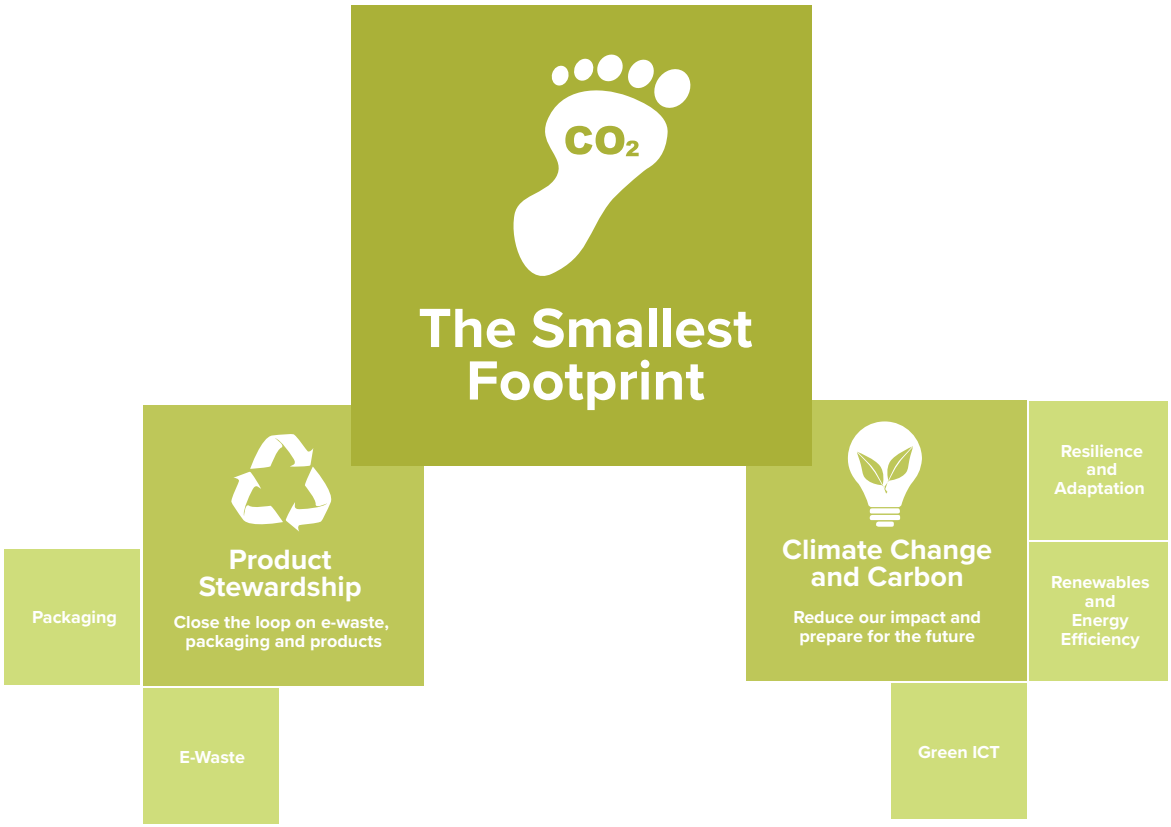
03 Environment
The Smallest Footprint

We are committed to minimising our environmental impact and building operational resilience.



This year has seen continued progress on our climate agenda at the global and national level.

The G20 Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD) has released recommendations to help businesses disclose climate-related financial information. These recommendations are a significant step forward in the climate space and we are proud to be among the first companies globally to endorse the recommendations and commit to working progressively towards the reporting framework.

In Singapore, the Government has accelerated action with the announcement of the carbon tax and a mandatory electrical and electronic waste management system by 2021. It has also named 2018 the 'Year of Climate Action' for Singapore.

With our ongoing climate mitigation and adaptation roadmap as well as the adoption of Science Based Targets and implementation of our energy and carbon reduction programmes, we are preparing the Singtel Group to tackle climate related risks and opportunities as well as contribute to keeping global warming below the 2°C threshold.

