TREASURING RESOURCES

USE SCARCE RESOURCES EFFICIENTLY

REDUCE EMISSIONS

"AT SATS, WE CARE FOR THE ENVIRONMENT. I HELP IN #TREASURING OUR RESOURCES BY ENHANCING OUR RECYCLING RATE AND SHIFTING TOWARDS RENEWABLE SOURCES OF ENERGY."

KENNETH LOH

#GROWINGWITHPURPOSE

TREASURING RESOURCES

CARING FOR THE ENVIRONMENT

Enhancing our operational efficiencies and reducing our carbon footprint and waste while shifting to renewable and sustainable sources of energy, water and raw materials to lessen the impact our business has on the environment.

WHO ARE OUR PRIMARY STAKEHOLDERS?

Our customers, employees, shareholders, local communities and the environment.

UNITED NATIONS' SUSTAINABLE DEVELOPMENT GOALS

USE SCARCE RESOURCES EFFICIENTLY

ELECTRICITY

110 GWh

6% DECREASE IN CONSUMPTION OVER THE LAST 2 YEARS

ELECTRICITY CONSUMPTION AVERAGE OF

1.45 kWh

PER PASSENGER HANDLED

INCREASED RECYCLING RATE

+4.4%

OVER THE LAST 3 YEARS

WATER CONSUMPTION

1,353 MILLION LITRES

33% DECREASE IN CONSUMPTION OVER THE LAST 2 YEARS

WATER CONSUMPTION AVERAGE OF

15 LITRES

PER UNIT MEAL

LAUNCHED DIGITAL TWIN TECHNOLOGY TO

OPTIMISE RESOURCES FOR PRODUCTION PLANNING

REDUCE EMISSIONS

GENERATED

4.8 GWh

FROM RENEWABLE ENERGY

78 ELECTRIC TRACTORS

09 ELECTRIC FORKLIFTS

06 ELECTRIC PALLET TRUCKS

PLANS TO CONVERT ANOTHER 220 DIESEL TRACTORS ACROSS ALL APRON UNITS

SAVED

446,706 LITRES

OF FUEL EQUIVALENT TO 1,215.04 TONNES OF CO_2 EMISSIONS

INTRODUCED THE WORLD'S FIRST

AIRSIDE DRIVING SIMULATOR

EMBARKED ON A SATS-WIDE CARBON FOOTPRINT AUDIT TO

ESTABLISH OUR CARBON EMISSIONS BASELINE

USE SCARCE RESOURCES EFFICIENTLY

Recognising that competition for talent, raw materials, energy and water will increase operational costs and place strains on the environment, we are constantly working to manage our growth in a sustainable and purposeful manner.

Integrating digital technology, energy-efficient innovations and environmentally conscious practices into our operations, we strive to optimise the use of resources by reducing wastage, increasing efficiencies and creating productive and sustainable cycles of renewal and regeneration.

OUR 2030 GOALS

TO ACHIEVE 100% WASTEWATER TREATMENT

TO USE 50% RECYCLED WATER FOR NON-FOOD USE

TO USE SUSTAINABLE FOOD PACKAGING

CASE STUDY

DIGITAL TWIN: DATA-DRIVEN SUSTAINABILITY

A digital twin is a replica of an actual product or process, an evolving digital profile based on cumulative real-time, real-world data measurements of its current and past behaviour, that can help to optimise business performance.[7]

Recognising its potential to help us utilise our resources more efficiently and achieve long-term, sustainable growth, SATS harnessed Digital Twin technology to enhance resource planning, improve operational efficiencies and knowledge management through the use of simulations and real-time data.

