

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

**IN LIGHT OF THE 26TH CONFERENCE OF THE PARTIES TO
THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE
(COP26) HELD IN OCTOBER 2021, WE RECOGNISE THE
URGENCY TO COMBAT THE IMPACT OF GLOBAL WARMING.
WARMER TEMPERATURES OVER TIME ARE CHANGING
WEATHER PATTERNS AND DISRUPTING THE USUAL BALANCE
OF NATURE, POSING A RISK TO LIFE FORMS ON EARTH.**

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

EMISSIONS & ENERGY	RESOURCE EFFICIENCY	SUSTAINABILITY TRANSITION
<p>Topic Message: Ensure fuel, energy and water efficiency by integrating best practices into business operations</p>	<p>Topic Message: Manage water efficiency and minimise waste generated through water harvesting and circularity activities (3Rs)</p> <p>Sub-Topics:</p> <ul style="list-style-type: none"> • Water • Waste management and circularity 	<p>Topic Message: Increase ridership by providing transportation accessibility to all</p>



In this chapter:

GRI: 302-1, 303-3, 303-5, 305-1, 305-2, 306-4, 306-5



According to the Intergovernmental Panel on Climate Change (IPCC), the extent of climate change effects on individual regions will vary over time and with it the ability of different societal and environmental systems to mitigate or adapt to change. As an island nation, Singapore is particularly vulnerable to certain climate change events, which is why active climate mitigation and resilience measures have been set out by the Singapore

Government. The Singapore Green Plan 2030 lays out how the Government plans to transition to a cleaner and more sustainable transport network. To contribute to the Singapore Green Plan, SBST supports LTA in its commitment to introduce greener buses, with the entire fleet of public buses running on cleaner energy by 2040.

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

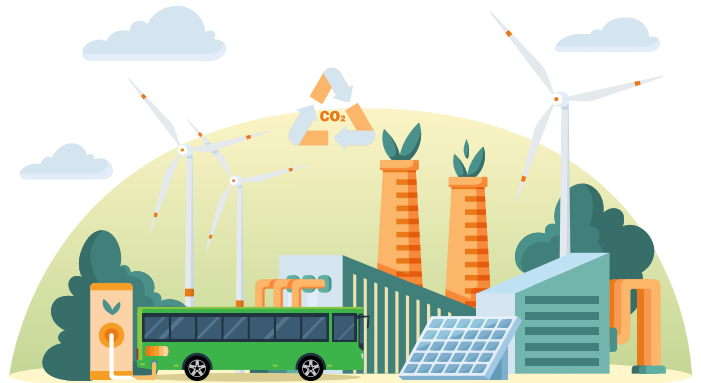
EMISSIONS & ENERGY

WHY THIS ISSUE IS MATERIAL

As a public transport service provider, we recognise our responsibility to reduce the impact we have on the environment and to constantly seek opportunities to reduce emissions. It is our aim to introduce greener modes of transportation for our customers and reduce our carbon footprint by providing them with environmentally friendly and efficient mobility at the same time.

HOW WE MANAGE THIS

To mitigate our impact on the environment, we have embarked on the use of solar energy. We are progressively improving diesel fuel consumption efficiency of our buses by using telematics to encourage good economical driving habits and reduce engine idling. Concurrently, we are working closely with the LTA to progressively introduce electric and hybrid buses to offer cleaner transportation modes.



OUR GREEN INITIATIVES

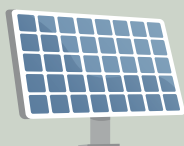
ENERGY EFFICIENCY AT OUR BUS AND TRAIN PREMISES

Since July 2018, our Ulu Pandan Bus Depot has been harnessing solar energy to power the facility during the day. It is the first depot in Singapore to be installed with the Solar PV Panel System with more than 2,000 solar panels installed on the building's rooftops that generates approximately 840 MWh of energy annually. Unconsumed surplus energy is fed into the national power grid system for utilisation. Our green efforts at the Ulu Pandan Bus Depot were recognised at the ASEAN Energy Award 2021 in the Energy Efficient Buildings and Green Buildings category.