For more details on our approach, please refer to our website.

Environment

CLIMATE CHANGE AND CARBON

We continue to address the threat of climate change through mitigation and adaptation efforts, focusing on improving our energy performance and efficiency measures, as well as building resilience across our operations.

Energy performance and efficiency

The Singtel Group has been working on a number of programmes targeting energy reduction across key energy intensive touchpoints of our operations, such as network infrastructure, data centres, satellite earth stations and office buildings.

For more details on our approach, please refer to our website.

Replacing and overhauling chillers and related equipment

Over the years, we have been regularly replacing and overhauling chiller units and related Mechanical and Engineering (M&E) equipment at our exchanges and office buildings in Singapore, targeting those that have been in operation for 15 years or more.

In FY2018, we replaced the older and less efficient chillers from NCS Hub with new chillers, cooling towers and pumps of high energy efficiency. Alongside the chiller replacement, old Computer Room Air Handling Units (CRAH) and Air Handling Units (AHUs) were replaced with newer and more energy efficient Electronically Commutated (EC) fan driven AHUs.

Our energy roadmap has been updated and extended until FY2021, and to replace 22 units of older chillers and related M&E equipment located at our exchanges and office buildings.

Progress in FY2018

Estimated energy savings and emissions avoidance:

4,401 MWh/year (15,842 GJ/year) or 1,898 tCO_2e/year in Singapore.

Potential reduction of a total of 6,141 MWh (22,108 GJ) annually when fully completed for all 22 chillers.

This will reduce our carbon footprint by 2,649 tCO_2e per year in Singapore.

Retrofitting M&E equipment

We have made concerted efforts to retrofit our M&E equipment such as installation of Variable Speed Drive (VSD) for air cooled chiller, AHU and CRAH at our Data Centres in Singapore.

Progress in FY2018

Estimated energy savings and emissions avoidance:

(a) *Retrofit of air cooled chiller with 1 VSD, NCS Bedok: 300 MWh/year (1,080 GJ/year) or 129 tCO_2e/year.*

(b) *Retrofit of AHUs with 50 VSDs, Kim Chuan 1 Data Centre: 1,282 MWh/year (4,615 GJ/year) or 553 tCO_2e/year.*

(c) *Retrofit of CRAH units with 47 VSDs, Kim Chuan 1 Data Centre: 1,131 MWh/year (4,072 GJ/year) or 488 tCO_2e/year.*

Switching to energy saving lighting

Concerted efforts made to retrofit to LED lightings in Singapore.

Progress in FY2018

Estimated energy savings and emissions avoidance:

164 MWh/year (591 GJ/year) or 71 tCO_2e/year at Kim Chuan 2 Data Centre in Singapore.

Implementing operational improvements

We created energy savings through operational improvements without the need for capital investments in Singapore.

We increased the temperature of common areas to 25 degrees Celsius and optimised the operating hours of the air conditioning units at our data centres.

We also looked into the operation methodology of the CRAH units at our telephone exchange and changed from running three units at an average of 80% fan speed to running four units at around 60% fan speed.

Progress in FY2018

Estimated energy savings and emissions avoidance:

(a) *Kim Chuan 1 Data Centre: 949 MWh/year (3,415 GJ/year) or 409 tCO_2e/year.*

(b) *DC West Data Centre: 5,909 MWh/year (21,271 GJ/year) or 2,548 tCO_2e/year.*

(c) *Yio Chu Kang telephone exchange: 66 MWh/year (239 GJ/year) or 29 tCO_2e/year.*

Upgrading fresh air cooling

Replacing current fresh air fans with modern DC variable speed fans and larger intake units with the capability of doubling the air intake and reducing the need to rely on air conditioners in Australia.

Progress in FY2018

Installation completed at 260 sites.

Estimated energy savings and emissions avoidance:

1,170 MWh/year (4,212 GJ/year) or 936 tCO_2e/year in Australia.

Replacing Uninterruptible Power Supply (UPS)

We replaced six units of UPS and improved efficiency from 84% to 92.5%.

