AIR QUALITY
IN HONG KONG 2021

Air Science Group

Environmental Protection Department

The Government of the Hong Kong
Special Administrative Region

A Report on the Results from the Air Quality Monitoring Network (2021)

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Summary

This report summarises the 2021 air quality monitoring data collected by the Environmental Protection Department's monitoring network comprising 15 general stations and 3 roadside stations.

The air quality in Hong Kong has been continuously improving. The Hong Kong Special Administrative Region (HKSAR) Government has implemented a wide range of measures targeting different local emission sources including motor vehicles, power plants and vessels. On the regional front, the HKSAR Government has worked closely with the Guangdong Provincial Government in cutting emissions in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA).

As a result of the numerous emission control measures implemented over the years, the concentrations of major air pollutants including respirable suspended particulates (RSP), fine suspended particulates (FSP), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) both at the roadside and in ambient air have declined steadily since 1999 by 29% to 81%.

While we have seen evident improvement in the overall air quality of Hong Kong, there remain challenges ahead. Roadside NO_2 levels still exceed the Hong Kong Air Quality Objectives (AQOs), despite falling 43% from its peak in 2011. Meanwhile, ambient ozone (O_3), which is mainly influenced by the regional photochemical smog problem, is still on a rise. The HKSAR Government will strengthen its collaboration with Guangdong to further reduce emissions in the region to alleviate the regional photochemical smog and O_3 problems, and take forward additional measures to reduce local emissions.

As in previous years, concentrations of carbon monoxide and lead in 2021 remain at levels well below their respective AQO limits.

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1. Introduction

1.1 Air Quality Monitoring Network

The Environmental Protection Department (EPD) operates a network of air quality monitoring stations (AQMSs) for measuring the concentrations of major air pollutants in Hong Kong. The AQMSs network comprises 18 monitoring stations, including 15 general stations and 3 roadside stations monitoring ambient air quality and roadside air quality respectively. Details of these monitoring stations are set out in Table B1 of Appendix B.

Facilities specifically designed for monitoring Toxic Air Pollutants (TAPs) have been installed at the Central/Western and Tsuen Wan general air quality monitoring stations since 1997.

The monitoring network operated smoothly in 2021. The average monthly data capture rate for the six air pollutants, namely sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), respirable suspended particulates (RSP or PM_{10}) and fine suspended particulates (FSP or $PM_{2.5}$) measured at all monitoring stations was above 96%.

Figure 1: Locations of EPD's Air Quality Monitoring Stations (2021)

Apart from EPD's network, the Hongkong Electric Co. Ltd. (HEC) and the CLP Power Hong Kong Limited (CLP) also operate a number of monitoring stations to assess the ambient levels of SO_2 and NO_2 in the vicinity of their power generating stations. The locations of these monitoring stations and the relevant monitoring results can be found on the power companies' web sites below:

HEC:
https://www.hkelectric.com/en/corporate-social-responsibility/caring-for-our-environment/how-we-care-for-our-environment/air-quality-monitoring-statistics-annual-summary

CLP:
https://www.clp.com.hk/en/about-clp/power-generation/cleaner-generation

1.2 Quality Control (QC) and Quality Assurance (QA)

To ensure that the air quality data from the monitoring stations are accurate and reliable, a quality system has been established in accordance with the Hong Kong Laboratory Accreditation Scheme (HOKLAS) criteria. Quality control and quality assurance work was carried out in accordance with EPD's quality manuals and with reference to international requirements. Performance audits and precision checks were conducted to check if the accuracy and precision of the network could attain our performance goals. The details are set out at section B.3 of Appendix B.

1.3 Statistical Analysis of Pollutant Concentrations

In this Report, the concentrations of gaseous air pollutants are adjusted to a reference temperature of 293K and a reference pressure of 101.325 kPa. The concentrations of particulate matters are measured at real-time temperature and atmospheric pressure during monitoring.

2. Gaseous Pollutants

2.1 Sulphur Dioxide (SO_2)

SO_2 is formed primarily from the combustion of sulphur-containing fossil fuels. In Hong Kong, emissions from power stations and marine vessels are the major sources of SO_2, followed by fuel combustion equipment and motor vehicles.

Exposure to high levels of SO_2 may cause impairment of respiratory function and aggravate existing respiratory and cardiac illnesses. Even at lower levels, prolonged exposure may also increase the risk of developing chronic respiratory diseases.

Figure 2a: Sulphur Dioxide Monitoring 2021
(10-Minute Average Statistics)

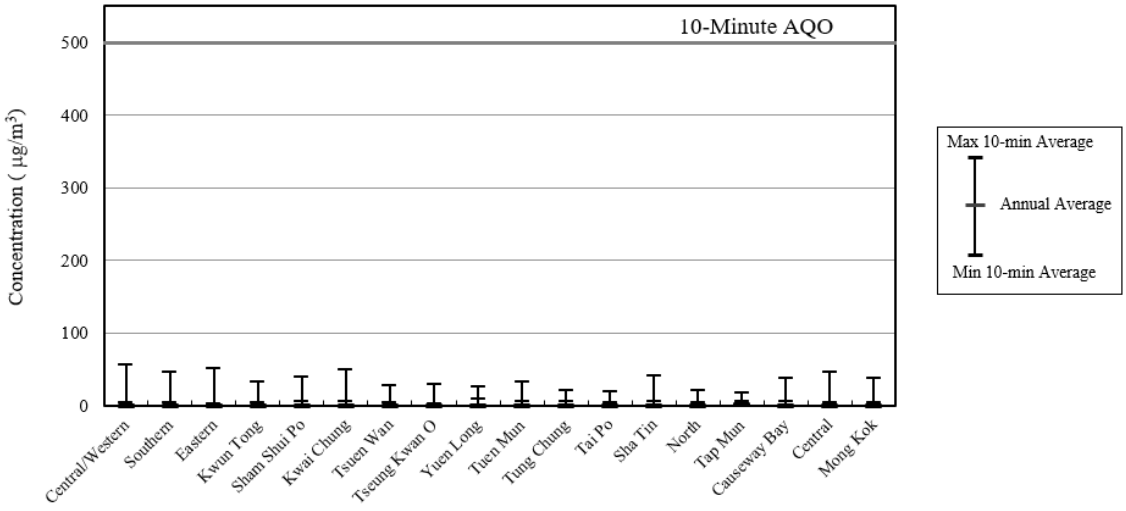
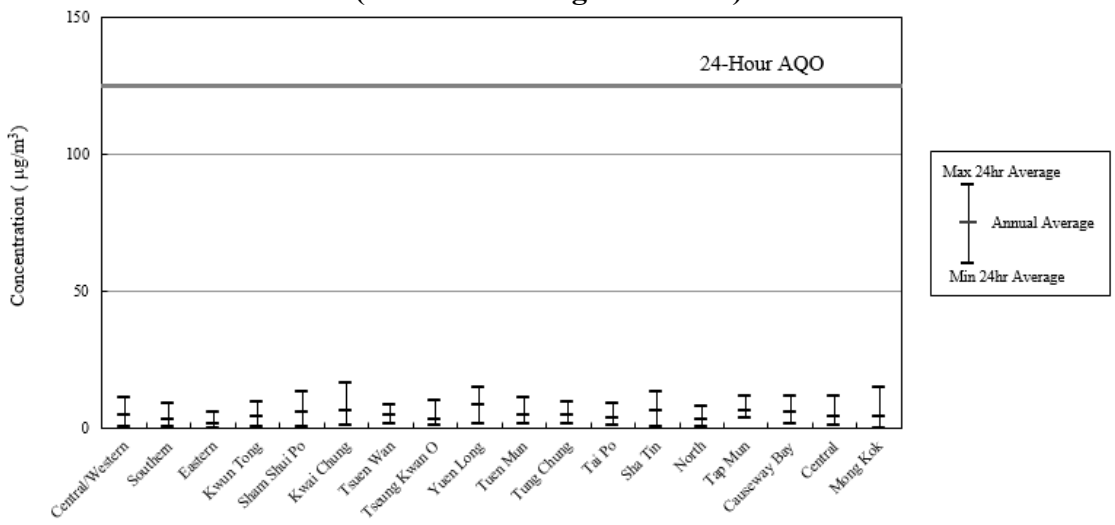


Figure 2b: Sulphur Dioxide Monitoring 2021
(24-Hour Average Statistics)



SO_2 was measured at all the 18 monitoring stations in 2021. As in previous years, SO_2 concentrations remained low throughout the territory. All general and roadside stations complied with the Hong Kong Air Quality Objectives[1] (AQOs) for SO_2. The highest 10-minute average (56 $\mu g/m^3$) and 24-hour average (16 $\mu g/m^3$) were recorded at Central/Western and Kwai Chung general stations respectively. Both were well below the AQO limits.

2.2 Nitrogen Oxides (NOx) and Nitrogen Dioxide (NO_2)

The various chemical species of the oxides of nitrogen are collectively termed nitrogen oxides (NOx). From an air pollution standpoint, the most important constituents of NOx are nitric oxide (NO) and NO_2, which are often mentioned as NOx collectively. They are usually produced in combustion processes and emitted to the atmosphere. Power stations, marine vessels and motor vehicles are the major emission sources of NOx in Hong Kong. NOx emissions from motor vehicles have greater impact on roadside air quality.

[1] Details of the Hong Kong Air Quality Objectives can be found in Appendix A.

NO_2 is mainly formed from the oxidation of NO emitted from fuel combustion. Long-term exposure to NO_2 can lower a person's resistance to respiratory infections and aggravate existing chronic respiratory diseases.

NO_2 was measured at all the 18 monitoring stations in 2021. The highest 1-hour average (301 μg/m^3) and the highest annual average (71 μg/m^3) were both recorded at Causeway Bay roadside station. All general stations complied with the 1-hour AQO (200 μg/m^3 with allowance of 18 exceedances of AQO limit per year), of which 10 general stations also complied with the annual AQO (40 μg/m^3). Non-compliance with the 1-hour and annual AQOs for NO_2 were recorded at all the 3 roadside stations.

Figure 3a: Nitrogen Dioxide Monitoring 2021
(1-Hour Average Statistics)

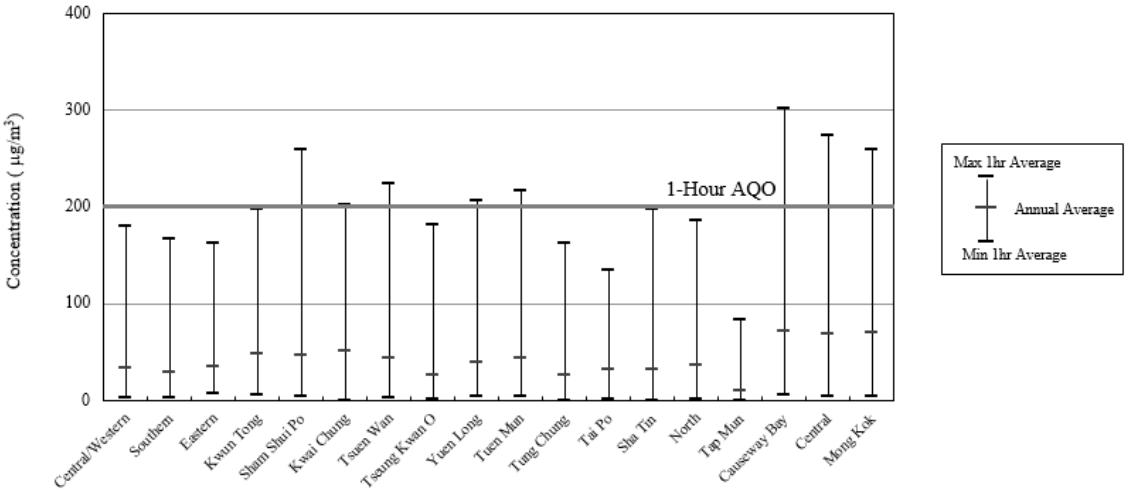
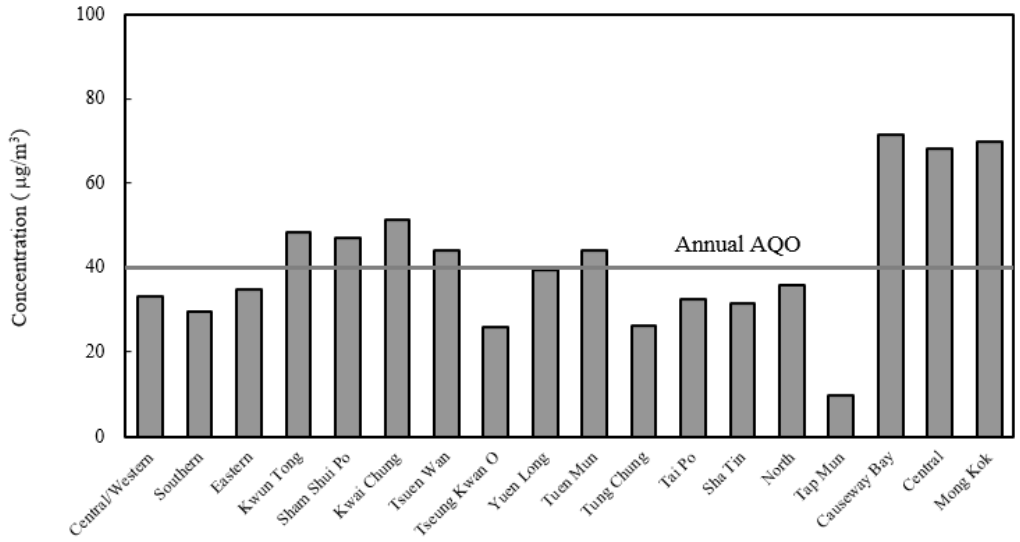


Figure 3b: Nitrogen Dioxide Monitoring 2021
(Annual Average)



2.3 Ozone (O_3)

O_3 is a major constituent of photochemical smog. It is not a pollutant directly emitted from pollution sources but formed by photochemical reactions between NOx and volatile organic compounds (VOCs) under sunlight. As it takes several hours for these photochemical reactions to take place, O_3 recorded in one place could be attributed to NOx and VOCs emissions from places afar. Hence, O_3 is more a regional air pollution problem.

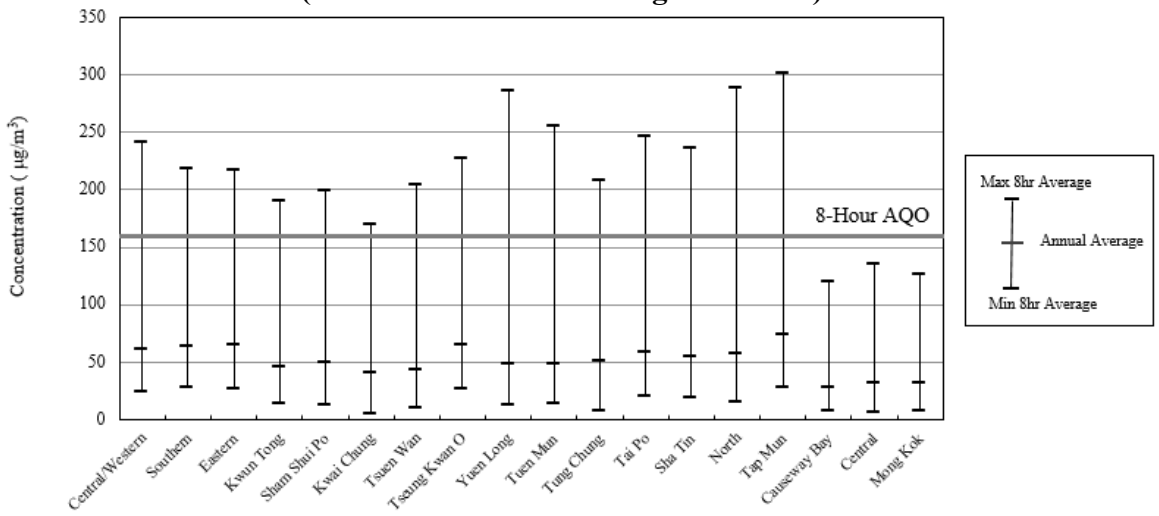
Being a strong oxidant, O_3 can cause irritation to the eyes, nose and throat even at low concentrations. At elevated levels, it can increase a person's susceptibility to respiratory infections and aggravate pre-existing respiratory illnesses such as asthma.

O_3 was monitored at all general and roadside stations in 2021. 5 general stations recorded non-compliance with the 8-hour AQO (160 μg/m^3 with allowance of 9 exceedances of AQO limit per year). The highest 8-hour average (301 μg/m^3) was recorded at Tap Mun general station.

All the 3 roadside stations complied with the 8-hour AQO in the year. At the roadside, the NO emitted from motor vehicles readily reacts with O_3 to form NO_2, thereby removing O_3. Because of such O_3 scavenging effect, the O_3 concentrations at the roadside stations are significantly lower than those at the general stations.

In Hong Kong, O_3 episode days are mostly associated with hot, fine and calm weather conditions in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA), which favour the formation and accumulation of O_3 via photochemical reactions. Such weather conditions mostly occur in summer and autumn, especially when Hong Kong and the GBA are under the influence of outer subsiding air induced by a tropical cyclone located near Taiwan or the Philippines.

