248,443	253,494	-12.8%
MOE	721	1,087	680	-5.7%
MOF	159	139	182	14.5%
MFA	19	17	15	-21.1%
MOH	1,414	1,276	2,092	47.9%
MHA	40,911	45,960	49,458	20.9%
MINLAW	2	4	4	100.0%
MOM	74	152	153	106.8%
MND	42	30	26	-38.1%
MSF	427	344	272	-36.3%
MSE[21]	795,618	732,867	501,261	-37.0%
MTI	511	1,159	832	62.8%
MOT	602,095	575,094	569,155	-5.5%
PMO	288	237	39	-86.5%
OOS	16	16	11	-31.3%
TOTAL	**1,734,298**	**1,607,894**	**1,378,838**	**-20.5%**

[21] MSE's Scope 1 emissions include emissions from NEA's waste-to-energy plants, which generate electricity during the waste incineration process. Any excess electricity generated that is not used by the plant is sold to the electricity grid. There is a small amount of double counting of emissions, as the emissions generated from producing electricity is accounted under MSE's Scope 1 emissions and in the Grid Emission Factor, which affect Ministries' Scope 2 emissions. Around 3% of electricity from the grid is generated by waste-to-energy plants.

9.2.4. Scope 2 Emissions

The public sector's total Scope 2 emissions for FY2022 was 2,330,203 tCO_2e, a 6.9% increase compared to the baseline. This was due to a gradual normalisation of economic and social activities, the opening of new healthcare facilities and MRT stations, and an increase in electric bus deployment. The increase in our Scope 2 emissions was also partially attributable to a 2.3% increase in the national Grid Emission Factor ("GEF"), which rose from 0.4074 kg CO_2/kWh in FY2020 to 0.4168 kg CO_2/kWh in FY2022. The increase in GEF was mainly because of an increase in diesel consumption, as natural gas markets worldwide tightened in 2022.

Table 3: Scope 2 emissions by Ministry family

Ministry family	Baseline (tCO_2e)	FY2021 (tCO_2e)	FY2022 (tCO_2e)	Change from baseline to FY2022
MCI	13,800	14,822	14,859	7.7%
MCCY	55,511	63,843	63,727	14.8%
MINDEF	221,671	224,147	225,098	1.5%
MOE	409,666	430,972	440,821	7.6%
MOF	17,266	15,712	17,119	-0.9%
MFA	2,954	3,026	2,928	-0.9%
MOH	273,085	289,270	289,155	5.9%
MHA	115,708	115,894	110,091	-4.9%
MINLAW	3,175	3,398	3,443	8.4%
MOM	8,262	7,843	8,454	2.3%
MND	47,869	48,133	51,814	8.2%
MSF	6,496	6,699	6,694	3.0%
MSE	293,977	298,554	292,461	-0.5%
MTI	99,306	103,095	115,059	15.9%
MOT	583,707	580,164	656,529	12.5%
PMO	18,740	20,210	22,808	21.7%
OOS	9,416	9,594	9,143	-2.9%
TOTAL	**2,180,609**	**2,235,376**	**2,330,203**	**6.9%**

9.2.5. Electricity Use

The public sector's electricity use in FY2022 was 5,590,700,505 kWh, a 1.7% increase compared to our baseline. This was mainly due to a gradual normalisation of economic and social activities, opening of new healthcare facilities and MRT stations, and an increase in electric bus deployment.

Table 4: Electricity use by Ministry family

Ministry family	Baseline (kWh)	FY2021 (kWh)	FY2022 (kWh)	Change from baseline to FY2022
MCI	37,470,395	36,282,932	35,649,343	-4.9%
MCCY	152,399,741	156,286,883	152,894,713	0.3%
MINDEF	556,706,961	548,707,224	540,063,186	-3.0%
MOE	1,104,920,889	1,055,011,886	1,057,633,061	-4.3%
MOF	51,271,416	38,462,752	41,072,768	-19.9%
MFA	7,831,277	7,408,581	7,025,254	-10.3%
MOH	617,127,265	708,127,787	693,748,899	12.4%
MHA	292,020,248	283,707,273	264,135,038	-9.5%
MINLAW	8,744,578	8,317,052	8,259,983	-5.5%
MOM	21,220,438	19,198,834	20,283,548	-4.4%
MND	123,607,588	117,828,752	124,313,247	0.6%
MSF	16,210,895	16,398,125	16,059,547	-0.9%
MSE	686,061,080	730,855,382	701,682,977	2.3%
MTI	248,394,744	252,373,409	276,052,866	11.1%
MOT	1,511,011,452	1,420,230,126	1,575,166,429	4.2%
PMO	42,569,511	49,474,800	54,722,359	28.5%
OOS	21,311,323	23,486,290	21,937,287	2.9%
TOTAL	**5,498,879,801**	**5,472,158,088**	**5,590,700,505**	**1.7%**

9.2.6. Energy Utilisation Index

In FY2022, the public sector's EUI was 120.4 kWh/m^2, a 1.3% increase when compared to the baseline. This was mainly due to the gradual reopening of the economy and increase in activities in FY2022 after two years of COVID-19 pandemic-related safe management measures, relative to the public sector's total gross floor area ("GFA").