Progress in FY2018

Estimated energy savings and emissions avoidance:

365 MWh/year (1,314 GJ/year) or 157 tCO_2e/year at Kim Chuan 1 Data Centre in Singapore.

Decomissioning obsolete mobile equipment

Shutting down and decommissioning obsolete mobile equipment as a result of the discontinuation of 2G technology in Australia.

Progress in FY2018

Radio frequency shutdown on 5,100 sites and equipment decommissioning on 1,750 sites.

Estimated energy savings and emissions avoidance:

11,424 MWh/year (41,126 GJ/year) or 9,139 tCO_2e/year in Australia.

Converting to energy efficient mobile base stations

We continue to upgrade our mobile networks in Singapore and convert to energy efficient mobile base stations.

Progress in FY2018

Energy efficient mobile base stations:
99.12% in Singapore.

Electricity use per cell carrier:
Improved to 3,238 kWh from 3,594 kWh last year.

Promoting sustainable transport options

We continue to make sustainable transport attractive to employees by running one of Australia's largest fleets of employee shuttle service with over 100 buses each day.

Progress in FY2018

Reduction of cars off the roads:
~1,400 cars daily

Switching to cleaner energy

Switching the power supply source from diesel generators to the national power grid for cleaner energy at our offshore Pulau Tekong Microwave Station.

Progress in FY2018

Estimated emissions avoidance:

223 tCO_2e/year in Singapore.

Climate change resilience

In response to the potential effects of climate change in Singapore, we have reviewed targeted critical infrastructure and identified those that may need enhancement to protect against floods. We are currently exploring measures to mitigate this risk.

We continue to participate actively at the Australian Business Roundtable for Disaster Resilience and Safer Communities (ABR), of which Optus is a founding member, and have published our fifth Report on Building Resilience to natural disasters in our states and territories. We are pleased that our efforts and research through ABR have contributed towards the Australian Government's recent announcement of establishing a National Resilience Taskforce to reduce the impact of natural disasters on the Australian community.

We have identified an additional 260 critical facilities across Australia for the next three years where we will upgrade energy standby generation and storage capacity from three to seven days, so that we will have extended uptime during times when the public energy grid is affected by natural disasters.

Two additional SATCATs (mobile cell on wheels with built-in generator power) were commissioned during the year to support mobile communications at disaster areas.

As part of our support for SDG 11 on Sustainable Cities and Communities, Singtel and Optus have been involved with the 100 Resilient Cities (100RC) projects in Singapore and Sydney, Australia, to provide input into the key long-term resilience issues and roadmap. We see significant interdependencies between different stakeholders and key infrastructures in ensuring overall resilience of cities to long-term 'systems shocks', such as climate change and climate action (SDG 13).

We engage the Centre for Liveable Cities, the Secretariat to the Singapore 100RC project, for such input at the national level and to mobilise broader corporate engagement with the 100RC initiative, which supports SDG 17 on Partnership for the Goals. Since 2016, we have been actively involved in the Sydney 100 Resilient Cities workshops and contributed to the strategy development, and we remain an advocate.

Environment

Singtel adopts Science Based Targets to keep global warming below 2°C

The Singtel Group became the first company in Asia excluding Japan to have our carbon reduction targets approved by the Science Based Targets initiative (SBTi) in October 2017. SBTi is a collaborative effort between CDP, World Resources Institute (WRI), World Wide Fund for Nature (WWF) and the United Nations Global Compact (UNGC) and aims to assist businesses to align with the Paris COP21 climate deal to keep global warming below 2°C.

SBTi Methodology

The SBTi methodology starts with what global carbon reductions are needed to come below 2°C and these absolute reductions are allocated by sector supply chains and countries of operation. Singtel adopted the sector decarbonisation approach and selected a market-based mechanism for meeting our targets. The country aspect also factors in current and future carbon coefficients of power generation in a particular country.

For example, for Optus in Australia, we took into account that today's energy is mainly derived from coal power generation, which has higher carbon coefficient compared to Singapore which uses mainly natural gas for power generation.