Figure 4: Ozone Monitoring 2021
(Maximum 8-Hour Average Statistics)

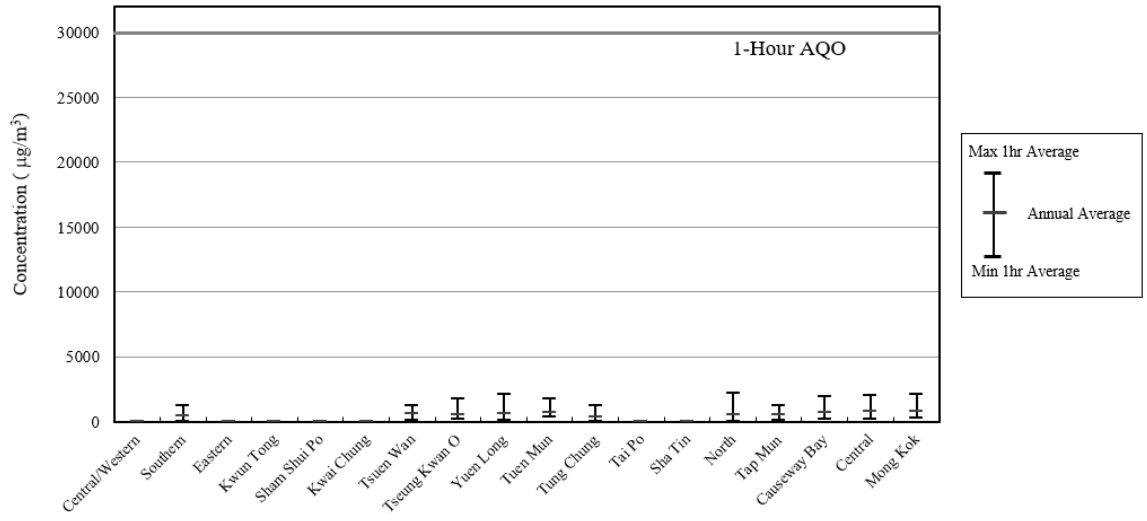


2.4 Carbon Monoxide (CO)

CO comes mainly from vehicular emissions although a small amount of it may also come from flue gases of factories and power stations. When CO enters the bloodstream, it can reduce oxygen delivery to the body's organs and tissues. Typical symptoms of CO poisoning include shortness of breath, chest pain, headache, and loss of co-ordination. The health threat from CO is more severe for those who suffer from heart diseases.

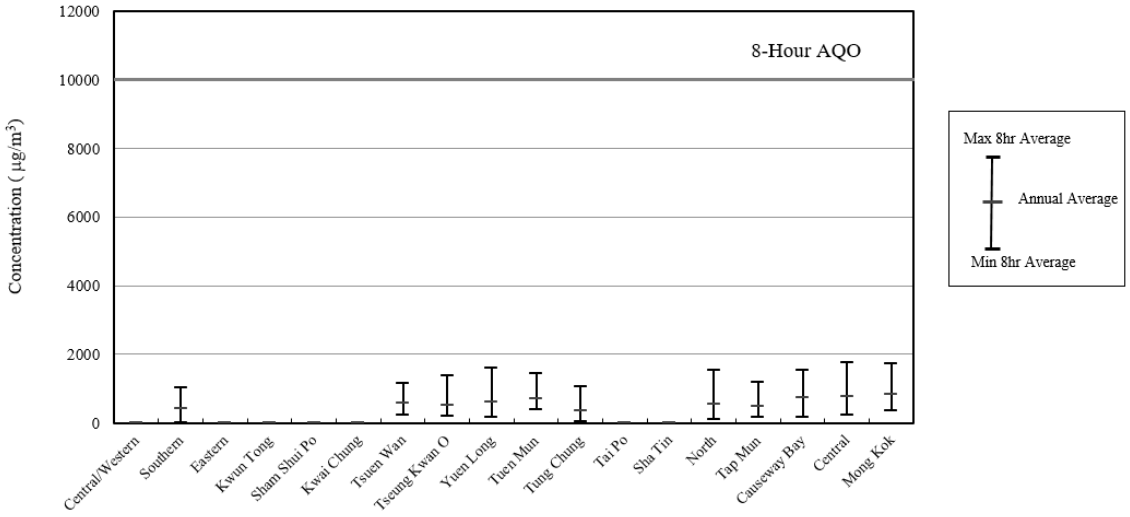
CO was monitored at 11 stations, including 8 general stations and 3 roadside stations in 2021. Similar to previous years, both ambient and roadside CO concentrations remained very low throughout the year. All the monitoring stations complied with the 1-hour (30,000 μg/m^3) and 8-hour (10,000 μg/m^3) AQOs for CO. The highest 1-hour average (2,150 μg/m^3) and 8-hour average (1,774 μg/m^3) were recorded at North general station and Central roadside station respectively, both being well below the respective AQO limits.

Figure 5a: Carbon Monoxide Monitoring 2021
(1-Hour Average Statistics)



Note: CO was monitored at Southern, Tsuen Wan, Tseung Kwan O, Yuen Long, Tuen Mun, Tung Chung, North and Tap Mun general stations and Causeway Bay, Central and Mong Kok roadside stations.

Figure 5b: Carbon Monoxide Monitoring 2021
(8-Hour Average Statistics)



Note: CO was monitored at Southern, Tsuen Wan, Tseung Kwan O, Yuen Long, Tuen Mun, Tung Chung, North and Tap Mun general stations and Causeway Bay, Central and Mong Kok roadside stations.

3. Suspended Particulates

3.1 Respirable Suspended Particulates (RSP)

RSP refers to those suspended particulates with nominal aerodynamic diameters of 10 micrometres or less. Combustion sources, in particular marine vessels, diesel vehicles and power plants, are the major regional and local sources of ambient RSP. Besides, RSP can also be formed by photochemical reactions of NOx and VOCs as well as atmospheric oxidation of gaseous pollutants, such as SO_2 and NOx. To a lesser extent, crustal derived dust and marine aerosols are also sources of RSP. In Hong Kong, RSP is contributed mainly by the regional sources.

RSP at high levels may cause chronic and acute effects on human health, particularly the pulmonary function, as RSP can penetrate deep into the lungs and cause respiratory problems. These effects are uplifted if high RSP levels are associated with higher levels of other pollutants, such as SO_2.

RSP was measured at all 18 monitoring stations in 2021. 10 of these stations were also equipped with high-volume samplers to collect particulate samples for chemical analysis.

In 2021, all general and roadside stations complied with the 24-hour AQO (100 μg/m^3 with allowance of 9 exceedances of AQO limit per year) and the annual AQO (50 μg/m^3) for RSP. The highest 24-hour average (130 μg/m^3) was recorded at Tuen Mun general station, while the highest annual average (39 μg/m^3) was recorded at Causeway Bay roadside station.

Figure 6a: RSP Monitoring 2021
(24-Hour Average Statistics)

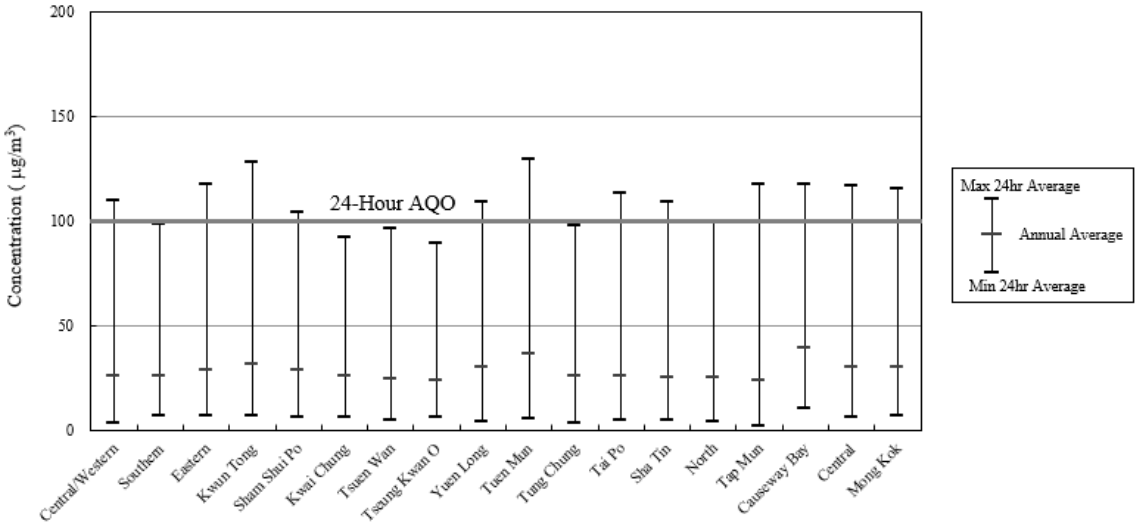
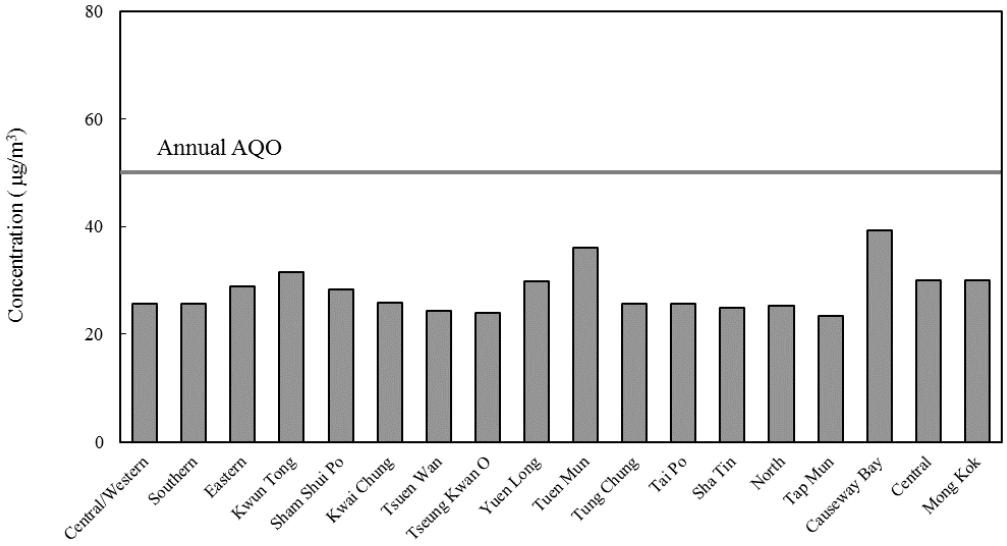


Figure 6b: RSP Monitoring 2021
(Annual Average)



3.2 Fine Suspended Particulates (FSP)

FSP refers to those suspended particulates with nominal aerodynamic diameters of 2.5 micrometres or less, which is the finer component of RSP. FSP has the same emission sources as RSP, which is also mainly contributed by regional sources. FSP is able to penetrate to the deepest parts of the lungs because of its small size, hence posing a higher risk to health. Besides, FSP also causes visibility impairment in air.

In 2021, all general and roadside stations complied with both the 24-hour AQO (75 µg/m^3 with allowance of 9 exceedances of AQO limit per year) and the annual AQO (35 µg/m^3) for FSP. The highest 24-hour average (75 µg/m^3) was recorded at Yuen Long general station while the highest annual average (23 µg/m^3) was recorded at Causeway Bay roadside station.

Figure 7a: FSP Monitoring 2021
(24-Hour Average Statistics)

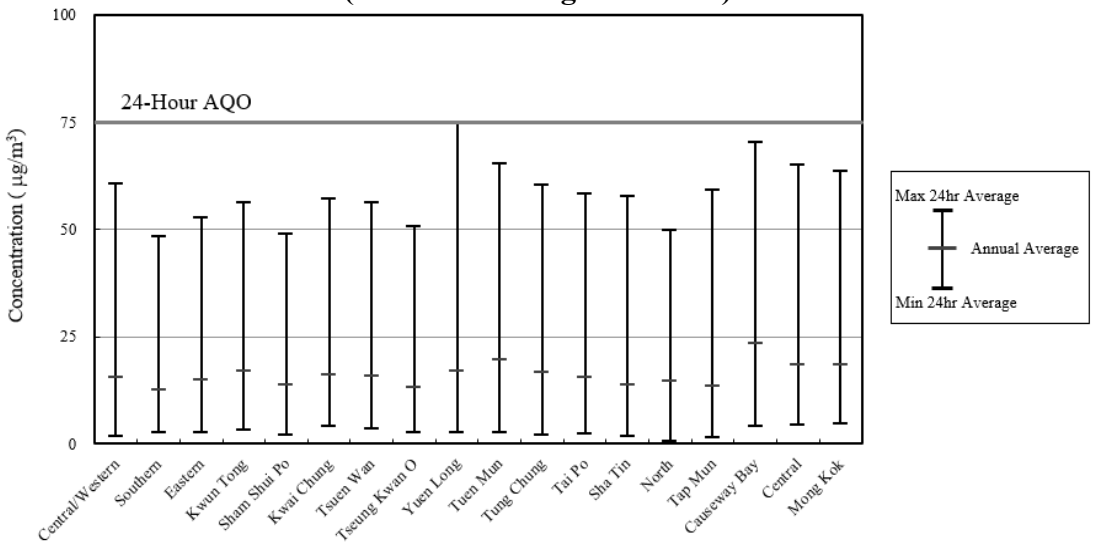
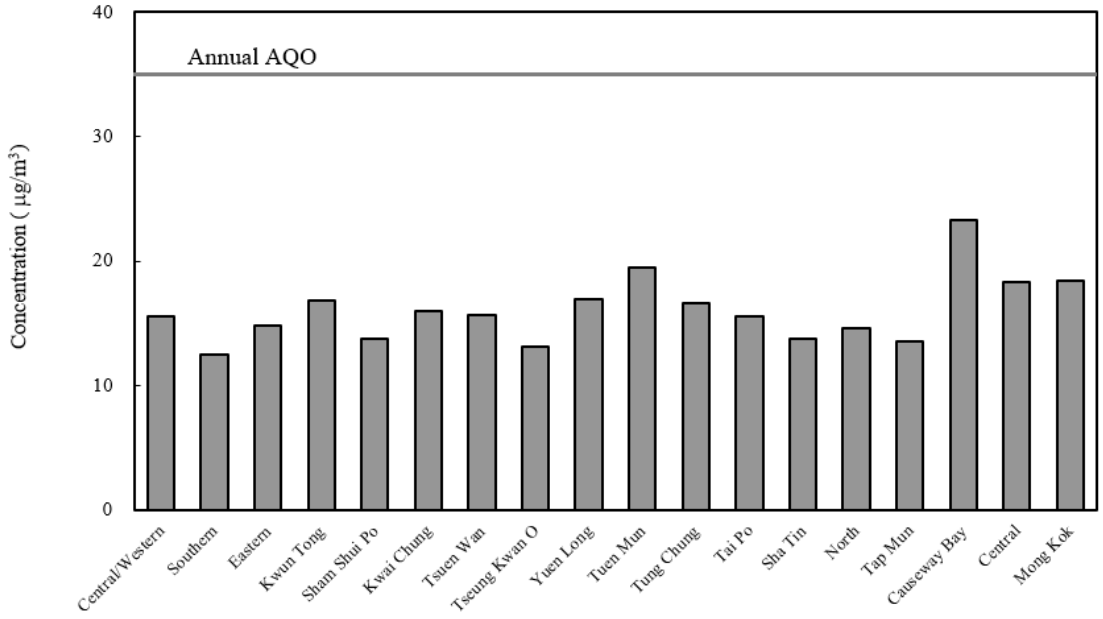


Figure 7b: FSP Monitoring 2021
(Annual Average)



3.3 Lead (Pb)

Lead (Pb) is the only criteria pollutant included in the AQOs that is also a TAP. In Hong Kong, the sale and supply of leaded petrol, which is a known major source of lead, was banned from 1 April 1999. Pb was measured at 9 general stations and 1 roadside station in 2021[2]. As in previous years, the Pb concentrations at the roadside and in ambient air continued to linger at very low levels during 2021. The annual averages, ranging from 9 ng/m^3 (at Kwun Tong) to 11 ng/m^3 (at Kwai Chung, Tung Chung, Yuen Long and Tuen Mun), were well below the respective annual AQO limit of 500 ng/m^3.

4. Toxic Air Pollutants (TAPs)

Two groups of TAPs, namely heavy metals and organic substances, have been regularly monitored at Central/Western and Tsuen Wan stations since mid of 1997. Among the various TAPs monitored, 8 of them are considered more important in terms of their health impacts and their annual averages in 2021 are summarised in Table C6. Detailed description of the TAPs monitoring operation is given in Appendix B4.

5. Variation of Air Pollution Levels over Time

The concentrations of air pollutants in the atmosphere can change over a day, over the months of a year and in the period of several years.

[2] Lead was measured at Central/Western, Kwun Tong, Sham Shui Po, Kwai Chung, Tsuen Wan, Tung Chung, Yuen Long, Tuen Mun and Tseung Kwan O general stations and Mong Kok roadside station.

5.1 Over a Day

The concentrations of most air pollutants generally follow the diurnal pattern of human activities and traffic. For instance, higher levels of NO_2, RSP and FSP are usually observed in the morning and the evening rush hours when there are more traffic and human activities. Likewise, the lowest concentrations often occur from midnight to dawn when the traffic is at its minimum. This type of traffic induced diurnal pattern is much more distinct for pollutant levels at the roadside.