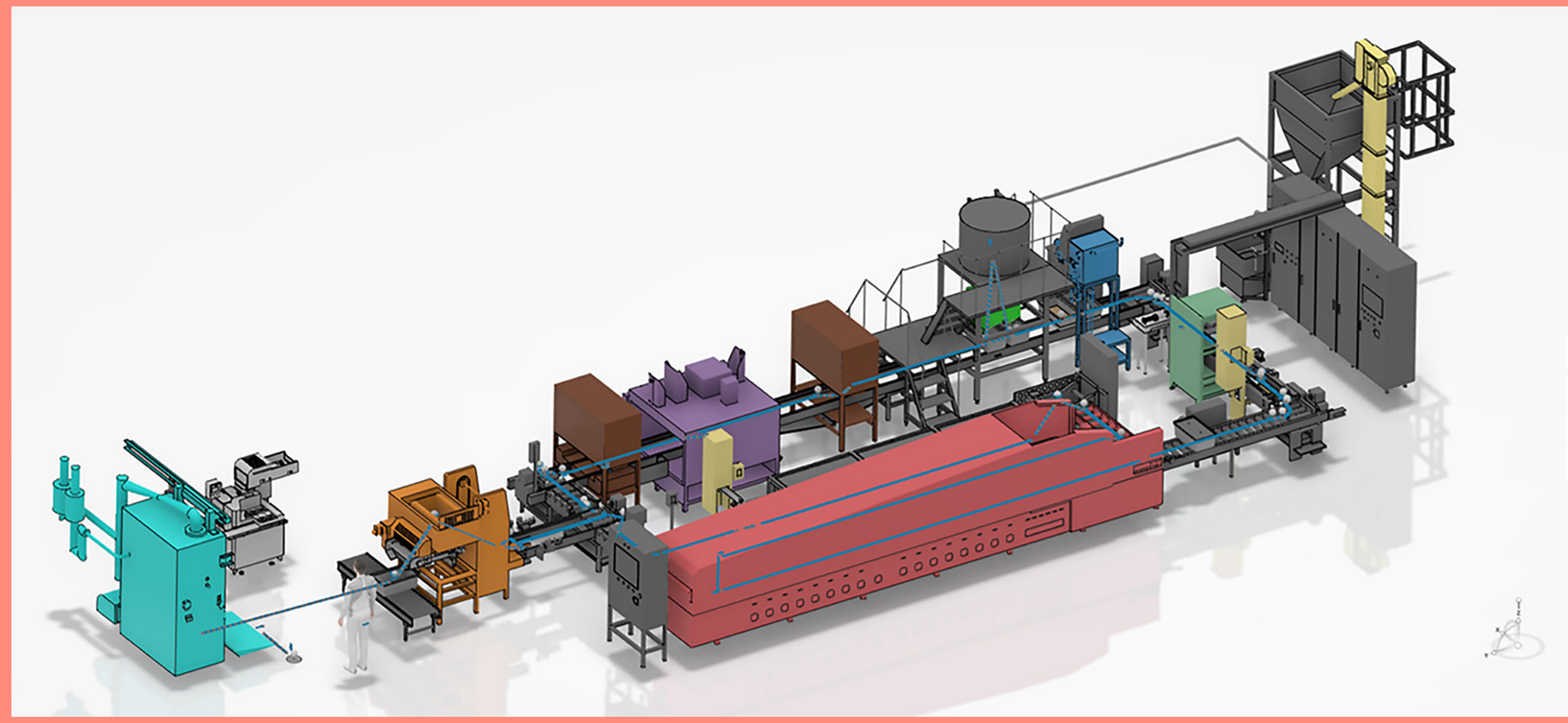
Through simulations, users are able to identify key bottlenecks and effectively allocate resources such as manpower and raw materials based on specific operations. With greater visibility of demand fluctuations and possible operational scenarios, capacity and resource planning can also be done before actual implementation and with greater accuracy.

With Digital Twin technology, the introduction of new machinery or production lines can be simulated through comprehensive 3D processes on a virtual environment. This enables us to better understand the potential impact on our operations, identify critical points of failure and make adjustments before actual deployment. Likewise, modifications to existing production, process flows and equipment can be virtually analysed and optimised before actual implementation.

Better knowledge management enables us to achieve better outcomes. In a kitchen environment, sensors installed provide real-time data that help us improve response time when handling different scenarios such as bottlenecks or disruptions.

In the longer term, this technology can also be applied across different operations, which enables planning for future expansions or new processes.

[7] Deloitte University Press. (2017). Industry 4.0 and The Digital Twin: Manufacturing Meets Its Match, p3.



STRENGTHENING OUR RECYCLING CAPABILITIES

Recycling waste materials and wastewater plays an important role in reducing greenhouse gas emissions that result from resource disposal. In line with our pursuit of sustainable growth, finding ways to reuse resources and maximise their utility not only contributes towards lowering our emissions, it also alleviates the strain on the environment due to the large-scale extraction of virgin resources.

Since 2008, SATS has been working with our licenced vendor to recycle plastic, metal, carton boxes, cooking oil and glass at SATS Inflight Catering Centres 1 and 2. Our recycling rate has improved by 4.4% over the last 3 years.

With water usage growing twice as fast as the rate of population growth and more countries experiencing water stress[8], there is a clear impetus for us to do our part by improving our water management and recycling efforts. Over the last 2 years, our combined efforts have resulted in a 33% decrease in water consumption across our operations.

Moving forward, we are in the midst of implementing rainwater collection projects at premises such as SAL and AFT while working with partners to develop extensive water recycling projects. We are in the process of increasing the volume of recycled water to 220 cubic metres per day, which consists of treated greywater for toilet flushing, general washing, irrigation and the cooling tower.

[8] Source: UN-Water

PRACTISING CONSCIOUS CONSUMPTION

Globally, there is a growing movement to address the indiscriminate use and disposal of products like single-use plastics. In 2018, Taiwan announced a blanket ban on single-use plastic items such as straws, plastic bags and cups by 2030. Similarly, in January 2019, the European Union introduced restrictions on single-use items including plastic cutlery, plates and straws. This reflects a growing awareness that materials like plastic, when consumed in huge amounts on a daily basis, have a detrimental impact on the environment at the end of their short life cycles.

PLEASE REFER TO:

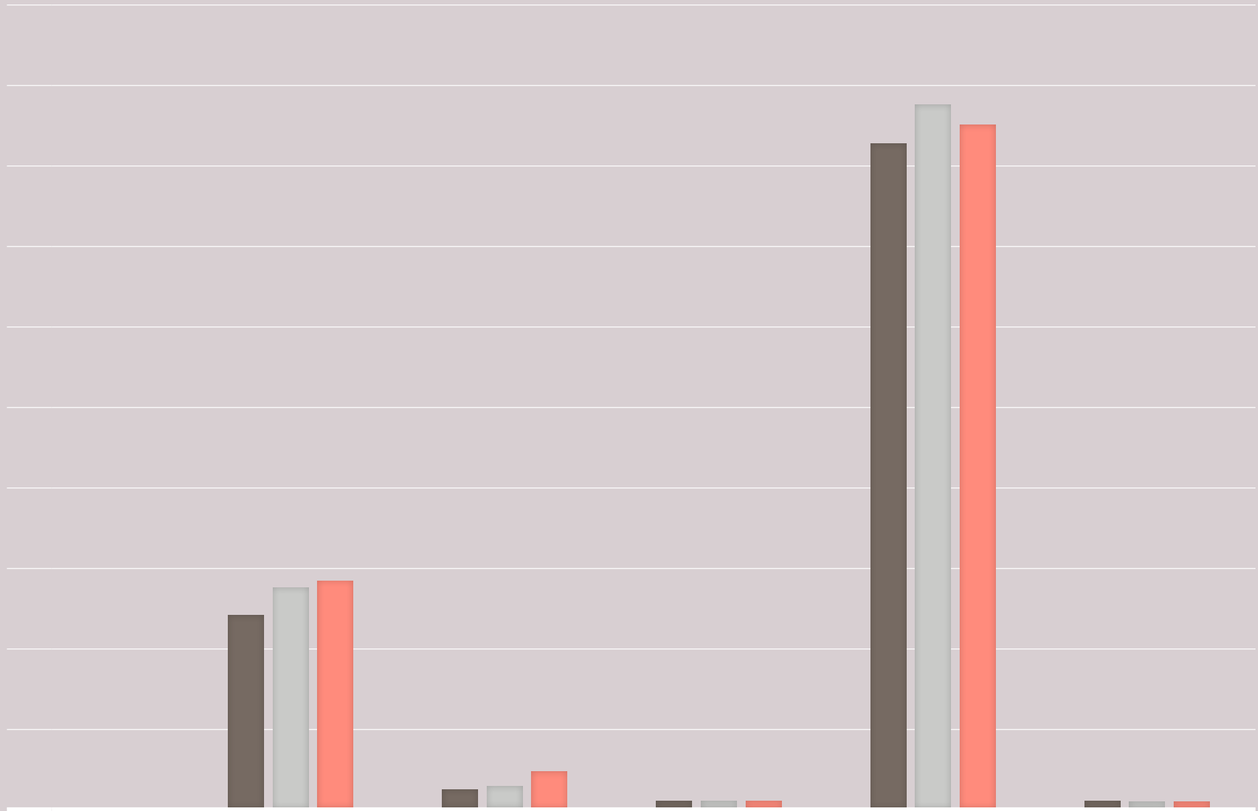
CHART 05
CHART 06
CHART 07

At SATS, we are equally committed to doing our part to encourage more conscious consumption, thereby reducing the demand for products that are not environmentally sustainable. For our staff, we will design and distribute SATS-branded personal cutlery to advocate the use of reusable cutlery and cups for all in-house functions and staff canteens. In doing so, we hope to significantly reduce the volume of plastic and disposable waste produced.

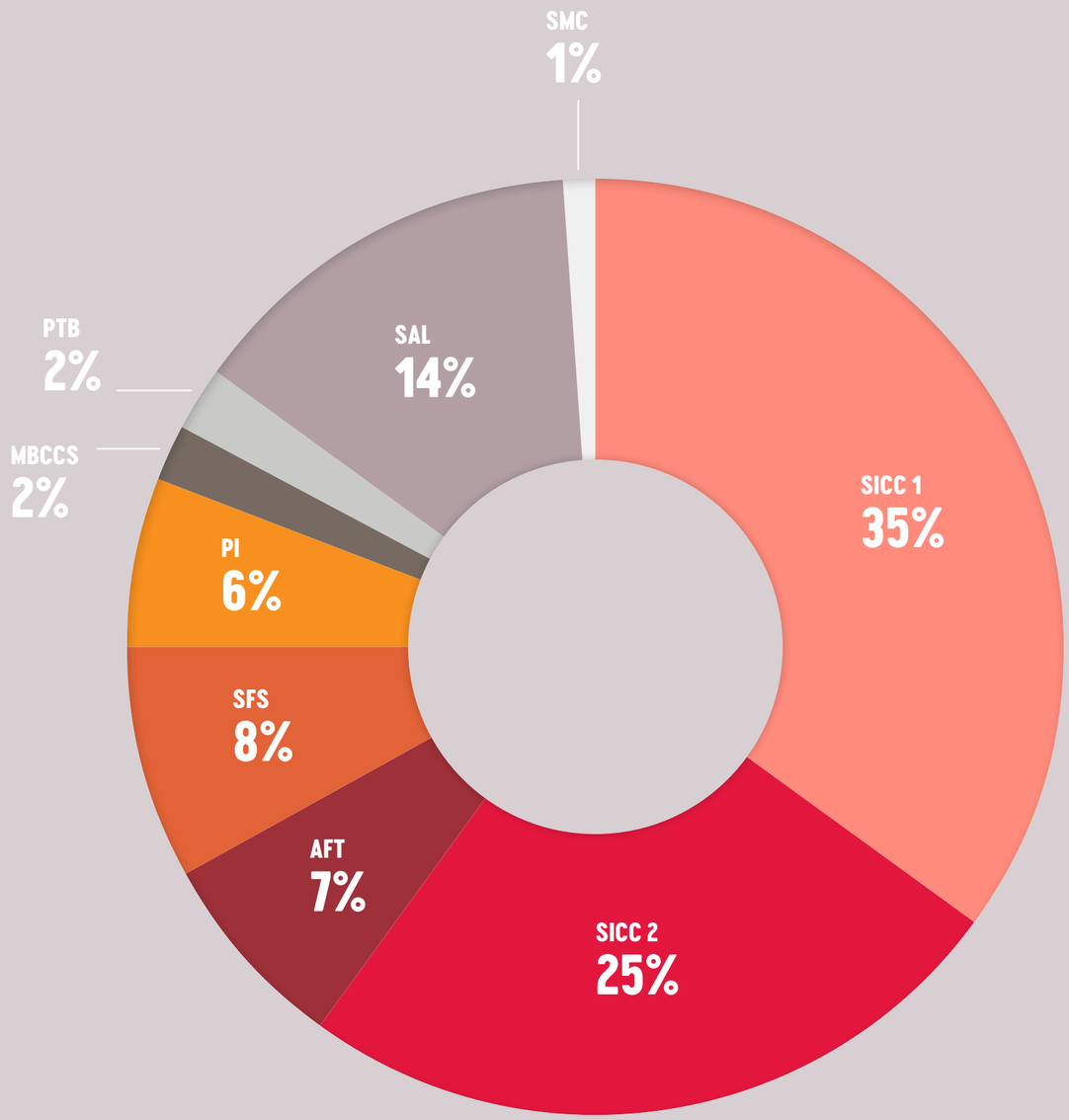
At the same time, we are exploring alternative packaging such as biodegradable material, to replace single-use plastic packaging in our production and laundry operations, where possible.