Why SBTi

Adoption of the SBTi targets is a follow-up to the Life Cycle Assessment (LCA) that we conducted in FY2016. The LCA identified carbon as a key area of focus across our value chain and helped us identify that 60% of the Group's carbon footprint was in our supply chain. We also recognised that with the growth of our business, there is a projected ongoing increase in energy consumption and carbon emissions leading up to 2030.

The SBTi framework and methodology has provided us with a 'top down' means to develop our aspirational targets and guide the business strategy going forward, one that is in line with the global intent to keep the global temperature rise to below 2°C. The SBTi framework and methodology are helpful in setting our targets that are related to our businesses and areas of operation.

Our targets

The Singtel Group aims to cut our absolute Scope 1 and 2 direct and indirect carbon emissions across our Singapore and Australian operations by 42% from 2015 base year by 2030. This is after factoring in further organic business growth. We will also work with our suppliers to reduce Scope 3 third-party emissions by 30% over the same period.

Looking ahead

We understand that a large quantum of these reductions will come through our supply chain. As we continue to work on the energy and operational efficiency initiatives in our operations, we will work progressively with our major vendors to understand how they can reduce their own carbon footprint.

Factoring in the supply side, we aim to work closely with energy providers and the authorities due to the dependency for some of the reductions on our renewable energy roadmap. We will also explore a larger scale direct renewable energy deployment in our infrastructure or bigger scale projects in both Australia and Singapore where available and economically viable.

"I applaud Singtel for taking the lead in corporate responsibility and ask that more companies, big and small, undertake efforts to study and publish their carbon footprint. Being transparent is the first and crucial step to reducing carbon emissions. We also encourage companies to undertake efforts to build operational resilience in the face of climate change."

MR MASAGOS ZULKIFLI, MINISTER OF THE ENVIRONMENT AND WATER RESOURCES, SINGAPORE, AT THE RESPONSIBLE BUSINESS FORUM, 22 NOVEMBER 2017

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

PRODUCT STEWARDSHIP

Waste Management

Electronic and packaging waste are the two key sources of waste generated from our operations and across our value chain. We focus on recycling our own waste, collaborating with partners and suppliers, and redesigning our product offerings to minimise our impact in this area.

E-waste

We continue to maintain high standards in e-waste recycling, with over 75% of our hazardous waste such as scrap copper cables and UPS lead acid batteries recycled with National Environment Agency (NEA) licensed vendors in Singapore. In Australia, we recycle over 98% of our own e-waste.

Packaging waste

We are committed to packaging sustainability and continue to be a high performing member of the Australian Packaging Covenant Organisation (APCO). In 2017, APCO revised its reporting framework in order to better account for its members packaging impact and measurement. These include providing quantitative data on the sustainability performance of packaging and other materials released to market. This will better reflect progress in areas such as recyclability, material efficiency and post-consumer recycled content. While we had progressively improved our scores to a high 4.2 out of 5 as reported last year, the revised reporting framework would result in a one-time recalibration and reduction of reporting scores for all members.

We see this as an opportunity to progressively raise our own standards in packaging and disclosures, and have begun developing a new five-year Packaging Strategy with measurable targets in line with the new APCO framework. We will report our progress in next year's report.

Recycling e-waste through partnerships in Singapore and Australia

The Ministry of Environment and Water Resources (MEWR) in Singapore has announced the implementation of a mandatory e-waste management system by 2021 with an Extended Producer Responsibility (EPR) approach. While details are not available yet, the scheme will have a direct impact on the mobile phone manufacturers. We will monitor the development closely while continuing to play our part to promote e-waste recycling.

Today, we offer our customers a trade-in scheme so that end-of-contract phones can be reused. We also provide recycling facilities at our retail outlets for consumers to dispose of their end of-life products and accessories easily.

