

ENVIRONMENTAL

OUR PERFORMANCE

In 2017, Sembcorp was ranked 21st in Energy Intelligence's 'Top 100 Green Utilities' ranking. The Group is the only company from Singapore on the list, which ranks the world's leading electric utilities based on their renewable energy portfolios and GHG emissions. The 100 companies represent about 55% of the world's power generating capacity.

A Climate Change Strategy Working Committee was set up in 2017 to formally identify, review and manage climate-related risks and opportunities. We developed a Climate Change Strategy, including carbon emission intensity and reduction targets.

We continue to pursue GHG emission mitigation initiatives through our asset optimisation programme. Deployed at all our energy plants globally, these help us to effectively pursue reductions in energy consumption and GHG emissions. In one of our cogeneration plants in Singapore, we were able to reduce the energy consumption of a natural gas compressor resulting in savings of 3,450 megawatt hours of electricity in 2017, or almost 1,500 tonnes of CO₂ equivalent of emissions avoided*. Such initiatives allow us to mitigate the impact of current and potential carbon taxes in the countries in which we operate.

* Emissions avoided are calculated using 2016 Energy Market Authority of Singapore published grid emission factor

** The data in this document is presented in accordance with the GRI Standards: Core option, and the relevant GRI Standards topic and indicator is specified

ALL ENVIRONMENTAL INDICATORS

Material Issue – Climate Change

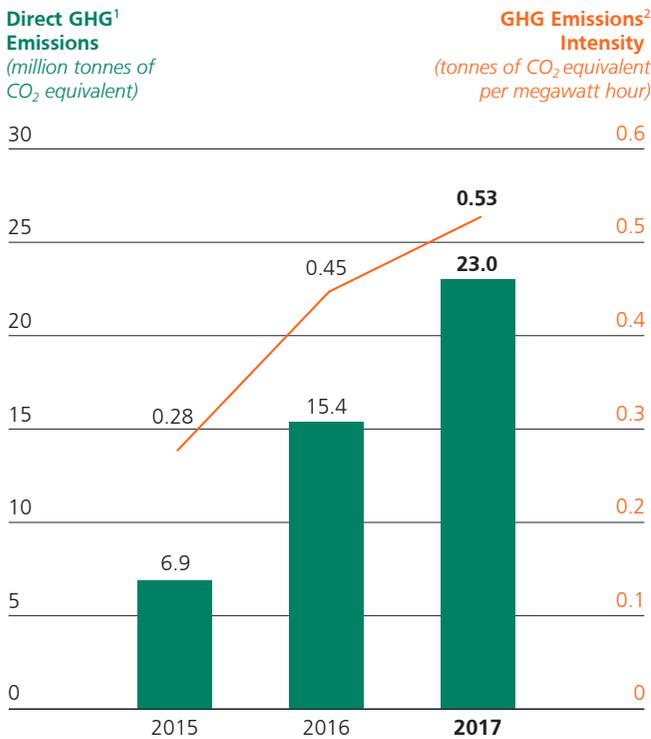
GRI 305-1 GRI 305-4 Environmental: Emissions

Direct GHG emissions and GHG emissions intensity (Scope 1)

In line with the methodology used for the development of our carbon emission targets, we now report our GHG emissions and GHG emissions intensity using an equity share approach. Our GHG emissions and GHG emissions intensity by equity share approach was 22.7 million tonnes of CO₂ equivalent and 0.55 tonnes of CO₂ equivalent per megawatt hour respectively. For the purpose of comparison, the operational consolidation data is presented below.