CHART 05

WEIGHT OF WASTE BEING RECYCLED AT SICC1 AND SICC2



(kg)	GLASS RECYCLED	METAL	PLASTIC	CARTON BOX	COOKING OIL
FY2016-17	239,816	22,606	7,786	828,630	8,085
FY2017-18	274,454	26,782	8,328	877,190	7,350
FY2018-19	**283,101**	**45,073**	**8,116**	**852,080**	**7,125**



TOTAL WATER CONSUMPTION

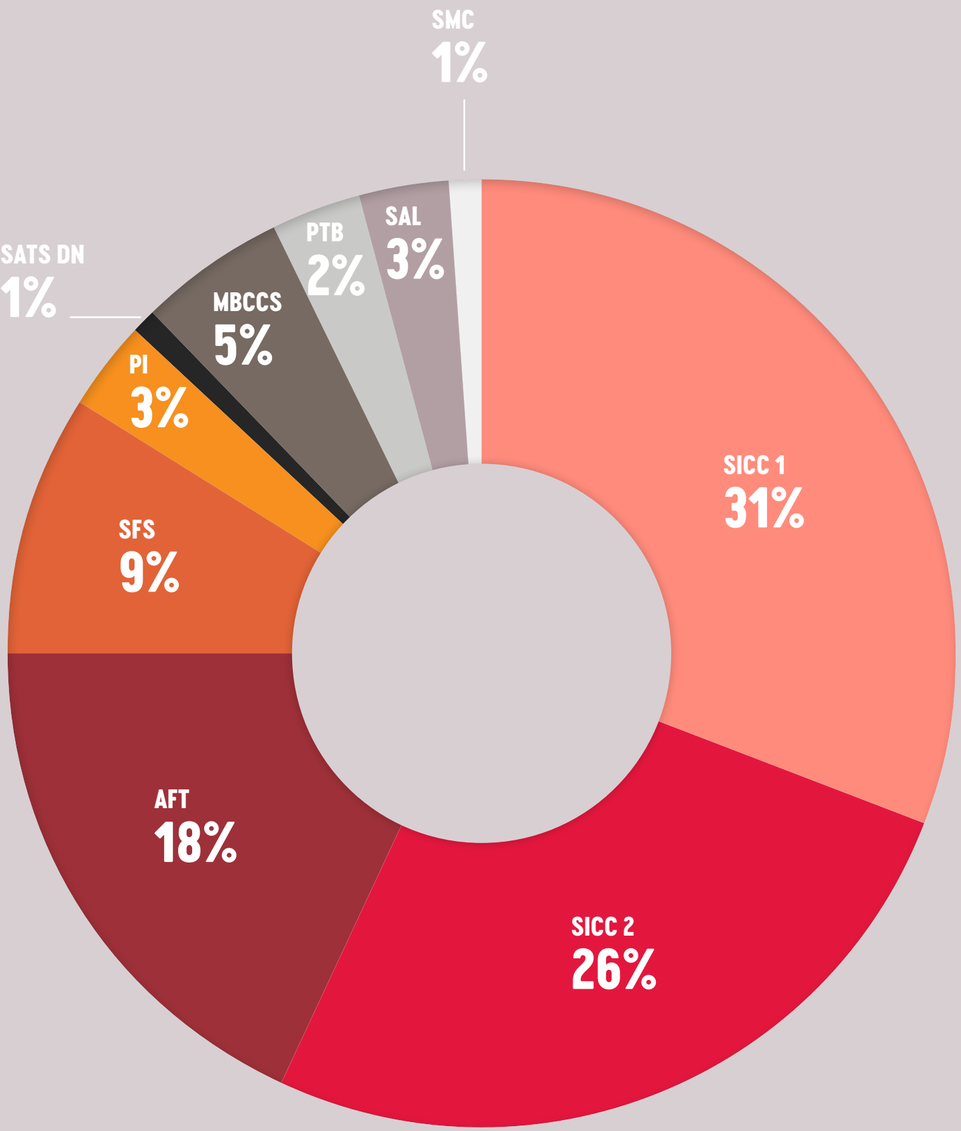
1,353 MILLION LITRES

33% DECREASE OVER THE LAST 2 YEARS

CHART 06

ANNUAL WATER CONSUMPTION BY BUILDINGS

	(m^3)
SICC 1	471,711
SICC 2	335,553
AFT	99,205
SFS	106,399
PI	77,322
SATS DN	4,404
MBCCS	33,319
PTB	23,766
SAL	191,489
SMC	10,264