In Singapore, we launched the ReCYCLE programme in collaboration with SingPost on World Environment Day 2017. Through the programme, which is supported by NEA, consumers can drop off their unwanted electronic items at our ReCYCLE bins at selected Singtel Shop, Singtel Exclusive Retailer and SingPost outlets. ReCYCLE envelopes are also available at all outlets for people to mail their mobile devices and accessories at their own convenience without the need for postage.

As at 31 March 2018, our programme collected a total of 9,677 kg (net weight) of e-waste, or almost 1,000 kg per month over ten months. This is a 250% increase before our strategic partnership with SingPost, demonstrating the benefits of increasing access through new outlets like post offices and the convenience of a mail-in option.

We also work with our e-waste vendor to organise regular roadshows at our key office premises to encourage our people to dispose of their unwanted e-waste responsibly.

In Australia, we continue to support the Mobile Muster programme, enabling customers to recycle their old mobile phones free of charge by taking them to any Optus retail store. During the year, 4,251 kg of handsets, batteries and accessories were collected for recycling.

Environment

Task Force on Climate-related Financial Disclosures: Singtel's current alignment and plans

GOVERNANCE

Our Plans

We plan to enhance information processes that will enable the Board and management to consider climate issues in relevant strategic decisions.

Board oversight

The Singtel Board provides oversight of the company's sustainability strategy and initiatives, and approves the sustainability-materiality register which includes climate change issues.

The Board is updated on the strategy, plans and performance at least once a year, and approves the sustainability report which provides comprehensive disclosures on the company's climate change agenda.

Management oversight

Climate change comes under the responsibility of the Vice President of Group Sustainability, who reports to a Singtel Management Committee Member. The climate and environment portfolio is headed by a Director of Group Environmental Sustainability.

The governance structure for climate related matters includes the company's Management Committee for all Group environment policy, strategy and plans; and Risk Management Committee for risk related updates on the topic.

There are other working groups - mainly from Networks and Facilities business units - relating to issues of climate adaptation and resilience planning.

STRATEGY

Our Plans

We are looking to refresh our analysis on transitional and physical climate issues and quantify the materiality of financial impact of these issues under different climate scenarios. We will also look at integrating these issues into core business management processes and financial planning.

Climate related risks and opportunities over the short, medium and long term

In FY2016, the Singtel Group conducted a formal climate adaptation and resilience study to understand the various models and assumptions of climate change patterns for our Singapore and Australian operations. This exercise helped us to identify the key climate change and impact scenarios, gaps and opportunities to improve resilience and adaptation of our networks to the long-term effects of climate change.

The biggest risks we identified are related to business continuity of network and operations, which is essential for any telecommunications operator. Inundation risk from increased frequency and intensity of cyclonic activities, coupled with sea level rise which can result in network and service disruptions and other interdependencies, is the top concern. This led to progressive development and upgrade of network design and infrastructure both in terms of redundancy and energy security. Regulatory risks identified are mainly linked to network availability and quality to meet regulatory service benchmarks.

a. Impact of the risks on business, strategy and financial planning

b. Resilience of strategy, considering different climate scenarios

We have identified the high-level financial drivers relating to climate risks and opportunities. We will progressively seek and isolate the required financial information to undertake long-term financial impact modelling.

As we undertake the SBTi roadmap, we will also know if there are any material financial exposures on our efforts to achieve the SBTi carbon targets.

The TCFD recommendations have provided further direction to our climate strategy, particularly on climate resilience. We are one of the first companies globally to endorse the TCFD recommendations and our initial assessment shows that we have all the building blocks in place to implement the recommendations into our existing management processes.

While we have done significant work in certain areas, such as setting metrics and targets, we recognise that there are other areas where we need to strengthen over the next three years of adopting the recommendations.

RISK MANAGEMENT

Our Plans

We plan to undertake a formal mapping and modelling of the financial drivers relating to climate change, which will help to establish a materiality threshold and assessment framework for climate risks versus other risks.

Process for assessing and identifying climate risks

We have undertaken Life Cycle Assessments, Climate Adaptation Mapping and SBTi as part of the methodology to identify risks, including climate risks.

