

## **NEA Singapore: Air Quality in Singapore**

Extracted from: <https://www.nea.gov.sg/our-services/pollution-control/air-pollution/air-quality>

The main sources of air pollution in Singapore are emissions from the industries and motor vehicles. From time to time, transboundary smoke haze from land and forest fires in the region also affect Singapore's air quality, particularly during the Southwest monsoon period from August to October.

The government employs a strategy of integrated urban and industrial planning, together with development control, to minimise air pollution. Additional measures include legislation, strict enforcement programmes, and air quality monitoring. These help ensure that air quality remains good despite Singapore's dense urban landscape and large industrial base.

Singapore enjoys better air quality than many cities in Asia, comparable with that of cities in the United States and Europe. Singapore's Pollutant Standards Index (PSI) has remained in the 'Good' and 'Moderate' range for much of 2019.

Singapore's air quality targets, sulphur dioxide emission inventory, as well as industrial and vehicle emission standards are detailed below.

### **Air quality targets**

As international air quality benchmarks such as the World Health Organisation Air Quality Guidelines (WHO AQGs) are constantly reviewed, NEA established the Advisory Committee on Ambient Air Quality in July 2010 to recommend air quality targets for Singapore. The committee was chaired by NEA, with representatives from various stakeholders from the public sector and institutions of higher education\*.

The committee completed its work in July 2011 and made recommendations based on the assessment that the WHO AQGs are internationally-recognised and rigorous as they are backed by scientific findings and health studies. The committee also proposed that NEA should work towards achieving the WHO AQGs for all air pollutants in the long term.

The executive summary of the committee's recommendations is appended: [executive summary](#)

\*Full list of representatives: Ministry of Health, Ministry of Trade and Industry, Economic Development Board, Energy Market Authority, Ministry of Manpower, Ministry of Community Development, Youth and Sports, Singapore Environment Council, Singapore Tourism Board, National University of Singapore, Nanyang Technological University, National Health Group and the Singapore Health Services.

MSE, together with NEA, reviewed the recommendations of the Advisory Committee and the Sustainable Singapore Blueprint (SSB) commitments launched in 2009 to achieve an annual mean of 12µg/m<sup>3</sup> of PM<sub>2.5</sub> by 2020. The agencies have worked with relevant government bodies and various stakeholders to arrive at a set of revised national air quality targets pegged to the WHO AQGs. The targets are in Annex I.

To work towards achieving these air quality targets by 2020, NEA has developed a roadmap with a set of abatement measures that will allow Singapore to achieve sustainable growth and development while maintaining public health and economic competitiveness. The abatement measures are summarised in Annex II.

## Annex I: Singapore Ambient Air Quality Targets

Pollutant	Singapore Targets by 2020	Long Term Targets
Sulphur Dioxide (SO <sub>2</sub> )	24-hour mean: 50µg/m <sup>3</sup> (WHO Interim Target)	24-hour mean: 20µg/m <sup>3</sup> (WHO Final)
Particulate Matter (PM <sub>2.5</sub> )	Annual mean: 12µg/m <sup>3</sup> (Sustainable Singapore Blueprint target) 24-hour mean: 37.5µg/m <sup>3</sup> (WHO Interim Target)	Annual mean: 10µg/m <sup>3</sup> 24-hour mean: 25µg/m <sup>3</sup> (WHO Final)
Particulate Matter (PM <sub>10</sub> )	Annual mean: 20 µg/m <sup>3</sup> 24-hour mean: 50 µg/m <sup>3</sup> (WHO Final)	
Ozone	8-hour mean: 100µg/m <sup>3</sup> (WHO Final)	
Nitrogen Dioxide (NO <sub>2</sub> )	Annual mean: 40µg/m <sup>3</sup> 1-hour mean: 200µg/m <sup>3</sup> (WHO Final)	
Carbon Monoxide (CO)	8-hour mean: 10mg/m <sup>3</sup> 1-hour mean: 30mg/m <sup>3</sup> (WHO Final)	

[1] Sustainable Singapore Blueprint annual target for PM<sub>2.5</sub> of 12µg/m<sup>3</sup> will be retained and aligned with WHO Interim Target of 37.5 µg/m<sup>3</sup> for 24-hour mean