Figure 8: 2021 Diurnal Variations of NO_2

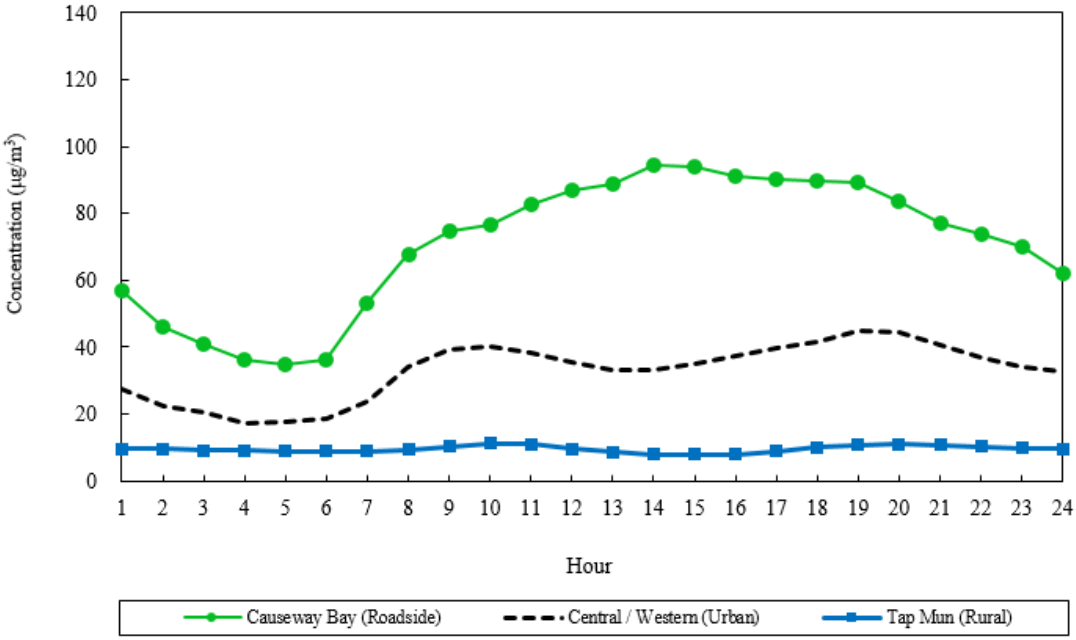


Figure 9: 2021 Diurnal Variations of RSP

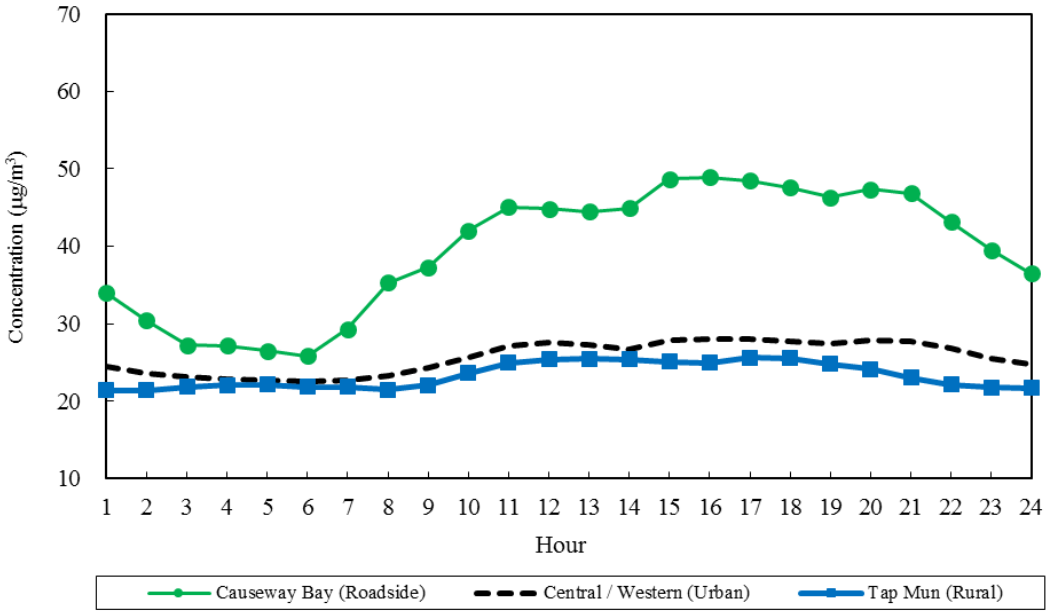
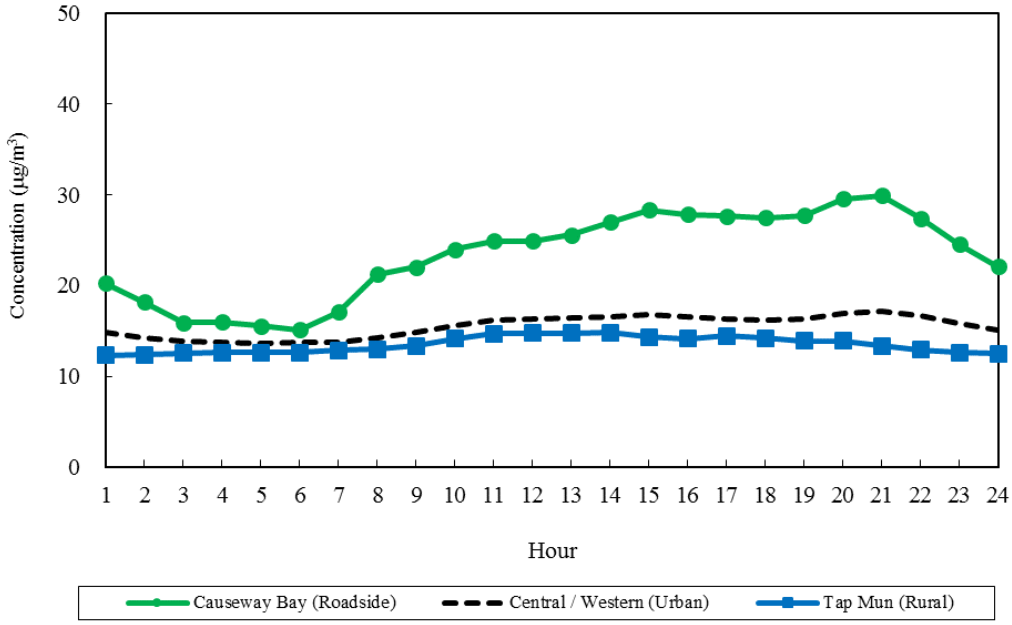
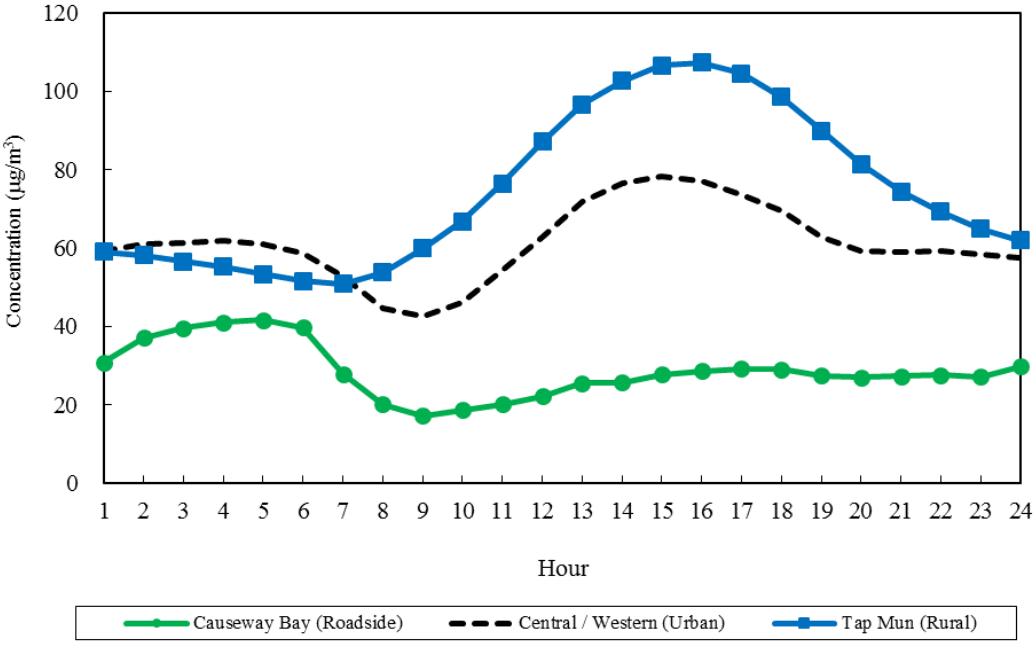


Figure 10: 2021 Diurnal Variations of FSP



The diurnal pattern of O_3 is different from those of NO_2, RSP and FSP. O_3 is formed by photochemical reactions of its precursor pollutants such as NOx and VOCs under sunlight. Outside urban centres, the ambient O_3 levels start to build up before noon and peak in the afternoon, when precursor pollutants are accumulated and sunlight is strong. In urban areas and at the roadside, the lowest O_3 concentrations are often observed during rush hours. This is because a large amount of NO from rush-hour traffic acts as an efficient scavenger of O_3. At the roadside, O_3 levels are significantly lower than those at general stations due to the scavenging effect of NO emissions from vehicles.

Figure 11: 2021 Diurnal Variations of O_3

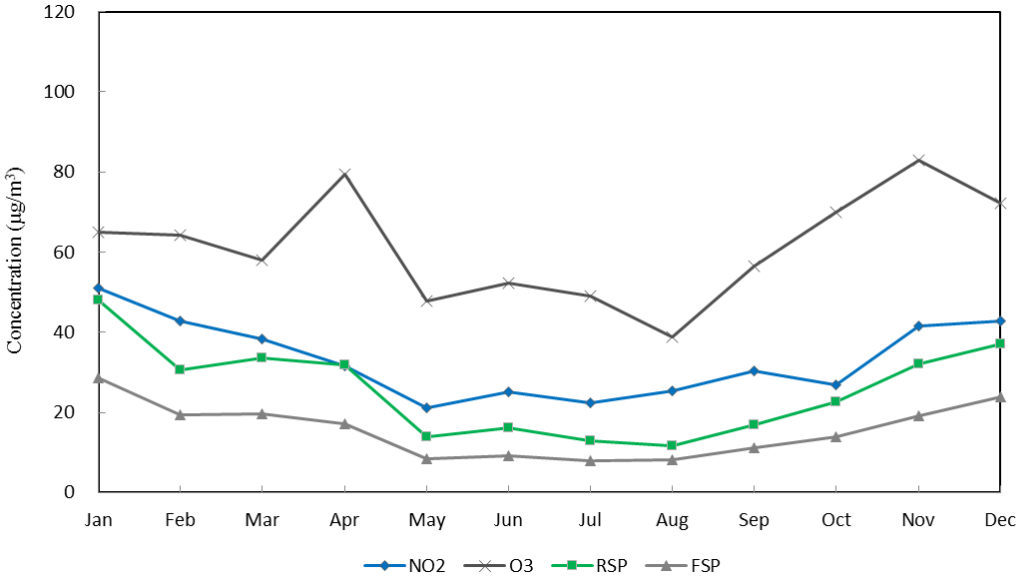


5.2 Over a Year

The concentrations of NO_2, RSP and FSP are in general lower in summer than autumn and winter for a number of reasons. The higher temperatures in summer months induce larger mixing heights, which favour the dispersion of pollutants. The rain in summer helps to wash out pollutants more frequently. The south-westerly monsoon in summer also helps to replenish the region with cleaner oceanic air.

As regards O_3, the highest monthly concentrations usually occur in Autumn with more favourable weather conditions (such as strong solar radiation, less rainfall, favourable wind direction etc.) for O_3 formation via photochemical reactions.

Figure 12: Monthly Variations of NO_2, O_3, RSP and FSP at Central/Western Station in 2021



5.3 Long Term Trends

Air quality is affected by both emissions and meteorology. Over a short period, for instance a few months to a year, air quality is more subject to variations in weather conditions even though the emission levels are more or less the same, e.g. stronger solar radiation will promote photochemical smog formation, more rainfall will help scrub pollutants from the air, etc. In the long run, however, air quality is primarily affected by emissions. Therefore, a scientific way to assess air quality changes and the effectiveness of emission control measures is to examine the trend of annual average pollutant concentrations over the years.

The long-term trends for air pollutants presented in this section are based on their annual average concentrations recorded from the relevant air quality monitoring stations categorised into 4 groups of land use types, namely Urban, New Town, Rural and Roadside as defined in Table 1.

Table 1: Classification of Air Quality Monitoring Stations by Land Use Types

Land Use Type	Land Use Characteristics	Air Quality Monitoring Stations
Urban	Densely populated residential areas mixed with some commercial and/or industrial areas	Central/Western, Southern, Eastern, Kwun Tong, Sham Shui Po, Kwai Chung, Tsuen Wan and Tseung Kwan O
New Town	Mainly residential areas	Yuen Long, Tuen Mun, Tung Chung, Tai Po, Sha Tin and North
Rural	Rural areas	Tap Mun (background station)
Roadside	Urban roadside in mixed residential/ commercial areas with heavy traffic and surrounded by many tall buildings	Causeway Bay, Central and Mong Kok

5.3.1 Sulphur Dioxide (SO_2)

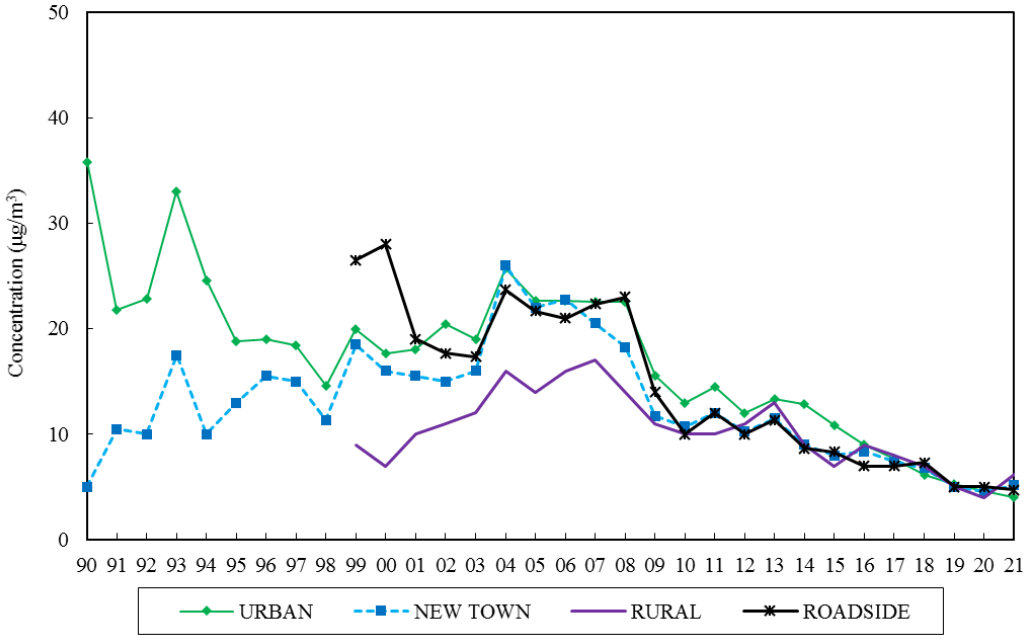
SO_2 concentrations in Hong Kong have shown a continuous declining trend as a result of the implementation of various fuel control measures. For instance, the implementation of the Air Pollution Control (Fuel Restriction) Regulations in 1990 regulated the sulphur contents of fuels for commercial and industrial use; the implementation of the Air Pollution Control (Motor Vehicle Fuel) Regulation in 1995 for controlling motor vehicle fuel quality, the introduction of ultra-low sulphur diesel for vehicle fleet in July 2000 and the introduction of Euro V motor diesel in December 2007 effectively reduced SO_2 emissions.

For marine vessels, the Government has all along been controlling the sulphur content of marine fuel to reduce their emissions. The Air Pollution Control (Marine Light Diesel) Regulation was introduced in April 2014 to cap the sulphur content of locally supplied marine light diesel at 0.05%. The Air Pollution Control (Ocean Going Vessels) (Fuel at Berth) Regulation was put in force on 1 July 2015 requiring ocean going vessels (OGVs) to switch to fuel with sulphur content not exceeding 0.5% (i.e. low sulphur fuel) while at berth. To dovetail with the implementation of coastal marine emission control areas in Mainland waters, the Air Pollution Control (Fuel for Vessels) Regulation took effect on 1 January 2019, requiring all vessels (including OGVs) to use compliant fuel (including low sulphur fuel or liquefied natural gas) within Hong Kong waters, irrespective of whether they are sailing or berthing.

On the regional front, the Governments of Guangdong Province and Hong Kong have been working together to introduce a wide range of control measures, such as retrofitting power plants with flue gas desulphurization devices, phasing out highly polluting industrial plants in the GBA, introducing fuels with a lower sulphur content, etc., to reduce SO_2 emissions in the Region.

As revealed in Figure 13, the SO_2 concentrations at both rural and other types of monitoring stations were all at a very low level, in the range of 4 to 6 $\mu g/m^3$.