We also actively engage the Singapore and Australian Government and agencies on the topic to understand emerging risks, policies or regulations. In Singapore, this is through business roundtables sharing and discussion on TCFD and SBTi. In Australia, this is mainly through ABR where we have undertaken collective research, economic modelling and policy discussions with federal and local governments.

In Singapore, we have begun proactive engagement and advocating collaboration with the National Climate Change Secretariat and Centre for Liveable Cities as part of 100 Resilient Cities, and lead business engagement and roundtables to share and discuss longer term climate risks.

Optus has been proactive through ABR on research and policy influence on government, given the major interdependencies on policy and funding. We also actively monitor and engage in the regulatory development relating to reporting and carbon emission taxes. In Australia, Optus provides annual comprehensive energy reporting to the National Green Energy Regulator (NGER).

Process for managing climate risks

Climate risks, as a standalone risk category after mitigation, does not feature among the top ten risks for the Singtel Group. However, it is considered under service interruption risks which can be caused by various factors including climatic disasters.

Integration of processes into overall risk management

The company's Risk Register is comprehensively updated to reflect the longer term risks of climate change. The Board Risk Committee considers in detail the most material risks for the company.

METRICS AND TARGETS

Our Plans

We are in the process of developing a decarbonisation roadmap and financial model for climate change impact which will help us to achieve our SBTi carbon reduction targets. We will also work on breaking down these targets for individual business units, projects and procurement budgets.

Metrics used to assess climate risks and opportunities

We currently track and monitor a number of climate related metrics including our carbon intensity (per revenue and data traffic) and these are disclosed in our annual sustainability reports.

Scope 1, 2 and 3 Greenhouse Gas (GHG) emissions

Please refer to page 18 for more details on our scope 1, 2 and 3 emissions data.

Resilience of strategy, considering different climate scenarios targets used and performance against targets

In FY2018, the Singtel Group conducted a review and modelling of our carbon footprint and carbon targets to achieve a less than 2°C temperature rise scenario. Our carbon reduction targets have since been approved by the Singtel Management Committee and SBTi, and are publicly disclosed. Please refer to page 14 for details on our SBTi targets.