In 2019, Singapore committed to scaling up its solar capacity by more than seven times from its current levels. This will increase the then achieved 260 megawatt-peak (MWp) of installed solar capacity to two gigawatt-peak (GWp) to meet the annual power needs and power around 350,000 households, or about 4% of Singapore's total electricity demand. To further improve on energy efficiency, Singapore

is increasingly investing in floating solar energy research and development (R&D) initiatives. In line with Singapore's vision, we have also expanded the installation of solar panels with 3.3MWp PV system to the Gali Batu Depot. Panels installed at our three sites generated 2.4 GWh energy in 2021, equivalent to the annual consumption of approximately 500 4-Room HDB flats each consuming 400kWh per month.



TOTAL INSTALLATION OF SOLAR PANELS AT 3 SITES



2.4GWh ENERGY GENERATED IN 2021



500 4-ROOM FLATS EACH CONSUMING 400kWh PER MONTH

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

ENERGY EFFICIENCY AT OUR BUS AND TRAIN PREMISES (CONT'D)

	2019	2020	2021
	kWh	kWh	kWh
Ulu Pandan Bus Depot	860,690	863,216	860,036
Yio Chu Kang Bus Interchange	-	10,809	199,322
Gali Batu Train Depot	1,203,000	869,000	1,334,000
Total	2,063,690	1,743,025	2,393,358

Beyond our Solar PV ambitions, all our stations has met the Singapore Standard SS530 for "Energy Efficiency for Building Services". Energy efficient lightings such as Light Emitting Diode (LED) lighting and fluorescent light fittings are used in stations while natural light is employed at station entrances.

As a conscious effort, we have rolled out initiatives such as the installation of energy saving features on our escalators at our train stations where their speeds are automatically reduced when unused. We have also installed air conditioning systems with carbon dioxide sensors at the DTL stations to regulate the outdoor air supply to our stations to reduce

our energy consumption. Other environmentally friendly innovations have been implemented on our rail systems where new generation trains are designed with efficient regenerative brakes that will not only reduce their wear and tear on the mechanical brakes but also allow recovering kinetic energy to be converted for use in other areas every time a train stops. These trains are also installed with inverters to recover any excess regenerative energy from the braking of trains that can then be utilised by an accelerating train nearby or channelled back into the power distribution network for other uses.

OUR TRANSITION TO A CLEANER BUS FLEET

We ensure that all our existing diesel buses comply with the National Environmental Agency (NEA) and European Union (EU) emission standards (up to Euro 6). These standards aim to reduce harmful exhaust emissions. Our buses run on diesel which has consistent and high-performance combustion characteristics such as good ignition quality, ease of fuel flow and improved atomisation resulting in low exhaust emissions. The diesel we use also contains additives that translate into improved engine performance whilst keeping the fuel injectors clean, thus, reducing emissions. To contribute to cleaner air, we use high quality diesel with less than 10ppm sulphur contents from a renowned and reliable petroleum manufacturing company.

To maintain our fleet's optimum performance whilst maintaining fuel efficiency, we strictly adhere to the preventive maintenance (PM) regime, that includes exhaust smoke tests. Our buses are also subject to stringent inspections by LTA authorised vehicle inspection centres on a biannual basis.







To enable the transition to a cleaner fleet, LTA have begun to introduce electric and hybrid buses to our bus fleet. After the initial introduction of 25 hybrid buses and 20 electric buses from LTA into our operations, we further received another


10 electric buses in 2021, thus increasing the total number of electric buses to 30 during the year. In contrast to the first 20 electric buses which rely on overnight charging at the bus depot, the latest electric buses utilise opportunistic charging through a pantograph charger to charge the battery rapidly during layovers at the Bus Interchange.

A full charge on the pantograph takes 25 minutes and can power a bus for 125 kilometers as compared to the three hours that a conventional overnight plug-in charger will take.



DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

MODEL	BYD D9RA Electric Bus	Linkker LM312 Electric Bus	MAN A22 Euro 6 Diesel Bus
			
CO₂ Emissions (kg/km)	0.504	0.480	1.339
 Technology	Battery capacity (310kWh) Charge rate 150 kW DC Charge time ~2.5 hrs (Overnight Charging)	Battery capacity (177kWh) Charge rate 450kW DC Charge time ~20 mins (Opportunistic Charging)	Exhaust Gas Recirculation Diesel Particulate Filter Selective Catalytic Reduction (AdBlue)
 Battery Type	Lithium Iron Phosphate Batteries	Lithium Iron Phosphate Batteries	N.A.
 Passenger Capacity	80 (28 seating, 52 standing)	83 (28 seating, 55 standing)	88 (33 seating, 55 standing)