Figure 13: SO_2 Long Term Trend



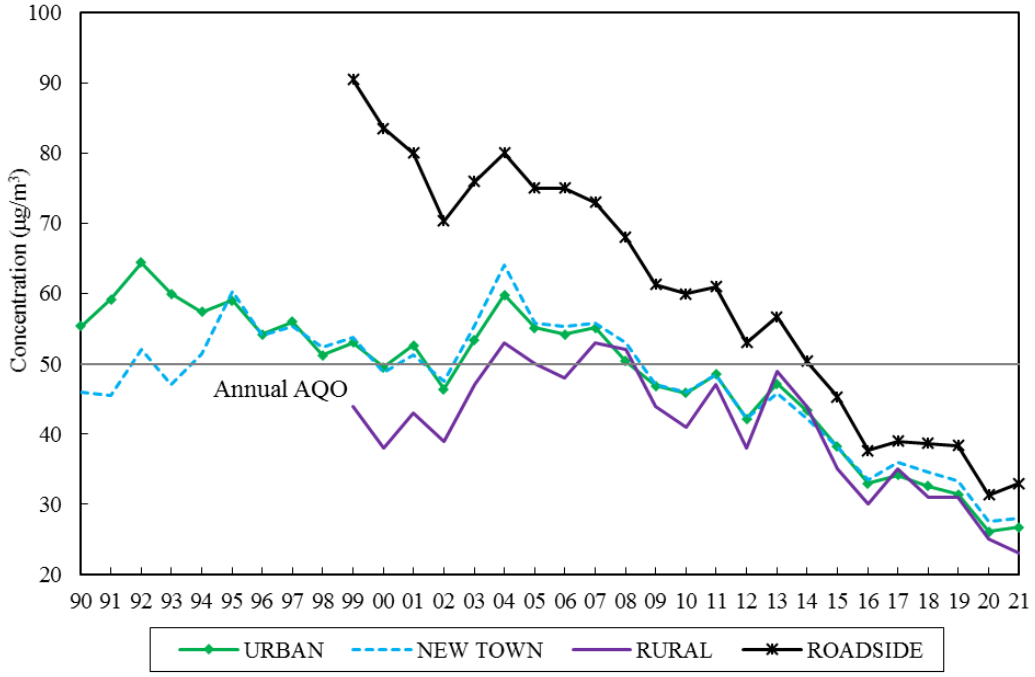
5.3.2 Respirable Suspended Particulates (RSP)

The ambient concentrations of RSP in the territory showed a primarily downward trend between 1995 and 2002, followed by a rebound that peaked in 2004 due to the increase in regional background RSP levels. The ambient RSP concentrations then continuously dropped to a level below the annual AQO limit from 2009 onwards, reflecting a reduction in regional background RSP levels over the last ten years.

As a result of the implementation of various vehicle emission control measures in the last two decades, the annual average of RSP concentration at the roadside in 2021 was significantly reduced by 64% when compared with the 1999[3] level and has remained below the annual AQO limit since 2014.

[3] 1999 is selected for comparison as this was the year when the Government started to implement a list of measures to cut vehicular emissions.

Figure 14: RSP Long Term Trend

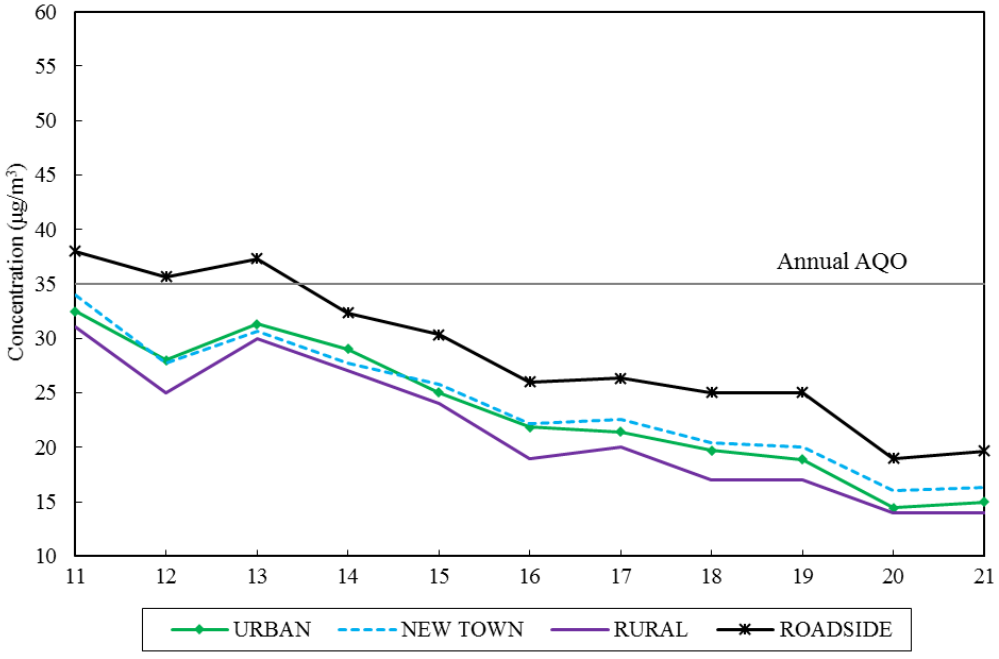


5.3.3 Fine Suspended Particulates (FSP)

We started to monitor FSP at all our monitoring stations in 2011[4]. Same as RSP, the ambient concentrations of FSP in the territory showed an overall downward trend between 2011 and 2021, reflecting a continuous reduction in regional background FSP levels.

The roadside FSP levels also showed a discernible improvement in recent years and has complied with the annual AQO since 2014. When compared with 2011, the annual average FSP concentration at the roadside in 2021 had reduced by 47% .

Figure 15: FSP Long Term Trend



[4] FSP were only monitored at four to five air quality monitoring stations between 1999 and 2010.

5.3.4 Ozone (O_3)

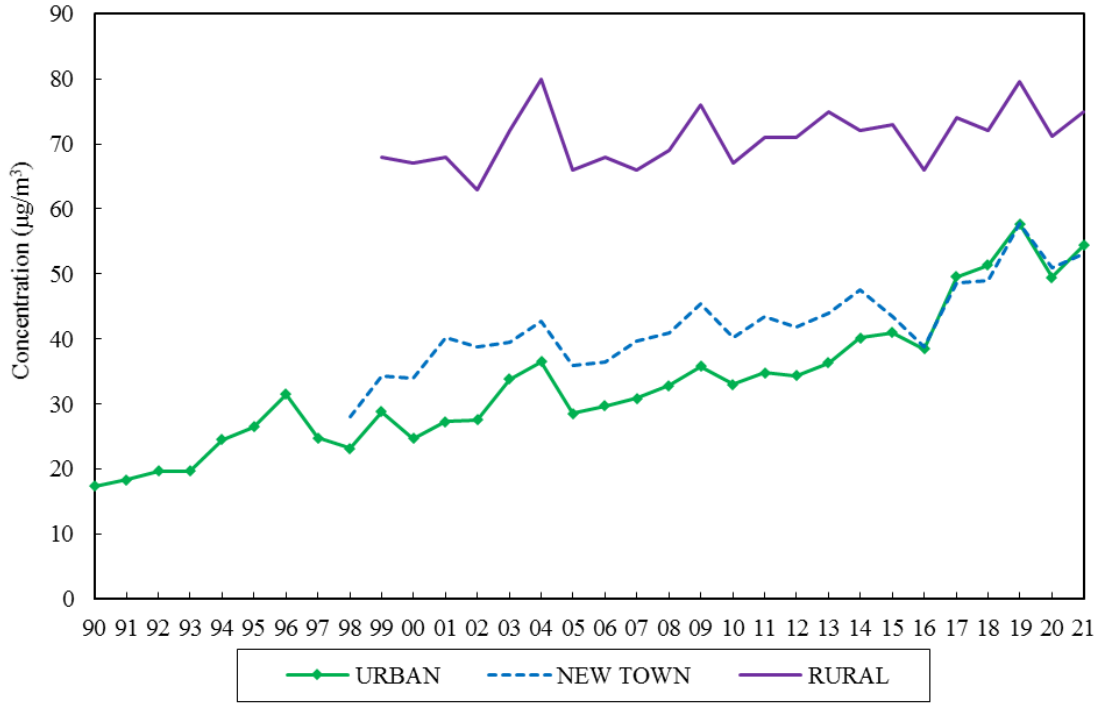
O_3 is a complex regional air pollution issue. It is formed when precursors such as NOx and VOCs undergo complicated photochemical reactions under sunlight. O_3 can travel long distances and affect areas downwind. On the other hand, O_3 can react with some pollutants like NO emitted from combustion sources (such as motor vehicles) and be scavenged. Hence the O_3 concentrations measured at a particular location would depend on the regional O_3 background level, its local formation as well as the scavenging effect.

As NO emissions from motor vehicles can react with and remove O_3 in the air, areas with heavy traffic normally have lower O_3 levels than areas with light traffic. Tap Mun station started monitoring O_3 in 1998. As Tap Mun station is located in a remote rural area with virtually no local emission, the O_3 concentrations recorded could represent the regional background O_3 levels. This station has consistently recorded higher O_3 levels than those recorded in urban areas, but the gap has been narrowing steadily from over 100% in the early 2000s to about 40% in recent years.

The rural O_3 concentrations showed a moderate upward trend from the early 2000s whereas the O_3 levels in new towns and urban areas have exhibited relatively more distinct rising trends. The rising trend of O_3 levels in Hong Kong, especially those in new towns and urban areas, could be attributed to the moderate increase in regional O_3 background as well as the reduction in local vehicle emissions, the latter leading to less NO in the air for reaction with O_3.

The Hong Kong Special Administrative Region Government and Guangdong Provincial Government have been implementing a regional air quality management plan to, among others, alleviate the photochemical smog and O_3 problem by reducing O_3 precursors levels in the GBA.

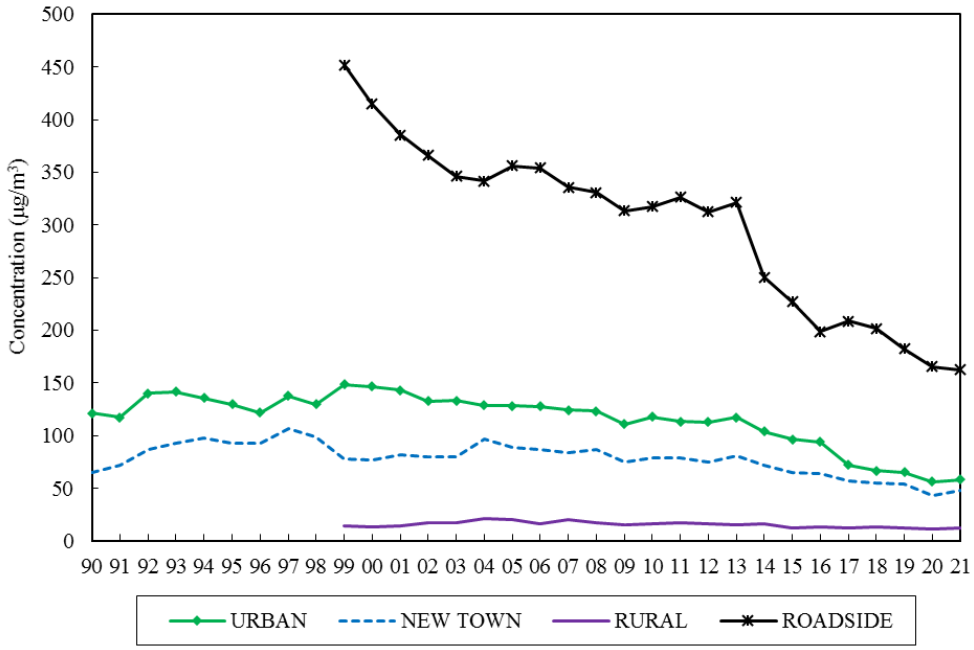
Figure 16: O_3 Long Term Trend



5.3.5 Nitrogen Oxides (NOx) and Nitrogen Dioxide (NO_2)

While the background NOx concentrations (i.e. rural area in Tap Mun) remained flat, the annual averages of ambient NOx in urban areas and new towns exhibited moderate declining trends between 1999 and 2021. During the same period, the roadside NOx concentration showed a more distinct descending trend, reflecting the effectiveness of various vehicle emission control measures implemented over the past decades. The roadside NOx concentration in 2021 was 64% lower than that in 1999[5].

Figure 17: NOx Long Term Trend



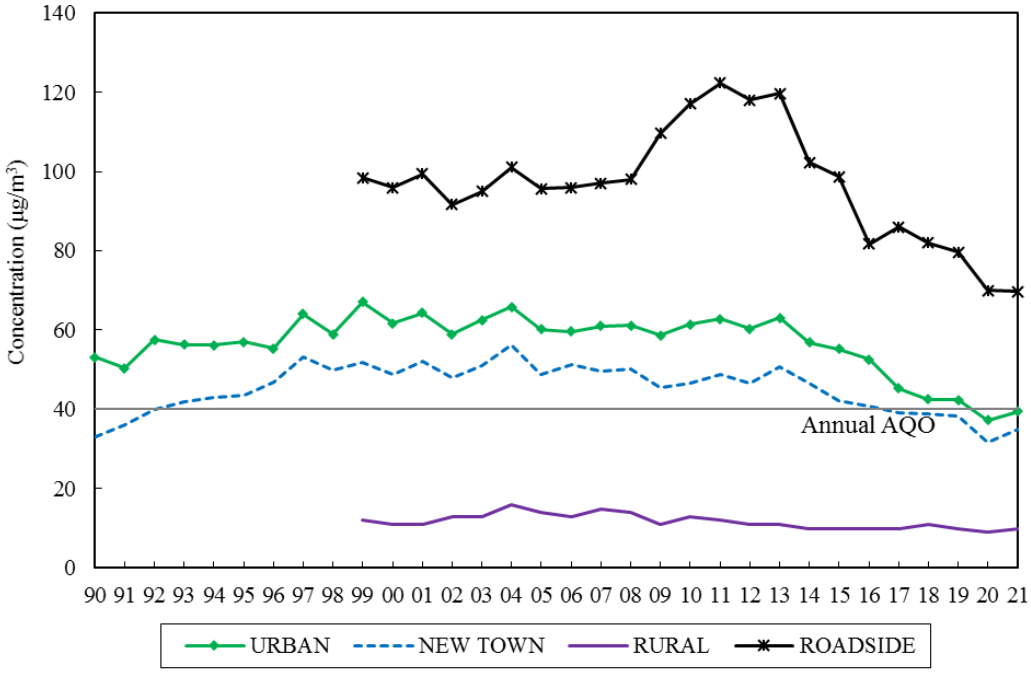
NO_2, a major component of NO_x, is mainly formed from the oxidation of NO. The oxidation can be promoted by the presence of a large amount of O_3 and VOCs in ambient air. The ambient NO_2 levels exhibited a slow ascending trend between 1990 and 2004, but the trend levelled off from 2005 to 2012 and has started to decline progressively since 2013.

Roadside NO_2 levels have been more difficult to reduce. However, the increasing trend of its concentrations once recorded in the past, which could be caused by a combination of the ageing of motor vehicles, increase in direct NO_2 emissions from motor vehicles and rise in regional background O_3 concentration promoting the conversion of NO emitted from motor vehicles to NO_2, was reversed and started to drop from its peak in 2011. The annual NO_2 concentration at the roadside recorded in 2021 had reduced by 29% when compared with the 1999 level.

To address the problem of the elevated roadside NO_2 pollution, the Government has put forward enhanced measures including supporting the transport trades to test green vehicles, stepping up the control on emissions from petrol and liquefied petroleum gas vehicles, providing incentives to accelerate the phasing out of old and polluting diesel commercial vehicles, as well as tightening the emission standards for newly registered motor vehicles.

[5] 1999 is selected for comparison as this was the year when the Government started to implement a list of measures to cut vehicular emissions.

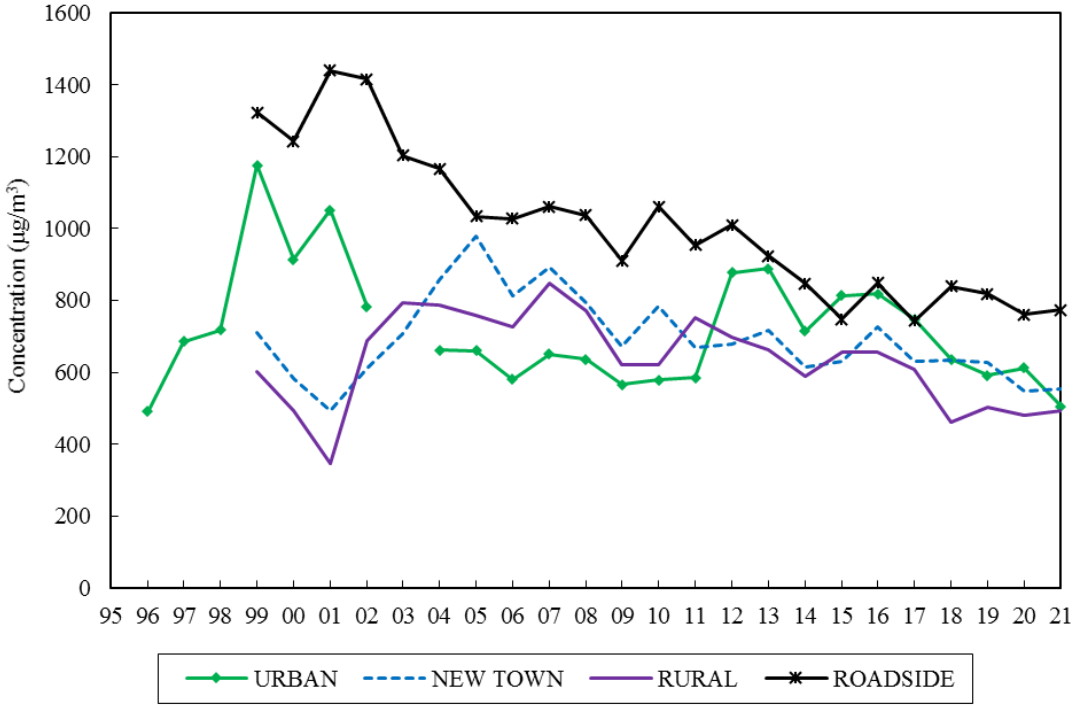
Figure 18: NO_2 Long Term Trend



5.3.6 Carbon Monoxide (CO)

The ambient concentration of CO in the territory remained at a very low level while the CO concentration at the roadside had dropped to a level close to the ambient one in recent years.