TOTAL ELECTRICITY CONSUMPTION

110 GWh TOTAL

6% DECREASE OVER THE LAST 2 YEARS

CHART 07

ANNUAL ELECTRICITY CONSUMPTION BY BUILDINGS

	(kWh)
SICC 1	34,980,000
SICC 2	28,450,373
AFT	19,813,238
SFS	9,634,999
PI	3,118,787
SATS DN	1,422,915
MBCCS	5,465,530
PTB	3,319,073
SAL	3,361,310
SMC	871,199

REDUCE EMISSIONS

Greenhouse gases like carbon dioxide are responsible for trapping heat in the earth's atmosphere, contributing to rising temperatures, rising sea levels and weather extremes, which affect all forms of life on land and in the ocean.

Within the aviation community, airports around the world are making a collective effort to reduce their carbon emissions in a bid to create a more sustainable industry. From May 2017 to May 2018, accredited airports under the global carbon management standard, Airport Carbon Accreditation, have successfully reduced an amount of carbon dioxide emissions under their direct control that is equivalent to an amount which would take more than 8 million trees planted over 10 years to absorb.[9]

As a leading provider of gateway services and food solutions in the region, we believe that we have an obligation and a pivotal role to play in driving positive climate action and reducing our carbon footprint across our businesses.

This year, the highlights of our sustainability efforts include integrating environment policies and practices into our operations, developing greater energy efficiency and increasing our use of renewable energy.

OUR 2030 GOALS

- TO EMPLOY 100% ELECTRIC GROUND HANDLING EQUIPMENT*
- TO ACHIEVE 40% USAGE OF RENEWABLE ENERGY IN SATS-OWNED BUILDINGS
- TO ACHIEVE 80% REDUCTION IN CARBON FOOTPRINT BY 2030

[9] Airports Council International. (2018). Global Climate Action by Airports up 25% in the Past Year.

* Subject to the development of infrastructure and facilities to support electric ground equipment by airports.

ALIGNING PRACTICE WITH POLICY

To identify our carbon emissions baseline on which we can build our sustainability goals and measure progress, we worked with external consultants, NEA, CAG and relevant business units to conduct a carbon footprint audit across our Singapore operations.

Using a defined methodology, we audited the operations of SICC1, SICC2, SFS, SAL, AFT, SMC, MBCCS and SATS Cargo. This exercise is crucial in helping us to devise standardised regulations, implement abatement measures and optimise the process of planning and implementation of future initiatives.

CARBON EMISSIONS CALCULATION METHODOLOGY

To calculate the volume of emissions, energy consumption data was compiled from different sources within SATS. Where possible, raw data was used – as close to the original data source as possible. The information was collected on a monthly basis and entered into the reporting tool.

The reporting tool contains input sheets that are separated into 5 classifications describing the different companies within SATS. These include Singaporean Subsidiaries, Singaporean Associates and Joint Ventures, Overseas Associates, Overseas Subsidiaries and Overseas Joint Ventures. Each company in the SATS corporate group is allocated into one of these classifications.

Under each company, different facilities are identified – these comprise the physical installations and activities of each company that generate emissions through fuel and electricity consumption. Within each facility, the respective data input are tagged to the relevant emission points identified. Moving forward, carbon emission data will be recorded accordingly.

DIFFERENT EMISSIONS SOURCES

The different emissions sources use different estimation methods to calculate greenhouse gas emissions.

FUEL COMBUSTION

A number of different fuels are used within SATS' operations. Each of these is reported in units of measurement specific to a particular emission point. These are then converted to required units of measurement that are used to calculate the volume of greenhouse gas emissions. The units of measurement supplied (reported units) and the required units for calculations are shown in the table on the right.

To calculate the emissions, the amount of fuel consumed is first converted to energy units. For emissions with required units in kg, the lower heating values published under NEA's Greenhouse Gas Measurement and Reporting Guidelines or the IPCC Guidelines for National Greenhouse Gas Inventories are used.

The lower heating values are used because these are consistent with the emissions factors that are used for calculating emissions. Each lower heating value is presented in GJ/kg so the gigajoules of each fuel combusted are calculated. Those fuels that are reported in energy units (kWh or MMBTU) are also converted to GJ.

Emissions factors for each fuel type are then used to calculate the greenhouse gas emissions from the energy consumed. Each fuel type has an emissions factor that is presented in kg of *CO_2-e per GJ of fuel combusted. Emissions factors for carbon dioxide, methane and nitrous oxide are presented separately for each fuel type.