2021 ESTIMATED REDUCTION OF EMISSIONS

800 tonnes

Approximate annual emissions of

174 passenger cars

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

MAINTAINING THE RELIABILITY OF OUR RAIL BATTERY MONITORING SYSTEM

As part of our efforts to further improve reliability, SBST Rail has installed an Automated Battery Monitoring System (BMS) which has greatly enhanced the overall productivity and safety in maintaining our Uninterruptible Power Supply. The BMS enables us to also implement a newly designed inspection regime, which includes smart real-time and online monitoring of battery voltage, temperature, and impedance at a set frequency.

We are able to achieve the following benefits through this initiative:

- i) **Reliability** – Mitigate human error and safety risks that may occur and remove the need for employees to have direct contact with energised batteries. The integration of the Automated BMS to the Downtown Line's existing



Integrated Supervisory Control System network enables the Power Facilities Regulator to monitor the battery's health condition remotely and accurately. This enables early detection of batteries with high temperatures so that they can be rectified immediately, to minimise the risk of fire and loss of backup power supply.

- ii) **Productivity** – Achieved more than 30% increase in efficiency, saving 300 man-hours on manual inspections every year. The batteries also have a longer shelf-life due to timely maintenance.
- iii) **Maintenance** – Leverage on digital data acquisition capabilities and achieve predictive maintenance. Conduct trend analysis of battery lifecycle patterns to prolong the battery lifespan, instead of depending on a five year preemptive battery replacement cycle which saves 9,000 batteries (57% reduction). As the solution involves minimal equipment set-up, quick installation, and turnaround, the BMS will be rolled out to the NEL depot and stations progressively.
- iv) **Environmental Impact** – By reducing the frequency of battery replacement with pre-emptive condition monitoring, we are able to reduce our carbon footprint in tandem with the reduction of lead acid battery disposal.



DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

OUR PERFORMANCE AND LOOKING FORWARD

Through optimisations in our operations, investments and adoption of green technology, we have seen improvements in our environmental performance. Our Scope 1 CO₂ emissions in 2021 totalled 357,643 tonnes, which is a decrease of 16,528 tonnes (4.5%) when compared to 2020 due to better fuel efficiency. Our Scope 2 CO₂ emissions in 2021 amounted to 172,232 tonnes, which is an increase of 6,300 tonnes (3.8%) when compared to 2020. The increase in electricity consumption is partially attributed to an increased adoption of electric buses in our fleet in 2021. Our target is to electrify 50% of our bus fleet by 2030, which will reduce our fuel consumption.

GRI 302-1 Energy Consumption Within the Organisation

FUEL CONSUMPTION BY TYPE (LITRES)	2019	2020*	2021*
Non-Renewable Fuels (Diesel)	152,176,790 (99.9350%)	139,146,555 (99.9978%)	135,545,321 (99.9973%)
Non-Renewable Fuels (Petrol)	3,145 (0.0021%)	3,010 (0.0022%)	3,588 (0.0027%)
Non-Renewable Fuels (CNG)	95,784 (0.0629%)	-	-
Total	152,275,719	139,149,565	133,548,909

ENERGY CONSUMPTION (kWh)	2019	2020*	2021*
Energy Purchased (kWh)	452,960,274	406,695,205	422,136,540
Renewable Electricity Generated (kWh)	2,063,690	1,743,025	2,393,358

GRI 302-3 Energy Intensity

ENERGY INTENSITY BY TYPE	2019	2020*	2021*
Total Fuel Intensity¹ (litres/S\$M Revenue)	105,367	113,047	101,884
Total Electricity Intensity² (kWh/S\$M Revenue)	313,424	330,405	322,045

GRI 305-1 Direct (Scope 1) GHG Emissions

GRI 305-2 Energy Indirect (Scope 2) GHG Emissions

GREENHOUSE GAS EMISSIONS (tCO ₂ e)	2019	2020*	2021*
Scope 1 (Direct Emissions)	409,215 (68.86% of total)	374,171 (69.28% of total)	357,643 (67.50% of total)
Scope 2 (Indirect Emissions from Electricity)	185,034 (31.14% of total)	165,932 (30.72% of total)	172,232 (32.50% of total)

GRI 305-4 GHG Emissions Intensity

EMISSION INTENSITY (tCO ₂ e/S\$M/REVENUE)	2019	2020*	2021*
Scope 1 + 2	411.2	438.8	404.2

* In 2020 and 2021, operations were affected due to the COVID-19 pandemic.