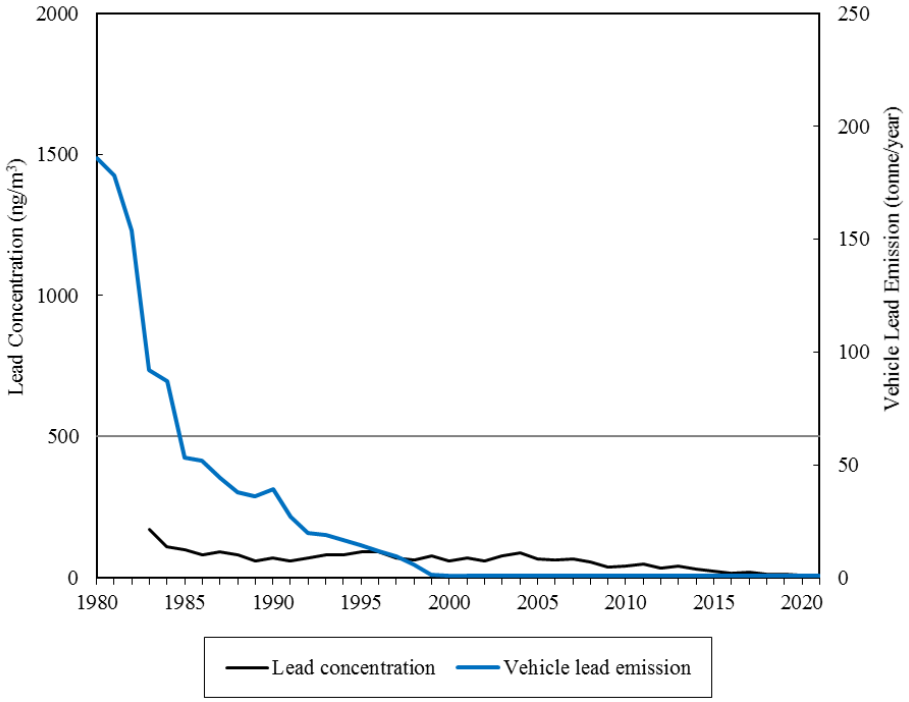
Figure 19: CO Long Term Trend



5.3.7 Lead (Pb)

The Pb concentrations at the roadside and in ambient air have been lingering at very low levels over the years since the oil companies took voluntary action in reducing the Pb content of petrol in the eighties. Pb emissions from motor vehicles were further reduced as a result of the introduction of unleaded petrol in April 1992 and completely eliminated when the sale and supply of leaded petrol were banned in April 1999.

Figure 20: Vehicle Lead Emission and Lead Concentration



Appendix A

Air Quality Objectives and their Compliance Status

Hong Kong Air Quality Objectives (AQOs) for 7 major air pollutants were set at levels to protect public health in 1987. This set of AQOs was reviewed and updated with effect from 2014 to 2021. The updated set of AQOs is given in Table A1. The compliance status of the new AQOs has been used as the indicator of air quality in different districts in Hong Kong.

Table A1: Hong Kong Air Quality Objectives (AQOs)

Pollutant	Averaging time	Concentration limit [i] ($\mu g/m^3$)	Number of exceedances of limit allowed
Sulphur dioxide	10-minute	500	3
	24-hour	125	3
Respirable suspended particulates (PM_{10}) [ii]	24-hour	100	9
	Annual	50	Not applicable
Fine suspended particulates ($PM_{2.5}$)[iii]	24-hour	75	9
	Annual	35	Not applicable
Nitrogen dioxide	1-hour	200	18
	Annual	40	Not applicable
Ozone	8-hour	160	9
Carbon monoxide	1-hour	30,000	0
	8-hour	10,000	0
Lead	Annual	0.5	Not applicable

Notes:

[i] All measurements of the concentration of gaseous air pollutants, i.e. sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide, are adjusted to a reference temperature of 293 Kelvin and a reference pressure of 101.325 kPa.

[ii] "Respirable suspended particulates" means suspended particles in air with a nominal aerodynamic diameter of 10 μm or less.

[iii] "Fine suspended particulates" means suspended particles in air with a nominal aerodynamic diameter of 2.5 μm or less.

Compliance with the short-term AQOs

Table A2 shows the compliance status with the short-term AQOs (i.e. 10-min, 1-hour, 8-hour and 24-hour AQOs) recorded at each monitoring station in 2021. 10 general stations and all 3 roadside stations complied with the 8 hour AQO for O_3 and all general stations complied with the 1-hour AQO for NO_2. For other criteria pollutants including RSP, FSP, SO_2 and CO, all general and roadside stations complied with their respective short-term AQOs.

Table A2: Compliance Status of Short-Term Air Quality Objectives in 2021

Station		O_3	NO_2	RSP	FSP	SO_2		CO	
		8-hr	1-hr	24-hr	24-hr	10-min	24-hr	1-hr	8-hr
General Station	Central/Western	✓	✓	✓	✓	✓	✓	--	--
	Southern	✓	✓	✓	✓	✓	✓	✓	✓
	Eastern	✓	✓	✓	✓	✓	✓	--	--
	Kwun Tong	✓	✓	✓	✓	✓	✓	--	--
	Sham Shui Po	✓	✓	✓	✓	✓	✓	--	--
	Kwai Chung	✓	✓	✓	✓	✓	✓	--	--
	Tsuen Wan	✓	✓	✓	✓	✓	✓	✓	✓
	Tseung Kwan O	✓	✓	✓	✓	✓	✓	✓	✓
	Yuen Long	×	✓	✓	✓	✓	✓	✓	✓
	Tuen Mun	×	✓	✓	✓	✓	✓	✓	✓
	Tung Chung	✓	✓	✓	✓	✓	✓	✓	✓
	Tai Po	×	✓	✓	✓	✓	✓	--	--
	Sha Tin	✓	✓	✓	✓	✓	✓	--	--
	North	×	✓	✓	✓	✓	✓	✓	✓
	Tap Mun	×	✓	✓	✓	✓	✓	✓	✓
Roadside Station	Causeway Bay	✓	×	✓	✓	✓	✓	✓	✓
	Central	✓	×	✓	✓	✓	✓	✓	✓
	Mong Kok	✓	×	✓	✓	✓	✓	✓	✓

Notes: "✓" *Complied with the AQO* "×" *Violated the AQO* "--" *Not measured*

Compliance with the long-term AQOs

Table A3 shows the compliance status of the long-term (annual) AQOs for all monitoring stations with sufficient data for calculating annual averages in 2021. All stations complied with the annual AQOs for RSP and FSP whereas 5 general and 3 roadside stations could not comply with the annual AQO for NO_2. For lead, all 10 monitoring stations achieved full compliance with the long-term AQO.

Table A3: Compliance Status of Long-Term (Annual) Air Quality Objectives in 2021

Station		Annual			
		NO_2	**RSP**	**FSP**	**Lead**
General Station	Central/Western	✓	✓	✓	✓
	Southern	✓	✓	✓	--
	Eastern	✓	✓	✓	--
	Kwun Tong	×	✓	✓	✓
	Sham Shui Po	×	✓	✓	✓
	Kwai Chung	×	✓	✓	✓
	Tsuen Wan	×	✓	✓	✓
	Tseung Kwan O	✓	✓	✓	✓
	Yuen Long	✓	✓	✓	✓
	Tuen Mun	×	✓	✓	✓
	Tung Chung	✓	✓	✓	✓
	Tai Po	✓	✓	✓	--
	Sha Tin	✓	✓	✓	--
	North	✓	✓	✓	--
	Tap Mun	✓	✓	✓	--
Roadside Station	Causeway Bay	×	✓	✓	--
	Central	×	✓	✓	--
	Mong Kok	×	✓	✓	✓

Notes: "✓" *Complied with the AQO* "×" *Violated the AQO* "--" *Not measured*

Appendix B

Air Quality Monitoring Operation

B.1 Network Operation

The Air Science Group of the Environmental Protection Department operates the Air Quality Monitoring Network with 18 monitoring stations in 2021. Table B1 shows the station site information. The measurement of respirable suspended particulates (RSP), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3) and carbon monoxide (CO) concentrations have been accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) since August 1995. In addition, the measurement of fine suspended particulates (FSP) concentration has been accredited by HOKLAS since August 2016.

In order to provide good representation of the air quality in areas of high population density, the locations of the 18 monitoring stations were carefully chosen by referencing to the United States Environmental Protection Agency's (USEPA) guidelines with practical consideration of the unique congested high-rise development of Hong Kong.

The details of the parameters monitored at each monitoring station and a list of equipment employed for measuring the air pollutants are summarised in Tables B2 and B3 respectively. In general, the concentrations of gaseous pollutants, RSP and FSP are measured continuously by automatic analysers. Manually operated high volume samplers using the gravimetric methods are also used regularly to measure RSP concentrations. The concentrations of lead are measured in the subsequent elemental analysis of the RSP samples by Government Laboratory using Inductively Coupled Plasma Optical Emission Spectroscopy. In addition, meteorological parameters, including temperature, solar radiation, wind speed and wind direction, are also recorded continuously at each station as appropriate.

Wet and dry deposition samples are collected at 3 stations, namely Central/Western, Kwun Tong and Yuen Long. The parameters measured for all wet and dry samples include conductivity, pH, Na^+, K^+, NH_4^+, NO_3^-, SO_4^{2-}, Cl^-, F^-, Ca^{2+}, Mg^{2+}, formate and acetate in the filtrate.

B.2 Data Processing and Dissemination

At each monitoring station, signals from the continuous analysers and the meteorological instruments are first stored in a data logger and then sent back to the Data Processing Unit of the Air Science Group via dedicated broadband data lines for further processing. After careful checking and validation, the monitoring data are disseminated to the public in the following manner:

- Hourly Air Quality Health Index[6] (AQHI) reporting for individual station
- Monthly release of the AQHI summary for all monitoring stations

[6] *The Air Pollution Index (API) was replaced by the Air Quality Health Index (AQHI) on 30 December 2013.*

- Monthly updating of the data in the Environmental Protection Interactive Centre (EPIC) for the public to download air quality monitoring data (https://www.epd.gov.hk/epd/epic/english/epichome.html)
- Reporting of monitoring data in the annual reports "*Air Quality in Hong Kong"* and "*Environment Hong Kong"*
- Ad hoc provision of air quality data to the public, academics and environmental consultants upon request for the purposes of research and air quality assessment

The reporting and forecast of AQHI will help the public (particularly susceptible groups such as the elderly, children and people with heart or respiratory illness) to decide on taking precautionary measures when necessary. The monitoring results are also regularly used to assist the formulation of air quality management plans and the evaluation of the effectiveness of the current air pollution control programmes.

B.3 Quality Control and Assurance

A quality policy is adopted to ensure that ambient air quality monitoring results from the monitoring stations attain a high degree of accuracy and precision. A quality system has been established in accordance with the HOKLAS criteria.

The accuracy of the monitoring network is assessed by performance audits. Performance goal of ±15% and ±20% are adopted for suspended particulates (RSP and FSP) and gaseous pollutants respectively. In 2021, 418 audit checks were carried out on the stations' analysers and samplers. Based on the 95% probability limits, the accuracy varied from -8.8% to 9.8% for gases, and from -6.5% to 6.8% for particulates. All parameters were well within the specified performance goal as shown in Figure B1.

The precision, a measure of the repeatability, of the measurements is checked in accordance with EPD's quality manuals. In 2021, 3374 precision checks were carried out on the analysers and samplers. As shown in Figure B2 and based on the 95% probability limits, the precision of the network varied between -6.7% and 4.9%, which was again within the performance goal of ±15% for both particulates (RSP and FSP) and gaseous pollutants.

In addition to the above operation, a system audit to review the quality assurance activities is carried out on an annual basis on the monitoring network. A report outlining the deficiencies and corrective actions is compiled at the end of the audit.

B.4 Toxic Air Pollutants Monitoring Operation

The Air Science Group installed in July 1997 additional monitoring facilities at Tsuen Wan and Central/Western stations to measure regularly the levels of Toxic Air Pollutants (TAPs) in Hong Kong. The TAPs being monitored can be broadly classified as volatile organic compounds (e.g. benzene, perchloroethylene and 1,3-butadiene), dioxins and furans (e.g. 2,3,7,8-TCDF and 2,3,7,8-TCDD), carbonyl compounds (e.g. formaldehyde), polycyclic aromatic hydrocarbons (e.g. benzo(a)pyrene), and hexavalent chromium. Five distinct methods were used to analyse the collected samples for the target TAPs (please refer to Table B4 for details). All these methods have stringent QA/QC criteria to ensure data quality. Sampling media used include stainless steel canisters, Sep-Pak cartridges,

polyurethane foams and bicarbonate impregnated filters. TAP samples are analysed by the Government Laboratory.

Table B1: Fixed Network Monitoring Stations: Site Information

Monitoring Station	Address	Area Type	Sampling Height		Date Start Operation
			Above P.D.H.K.	Above Ground	
Central/Western (Sai Ying Pun Community Complex)	2 High Street, Sai Ying Pun	Urban: Mixed residential/ commercial	82m	16m (5 floors)	Nov 1983[1]
Southern (Aberdeen Tennis and Squash Centre)	1 Aberdeen Praya Road, Hong Kong	Urban: Mixed residential/ commercial/industrial	22m	18m (2 floors)	Jul 2020
Eastern (Sai Wan Ho Fire Station)	20 Wai Hang Street, Sai Wan Ho	Urban: Residential	28m	15m (4 floors)	Jan 1999
Kwun Tong (Kwun Tong Police Station)	9 Lei Yue Mun Road, Kwun Tong, Kowloon	Urban: Mixed residential/ commercial/industrial	23m	14.7m (2 floors)	Jul 1983[2]
Sham Shui Po (Sham Shui Po Police Station)	37A Yen Chow Street, Sham Shui Po	Urban: Mixed residential/ commercial	21m	17m (4 floors)	Jul 1984
Kwai Chung (Kwai Chung Police Station)	999 Kwai Chung Road, Kwai Chung	Urban: Mixed residential/ commercial/industrial	19m	13m (2 floors)	Jul 1988[3]
Tsuen Wan (Princess Alexandra Community Centre)	60 Tai Ho Road, Tsuen Wan	Urban: Mixed residential/ commercial/industrial	21m	17m (4 floors)	Aug 1988
Tseung Kwan O (Tseung Kwan O Sports Centre)	9 Wan Lung Road, Tseung Kwan O, Sai Kung	Urban: Residential	23m	16m (2 floors)	Mar 2016
Yuen Long (Yuen Long District Office Bldg.)	269 Castle Peak Road, Yuen Long	New Town: Residential	31m	25m (6 floors)	Jul 1995
Tuen Mun (Tuen Mun Public Library)	1 Tuen Hi Road, Tuen Mun	New Town: Residential	31m	27m (4 floors)	Dec 2013
Tung Chung (Tung Chung Health Centre)	6 Fu Tung Street, Tung Chung	New Town: Residential	34.5m	27.5m (4 floors)	Apr 1999
Tai Po (Tai Po Govt. Offices Bldg.)	1 Ting Kok Road, Tai Po	New Town: Residential	31m	28m (6 floors)	Feb 1990[4]
Sha Tin (Sha Tin Govt. Secondary School)	11-17 Man Lai Road, Tai Wai, Sha Tin	New Town: Residential	31m	25m (6 floors)	Jul 1991

Table B1 (Cont.): Fixed Network Monitoring Stations: Site Information

Monitoring Station	Address	Area Type	Sampling Height		Date Start Operation
			Above P.D.H.K.	Above Ground	
Tap Mun	Tap Mun Police Post	Background: Rural	26m	11m (3 floors)	Apr 1998
North (Po Wing Road Sports Centre)	Po Wing Road Sports Centre, 19 Pak Wo Road, Sheung Shui	New Town: Residential	33m	22m (3 floors)	Jul 2020
Causeway Bay	1 Yee Woo Street, Causeway Bay	Urban Roadside: Mixed commercial/ residential area surrounded by tall buildings	6.5m[5] / 7m[6]	3m[5] / 3.5m[6]	Jan 1998
Central	Junction of Des Voeux Road Central and Chater Road, Central	Urban Roadside: Busy commercial/ financial area surrounded by tall buildings	8.5m	4.5m	Oct 1998
Mong Kok	Junction of Nathan Road and Lai Chi Kok Road, Mong Kok	Urban Roadside: Mixed commercial/ residential area surrounded by tall buildings	8.5m[5] / 10.9m[6]	3m[5] / 5.4m[6]	Apr 1991[7]

Notes: P.D. = Principal Datum
[1] Central/Western station was relocated to the current address in October 2009.
[2] Kwun Tong station was relocated to the current address in March 2020.
[3] Kwai Chung station was relocated to the current address in January 1999.
[4] Tai Po station was relocated to the current address in February 2006.
[5] Sampling height for gaseous pollutants.
[6] Sampling height for suspended particulates.
[7] Mong Kok station was relocated to the current address in January 2001.

Table B2: Summary of the Parameters Monitored in the Network (2021)

Monitoring Station	SO_2	NO_x	NO	NO_2	CO	O_3	FSP	RSP		MET [3]
								Cont [1]	Hi-Vol [2]	
Central/ Western	✓	✓	✓	✓		✓	✓	✓	✓	✓
Southern	✓	✓	✓	✓	✓	✓	✓	✓	✓[4]	✓
Eastern	✓			✓		✓	✓	✓		✓
Kwun Tong	✓	✓	✓	✓		✓	✓	✓	✓	✓
Sham Shui Po	✓	✓	✓	✓		✓	✓	✓	✓	✓
Kwai Chung	✓	✓	✓	✓		✓	✓	✓	✓	✓
Tsuen Wan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tseung Kwan O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yuen Long	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tuen Mun	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tung Chung	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tai Po	✓	✓	✓	✓		✓	✓	✓		✓
Sha Tin	✓	✓	✓	✓		✓	✓	✓		✓
North	✓	✓	✓	✓	✓	✓	✓	✓		✓
Tap Mun	✓	✓	✓	✓	✓	✓	✓	✓		✓
Causeway Bay	✓	✓	✓	✓	✓	✓	✓	✓		
Central	✓	✓	✓	✓	✓	✓	✓	✓		✓
Mong Kok	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes:
[1] "Cont" denotes continuous monitoring.
[2] "Hi-Vol" denotes high-volume sampling.
[3] "MET" denotes meteorological parameters such as temperature, wind speed, wind direction, etc.
[4] Weighing only, no chemical analysis.