## Annex II: Summary of Abatement Measures

Pollutant	Measures
Sulphur Dioxide (SO <sub>2</sub> )	With effect from July 2013, NEA mandated the supply of Near Sulphur-Free Diesel (NSFD) with a sulphur content of 0.001% to pave the way for Euro V emission standards for diesel vehicles and further reduce SO <sub>2</sub> emissions from diesel vehicles and industries.
	With effect from 1 October 2013, NEA will mandate cleaner petrol for motor vehicles with sulphur content lower than 0.005% to pave the way for the Euro IV emission standards. This will also reduce HC and NO <sub>x</sub> which will give rise to ozone.
	With effect from 1 July 2017, NEA mandated the supply of cleaner petrol for motor vehicles with sulphur content lower than 0.001%.
	NEA, together with EDB, will work with refineries to improve their processes and decrease their SO <sub>2</sub> emissions. Power stations are also working towards using cleaner fuels for their energy needs in order to lower their SO <sub>2</sub> emissions. As the power stations and industries switch to the use of cleaner fuels to reduce SO <sub>2</sub> , there will also be a simultaneous reduction in other pollutants including PM <sub>2.5</sub> .
Particulate Matter (PM <sub>2.5</sub> + PM <sub>10</sub> )	With effect from 1 Sep 2017, all new petrol vehicles will have to meet the Euro VI emission standard. With effect from 1 Jan 2018, all new diesel vehicles will have to meet the Euro VI emission standard.
	From 1 Aug 2017 to 31 Jul 2019, the enhanced Early Turnover Scheme for commercial vehicles will incentivise owners of Euro II or Euro III emission standards vehicles to turnover to Euro VI (or equivalent) vehicles.
	With effect from 1 January 2014, all in-use diesel driven vehicles are required to achieve a smoke opacity reading of 40 Hartridge Smoke Units (from 50 Hartridge Smoke Units) or below during vehicle inspection.
Ozone	From 1 January 2018, the emission standard for all three-wheeled (Cat L5e) and large motorcycles with an engine capacity of more than 200cc will be tightened to the Euro VI standard, while smaller motorcycles with an engine capacity of 200cc and below will see the Euro VI standard implemented from 1 Jan 2020.
	From 1 April 2018, the exhaust emission standards for in-use petrol vehicles will be tightened. Limits for carbon monoxide and hydrocarbon, which is a precursor to ozone, will be tightened and introduced respectively.

[2] Ozone is not directly emitted but is formed through complex chemical reactions involving hydrocarbons (HC) and nitric oxide & nitrogen dioxide (NO<sub>x</sub>) in the presence of sunlight. HC and NO<sub>x</sub> emitted from motor vehicles, industries, power stations and refineries are the precursors for ozone formation.

## Sulphur dioxide (SO<sub>2</sub>) Emission Inventory

Sulphur dioxide (SO<sub>2</sub>) is one of six pollutants that are closely tracked and monitored in Singapore. The others are particulate matter (PM<sub>10</sub>), fine particulate matter (PM<sub>2.5</sub>), nitrogen dioxide, carbon monoxide, and ozone. Sources of SO<sub>2</sub> emissions in Singapore include industries such as refineries and power stations, as well as motor vehicles.

The 2018 SO<sub>2</sub> emission inventory, developed based on extensive emissions data from various sources, is shown in the table below. While these companies operate within permissible limits and form part of the chemical cluster (comprising the petroleum, petrochemicals, and specialty chemicals sectors which contribute to over a third of Singapore's total manufacturing output), it is important to continue working towards lower emissions.

Sources	Emitters	SO <sub>2</sub> Emissions (tonnes)	Contribution of SO <sub>2</sub> Emissions
Refineries	Shell	23,659	91.00%
	Singapore Refining Company	18,017	
	ExxonMobil	23,978	
Power Stations	Power Seraya	12	2.60%
	Tuas Power	0	
	Senoko Power	0	
	TP Utilities (BMCC)	1,858	
Other Industries	Sembcorp Industries	25	6.30%
	ExxonMobil Petrochemical	968	
	Linde Gas	283	
	Mitsui Phenol	12	
	Petrochemical Corporation of Singapore	116	
	Evonik Methionine	111	
	Other Fuel Oil Users	3,045	
	Diesel Users	4	
Motor Vehicles	Petrol Vehicles	45	0.10%
	Diesel Vehicles	19	
Total		72,152	100%

## Industrial emissions

The NEA's Source Emission Test Scheme for industries requires industries to conduct source emission tests on their own, or engage accredited laboratories under the Singapore Laboratory Accreditation Scheme (SAC-SINGLAS) to do so for them. This allows industries to monitor their air emissions regularly, and ensure they meet prescribed air emission standards.