1 Includes non-renewable fuel consumption only.

2 Includes electricity purchased only.

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE



RESOURCE EFFICIENCY

Our efforts to ensure our vehicles and premises are clean and hygienic for use by our passengers and employees, in particular during the pandemic, has led to an increase in water usage and waste generated. While our activities do not have a significant impact on Singapore’s water resources, we nevertheless take our responsibility to minimise the impact we have on the environment in totality and this includes the

use of water resources. Towards this goal, we invest in water saving infrastructure, support water conservation initiatives, promote a water-conscious culture and implement responsible waste management practices.

WATER

WHY THIS ISSUE IS MATERIAL

At SBST, we recognise that water is a scarce and precious natural resource, and our water supply remains vulnerable to factors such as climate change. For instance, in 2021, Singapore’s reservoirs were running dry after a prolonged dry spell that lasted for several months. Water is essential for living and having a constant supply of it is necessary to meet the growing demands of our population. Hence, efficient management and responsible consumption of water is of great importance.

HOW WE MANAGE THIS

At SBST, we use water largely for cleaning and washing our vehicles and premises. At the Ulu Pandan Bus Depot, we have initiated the use of NEWater, which is non-potable water, for bus washing and to irrigate our rooftop garden.

OUR GREEN INITIATIVES

INSTALLING WATER EFFICIENT TAPS

To promote sustainable and efficient water practices, we have started to replace the taps at the wash basins with water efficient ones. We have completed tap replacements at the Ulu Pandan Bus Depot and the Gali Batu Depot and received the Water Efficient Building (Basic) Certification from the PUB. The new taps have 3-ticks, which is the highest rating in efficiency and performance, under the PUB’s Water Efficient Labelling Scheme.



REPORT WATER LEAKS

Please contact:
Building Management

Download Now!
OneService App MyWaters

www.pub.gov.sg
facebook.com/PUBsg

REDUCING WATER IN BUS WASHING THROUGH RECYCLING

To minimise water consumption and increase water efficiency, all our bus depots are equipped with automated bus washing machines that are fitted with an underground water recycling system to collect, filter and recycle about 80% of the water used in the washing process. The first rinse uses filtered recycled water while the final rinse uses clean water which is then drained back to an underground storage tank for filtration and reuse.

Water flow metres are also installed at each machine to track individual water consumption and monitor potential leaks. This also enables us to assess the effectiveness and efficiency of the water filtration and recycling processes for future enhancements.

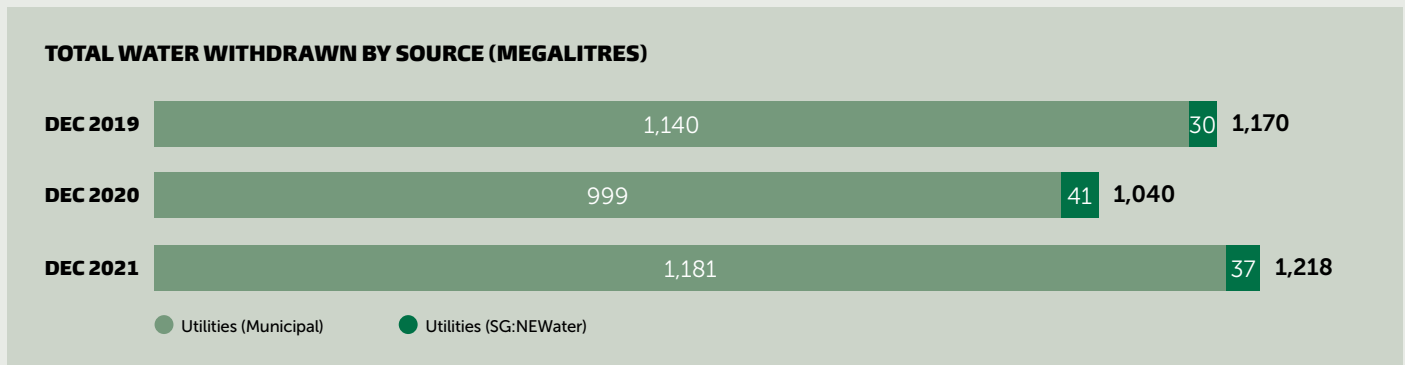
Regular plumbing audits are conducted at all our interchanges and depots to minimise leaks and ensure waste water is treated before it is being discharged, in compliance with regulatory requirements.