Table B3: List of Equipment Used in Measuring Air Pollutant Concentration

Pollutants	**Measurement Principle**	**Commercial Instrument**
SO_2	UV fluorescence	API 100E, API T100, API T100U, TECO 43i
NO, NO_2, NO_x	Chemiluminescence	API 200A, API T200, TECO 42i
O_3	UV absorption	API 400, API 400A, API T400
SO_2, NO_2, O_3	Differential Optical Absorption Spectroscopy	Opsis AR 500 System
CO	Non-dispersive infra-red absorption with gas filter correlation	API 300, API T300, API T300U
RSP (PM_{10})	a) Gravimetric b) Oscillating microbalance c) Beta Attenuation	Tisch PM10+, R&P TEOM Series 1400a-AB-PM10, Thermo Scientific TEOM 1405-DF, Met One BAM 1020, T-API 602 Beta Plus
FSP ($PM_{2.5}$)	a) Oscillating microbalance b) Beta Attenuation	Thermo Scientific TEOM 1405-DF, Met One BAM1020, T-API 602 Beta Plus

Table B4: Sampling and Analysis Methods Used in Measuring Toxic Air Pollutants

Toxic Air Pollutants	Sampling and Analysis method	Sampling Instrument	Sampling Media	Sampling Schedule	Sampling Period
Benzene	USEPA Method TO-14A	Xontech 910A / RM 910A / ATEC 2200	Canister	Twice per month	24 hours
Perchloro-ethylene	USEPA Method TO-14A	Xontech 910A / RM 910A / ATEC 2200	Canister	Twice per month	24 hours
1,3-Butadiene	USEPA Method TO-14A	Xontech 910A / RM 910A / ATEC 2200	Canister	Twice per month	24 hours
Formaldehyde	USEPA Method TO-11A	Xontech 925/ RM 925 / ATEC 2200	DNPH coated Sep-Pak cartridge	Once per month	24 hours
Benzo(a)pyrene	USEPA Method TO-13	Tisch TE-1000	Quartz fibre filter and polyurethane foam with XAD-2 resin	Once per month	24 hours
Dioxin	USEPA Method TO-9A	Tisch TE-1000	Quartz fibre filter and polyurethane foam	Once per month	24 hours
Hexavalent chromium	CARB SOP MLD 039	Xontech 924	Bicarbonate impregnated filter	Once per month	24 hours

Figure B1: Accuracy of Air Quality Monitoring Network, 2021

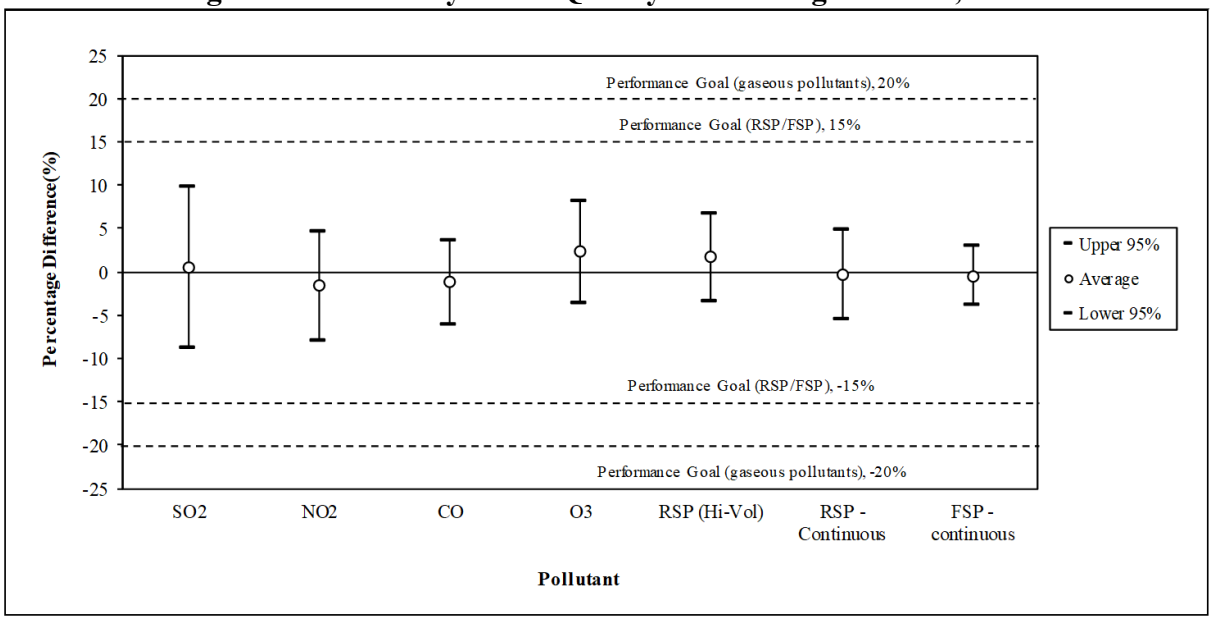
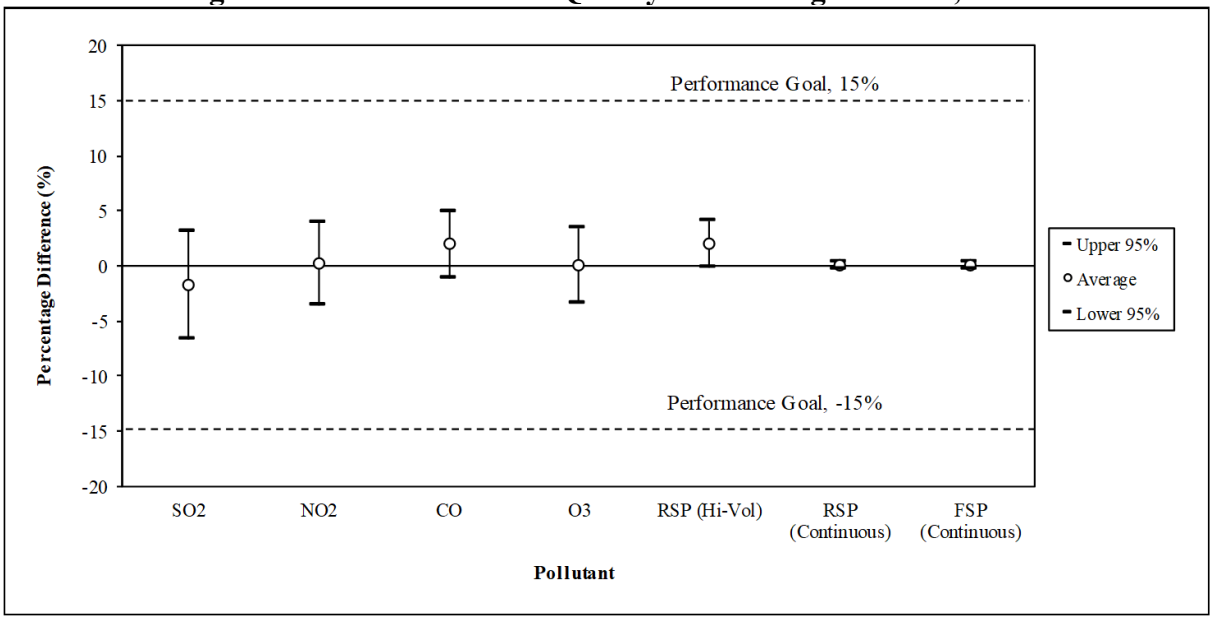


Figure B2: Precision of Air Quality Monitoring Network, 2021



Appendix C

Tables of Air Quality Data

Table C1: 2021 Exceedance of Short-Term Limits of Air Quality Objectives

Pollutant: Sulphur Dioxide

(10-minute limit value = 500 μg/m^3 ; allowable no. of exceedance of limit value = 3)

Station	No. of exceedance of limit vaue	1st High	2nd High	3rd High	4th High
Central/Western	0	56	54	52	51
Southern	0	46	38	38	36
Eastern	0	51	36	34	22
Kwun Tong	0	33	32	26	24
Sham Shui Po	0	40	39	39	38
Kwai Chung	0	48	45	45	45
Tsuen Wan	0	27	26	25	23
Tseung Kwan O	0	30	23	18	18
Yuen Long	0	26	26	25	24
Tuen Mun	0	33	25	23	22
Tung Chung	0	20	19	19	19
Tai Po	0	20	17	15	15
Sha Tin	0	40	38	34	33
North	0	20	19	18	18
Tap Mun	0	18	17	17	17
Causeway Bay	0	38	34	32	32
Central	0	46	44	29	26
Mong Kok	0	37	31	30	30

Pollutant: Carbon Monoxide

(1-hour limit value = 30,000 μg/m^3 ; allowable no. of exceedance of limit value = 0)

Station	No. of exceedance of limit vaue	1st High
Southern	0	1230
Tsuen Wan	0	1240
Tseung Kwan O	0	1750
Yuen Long	0	2090
Tuen Mun	0	1720
Tung Chung	0	1240
North	0	2150
Tap Mun	0	1210
Causeway Bay	0	1920
Central	0	1990
Mong Kok	0	2130

Pollutant: Sulphur Dioxide

(24-hour limit value = 125 μg/m^3 ; allowable no. of exceedance of limit value = 3)

Station	No. of exceedance of limit vaue	1st High	2nd High	3rd High	4th High
Central/Western	0	11	11	10	10
Southern*	0	9	9	9	8
Eastern	0	5	5	5	5
Kwun Tong	0	9	8	8	7
Sham Shui Po	0	13	13	13	12
Kwai Chung	0	16	16	14	14
Tsuen Wan	0	8	8	8	8
Tseung Kwan O	0	10	9	9	9
Yuen Long	0	15	15	14	14
Tuen Mun	0	11	11	10	9
Tung Chung	0	9	9	9	9
Tai Po	0	9	8	8	8
Sha Tin	0	13	12	11	11
North*	0	8	7	7	7
Tap Mun	0	12	11	11	11
Causeway Bay	0	12	11	11	11
Central	0	11	11	11	10
Mong Kok	0	15	12	11	10

Pollutant: Carbon Monoxide

(8-hour limit value = 10,000 μg/m^3 ; allowable no. of exceedance of limit value = 0)

Station	No. of exceedance of limit vaue	1st High
Southern	0	1014
Tsuen Wan	0	1164
Tseung Kwan O	0	1375
Yuen Long	0	1591
Tuen Mun	0	1450
Tung Chung	0	1073
North	0	1550
Tap Mun	0	1188
Causeway Bay	0	1551
Central	0	1774
Mong Kok	0	1719

Pollutant: Nitrogen Dioxide (1-hour limit value = 200 μg/m^3 ; allowable no. of exceedance of limit value = 18)

Station	No. of exceedance of limit vaue	1st High	2nd High	3rd High	4th High	5th High	6th High	7th High	8th High	9th High	10th High	11th High	12th High	13th High	14th High	15th High	16th High	17th High	18th High	19th High
Central/Western	0	180	176	175	170	170	168	167	166	164	163	158	157	156	156	155	154	151	149	149
Southern	0	167	162	160	159	157	148	141	140	139	133	132	130	129	125	125	124	123	123	123
Eastern	0	162	160	151	151	149	146	145	145	139	137	135	132	131	131	130	130	129	129	129
Kwun Tong	0	197	191	189	187	184	181	179	176	175	174	172	169	167	166	165	165	165	164	164
Sham Shui Po	3	259	229	207	187	186	186	184	183	182	181	180	180	179	176	175	175	173	171	171
Kwai Chung	2	202	202	197	189	189	187	187	186	186	185	184	182	182	182	181	181	181	181	180
Tsuen Wan	2	224	201	182	177	175	174	171	165	164	161	159	158	156	155	155	153	153	152	151
Tseung Kwan O	0	182	177	158	156	152	151	149	148	148	147	142	140	137	137	137	134	133	133	132
Yuen Long	1	206	194	176	176	175	169	168	164	164	161	161	159	158	156	154	152	151	149	148
Tuen Mun	6	217	214	212	211	210	201	197	195	187	182	182	179	177	177	177	175	173	172	172
Tung Chung	0	163	157	139	136	136	134	131	130	130	130	127	126	123	122	120	119	118	118	115
Tai Po	0	134	129	129	129	125	123	122	122	121	120	120	119	119	119	117	116	116	115	115
Sha Tin	0	198	195	193	175	175	172	170	169	168	168	165	164	164	164	164	162	162	162	159
North	0	186	166	165	162	156	154	150	150	148	148	144	143	143	142	141	140	139	136	135
Tap Mun	0	83	82	78	78	77	70	69	69	63	62	61	60	60	59	58	57	57	56	56
Causeway Bay	29	301	287	257	244	239	238	238	234	232	226	225	223	221	220	219	215	214	211	211
Central	35	274	268	265	251	246	240	236	228	228	226	224	221	221	220	220	219	219	218	216
Mong Kok	19	259	240	235	232	232	227	224	224	220	217	209	205	204	203	203	202	201	201	201

Table C1 (Cont.): 2021 Exceedance of Short-Term Limits of Air Quality Objectives

Pollutant: Ozone (Daily maximum 8-hour limit value = 160 μg/m^3 ; allowable no. of exceedance of limit value = 9)

Station	No. of exceedance of limit value	1st High	2nd High	3rd High	4th High	5th High	6th High	7th High	8th High	9th High	10th High
Central/Western	8	241	221	205	176	170	165	164	163	155	155
Southern	6	218	205	181	176	175	167	160	156	155	155
Eastern	6	217	208	197	166	165	161	160	157	149	148
Kwun Tong	2	190	169	153	153	151	150	148	139	138	136
Sham Shui Po	4	199	193	182	163	151	145	145	137	137	136
Kwai Chung	2	170	169	156	156	142	135	131	130	126	124
Tsuen Wan	4	204	191	167	167	149	145	142	141	139	130
Tseung Kwan O	9	227	208	191	190	181	170	164	164	163	158
Yuen Long	14	286	228	206	206	190	184	181	180	179	178
Tuen Mun	11	256	233	198	187	185	182	180	180	164	161
Tung Chung	7	208	205	187	180	176	173	161	160	160	158
Tai Po	12	246	236	230	222	200	184	183	183	179	168
Sha Tin	8	236	222	193	190	169	167	162	162	160	157
North	20	289	249	231	217	212	211	193	188	187	187
Tap Mun	22	301	274	250	214	199	196	188	188	178	177
Causeway Bay	0	120	113	104	102	101	101	98	98	95	94
Central	0	135	132	129	121	116	115	110	109	109	107
Mong Kok	0	126	115	114	111	109	101	100	99	99	97

Pollutant: Respirable Suspended Particulates (PM_{10}) (24-hour limit value = 100 μg/m^3 ; allowable no. of exceedance of limit value = 9)

Station	No. of exceedance of limit value	1st High	2nd High	3rd High	4th High	5th High	6th High	7th High	8th High	9th High	10th High
Central/Western	1	110	94	82	80	79	77	70	68	65	65
Southern	0	99	96	75	74	69	67	67	63	59	53
Eastern	2	117	116	88	86	80	78	76	76	74	62
Kwun Tong	2	128	102	99	95	88	77	77	75	74	72
Sham Shui Po	2	104	103	89	88	85	79	77	72	68	67
Kwai Chung	0	92	92	88	73	72	69	68	67	64	56
Tsuen Wan	0	96	89	82	71	71	71	67	66	64	60
Tseung Kwan O	0	89	88	67	65	62	61	60	52	50	50
Yuen Long	1	109	98	92	90	88	87	86	78	73	73
Tuen Mun	4	130	111	111	107	98	91	90	89	89	87
Tung Chung	0	98	92	80	77	76	70	70	65	64	63
Tai Po	1	113	94	79	77	70	69	69	69	63	60
Sha Tin	2	109	102	88	81	76	75	73	61	59	58
North	0	100	86	76	75	74	71	67	67	63	62
Tap Mun	1	118	96	74	72	68	68	68	64	60	54
Causeway Bay	4	117	109	104	103	92	86	85	83	83	79
Central	2	117	101	90	90	86	85	73	73	70	70
Mong Kok	1	115	100	91	88	86	80	74	73	70	69

Pollutant: Fine Suspended Particulates ($PM_{2.5}$) (24-hour limit value = 75 μg/m^3 ; allowable no. of exceedance of limit value = 9)

Station	No. of exceedance of limit value	1st High	2nd High	3rd High	4th High	5th High	6th High	7th High	8th High	9th High	10th High
Central/Western	0	61	57	57	50	48	45	45	44	41	39
Southern	0	48	42	39	33	32	32	31	31	30	29
Eastern	0	53	51	50	39	39	38	38	36	36	34
Kwun Tong	0	56	56	45	43	41	41	41	38	37	36
Sham Shui Po	0	49	46	40	38	35	35	34	33	33	33
Kwai Chung	0	57	52	51	42	42	41	40	38	38	37
Tsuen Wan	0	56	51	51	50	49	46	44	42	40	39
Tseung Kwan O	0	51	44	34	32	32	32	31	31	31	30
Yuen Long	0	75	66	55	49	47	46	45	45	44	43
Tuen Mun	0	65	64	60	54	53	52	52	47	47	46
Tung Chung	0	60	60	59	51	48	47	45	45	45	44
Tai Po	0	58	54	54	51	48	42	39	39	39	38
Sha Tin	0	58	45	40	38	38	37	36	36	34	34
North	0	50	44	44	43	41	40	40	39	34	34
Tap Mun	0	59	54	47	39	39	36	34	33	33	32
Causeway Bay	0	70	63	62	61	60	56	53	50	49	47
Central	0	65	64	64	52	50	49	49	47	46	43
Mong Kok	0	63	62	61	53	50	48	47	47	46	44

Notes:

1. All concentration units are in microgram per cubic metre (μg/m^3).
2. Shaded no. of exceedance of limit value respresents exceedance of the respective air quality objective.
3. Shaded concentration is higher than the limit value of the respective air quality objective.