Table 5: EUI by Ministry family

Ministry family	Baseline (kWh/m^2)	FY2021 (kWh/m^2)	FY2022 (kWh/m^2)	Change from baseline to FY2022
MCI	173.2	167.7	164.6	-5.0%
MCCY	104.2	107.6	106.9	2.6%
MINDEF	83.2	82.0	80.4	-3.4%
MOE	76.5	72.3	73.4	-4.1%
MOF	126.0	94.5	103.3	-18.0%
MFA	205.5	187.8	178.1	-13.3%
MOH	306.9	322.2	282.9	-7.8%
MHA	127.3	115.7	109.8	-13.7%
MINLAW	188.8	173.5	172.3	-8.7%
MOM	179.6	162.8	166.6	-7.2%
MND	65.5	62.0	64.1	-2.1%
MSF	66.3	64.1	62.2	-6.2%
MSE	81.9	87.7	87.3	6.6%
MTI	146.9	134.9	145.2	-1.2%
MOT	338.1	312.3	305.8	-9.6%
PMO	132.2	107.3	122.6	-7.3%
OOS	103.4	85.9	103.9	0.5%
TOTAL	**118.8**	**115.3**	**120.4**	**1.3%**

9.2.7. Methodology and Assumptions Used in Calculating Greenhouse Gas Emissions and Energy

Greenhouse Gas Emissions

The methodology for calculating Scope 1 and 2 emissions is aligned with the Greenhouse Gas ("GHG") Protocol. We have set our organisational boundary under the GHG Protocol's 'Operational Control' approach. Under this approach, a reporting entity has control over an operation if the former or one of its subsidiaries has full authority to introduce and implement operating policies.

In line with the 'Operational Control' approach, our reporting scope covers buildings and premises that are owned, occupied, and/or operated by the public sector.

Scope 1 Emissions

Scope 1 emissions relate to the direct burning of non-renewable fuel on site. This entails combustion of natural gas, town gas, petrol and diesel amongst others.

Data on fuel consumption is obtained from the respective Facility Managers of each premises. Town gas consumption is obtained from GovTech Trusted Centre for Sensor Data with utility account numbers for the respective premises.[22]

If actual fuel consumption data for any operation or period of time is not available, an estimate is made based upon the best available information (i.e. using the consumption from a similar period of time as a proxy).

Scope 2 Emissions

Scope 2 emissions relate to purchased electricity consumed.

Emission Factors

The emission factors for Scope 1 emissions were obtained from the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines Volume 2 Chapters 2 and 3 except for town gas where a country-specific emission factor was used.[23] On the other hand, Net Calorific Values ("NCVs") were derived based on the GHG Protocol's Emissions Factor for Cross-Sector Tools.

To calculate Scope 2 GHG emissions, the latest GEF data was obtained from the Energy Market Authority's website.[24]

The emission factors used in our calculations are as follows:

Table 6: Scope 1 Emission Factors

Fuel Type	Carbon dioxide (CO_2)	Methane (CH_4)	Nitrous Oxide (N_2O)
Units	(tC/TJ)[25,26]	(kg/TJ)	(kg/TJ)
Town Gas	15.20	5	0.1
Natural Gas	15.30	1	0.1
Diesel	18.90	25	8
Petrol	20.20	3.9	3.9
Jet Kerosene	19.50	0.5	2
Aviation Gasoline	19.10	0.5	2
Diesel (Marine)	20.20	7	2

[22] GovTech Trusted Centre for Sensor Data is part of the Government Data Architecture initiative that manages the data lifecycle effectively from acquisition to destruction. Utility data obtained from the GovTech Trusted Centre for Sensor Data is considered to be of high quality and authoritative.

[23] 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 2 Ch 2
2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 2 Ch 3

[24] SES Chapter 2: Energy Transformation, EMA.

[25] 1996 IPCC Guidelines on Net Calorific Values and Emission Factors for Oils - Table 1

[26] TC/TJ is tonnes of Carbon per Terajoule. For further conversion to CO_2, it needs to be multiplied by a factor of 44/12. TJ is in net calorific value basis.

Table 7: Global Warming Potential of Greenhouse Gases

Gas	Global Warming Potential
CO_2	1
CH_4	28
N_2O	265

Table 8: Scope 2 Emission Factors

Year	GEF (kg CO_2/kWh)
2022	0.4168
2021	0.4085
2020	0.4074

Energy

Energy use and EUI metrics relate only to electricity use for now. The total electricity use is defined as electricity consumed from the grid. Solar energy generated and used on-site is not included. Biomass energy and energy used for district cooling are also not included. We are working to include other forms of energy used in future reports.