FUEL TYPE	REPORTED UNITS	REQUIRED UNITS	CONVERSION METHOD
Diesel	Litres	kg	Diesel density = 0.831 kg/L
Petrol	Litres	kg	Petrol density = 0.748 kg/L
Town gas	kWh	MWh	1 MWh = 1,000 kWh
	Sm^3	kg	Gas density = 0.604 kg/Sm^3
	MMBTU	GJ	1 MMBTU = 1.055 GJ
LPG	kg	kg	Not applicable

* Co_2-e = Carbon Dioxide Emission
- GJ = Gigajoule
- kg = Kilogramme
- L = Litre
- kWh = Kilowatt Hour
- MWh = Megawatt Hour
- Sm^3 = Standard Cubic Metre
- MMBTU = Metric Million British Thermal Unit

The global warming potential for each of these 3 greenhouse gases is then converted to kilogrammes of equivalent carbon dioxide (kg CO_2-e). These global warming potentials, taken from the IPCC Assessment Report 4, represent the relative warming of methane and nitrous oxide compared to carbon dioxide. Methane for example, has a global warming potential of 25 t CO_2-e/t CH_4 –, which indicates that it is 25 times more powerful as a greenhouse gas over a 100-year time horizon.

SCOPE 2 EMISSIONS

Scope 2 emissions refer to indirect emissions and in this data set, it comes purely from purchased electricity. These are calculated from invoices and other records such as utility bills showing the kWh of electricity purchased for different facilities or purposes. To calculate scope 2 emissions, the average grid emissions factor for the country in which that electricity is purchased is used. This is generally presented in units of kg CO_2-e/kWh. In Singapore, the grid emission factor is currently 0.413 kg CO_2-e/kWh.

INCREASING USE OF RENEWABLE ENERGY AND ENERGY-EFFICIENT EQUIPMENT

To reduce our carbon footprint and lower the greenhouse effect on our environment, we are working to increase our reliance on renewable sources of energy as viable, long-term alternatives. In FY2018-19, SATS generated 4.8GWh from renewable energy – enough to power approximately 13,000 four-room flats for a year.

Solar energy currently comprises 4% of the energy supplied to SATS facilities such as SFS, SMC and AFT. Our goal for FY2019-20 is to explore solar usage in other areas such as ground support equipment (GSEs).

At the same time, we are working with our partners on ways to increase our supply of solar energy as well as on initiatives such as the development of solar arrays on all viable roof spaces. The collaboration will also include testing of solar photovoltaic thermal panels, which is projected to provide for about 15% of the hot water supply in ICC1, as a potential energy supply for our laundry and food processing plants.

Besides growing our sources of renewable energy, the use of energy-efficient equipment also plays an important part in reducing our overall emissions. SATS has carried out chiller replacement projects at SICC 1, SICC 2 and Changi Airfreight Terminals 1 to 6, replacing existing chiller plant systems with new ones that are equipped with energy management features. In FY2018-19, these replacements have enabled us to save 1.79GWh, which is equivalent to the annual energy consumption of approximately 4,800 four-room flats.

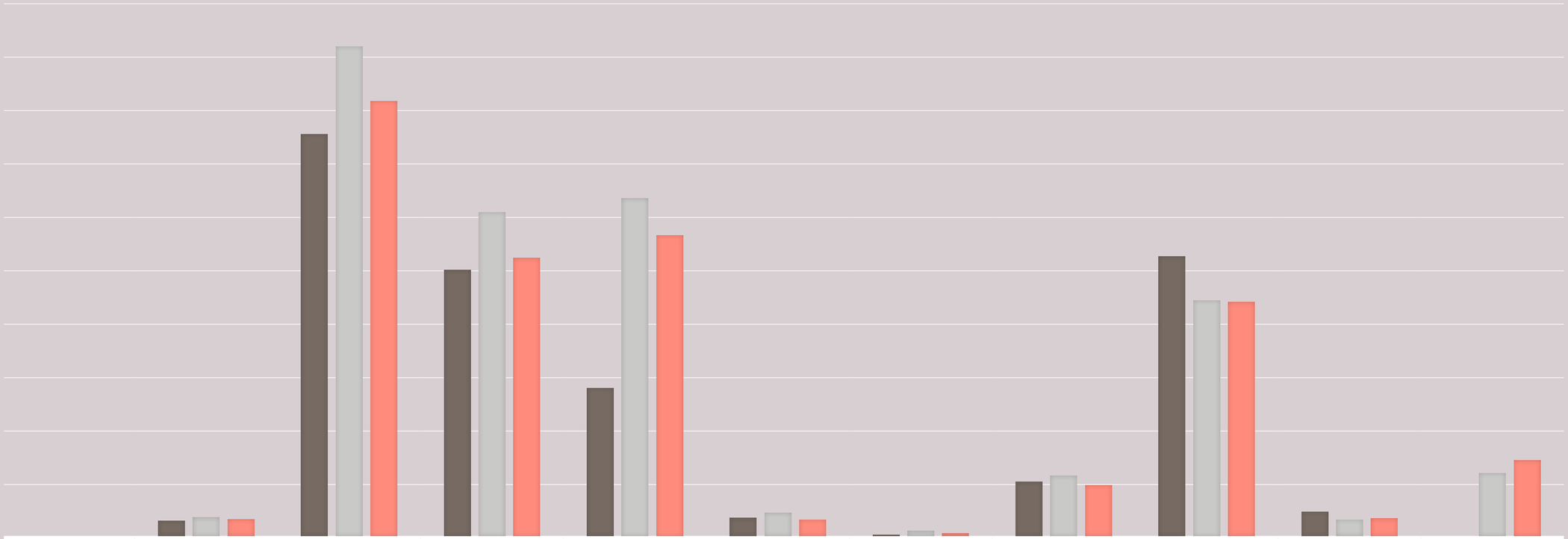
DEVELOPING NEW WAYS TO GO GREENER

Applying a technology-driven, people-led approach to growing the business in line with our sustainability goals, SATS is constantly exploring new and productive ways to harness innovative technology for greener and more efficient operations. In doing so, we hope to create lasting value for our customers, our people, the airport and aviation community as well as the natural environment.