Table C2: 2021 Monthly and Annual Averages of Air Pollutants Concentrations

Pollutant: Sulphur Dioxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	4	4	4	4	5	5	6	6	6	2	4	4	4
Southern	3	2	2	2	4	4	5	5	5	3	2	2	3
Eastern	3	1	1	1	1	1	1	1	2	1	2	2	2
Kwun Tong	5	3	3	3	4	5	4	3	4	3	5	6	4
Sham Shui Po	7	5	5	7	8	8	9	4	4	2	5	5	6
Kwai Chung	7	6	7	7	10	8	6	5	5	3	4	6	6
Tsuen Wan	4	3	3	3	4	5	5	6	6	5	5	6	5
Tseung Kwan O	4	2	3	3	2	2	2	2	3	2	3	6	3
Yuen Long	9	7	7	8	8	8	9	9	10	10	12	5	9
Tuen Mun	6	4	4	4	4	4	5	5	6	5	7	6	5
Tung Chung	5	3	4	4	4	5	6	6	7	7	3	4	5
Tai Po	5	3	3	5	3	2	2	3	3	3	4	5	4
Sha Tin	5	8	6	7	7	4	6	6	7	4	6	6	6
North	4	1	3	4	3	4	3	4	3	3	4	4	3
Tap Mun	6	5	5	6	5	5	5	6	7	7	8	9	6
Causeway Bay	7	6	6	6	7	5	5	6	7	4	5	6	6
Central	7	4	4	3	4	4	3	4	4	4	5	6	4
Mong Kok	5	4	5	5	5	4	3	4	5	1	4	3	4

Pollutant: Nitrogen Oxides

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	62	55	51	37	26	31	29	36	41	31	48	52	41
Southern	49	42	42	34	35	40	36	43	38	29	41	48	40
Kwun Tong	95	83	69	62	71	72	69	81	83	57	80	84	76
Sham Shui Po	94	87	73	63	49	62	58	66	72	51	70	75	68
Kwai Chung	99	89	87	75	98	104	89	99	85	51	75	82	86
Tsuen Wan	79	67	62	54	62	63	58	68	58	42	59	68	62
Tseung Kwan O	47	38	31	28	34	38	38	46	38	19	35	33	35
Yuen Long	88	62	53	44	36	41	47	54	58	44	70	80	56
Tuen Mun	105	72	63	51	38	42	39	50	49	43	73	87	59
Tung Chung	56	39	36	27	21	23	22	26	34	29	46	56	35
Tai Po	63	48	40	36	34	38	39	45	41	34	52	58	44
Sha Tin	68	48	38	35	33	33	34	47	43	26	51	54	42
North	72	56	45	39	32	38	42	48	50	41	69	74	51
Tap Mun	18	11	12	10	9	9	8	13	11	9	13	16	12
Causeway Bay	209	202	179	151	190	195	208	223	213	165	209	248	199
Central	189	150	137	111	133	144	141	159	154	121	175	184	150
Mong Kok	156	147	132	132	143	148	144	158	151	98	134	127	139

Pollutant: Nitrogen Dioxide (Annual limit value = 40 $\mu g/m^3$)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	51	43	38	32	21	25	22	25	30	27	42	43	33
Southern	39	30	31	27	26	29	25	29	25	23	33	36	30
Eastern	45	39	38	34	24	30	29	30	34	31	42	43	35
Kwun Tong	63	55	47	43	40	42	41	44	51	41	59	58	49
Sham Shui Po	66	57	49	46	33	42	38	42	45	39	55	56	47
Kwai Chung	65	55	52	50	52	54	48	50	49	34	54	55	52
Tsuen Wan	59	49	44	41	40	41	39	42	40	33	48	51	44
Tseung Kwan O	34	29	23	21	23	25	25	30	27	16	30	28	26
Yuen Long	57	41	40	34	24	27	31	34	39	35	55	57	40
Tuen Mun	74	54	48	41	29	32	30	34	36	34	58	62	44
Tung Chung	44	29	27	21	14	15	15	17	25	25	39	43	26
Tai Po	49	36	31	28	24	27	27	30	30	25	39	42	32
Sha Tin	49	36	30	27	25	24	25	31	29	22	41	42	32
North	53	38	35	30	22	26	28	31	33	33	49	51	36
Tap Mun	16	9	9	8	6	6	7	10	9	8	12	15	10
Causeway Bay	88	79	72	70	60	63	62	57	68	65	85	86	71
Central	90	73	67	64	57	59	59	57	66	60	84	81	68
Mong Kok	84	78	71	76	61	65	63	62	69	57	81	72	70

Pollutant: Carbon Monoxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Southern	501	461	428	329	255	265	263	428	450	496	422	581	407
Tsuen Wan	745	642	521	572	471	604	576	521	536	601	562	633	582
Tseung Kwan O	790	798	670	433	363	424	438	469	474	468	439	550	525
Yuen Long	814	638	679	516	435	566	473	600	680	530	672	700	608
Tuen Mun	877	869	707	738	716	608	652	726	664	625	689	718	715
Tung Chung	563	430	400	331	204	223	281	371	345	330	307	496	357
North	580	597	412	364	445	337	413	545	676	620	735	697	534
Tap Mun	640	491	489	534	476	370	304	356	479	653	443	684	494
Causeway Bay	892	806	885	811	611	647	658	754	790	661	587	776	740
Central	781	680	695	558	449	519	519	671	983	1093	1109	1021	758
Mong Kok	933	831	1035	1036	673	890	837	767	660	764	672	789	824

Table C2 (Cont.): 2021 Monthly and Annual Averages of Air Pollutants Concentrations

Pollutant: Ozone

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	65	64	58	79	48	52	49	39	57	70	83	72	61
Southern	79	78	66	84	44	48	44	35	56	75	79	73	63
Eastern	71	73	67	87	56	57	51	42	61	71	78	72	65
Kwun Tong	58	53	50	68	29	31	27	20	39	56	63	57	46
Sham Shui Po	59	57	52	69	41	39	38	28	47	59	62	51	50
Kwai Chung	51	51	46	62	20	23	22	15	37	55	58	50	41
Tsuen Wan	50	50	45	63	29	34	31	22	42	56	59	49	44
Tseung Kwan O	80	75	73	90	42	46	44	34	61	78	86	79	65
Yuen Long	49	54	50	71	43	44	42	29	47	55	56	46	49
Tuen Mun	48	54	48	68	43	43	45	32	53	57	57	43	49
Tung Chung	51	53	49	67	43	47	43	33	52	60	60	48	51
Tai Po	69	69	67	84	47	50	47	34	59	63	67	57	59
Sha Tin	60	58	59	77	41	48	42	28	51	67	67	56	54
North	64	65	61	82	50	50	48	35	57	61	61	51	57
Tap Mun	89	85	77	98	56	61	56	42	73	80	96	82	75
Causeway Bay	38	37	36	50	24	25	16	13	19	31	30	27	29
Central	37	41	40	54	23	23	18	14	25	38	37	34	32
Mong Kok	42	40	36	48	21	21	18	13	25	42	45	37	32

Pollutant: Respirable Suspended Particulates (PM_{10}) (Annual limit value = 50 $\mu g/m^3$)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	48	31	34	32	14	16	13	12	17	23	32	37	26
Southern	42	27	29	30	17	20	16	16	19	24	33	35	26
Eastern	50	33	34	36	16	20	19	15	20	27	34	39	29
Kwun Tong	58	37	40	38	20	21	18	18	24	27	37	41	31
Sham Shui Po	50	35	36	35	17	22	17	16	20	23	33	37	28
Kwai Chung	40	28	33	31	17	20	16	15	19	23	31	36	26
Tsuen Wan	43	24	28	29	14	18	15	14	19	22	29	37	24
Tseung Kwan O	37	25	27	29	16	18	16	15	20	24	30	32	24
Yuen Long	56	32	33	31	16	19	16	15	23	27	41	49	30
Tuen Mun	69	39	42	40	19	22	20	16	26	33	50	55	36
Tung Chung	48	27	24	30	14	16	13	14	17	24	39	44	26
Tai Po	46	28	30	29	15	17	15	14	20	24	30	36	26
Sha Tin	46	26	29	31	16	17	14	14	18	21	29	36	25
North	47	27	28	27	14	15	14	14	23	24	33	38	25
Tap Mun	44	26	27	29	12	14	11	11	16	25	29	35	23
Causeway Bay	62	44	47	43	29	29	28	25	33	35	46	50	39
Central	53	35	36	36	20	20	18	17	22	25	36	43	30
Mong Kok	52	36	40	37	17	20	17	16	22	27	36	41	30

Pollutant: Fine Suspended Particulates ($PM_{2.5}$) (Annual limit value = 35 $\mu g/m^3$)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	29	19	20	17	8	9	8	8	11	14	19	24	16
Southern	20	15	15	14	8	9	8	7	9	11	16	18	13
Eastern	25	18	17	16	9	10	9	8	11	13	17	21	15
Kwun Tong	28	20	20	19	12	12	10	10	13	15	19	23	17
Sham Shui Po	23	18	17	14	8	9	8	9	11	13	16	20	14
Kwai Chung	22	19	20	17	10	12	11	10	13	15	19	25	16
Tsuen Wan	26	17	18	17	10	11	10	10	13	15	18	25	16
Tseung Kwan O	20	14	15	15	8	9	8	8	11	13	16	19	13
Yuen Long	27	18	16	15	10	11	10	10	15	17	24	31	17
Tuen Mun	37	24	23	20	10	10	9	9	14	18	26	32	19
Tung Chung	28	17	15	16	9	9	9	11	12	16	26	31	17
Tai Po	28	18	18	16	9	9	9	9	13	14	18	23	16
Sha Tin	24	14	15	14	9	9	8	8	11	12	17	23	14
North	26	17	16	15	10	9	10	9	13	13	17	21	15
Tap Mun	25	17	15	14	7	8	7	6	11	13	16	21	14
Causeway Bay	35	27	28	23	17	17	17	17	21	21	27	31	23
Central	31	21	21	20	12	13	12	12	15	15	21	27	18
Mong Kok	31	23	25	22	12	12	11	11	14	15	20	25	18

Notes:

1. All concentration units are in microgram per cubic metre ($\mu g/m^3$).
2. Shaded annual average represents exceedance of the respective air quality objective.

Table C3: 2021 Hourly Statistics of Air Pollutants Concentrations

Pollutant: Sulphur Dioxide

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles----------> 10	25	50	75	90	95	97.5	99	99.8	Arithmetic mean	Highest 1-hour
Central/Western	8509	97.1	2	3	4	6	7	9	10	13	18	4	45
Southern*	8641	98.6	1	1	3	4	6	7	9	11	16	3	30
Eastern	8568	97.8	0	1	1	2	3	4	5	6	9	2	28
Kwun Tong	8442	96.4	2	3	3	5	6	7	8	9	13	4	19
Sham Shui Po	8451	96.5	2	3	5	8	10	12	14	16	21	6	32
Kwai Chung	8464	96.6	2	4	5	8	12	14	16	19	25	6	42
Tsuen Wan	8467	96.7	2	3	4	6	7	8	9	11	14	5	19
Tseung Kwan O	8550	97.6	1	2	2	3	5	8	9	9	11	3	15
Yuen Long	8440	96.3	6	8	8	10	12	13	14	15	17	9	21
Tuen Mun	8615	98.3	3	3	4	6	8	9	10	12	15	5	18
Tung Chung	8452	96.5	3	3	5	6	7	8	9	11	14	5	16
Tai Po	8462	96.6	2	2	3	5	6	6	7	9	11	4	14
Sha Tin	8442	96.4	2	4	6	8	10	11	12	14	17	6	32
North*	8562	97.7	1	2	3	4	5	6	7	8	11	3	14
Tap Mun	8448	96.4	4	5	6	7	8	10	11	12	13	6	15
Causeway Bay	8519	97.2	3	4	5	7	9	11	12	14	17	6	22
Central	8510	97.1	2	3	4	5	7	9	10	12	16	4	27
Mong Kok	8469	96.7	2	3	4	5	7	9	11	14	18	4	27

Pollutant: Nitrogen Oxides

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles----------> 10	25	50	75	90	95	97.5	99	99.8	Arithmetic mean	Highest 1-hour
Central/Western	8497	97.0	12	18	32	51	79	106	142	193	293	41	487
Southern	8612	98.3	14	21	32	47	72	96	123	163	243	40	414
Kwun Tong	8433	96.3	25	41	66	97	133	166	202	254	357	76	462
Sham Shui Po	8395	95.8	24	38	59	85	115	144	183	248	396	68	500
Kwai Chung	8427	96.2	25	44	75	115	158	193	225	274	357	86	543
Tsuen Wan	8477	96.8	22	39	56	76	103	129	157	198	264	62	371
Tseung Kwan O	8583	98.0	12	16	23	42	76	101	126	159	253	35	417
Yuen Long	8405	95.9	22	33	48	68	100	128	161	207	285	56	540
Tuen Mun	8621	98.4	20	31	49	74	109	143	181	228	341	59	490
Tung Chung	8426	96.2	9	14	25	48	73	90	106	132	181	35	318
Tai Po	8506	97.1	18	26	38	54	76	95	118	144	223	44	365
Sha Tin	8428	96.2	13	18	31	53	89	118	143	183	249	42	326
North	8611	98.3	16	25	40	62	96	129	162	211	309	51	710
Tap Mun	8416	96.1	4	6	9	15	21	26	32	42	71	12	142
Causeway Bay	8475	96.7	59	107	178	268	369	435	486	563	665	199	972
Central	8508	97.1	47	78	126	199	285	341	392	471	638	150	950
Mong Kok	8460	96.6	42	79	131	184	240	278	321	381	495	139	602

Pollutant: Nitrogen Dioxide (1-hour limit value = 200 μg/m^3; allowable no. of exceedance of limit value = 18
Annual limit value = 40 μg/m^3)

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles----------> 10	25	50	75	90	95	97.5	99	99.8	Arithmetic mean	Highest 1-hour	No. of exceedance of limit value
Central/Western	8497	97.0	11	16	28	42	62	80	98	119	149	33	180	0
Southern	8612	98.3	11	17	26	36	52	66	81	99	123	30	167	0
Eastern	8567	97.8	16	22	32	44	57	67	79	100	129	35	162	0
Kwun Tong	8433	96.3	20	30	44	61	80	100	118	136	164	49	197	0
Sham Shui Po	8395	95.8	19	28	42	60	80	96	111	133	171	47	259	3
Kwai Chung	8427	96.2	19	31	47	64	89	110	129	151	181	52	202	2
Tsuen Wan	8477	96.8	17	29	41	54	73	89	102	120	152	44	224	2
Tseung Kwan O	8583	98.0	9	13	18	31	54	72	89	106	133	26	182	0
Yuen Long	8405	95.9	16	24	35	49	68	84	101	120	149	40	206	1
Tuen Mun	8621	98.4	17	25	38	56	80	99	117	137	172	44	217	6
Tung Chung	8426	96.2	6	11	21	37	55	66	75	91	118	26	163	0
Tai Po	8506	97.1	13	19	29	41	56	68	82	98	115	32	134	0
Sha Tin	8428	96.2	9	15	24	40	64	86	103	119	162	32	198	0
North	8611	98.3	13	20	31	46	64	79	96	113	136	36	186	0
Tap Mun	8416	96.1	3	5	8	13	18	23	27	36	56	10	83	0
Causeway Bay	8475	96.7	32	47	67	91	115	132	148	171	211	71	301	29
Central	8508	97.1	30	43	62	86	112	132	152	175	218	68	274	35
Mong Kok	8460	96.6	29	46	66	88	115	132	149	169	201	70	259	19

Pollutant: Carbon Monoxide (1-hour limit value = 30,000 μg/m^3 ; allowable no. of exceedance of limit value = 0)

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles----------> 10	25	50	75	90	95	97.5	99	99.8	Arithmetic mean	Highest 1-hour	No. of exceedance of limit value
Southern	8630	98.5	200	290	390	500	630	690	790	860	1020	407	1230	0
Tsuen Wan	8481	96.8	380	450	560	690	810	870	940	1022	1150	582	1240	0
Tseung Kwan O	8559	97.7	330	380	460	640	810	900	1010	1120	1308	525	1750	0
Yuen Long	8434	96.3	400	470	580	710	870	970	1080	1200	1401	608	2090	0
Tuen Mun	8647	98.7	540	600	680	800	940	1030	1100	1210	1457	715	1720	0
Tung Chung	8444	96.4	160	240	330	450	580	680	760	850	980	357	1240	0
North	8637	98.6	260	380	520	660	810	930	1030	1180	1427	534	2150	0
Tap Mun	8403	95.9	300	370	460	600	740	810	880	970	1092	494	1210	0
Causeway Bay	8494	97.0	480	572.5	710	870	1050	1170	1270	1420	1620	740	1920	0
Central	8495	97.0	380	510	730	990	1170	1250	1340	1450	1650	758	1990	0
Mong Kok	8510	97.1	550	650	790	980	1150	1230	1320	1430	1640	824	2130	0