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

OUR PERFORMANCE AND LOOKING FORWARD

In 2021, more of our public buses resumed operations following the easing of COVID-19 restrictions. This has led to an increase in water consumption due largely to bus cleaning and washing. We will continue to explore and incorporate more initiatives to reduce consumption and maximise the efficient use of water.

GRI 303-3 Water Withdrawal



Water Intensity

WATER INTENSITY (MEGALITRES/\$M REVENUE)	2019	2020*	2021*
Total Water Intensity	0.810	0.845	0.929

* In 2020 and 2021, operations were affected due to the COVID-19 pandemic.

WASTE MANAGEMENT AND CIRCULARITY

WHY THIS ISSUE IS MATERIAL

Waste management is a critical issue in today's world, especially in land scarce Singapore. Due to the COVID-19 pandemic, dining out was restricted and this resulted in a spike in food deliveries and take-out meals using plastic containers. This unfortunately generated an additional 1,334 tonnes of plastic waste in Singapore¹, which is equivalent to the weight of 92 double-deck buses. When discussing waste management, it is important to take into consideration methods of disposal, recycling, avoidance and reduction, as well as transportation of waste. Without adequate efforts being implemented, waste will continue to build over time which will become a grave concern, in particular, for land scarce countries such as ours.

HOW WE MANAGE THIS

At SBST, the bulk of our waste comes from the disposal of scrap materials from buses that have reached the end of their useful lives. Additionally, waste produced by our passengers also falls within our responsibility.

WASTE DISPOSAL WITH RECYCLING BINS

Employees are encouraged to dispose their waste into the recycling bins that are labelled for different materials. According to a study by a non-profit organization, Recycle Across America

(RAA), standardised recycling labels help increase recycling by more than 50% and significantly decrease the amount of trash or incorrect recyclables thrown into recycling bins and pollute that once valuable material.

Concurrently, digitalising our operations has led to a drop in paper waste as physical hardcopy documents and forms are no longer commonplace. In our Eco Office-certified workplace, employees are also encouraged to switch off the lights when they leave to conserve energy.



1 Based on a study led by six alumni students from the National University of Singapore's Master of Science (Environmental Management) programme

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

OUR GREEN INITIATIVES

Operating approximately 30,500 bus trips a day, it is imperative that we regularly maintain our vehicles well to ensure roadworthiness, and reliability of service for our customers. To maximise the use of our resources, a tyre retreading initiative was rolled out that resulted in the reuse of more than 26,000 tyres, and reduced our waste by 1,467 tonnes in 2021.

At our train stations and bus depots, we are committed to procuring sustainable and green-label products such as floor detergents, hand soaps and toilet rolls – all of which are certified by the Singapore Green Labelling Scheme and the Singapore Green Building Council (SGBC).

All engine and transmission oils are properly managed and disposed in a responsible manner. While our workshop technicians and maintenance engineers are briefed on the safe use, handling and disposal of these hazardous fluids using the Material Safety Data Sheets at their regular safety toolbox meetings.



At the current rate of Singapore’s waste disposal, the Semakau Landfill is expected to be filled up by 2035. In alignment with the Singapore Green Plan to reduce waste sent to landfills by 20% by 2026, we leveraged our public influence to encourage the community to adopt a more sustainable lifestyle in the “Say Yes to Waste Less” campaign

which focused on reducing single-use disposables and food wastage. We displayed posters prominently at depots and offices to encourage the adoption of these sustainable practices.



A SECOND LIFE FOR OUR DECOMMISSIONED BUSES

Our decommissioned and retired buses are sold to scrap merchants who either export them for use overseas or reduce them to scrap metal.



A few of these decommissioned buses have been given a second life as they were repurposed for other meaningful uses. For patient rehabilitation, we donated a bus to the Tan Tock Seng Hospital for its soon-to-be-opened new Integrated Care Hub. It will be used to assist the Hospital’s occupational therapists in conducting bus simulation training for patients in a safe and controlled environment. This will prepare patients to resume daily routines such as boarding a bus safely after they are discharged.