Direct GHG Emissions and GHG Emissions Intensity (Scope 1)

(applying operational consolidation approach)



¹ Emissions data covers entities that produce GHG from the combustion of fossil fuels consumed in our Utilities business' assets. It excludes emissions from anaerobic wastewater treatment plants, and maintenance and servicing equipment. Only CO₂, CH₄ and N₂O emissions are included in the calculation of direct GHG emissions. Global warming potential factors used are from the IPCC Fourth Assessment Report for 2015 and 2016 data, and the IPCC Fifth Assessment Report for the 2017 data. The time horizon applied is a 100-year time horizon

² GHG emissions intensity data for 2015 has been estimated. A small proportion of energy attributed to steam production in 2015 was not available and was estimated based on data from 2016

The increase in direct GHG emissions and GHG emissions intensity in 2017 was largely due to the inclusion of data from our second supercritical coal-fired power plant in India.

We report emissions from the combustion of biomass separately, in accordance with GRI Standards. These emissions amounted to approximately 442,000 tonnes of CO₂ equivalent in 2017 compared to approximately 566,000 tonnes in 2016. This decrease was due to both planned and unplanned downtime of our biomass plant in the UK.

GRI 305-2 Environmental: Emissions

Energy indirect (Scope 2) GHG emissions

Our indirect GHG emissions by equity share approach for 2017 was 260.5 thousand tonnes of CO₂ equivalent (location-based data). It includes data for all utilities business' assets; to avoid double counting between scope 1 and 2, data from Singapore businesses and the Singapore corporate office were excluded. Data from associates and joint ventures were not available for 2017, but we aim to include this data for the next reporting cycle.

CO₂ (including fugitive emissions), CH₄, N₂O, HFCs, PFCs and SF₆ emissions are included in the calculation of indirect GHG emissions, except for UK and Chile which only include CO₂, CH₄ and N₂O, and India which only includes CO₂. Emission factors are taken from the International Energy Agency (IEA), Ministry of Energy of Chile, Central Electricity Authority (CEA) of India, and the UK Department for Environment, Food & Rural Affairs (DEFRA).

Material Issue – Local Environment Protection

GRI 305-7 Environmental: Emissions

Nitrogen oxides (NO_x), sulfur oxides (SO_x), and other significant air emissions

Material air pollutants are NO_x, SO_x, and particulate matter. Persistent organic pollutants (POP), volatile organic compounds (VOC) and hazardous air pollutants (HAP) emissions are not considered significant and therefore not monitored.

Atmospheric emissions ¹ (thousand tonnes)	2017	2016	2015
Nitrogen oxides (NO _x)	22.3	17.1	3.7
Sulphur oxides (SO _x)	47.6	19.6	0.8
Particulate matter (PM)	1.6	1.1	0.1

¹ Emission figures are derived from direct measurement.

The increase in emissions from 2015 to 2016 and 2016 to 2017 is due to the inclusion of data from our first and second supercritical coal-fired power plants in India respectively.

GRI 306-1 Environmental: Effluents and Waste

Water discharge by quality and destination

	2017	2016	2015
Water discharge ¹ (million m ³)	1,234.3	1,321.3	1,258.4

2017	
Water discharge ^{1,2} by destination (million m ³)	
Surface water: Sea	1,132.7
Surface water: Others	88.3
Wastewater treatment plant	13.3

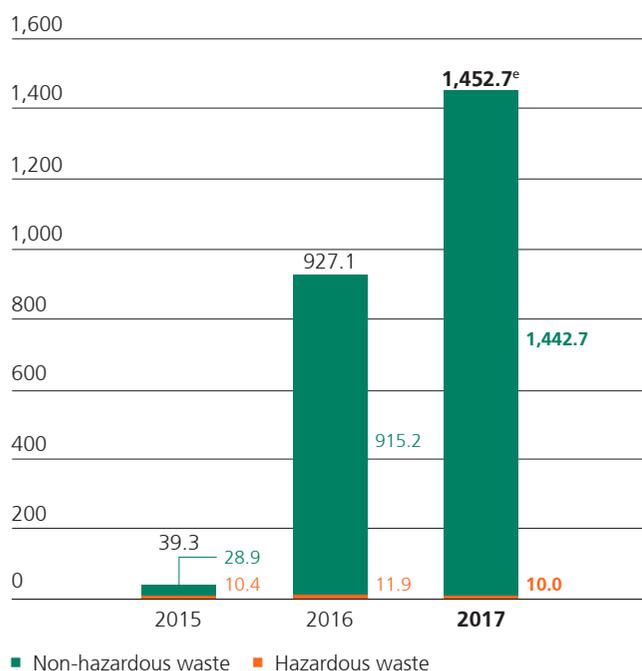
¹ The data includes water that is treated and discharged for our customers. Discharge figures are derived from a mix of direct measurement and mass balance. Water was not reused by another organisation