EUI is calculated using the following formula:

$$\frac{\textbf{Total electricity used in Year X}}{\textbf{Total GFA in Year X}}$$

Baseline EUI is calculated using the following formula:

$$\frac{\textbf{Σ Total electricity used between FY2018 and FY2020}}{\textbf{Σ Total GFA between FY2018 and FY2020}}$$

EUI is computed for buildings in the built environment category only.[27] It is not meaningful to calculate EUI for other categories as they may not have GFA or their electricity use is less dependent on floor area.

Where utility account numbers are available, electricity use data is obtained from GovTech Trusted Centre for Sensor Data. For the remaining facilities, electricity use data is reported by the respective Facility Managers of each premises. For electric vehicle ("EV") charging, electricity use data is obtained from meters at onsite EV charging stations. In a small number of cases where actual electricity use data for any operation or period of time is not available, an estimate is made based on the best available information (i.e. applying an average across a similar period or calculating proxies).

Data on GFA is reported by the respective staff overseeing the premises and is verified by each Ministry's Sustainability Manager.

[27] Buildings in the built environment category refer to premises such as office buildings. Other categories include infrastructure such as water treatment and waste-to-energy plants, and transport fleets.

9.3. WATER

9.3.1. Baseline

Similar to the approach taken for energy, the baseline has been established as the average of FY2018 to FY2020.

9.3.2. Water Use

In FY2022, the public sector used 32,875,004,695 litres of water, a 1.2% increase compared to the baseline. This was mainly due to a gradual reopening of the economy and increase in activities in FY2022, increased use of school sports facilities by the public, as well as opening of new healthcare facilities.

Table 9: Water use by Ministry family

Ministry family	Baseline (litres)	FY2021 (litres)	FY2022 (litres)	Change from baseline to FY2022
MCI	204,332,973	169,127,959	180,942,000	-11.4%
MCCY	2,455,511,003	1,660,728,970	2,168,882,700	-11.7%
MINDEF	5,211,728,070	5,239,559,064	5,890,232,236	13.0%
MOE	8,100,212,016	6,841,303,959	8,331,042,800	2.8%
MOF	391,079,167	305,304,100	300,143,600	-23.3%
MFA	37,861,667	37,542,000	39,646,000	4.7%
MOH	4,388,467,631	4,714,980,830	4,635,982,340	5.6%
MHA	3,742,311,886	2,990,039,550	3,839,820,387	2.6%
MINLAW	128,426,400	124,148,500	50,843,300	-60.4%
MOM	100,907,667	87,083,000	103,170,000	2.2%
MND	1,721,807,467	1,541,422,200	1,714,006,511	-0.5%
MSF	374,035,133	393,728,400	427,163,000	14.2%
MSE	1,078,172,929	1,050,079,378	868,469,921	-19.4%
MTI	1,874,522,900	1,542,495,489	1,627,971,900	-13.2%
MOT	2,433,142,400	2,249,324,400	2,520,131,000	3.6%
PMO	126,654,233	97,086,300	81,430,000	-35.7%
OOS	100,497,800	98,975,000	95,127,000	-5.3%
TOTAL	**32,469,671,342**	**29,142,929,099**	**32,875,004,695**	**1.2%**

9.3.3. Water Efficiency Index

In FY2022, the public sector's WEI was 63.9 litres per person per day, a 0.8% increase compared to the baseline. The increase was largely due a rise in the number of occupants and visitors to public sector premises in FY2022, together with the gradual reopening of the economy and increase in activities which resulted in greater water use across the public sector.

Table 10: WEI by Ministry family

Ministry family	Baseline (litres/pax/day)	FY2021 (litres/pax/day)	FY2022 (litres/pax/day)	Change from baseline to FY2022
MCI	38.1	46.7	42.7	12.1%
MCCY	223.1	164.3	123.0	-44.9%
MINDEF	210.5	211.7	234.0	11.2%
MOE	45.2	37.8	46.5	2.9%
MOF	173.5	180.6	139.4	-19.7%
MFA	224.5	220.6	153.0	-31.8%
MOH	165.6	168.9	138.5	-16.4%
MHA	90.2	186.0	113.5	25.8%
MINLAW	189.7	460.8	125.3	-33.9%
MOM	49.5	48.1	49.7	0.4%
MND	19.6	13.4	21.9	11.7%
MSF	216.6	240.7	228.4	5.4%
MSE	40.1	37.9	40.7	1.5%
MTI	96.4	86.7	60.3	-37.4%
MOT	25.6	32.8	29.7	16.0%
PMO	61.7	73.9	51.2	-17.0%
OOS	179.7	175.8	156.3	-13.0%
TOTAL	**63.4**	**59.6**	**63.9**	**0.8%**