PLEASE REFER TO:
CHART 08
CHART 09
TABLE 02
TABLE 03
TABLE 04

CHART 08

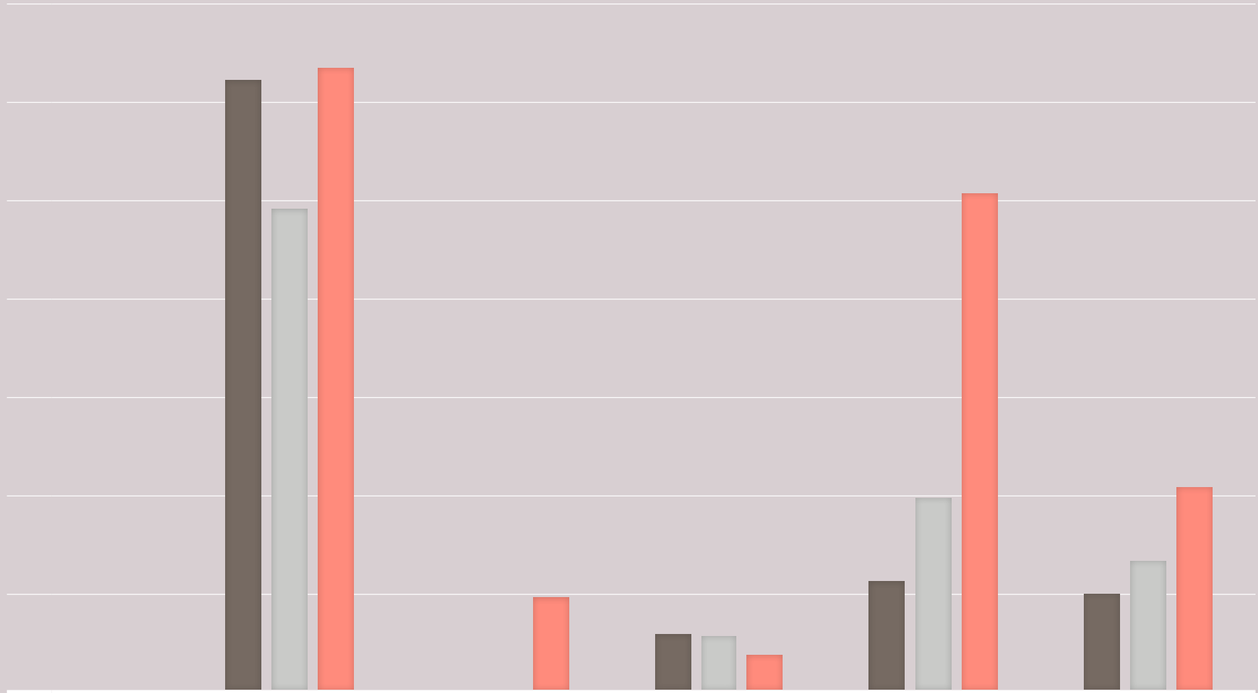
DIESEL CONSUMPTION FOR RESPECTIVE BUSINESS UNITS



(litres)	PASSENGER SERVICES	APRON OPS	CARGO SERVICES	SATS CATERING	SATS SECURITY	SATS HOLDINGS	SATS ASIA PACIFIC STAR	SATS AERO LAUNDRY	PRIMARY INDUSTRY	SATS FOOD SERVICES
FY2016-17	144,202	3,779,392	2,501,655	1,391,799	169,846	1,113	510,788	2,629,055	230,000	–
FY2017-18	175,560	4,601,277	3,045,677	3,174,201	219,409	8,241	566,550	2,216,474	155,000	590,838
FY2018-19	**157,208**	**4,090,886**	**2,615,295**	**2,828,922**	**154,264**	**4,385**	**477,317**	**2,200,613**	**165,000**	**710,983**

CHART 09

PETROL CONSUMPTION FOR RESPECTIVE BUSINESS UNITS



(litres)	APRON OPS	CARGO SERVICES	SATS CATERING	SATS SECURITY	SATS ASIA PACIFIC STAR
FY2016-17	31,245	–	2,844	5,544	4,920
FY2017-18	24,638	–	2,747	9,836	6,602
FY2018-19	**31,885**	**4,715**	**1,777**	**25,451**	**10,379**