² Our facilities have different effluent requirements. We are exploring how best to report on water discharge by quality meaningfully, including closely reviewing the Exposure Draft GRI Standards 303: Water and Effluents

GRI 306-2 Environmental: Effluents and Waste

Waste by type and disposal method

Waste Generated^{1,2} (thousand tonnes)



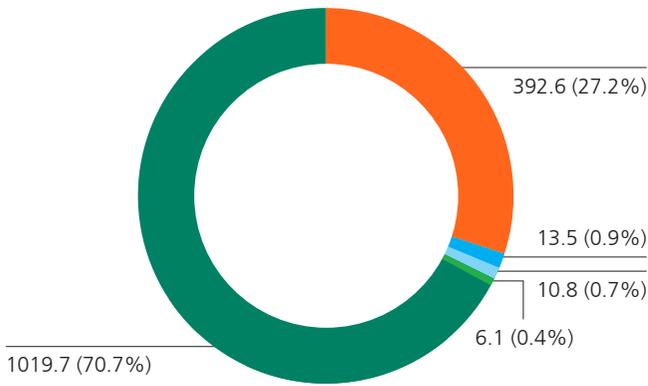
¹ The data excludes waste that is collected and incinerated for our customers

² Hazardous and non-hazardous waste are defined by relevant country regulations in each market

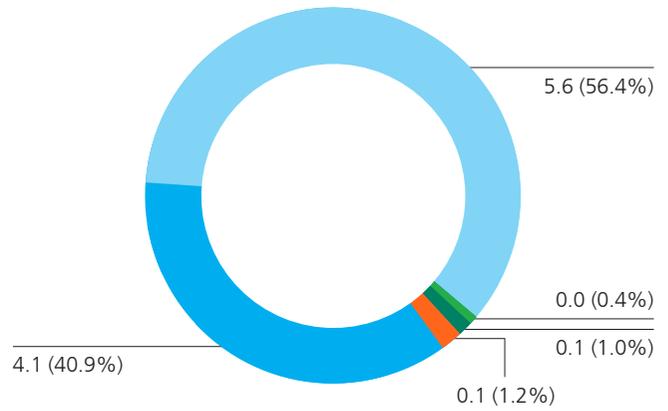
^e Indicates data is based on management's best estimates; we look to further refine the accuracy and consistency of the data

The significant increase in non-hazardous waste in 2017 was largely due to the inclusion of data from our second supercritical coal-fired power plant in India. The non-hazardous waste comprised mainly fly ash, a by-product of coal combustion in power plants. Our India operations have memoranda of understanding to sell up to 90% of their fly ash to be reused as a partial replacement for Portland cement in the production of concrete, although the uptake of the ash is dependent on market demand.

Disposal Method for Non-hazardous Waste^{1, 2}
(thousand tonnes, %)



Disposal Method for Hazardous Waste^{1, 2}
(thousand tonnes, %)



- On-site storage
- Recycling
- Landfilling
- Incineration
- Others / Reuse, recovery, composting

¹ We do not dispose waste through deep-well injection. The respective disposal methods have been determined through organisational defaults of waste disposal contractors, except for coal ash, which is largely directly disposed by Sembcorp, in line with local regulations
² Percentages may not add up to 100% as they are rounded to the nearest one decimal place