Besides this, decommissioned buses have also been donated for educational purposes. In recent years, a bus was permanently parked in the compound of the St Andrew’s Autism School and another at Chao Yang Special School. These are to help build the confidence of students with special needs to travel safely and independently on public buses.

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE

OUR PERFORMANCE

The increase in hazardous waste arose due to planned replacement of batteries which have reached the end of their useful life for 10 DTL MRT stations. These batteries were responsibly managed and sent for recycling by our hazardous waste management vendor.

GRI 306-3 Waste Generated

TOTAL WASTE GENERATED (METRIC TONS)	2020	2021
Hazardous	168	504
Non-Hazardous	507	580
Total	675	1,084

GRI 306-4 Waste Directed to Disposal

WASTE DIRECTED TO DISPOSAL (METRIC TONS)	2020	2021
Hazardous Waste		
Landfill	-	-
Incineration	1	6
Total	1	6
Non-Hazardous Waste		
Landfill	-	-
Incineration	-	-
Total	-	-

GRI 306-5 Waste Diverted from Disposal

WASTE DIRECTED FROM DISPOSAL (METRIC TONS)	2020	2021
Hazardous Waste		
Recycled	167	498
Reused	-	-
Total	167	498
Non-Hazardous Waste		
Recycled	507	580
Reused	-	-
Total	507	580

DRIVING ENVIRONMENTAL STEWARDSHIP TO ENHANCE SUSTAINABILITY IN SINGAPORE



SUSTAINABILITY TRANSITION

By 2040, LTA aims for nine in 10 peak-period journeys to be made via the Walk-Cycle-Ride modes of transport. With heavy investments in the public transport network, it aims to make journeys seamless and convenient. For instance, travel to the city will take no more than 45 minutes and to the neighbourhood centres within 20 minutes. Besides reducing the average time taken to travel to work and bringing jobs closer to our homes, this commitment addresses Singapore's Green Plan to mitigate carbon footprint by as much as possible.

WHY THIS ISSUE IS MATERIAL

At SBST, we seek to increase ridership on our public transport network as it is one of the most environmentally friendly modes of getting around. On a per passenger-kilometre travelled basis, a car with only a driver uses nine times the energy used by a single deck bus which can carry up to 80 passengers and 12 times that used by a train with a load of some 1,400 people. The COVID-19 pandemic had affected ridership demand as work from home arrangements was the norm. However, as the situation evolves to become endemic, we expect demand to pick up again.

Today, our rail network extends to 83 km with trains operating at a frequency of between 2 and 2.5 minutes during weekday peak hours and our buses are running at an average frequency of 8.5 minutes during peak hours on weekdays. We will continue to work with LTA to promote the use of public transport as a choice mode of travel. By making greener and cleaner land transport accessible to all including persons with disabilities, we will be able to reduce our carbon emission contributions.

HOW WE MANAGE THIS

As a responsible major public transport operator, we are keenly aware of the important role we play in the preservation of the environment. To further reduce carbon footprint of public transport, LTA has committed to having the entire public bus fleet run on cleaner energy by 2040. In support of this, we are working very closely with the Authority on areas that we can contribute and provide support such as trialling new types of green buses and testing new and more efficient ways of charging electric buses.

OUR INITIATIVES AND LOOKING FORWARD

EXPANDING OUR RAIL NETWORK

In 2021, we operated 78 stations spanning 83km of rail networks on the NEL, DTL and Sengkang Punggol LRT. In 2023, the NEL Punggol extension is slated to open for passenger service with the addition of a new station – Punggol Coast.

LTA is also developing two new rail lines – the Jurong Region Line and the Cross Island Line – which will increase the rail network significantly and benefit customers as they increase connectivity and enhance resilience of the MRT network.

Meanwhile, as the rail network is set to increase, we will continue to work on the other aspects to make public transport a choice mode of travel. From providing good customer service to more comprehensive travel information, we will work harder to cater to the diverse groups of customers whom we serve such as students, working adults, those with physical disabilities, mothers with young children and the elderly. In doing so, we seek to increase public transport ridership and reduce the use of private transport to reduce carbon emissions and footprint.