Environmental Performance Indicators

Environment

	Singtel			Optus			Singtel Group		
	2018	2017	2016	2018	2017	2016	2018	2017	2016
Total energy use (GJ)	**1,395,100**	1,404,843	1,379,633	**1,724,106**	1,702,440	1,657,262	**3,119,206**	3,107,283	3,036,895
Energy intensity (GJ/S$million revenue)	**166**	177	180	**189**	194	178	**178**	186	179
Energy intensity (GJ/TB*)	**0.43**	0.53	0.77	**0.71**	0.92	1.28	**0.55**	0.69	0.98
(i) Electricity Use (GJ)	1,372,809	1,385,099	1,358,030	1,692,773	1,665,694	1,618,544	3,065,582	3,050,793	2,976,574
Electricity Use (MWh)	381,336	384,750	377,231	470,215	462,693	449,595	851,551	847,443	826,826
Electricity Intensity (GJ/S$million revenue)	164	175	177	185	190	174	175	183	175
Electricity Intensity (GJ/TB)	0.42	0.52	0.76	0.70	0.90	1.25	0.54	0.67	0.96
Electricity Intensity (kWh/TB)	118	144	210	195	251	348	151	187	268
(ii) Fuel use from non-renewable sources (GJ)	21,935	19,369	21,198	30,869	36,282	38,255	52,804	55,651	59,453
(iii) Fuel use from renewable sources (GJ)	356	375	405	464	464	463	820	839	868
Solar energy (MWh)	99	104	112	129	129	129	228	233	241
Total carbon emissions (tonnes CO_2 equivalent) [1]	**174,391**	173,811	174,112	**418,760**	418,269	420,827	**593,151**	592,080	594,938
(i) Scope 1	**3,367**	1,992	4,629	**2,725**	2,495	2,614	**6,092**	4,487	7,243
Refrigerants	1,828	643	3,174	589 [2]	N.A. [2]	N.A. [2]	2,417	643	3,174
Fuel combustion	587	582	525	329	397	355	916	979	880
Company fleet	952	767	929	1,807	2,097	2,259	2,759	2,864	3,188
(ii) Scope 2	**164,470**	165,943	163,416	**399,257**	397,785	394,249	**563,727**	563,728	557,665
(iii) Scope 3	**6,554**	5,876	6,067	**16,778**	17,989	23,964	**23,332**	23,865	30,030
Contractor fleet	687	733	813	1,168	1,119	4,810	1,855	1,852	5,623
Air travel	3,845	3,113	3,180	8,004	8,551	9,442	11,849	11,664	12,621
Employee commute [3]	1,821	1,821	1,821	7,606	8,319	9,712	9,427	10,140	11,533
Retail franchisees	201	209	253	N.A.	N.A.	N.A.	201	209	253
Carbon Intensity (tCO_2e/S$ million revenue)	**21**	22	23	**46**	48	45	**34**	35	35
Carbon Intensity (tCO_2e/TB) [4]	**0.05**	0.06	0.09	**0.17**	0.22	0.31	**0.10**	0.13	0.18
Total Water Use (m^3)	**752,207** [5]	814,447	756,398	**74,235** [6]	82,111	70,254	**826,442**	896,558	826,652
Water Intensity (m^3/S$million revenue)	**90**	103	99	**N.A.**	N.A.	N.A.	**47**	54	49
Total Waste: hazardous and non-hazardous (tonnes)	**6,289**	4,613	4,223	**2,197** [8]	1,853 [8]	1,503 [8]	**8,486**	6,466	5,726
Total Non-Hazardous Waste by disposal method (tonnes) [7]	**2,227**	2,194	–	**1,972** [8]	1,177 [8]	–	**4,199**	3,371	–
Incineration with energy recovered	1,968	2,116		N.A.	N.A.		1,968	2,116	
Landfill	0	0		1,720	517		1,720	517	
Recycle / Reuse	259	78		252	660		511	738	
Total Hazardous Waste by disposal method (tonnes) [7]	**4,062**	2,419	–	**225** [8]	677 [8]	–	**4,287**	3,095	–
Incineration with energy recovered	388	285		0	N.A.		388	285	
Landfill	593	184		3	10		596	193	
Recycle / Reuse	3,081	1,950		222	667		3,303	2,617	
Customer E-waste Recycling (tonnes)	**36**	21	–	**4**	4	–	**40**	25	–

Footnotes:

* TB refers to terabyte of data transported across our network.
Terabyte related figures of Optus and the Singtel Group for 2016 and 2017 were restated.

1 The carbon emissions reported in the table is based on the reporting requirements of the WRI and WBCSD 'GHG Protocol Corporate Accounting and Reporting Standard'. The equivalent CO_2 emissions for electricity use are calculated based on the updated simple operating margin grid emission factors from the National Environment Agency in Singapore for the relevant time period and from corresponding states in Australia. Scope 1 direct emissions are calculated using the 2010 Guidelines to DEFRA/DECC's GHG conversion factors for company reporting (Annex 1). Scope 3 other indirect emissions are calculated using the 2010 Guidelines to conversion factors for DEFRA/DECC's GHG company reporting (Annex 6 and 7). Scope 3 air travel emission factors are derived from WRI, DEFRA, Oxford University and the UK Royal Commission on Environmental Pollution.

2 Optus uses a combination of air, water and refrigerant cooling systems. Refrigerants tracked and reported from FY2018.

3 Employee commute carbon emissions data will be updated only when there is a significant change in our company's operations or workforce.

4 Covers Scope 1 and 2 only.

5 Total volume withdrawn from municipal water supplies and includes use of 118,793m^3 NEWater instead of potable water.

6 Total volume withdrawn from municipal water supplies and includes rainwater harvesting of 3,660m^3 instead of potable water.
Water use for Optus Sydney campus only.

7 New GRI standards indicators tracked from FY2017.

8 Waste across facility under Optus waste direct contract and not inclusive of all sites.