GRI 306-3 Environmental: Effluents and Waste

Significant spills

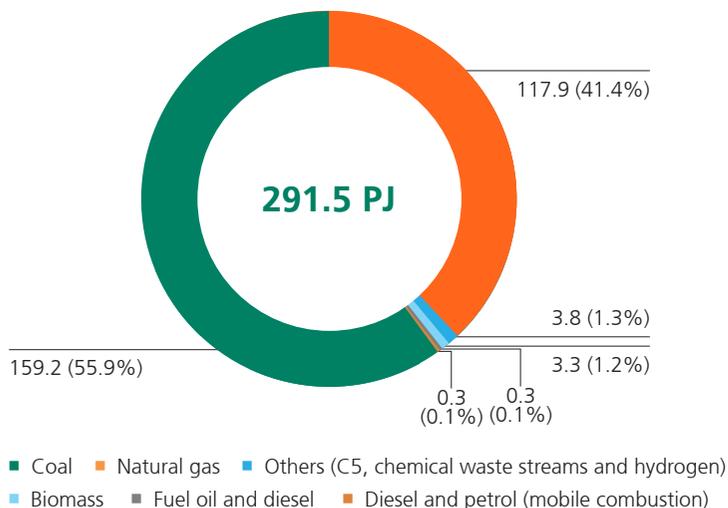
Significant spills are defined as that which resulted in a significant fine i.e. a fine equal or above S\$50,000 that has been paid. There were no significant spills in 2017.

Material Issue – Energy and Water Efficiency

GRI 302-1 Environmental: Energy

Energy consumption within the organisation

Primary Energy Consumption¹ (PJ, %)



¹ Mobile combustion of fuel oil and diesel by company-owned vehicles has been included in 2017. This amounts to less than 0.1% of total energy consumption

Energy Consumed and Sold (in PJ)

Subsidiaries	Non-renewable Fuel				Renewable Fuel	Purchased for Consumption		Self-Generated	Sold	
	Natural gas	Fuel oil, diesel or petrol	Coal	Others	Biomass	Electricity	Steam	Electricity from solar, wind and waves	Electricity	Steam
Energy Utilities	117.8	0.3	159.2	3.8	3.3	2.6	0.4	6.0	109.5	23.8
Water Utilities	0.02	0.003	0.03	-	-	0.8	0.03	-	-	-
Waste Management	-	0.008	-	-	-	0.01	-	-	-	-
Others	-	-	-	-	-	0.01	-	-	-	-
Mobile Combustion ¹ (all subsidiaries)	-	0.3	-	-	-	-	-	-	-	-
Total	281.5				3.3	3.4	0.4	6.0	109.5	23.8

¹ Conversion of fuel data to MWh is based on Carbon Disclosure Project's Technical Note and 2006 IPCC Guidelines

Total energy consumed within Sembcorp in 2017 is 161.3 petajoules. Data is collected from meters or invoices.

GRI 302-3 Environmental: Energy*Energy intensity*

In 2017, our energy intensity is 3.4 gigajoules per megawatt hour of energy produced for our Utilities businesses' assets, and 0.04 gigajoules per cubic metres of water produced.

GRI 302-4 Environmental: Energy*Reduction of energy consumption*

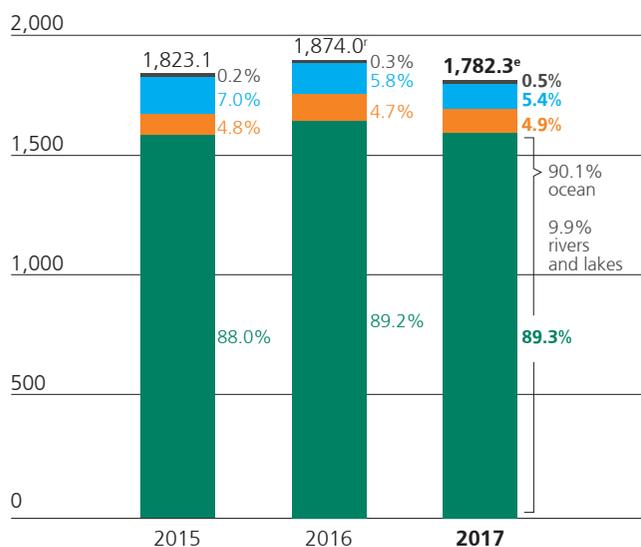
Our asset optimisation programme deployed at all our energy plants globally has helped us to effectively reduce our energy consumption. The following are examples of asset optimisation projects which resulted in energy savings in 2017:

- Natural gas optimisation efforts at the Banyan Cogeneration Plant in Singapore, resulting in 3,450 megawatt hour less electricity consumed. Reduction figure is based on the number of hours that the natural gas compressor was intentionally turned off in 2017
- Condenser performance improvements at our Sembcorp Cogeneration Plant in Singapore, resulting in 428,185 million British thermal units less heat generated. Reduction figure is estimated based on heat rate improvement from 2016 to 2017
- Installation of variable-speed drives for blowers in wastewater plants in Singapore, resulting in 521,000 kWh per year saved. Reduction figure is estimated based on the difference between theoretical and current consumption of energy before and after installation of variable-speed drives respectively

GRI 303-1 Environmental: Water

Water withdrawal by source

Water Withdrawal^{1,2,3} (million m³)



- Surface water
- Groundwater
- Water utilities (potable and non-potable)
- Wastewater from another organisation

¹ Data is collected from meters

² Water that is withdrawn during plant commissioning for a closed-loop cooling system is excluded from the reporting scope

³ Percentages may not add up to 100% as they are rounded to the nearest one decimal place

^r Indicates restated figure. Water withdrawal for 2016 has been restated to 1,874.0 million cubic metres after an internal verification exercise, instead of 1,873.9 million cubic metres as previously reported

^e Indicates data is based on management's best estimates; we look to further refine the accuracy and consistency of the data

In 2017, 89.3% of our total water withdrawn was abstracted from surface sources, of which 90.1% of surface water withdrawn was water abstracted from the ocean. More than half of this water abstracted from the ocean was desalinated into potable water for the community, and the rest was used as cooling water for Sembcorp's power plant operations and for our customers' plant processes. 9.9% of surface water withdrawn was from rivers and lakes, of which, 97.0% was used for the production of potable water for the community, and the remaining 3.0% was for internal use. Groundwater abstraction remained steady. 100% of groundwater abstracted was treated to produce potable water for the community. 73.9% of water we obtained from water utilities was treated non-potable industrial and domestic wastewater, which we reclaimed to produce high-grade industrial and potable water. The remaining 26.1% of water obtained from water utilities was potable water. "Wastewater from another organisation" represents wastewater we treated for our customers. 10.1% of wastewater treated for customers was reclaimed and reused.

Figures below are restated after an internal verification exercise:

2016 Total Water Withdrawal: 1,873.9 million m³ (erroneous), 1,874.0 million m³ (restated)

GOING FORWARD

As part of our Climate Change Strategy, we have identified several initiatives that will help us manage our climate-related risks and opportunities, including the development of a low-carbon growth roadmap. Climate-related risks will also be included in our risk management processes. Performance incentives linked to the achievement of our key targets will be developed to ensure accountability.

We are in the process of creating an Environmental Management Policy and Framework to supplement our existing Group Health, Safety and Environment Policy and Framework. This will provide more clarity and focus on environmental risks across the asset life cycle. We will continue to invest in technology to improve the environmental performance of our facilities. The progressive implementation of the Sembcorp Global Asset Management System is expected to improve our energy efficiency.

Climate Change

To have a business portfolio that balances the economic expectations of our stakeholders and our businesses' impact on the climate

Local Environmental Protection

To fulfil our duty to protect the environment and conserve resources, while providing competitive and reliable solutions for our stakeholders

Energy and Water Efficiency

To improve energy and water efficiency through good and economically viable environmental practices