TABLE 02

EMISSIONS BY FACILITY TYPE

FACILITY TYPE	ENERGY (GJ)	EMISSIONS ($T CO_2$-E)		TOTAL EMISSIONS
		SCOPE 1 EMISSIONS	SCOPE 2 EMISSIONS	
Food preparation and delivery	516,402	14,949	36,229	**51,179**
Building operations	135,313	0	18,267	**18,267**
Cargo services	179,389	7,918	9,951	**17,870**
Apron and ramp services	148,100	11,023	0	**11,023**
Laundry operations	85,191	5,971	804	**6,775**
Management of international cruise terminal	19,676	0	2,656	**2,656**
Abattoir	28,182	651	1,516	**2,167**
Ground handling services	15,749	1,186	0	**1,186**
Security services	6,417	480	0	**480**
Passenger services	6,097	459	0	**459**
Maintenance operations	3,134	0	423	**423**
Administration services	158	12	0	**12**
TOTAL	1,143,809	42,650	69,847	112,496

TABLE 03

EMISSIONS BY FUEL TYPE

FUEL TYPE	ENERGY (GJ)	EMISSIONS ($T CO_2$-E)		TOTAL EMISSIONS
		SCOPE 1 EMISSIONS	SCOPE 2 EMISSIONS	
Electricity	517,383	0	69,847	**69,847**
Diesel - stationary	248,389	18,469	0	**18,469**
Diesel - transport	242,936	18,308	0	**18,308**
Town gas - SG	125,721	5,263	0	**5,263**
LPG - stationary	6,964	440	0	**440**
Motor Gasoline - transport	1,376	98	0	**98**
Motor Gasoline - stationary	1,040	72	0	**72**
TOTAL	**1,143,809**	**42,650**	**69,847**	**112,496**

TABLE 04

EMISSIONS BY SINGAPORE COMPANY

COMPANY	ENERGY (GJ)	EMISSIONS ($T CO_2$-E)		TOTAL EMISSIONS
		SCOPE 1 EMISSIONS	SCOPE 2 EMISSIONS	
SATS Airport Services Pte Ltd	472,019	19,400	28,642	**48,041**
SATS Catering Pte Ltd	427,633	11,398	30,828	**42,225**
SFI Manufacturing Pte Ltd	65,656	2,260	4,646	**6,906**
SATS Aero Laundry Pte Ltd	85,191	5,971	804	**6,775**
SATS Creuers Cruise Services Pte Ltd	19,676	0	2,656	**2,656**
Primary Industries Pte Ltd	28,182	651	1,516	**2,167**
SATS Asia Pacific Star Pte Ltd	17,534	1,320	0	**1,320**
SATS BRF Food Pte Ltd	12,969	942	64	**1,006**
SATS Delaware North Pte Ltd	5,569	6	692	**697**
SATS Security Services Private Limited	6,417	480	0	**480**
SATS Food Services Pte Ltd	2,791	210	0	**210**
SATS Ltd	158	12	0	**12**
SATS Aerolog Express Pte Ltd	14	1	0	**1**
TOTAL	**1,143,809**	**42,650**	**69,847**	**112,496**

CASE STUDY

THE POWER OF GOING ELECTRIC

To ensure that we continue to grow sustainably, reducing our long-term environmental, operating and energy costs, we are carrying out an 11-year master plan to transition fully from diesel GSEs to electric ones by 2030. This includes the provision of sustainable charging points, which use data and predictive analytics to optimise utility and resource scheduling.

Since the introduction of the first batch of electric tractors in August 2017, we have successfully converted a total of 93 GSEs to electric ones comprising 78 tractors, 9 forklifts and 6 pallet trucks. Today, fully electric tractors have been deployed at Changi Airport's Terminals 2, 3 and 4 baggage departments.

In the process of going fully electric and expanding our deployment of electric GSEs across our ground operations, a tender has been awarded for the replacement of 220 units of diesel tractor across all apron units at Changi Airport. We have a total of 1,172 motorised GSEs, including 144 forklifts used in our cargo operations, of which 9 are electric. By March 2020, approximately one-third of our total fleet will be converted to electric GSEs.

The successful transformation of our ground operations also requires close collaboration with our airport partner, CAG, to develop provisions for electric vehicles such as increasing the number of electric charging stations from 22 points to 114 units.

SUSTAINABILITY IMPACT

1. **A HEALTHIER WORKING ENVIRONMENT**
   Switching to electric vehicles has resulted in a reduction in noise levels, fumes and carbon emissions from diesel tractors, creating a quieter and healthier working environment at baggage handling areas.

2. **A SMALLER CARBON FOOTPRINT**
   In 2018, the conversion to electric GSEs saved approximately 446,706 litres of fuel, which is equivalent to an estimated 1,215 tonnes of carbon dioxide – an amount that would take 20,000 tree seedlings 10 years to sequester.

3. **LOWER MAINTENANCE COSTS**
   Replacing diesel vehicles with electric ones also removes a key source of soot, reducing maintenance costs of cleaning the walls of buildings.

4. **ENHANCED SAFETY**
   With in-built speed regulators that limit the speed of forward and reverse movement to 20km/h and 5km/h respectively, the electric tractors are designed to ensure greater safety levels during operations.

   Patented by SATS, the tow-hitch sensor is installed on electric tractors to prevent baggage trollies, pallet dollies and mail trollies in the airside from dislodging when being towed. When reversing, a reverse blue light is activated to provide visible warning to other operators. In addition, seat sensors have also been fixed to prevent the possibility of a runaway tractor when unmanned at the airside.

Moving forward, SATS is working with potential vendors including car manufacturers such as Renault and Hyundai to explore conversion options for GSEs such as transport vans, cars and apron passenger buses.