9.3.4. Methodology and Assumptions for Water Data

WEI is calculated using the following formula:

$$\frac{\text{Total water used in Year X}}{\text{No. of operational days in Year X} \times (\text{Avg. no. of staff per day} + 0.25\ (\text{Avg. no. of visitors per day}) \text{ in Year X})}$$

Baseline WEI is calculated using the following formula:

$$\frac{\sum \text{Total water used between FY2018 and FY2020}}{\text{Avg. no. of operational days} \times \sum (\text{Avg. no. of staff per day} + 0.25\ (\text{Avg. no. of visitors per day}) \text{ between FY2018 and FY2020})}$$

WEI is computed for buildings in the built environment category only.[28] It is not meaningful to calculate WEI for other categories as water use is less dependent on the number of occupants and visitors.

Water use data is either obtained from GovTech Trusted Centre for Sensor Data using utility account numbers or from the Facility Managers of each premises. The water use data includes both potable water and NEWater.

The occupancy and visitor number data is reported by Facility Managers. They are generally based on the number of occupants (such as staff, students and tenants) physically present in the respective premises for extended periods of time and number of visitors accounted under the premises' visitor management or tracking systems. Visitors include persons who are in the premises for short periods of time. As it is assumed that their average water use is 25% that of premises' occupants, a factor of 0.25 is also applied to the WEI calculation.

9.4 DATA GAPS

Energy data from district cooling is currently not collected nor reflected in this report.

Where actual data for utilities, or occupancy and visitor numbers are not available, proxies have been applied, based on the following broad principles:

a) For premises with missing data for specific years or months, data from a similar period is used. For example, FY2019 data might be used as a proxy for FY2018 which is a non-COVID-19 year, and FY2021 data might be used as a proxy for FY2020, which is a COVID-19 year.

b) For premises with missing data for all years, data from similar facilities is used. For example, consumption data from a community facility could be used as a proxy for another community facility with missing data, with usage being pro-rated by the facility's GFA.

We are working towards patching these data gaps to the best of our ability in future GreenGov.SG reports.

[28] Buildings in the built environment category refer to premises such as office buildings, while other categories include infrastructure such as water treatment and waste-to-energy plants, and transport fleets.

APPENDIX B – List of Relevant Publications

National publications

1. Singapore's Long-Term Low-Emissions Development Strategy
2. Singapore's National Communications and Biennial Update Reports
3. Singapore Green Plan 2030
4. Singapore's Second National Climate Change Study – Climate Projections to 2100 Science Report
5. National Action Strategy on Marine Litter
6. Zero Waste Masterplan
7. Maritime Singapore Decarbonisation Blueprint
8. Energy 2050 Committee Report
9. Singapore Energy Statistics 2022
10. Land Transport Masterplan 2040
11. Singapore Green Bond Report 2023
12. Finance for Net Zero Action Plan

Statutory Board publications

13. EMA Annual Report 2022/2023
14. IMDA Annual Report 2022/2023
15. LTA Sustainability Report 2022/23
16. MAS Sustainability Report 2022/2023
17. NEA Annual & Sustainability Report 2022
18. PUB Sustainability Report 2023
19. SDC Sustainability Report 2022/2023

APPENDIX C – United Nations Sustainable Development Goals Mapping

GreenGov.SG Commitments	United Nations Sustainable Development Goals Targets and Indicators
GREENHOUSE GAS EMISSIONS Peak emissions around 2025 Achieve net zero emissions around 2045	**9.4** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
	13.2 Integrate climate change measures into national policies, strategies and planning **13.2.2** Total greenhouse gas emissions per year
	13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
ENERGY Reduce energy use by 10% from the baseline by 2030	**7.2** By 2030, increase substantially the share of renewable energy in the global energy mix
WATER Reduce water use by 10% from the baseline by 2030	**6.4** By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity **6.4.1** Change in water-use efficiency over time
WASTE Reduce waste disposed of by 30% from the baseline by 2030	**12.5** By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
	12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities

GreenGov.SG Commitments	United Nations Sustainable Development Goals Targets and Indicators
GREEN ECONOMY Incorporate environmental sustainability considerations into all government procurement by 2028	**12.6:** Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle
	12.7: Promote public procurement practices that are sustainable, in accordance with national policies and priorities
GREEN CITIZENRY Embed environmental sustainability into public touchpoints and community-based programmes	**12.8:** By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
	17.17: Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships
CAPABILITY BUILDING Elevate environmental sustainability awareness and knowledge across the public sector	**12.8:** By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
	17.16: Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries
CULTURE BUILDING Enable public officers to take environmental sustainability action	**17.17:** Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

GREEN GOV SG