Table C3 (Cont.): 2021 Hourly Statistics of Air Pollutants Concentrations

Pollutant: Ozone

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles---------->									Arithmetic mean	Highest 1-hour
			10	25	50	75	90	95	97.5	99	99.8		
Central/Western	8663	98.9	20	34	54	87	109	122	134	156	213	61	304
Southern	8639	98.6	20	35	57	91	112	125	137	153	203	63	265
Eastern	8565	97.8	28	41	60	88	108	119	130	149	199	65	253
Kwun Tong	8391	95.8	10	19	37	69	93	106	119	132	167	46	222
Sham Shui Po	8378	95.6	14	26	45	70	91	104	119	139	193	50	295
Kwai Chung	8364	95.5	3	12	33	66	90	101	111	126	170	41	252
Tsuen Wan	8472	96.7	8	19	37	65	88	99	113	133	189	44	318
Tseung Kwan O	8573	97.9	17	32	57	98	122	135	147	161	214	65	259
Yuen Long	8445	96.4	7	21	40	69	99	117	138	172	240	49	341
Tuen Mun	8595	98.1	10	22	40	68	98	116	140	173	234	49	326
Tung Chung	8413	96.0	11	25	43	70	99	117	135	171	220	51	275
Tai Po	8669	99.0	13	28	50	87	116	130	147	170	243	59	311
Sha Tin	8377	95.6	6	23	46	82	110	126	139	159	218	54	278
North	8654	98.8	9	25	48	84	112	128	151	193	260	57	353
Tap Mun	8438	96.3	27	44	66	103	132	146	159	186	244	75	350
Causeway Bay	8624	98.4	7	11	21	40	62	76	86	97	115	29	142
Central	8677	99.1	5	11	23	48	72	86	97	108	130	32	161
Mong Kok	8526	97.3	7	12	26	47	67	80	91	101	122	32	159

Pollutant: Respirable Suspended Particulates (PM_{10}) (Annual limit value = 50 µg/m3)

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles---------->									Arithmetic mean	Highest 1-hour
			10	25	50	75	90	95	97.5	99	99.8		
Central/Western	8691	99.2	7	12	23	35	46	55	72	86	128	26	179
Southern	8471	96.7	10	15	23	33	43	51	61	76	116	26	155
Eastern	8273	94.4	10	16	26	37	49	58	73	91	140	29	191
Kwun Tong	8045	91.8	10	18	28	42	55	64	79	96	138	31	174
Sham Shui Po	8550	97.6	10	16	25	37	49	58	72	89	127	28	181
Kwai Chung	8602	98.2	9	14	23	33	44	54	66	82	117	26	153
Tsuen Wan	8635	98.6	8	12	21	31	44	56	68	82	124	24	157
Tseung Kwan O	8614	98.3	9	14	22	31	40	48	55	66	107	24	149
Yuen Long	8586	98.0	9	14	25	40	56	68	82	101	135	30	205
Tuen Mun	8539	97.5	11	18	31	48	67	80	97	116	156	36	200
Tung Chung	8586	98.0	7	12	22	34	50	62	74	88	124	26	150
Tai Po	8523	97.3	8	13	22	34	45	54	68	87	130	26	169
Sha Tin	8464	96.6	8	14	22	32	44	53	67	86	130	25	172
North	8314	94.9	9	13	21	33	45	56	69	87	120	25	154
Tap Mun	8586	98.0	6	11	20	32	44	51	61	79	126	23	167
Causeway Bay	8455	96.5	17	25	36	50	64	74	88	104	145	39	194
Central	8483	96.8	11	17	27	39	51	61	78	93	134	30	158
Mong Kok	8622	98.4	10	16	27	40	52	61	76	90	136	30	162

Pollutant: Fine Suspended Particulates ($PM_{2.5}$) (Annual limit value = 35 µg/m3)

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles---------->									Arithmetic mean	Highest 1-hour
			10	25	50	75	90	95	97.5	99	99.8		
Central/Western	8694	99.2	4	8	13	21	29	35	43	56	75	16	125
Southern	8455	96.5	3	7	11	17	23	28	33	41	54	13	66
Eastern	8192	93.5	5	8	13	19	27	32	38	49	70	15	85
Kwun Tong	8569	97.8	6	10	15	22	29	35	41	50	68	17	89
Sham Shui Po	8550	97.6	4	7	12	18	25	30	36	44	59	14	117
Kwai Chung	8603	98.2	6	9	14	20	28	34	41	51	68	16	98
Tsuen Wan	8635	98.6	5	8	13	20	29	36	45	54	75	16	125
Tseung Kwan O	8612	98.3	4	7	12	17	24	28	34	41	58	13	79
Yuen Long	8616	98.4	5	8	14	23	33	40	48	58	83	17	143
Tuen Mun	8539	97.5	5	9	17	27	37	44	53	62	92	19	124
Tung Chung	8583	98.0	4	8	14	22	32	41	48	57	74	17	103
Tai Po	8521	97.3	5	8	13	21	29	35	42	52	72	16	89
Sha Tin	8461	96.6	4	7	11	18	27	32	39	47	66	14	79
North	8310	94.9	5	8	12	19	27	33	39	52	64	15	94
Tap Mun	8587	98.0	3	6	12	18	26	31	36	44	72	14	90
Causeway Bay	8455	96.5	10	15	21	30	39	46	54	66	87	23	138
Central	8483	96.8	7	11	16	23	32	39	48	61	80	18	111
Mong Kok	8622	98.4	7	10	16	24	33	41	48	61	79	18	118

Notes:

1. All concentration units are in microgram per cubic metre ($\mu g/m^3$).
2. Shaded arithmetic mean represents exceedance of the respective air quality objective.

Table C4: 2021 Diurnal Variations of Air Pollutants Concentrations

Pollutant: Sulphur Dioxide

Station	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23	Hr24
Central/Western	4	4	4	4	4	4	4	4	5	5	5	5	5	4	5	5	5	4	4	4	4	4	4	4
Southern	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3
Eastern	1	1	2	2	1	2	1	2	2	2	2	2	2	2	2	2	1	1	1	1	2	1	1	1
Kwun Tong	3	3	3	3	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3
Sham Shui Po	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Kwai Chung	6	6	5	5	5	5	5	6	6	7	7	7	7	6	6	6	7	7	7	7	7	6	6	6
Tsuen Wan	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4
Tseung Kwan O	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Yuen Long	8	9	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	9	9	8	8	8	8	8
Tuen Mun	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Tung Chung	4	4	4	4	4	4	4	4	5	6	6	6	6	6	6	6	5	5	5	5	4	4	4	4
Tai Po	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3
Sha Tin	6	6	6	6	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
North	3	3	3	3	3	3	3	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3
Tap Mun	6	7	6	6	6	6	6	6	6	7	7	7	6	6	6	6	6	6	6	6	6	6	6	6
Causeway Bay	5	4	4	4	4	4	5	6	7	7	7	7	7	7	7	7	7	6	7	6	6	6	6	5
Central	3	3	3	3	3	3	3	4	5	5	5	5	5	4	5	5	5	5	5	5	4	4	4	4
Mong Kok	3	3	3	3	3	3	3	4	4	4	4	5	4	5	5	5	5	5	5	5	4	4	4	4

Pollutant: Nitrogen Oxides

Station	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23	Hr24
Central/Western	33	26	24	20	21	22	28	47	59	62	54	48	43	42	44	46	47	47	50	50	46	43	40	40
Southern	30	24	21	20	20	26	38	52	63	62	58	52	45	41	39	41	45	48	46	43	39	36	33	31
Kwun Tong	61	48	39	39	33	43	73	101	102	99	95	90	83	86	88	86	88	88	89	84	72	69	72	70
Sham Shui Po	54	44	39	34	37	41	57	74	83	84	79	75	71	74	76	79	85	88	88	83	75	67	65	61
Kwai Chung	65	51	43	42	40	48	71	104	121	116	101	94	89	89	95	100	107	111	116	107	94	85	79	75
Tsuen Wan	49	35	30	26	27	32	50	69	80	80	75	73	68	68	69	72	75	81	84	80	69	62	61	57
Tseung Kwan O	39	33	27	24	30	35	52	51	37	31	29	27	25	26	27	28	32	38	42	44	42	41	42	41
Yuen Long	50	45	37	33	34	41	66	83	73	59	51	48	47	49	49	53	59	64	70	72	71	68	65	61
Tuen Mun	53	45	38	33	34	40	56	85	84	74	64	57	51	52	54	56	61	70	79	78	69	65	64	59
Tung Chung	28	25	20	18	18	21	28	40	47	48	46	42	40	38	38	38	39	40	40	38	38	35	34	31
Tai Po	39	34	29	28	28	32	50	71	65	50	42	38	37	37	37	39	43	49	55	55	51	49	47	44
Sha Tin	45	37	32	30	29	32	47	60	55	46	36	33	31	29	30	33	37	46	53	60	58	54	52	49
Tap Mun	46	36	30	29	31	46	72	91	75	53	46	41	38	38	39	42	47	54	63	65	61	60	56	52
North	11	11	11	11	10	10	11	12	14	15	15	13	11	10	10	10	11	12	12	12	12	12	11	11
Causeway Bay	137	96	81	69	68	72	143	219	268	259	260	266	258	280	265	242	244	244	255	233	201	204	198	158
Central	99	80	62	65	63	68	95	150	224	212	193	188	173	162	179	189	188	209	232	191	155	134	127	120
Mong Kok	100	63	60	53	54	57	93	124	163	166	165	164	163	177	182	189	201	200	198	174	149	145	145	123

Pollutant: Nitrogen Dioxide

Station	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23	Hr24
Central/Western	28	23	21	17	18	19	24	34	39	40	38	35	33	33	35	37	40	42	45	45	41	37	34	33
Southern	24	20	18	16	17	20	25	32	37	38	37	35	32	30	30	33	37	40	38	35	32	29	27	26
Eastern	30	25	22	20	20	22	30	40	43	41	38	37	36	37	38	39	43	45	46	44	40	37	36	33
Kwun Tong	42	34	29	28	25	30	43	52	53	53	54	53	52	54	56	57	59	61	61	59	53	49	49	47
Sham Shui Po	39	32	28	25	27	29	39	46	49	49	48	48	47	50	52	55	60	64	66	63	57	50	47	44
Kwai Chung	42	34	30	29	28	31	39	51	55	55	53	53	54	56	61	64	69	71	72	67	60	54	50	47
Tsuen Wan	37	28	24	21	21	24	36	44	47	47	45	46	46	48	50	53	57	62	64	61	54	49	47	44
Tseung Kwan O	30	26	21	19	21	24	30	29	24	20	19	19	18	19	20	21	24	30	35	37	35	33	33	32
Yuen Long	37	34	29	27	27	29	37	42	40	36	34	33	33	36	36	40	46	51	55	56	52	49	46	43
Tuen Mun	41	37	32	28	29	33	39	47	47	45	42	40	38	39	42	44	50	58	64	62	55	51	49	46
Tung Chung	22	20	17	15	15	16	20	25	29	30	30	29	29	29	29	31	32	34	34	32	32	29	27	24
Tai Po	31	27	23	22	22	24	33	39	38	32	28	26	26	27	27	29	34	39	45	45	42	39	37	35
Sha Tin	34	29	25	24	23	25	31	35	34	30	25	23	22	22	23	25	30	38	44	47	45	42	40	37
North	34	28	25	24	25	29	38	44	41	35	32	30	29	29	31	33	38	45	50	50	47	44	41	38
Tap Mun	10	10	9	9	9	9	9	9	10	11	11	10	9	8	8	8	9	10	11	11	11	10	10	10
Causeway Bay	57	46	41	36	35	36	53	67	74	77	83	87	89	94	94	91	90	90	89	84	77	74	70	62
Central	53	45	38	38	37	39	48	63	77	76	76	77	77	78	84	88	88	91	93	86	75	68	64	60
Mong Kok	56	41	38	34	34	36	50	60	69	72	74	78	81	87	90	94	97	97	96	88	79	75	72	66

Pollutant: Carbon Monoxide

Station	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23	Hr24
Southern	385	372	368	362	365	375	398	431	451	439	425	409	406	402	400	407	417	429	434	431	424	419	411	401
Tsuen Wan	541	515	498	491	501	522	574	618	632	620	603	588	580	583	584	586	589	606	635	648	637	615	598	573
Tseung Kwan O	553	527	513	483	495	496	538	548	528	507	499	496	493	492	493	493	501	522	550	573	574	574	578	573
Yuen Long	630	613	592	576	574	580	623	653	631	597	589	572	563	559	557	570	584	600	635	661	674	665	656	648
Tuen Mun	702	684	670	652	702	713	722	775	750	724	720	706	700	699	691	687	689	706	748	764	754	741	735	719
Tung Chung	349	347	334	330	327	331	343	360	369	366	361	358	362	364	363	360	354	358	367	375	380	376	371	362
North	538	525	509	501	506	520	583	600	565	517	498	491	487	477	478	485	499	521	565	595	598	605	596	557
Tap Mun	492	490	492	493	492	493	497	503	506	505	503	497	495	494	491	490	490	491	491	490	488	490	489	488
Causeway Bay	669	633	613	599	566	602	646	702	738	789	788	779	792	789	776	804	795	819	852	883	855	785	714	697
Central	687	668	621	636	616	637	664	725	767	779	806	796	803	809	790	778	767	827	867	887	890	817	754	729
Mong Kok	790	756	747	727	722	726	746	796	826	844	830	825	826	838	851	854	866	884	917	929	908	863	846	823

Table C4 (Cont.): 2021 Diurnal Variations of Air Pollutants Concentrations

Pollutant: Ozone

Station	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23	Hr24
Central/Western	59	61	61	62	61	59	53	44	42	46	54	63	72	77	78	77	74	69	63	59	59	59	58	57
Southern	58	60	60	60	58	54	49	46	47	51	59	67	77	83	85	84	80	73	68	63	60	60	59	59
Eastern	63	66	66	66	65	62	54	46	46	53	61	68	76	79	79	78	75	72	69	67	66	65	63	63
Kwun Tong	42	47	49	48	49	44	33	28	30	34	40	48	55	58	58	59	56	52	48	46	46	45	42	42
Sham Shui Po	49	54	55	56	52	48	40	35	36	40	47	55	62	65	65	64	58	51	45	44	45	47	47	47
Kwai Chung	39	44	45	44	45	40	33	26	26	31	40	45	51	55	55	53	47	42	36	35	36	37	37	37
Tsuen Wan	40	45	47	47	45	42	32	28	30	35	43	49	56	60	62	62	58	50	41	37	37	38	37	37
Tseung Kwan O	52	54	56	58	52	49	44	47	54	63	71	80	87	91	93	93	89	81	72	64	61	59	55	53
Yuen Long	38	37	39	39	37	33	27	25	32	43	54	65	73	78	82	80	73	63	52	44	40	38	37	36
Tuen Mun	41	42	44	44	42	38	32	27	31	39	47	58	69	75	78	79	72	59	46	43	44	43	40	40
Tung Chung	43	43	45	45	44	41	36	33	35	41	48	56	65	72	76	79	75	66	53	47	43	43	42	42
Tai Po	47	47	48	47	45	42	35	33	40	53	65	76	85	90	93	91	86	75	64	58	55	52	49	47
Sha Tin	41	44	45	43	43	40	34	33	40	49	61	70	79	85	86	84	79	68	56	49	45	44	43	42
North	45	46	46	45	43	37	30	29	37	49	62	73	84	91	93	90	85	75	62	55	52	48	47	46
Tap Mun	59	58	57	55	53	52	51	54	60	67	76	87	97	103	107	107	105	99	90	81	74	69	65	62
Causeway Bay	31	37	40	41	42	40	28	20	17	19	20	22	25	26	28	29	29	29	27	27	27	28	27	30
Central	36	40	43	42	42	39	31	23	18	21	24	29	34	37	36	33	33	29	25	26	29	32	32	32
Mong Kok	35	43	45	45	44	42	31	24	21	24	27	30	35	35	35	33	30	28	25	26	29	30	29	30

Pollutant: Respirable Suspended Particulates (PM_{10})

Station	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23	Hr24
Central/Western	24	24	23	23	23	23	23	23	24	26	27	28	27	27	28	28	28	28	27	28	28	27	26	25
Southern	24	24	24	23	23	23	23	23	24	25	27	28	27	26	27	27	28	29	29	28	27	26	26	25
Eastern	28	28	27	27	27	27	27	27	27	27	28	29	29	29	29	30	31	32	32	31	31	31	30	29
Kwun Tong	29	28	27	27	27	27	26	28	30	32	34	35	36	34	35	35	35	35	35	35	34	32	31	30
Sham Shui Po	28	26	25	25	25	25	24	25	25	26	27	28	28	29	30	32	33	32	32	32	33	32	31	29
Kwai Chung	24	24	23	22	22	23	23	23	24	25	26	27	27	27	28	28	29	29	28	29	29	28	26	25
Tsuen Wan	22	22	21	20	20	20	21	21	22	23	24	25	26	26	27	28	28	29	28	28	28	26	24	23
Tseung Kwan O	24	23	23	22	22	22	22	22	22	22	23	23	24	24	24	25	26	26	27	27	26	26	25	24
Yuen Long	29	28	27	26	26	26	26	27	28	29	30	30	30	30	31	31	32	33	33	33	33	32	31	30
Tuen Mun	34	33	31	31	31	30	30	31	33	35	37	38	38	38	40	41	42	41	40	40	40	38	36	35
Tung Chung	23	23	22	22	22	22	22	22	23	25	27	28	28	30	31	31	32	30	28	26	26	25	25	24
Tai Po	25	24	23	23	23	23	24	24	25	26	26	27	27	27	26	26	26	27	27	27	28	27	26	25
Sha Tin	25	24	23	22	22	22	23	23	24	25	25	26	25	25	25	26	26	27	27	27	27	27	26	25
North	25	25	24	23	23	22	22	22	23	24	26	26	27	27	26	26	26	27	28	28	28	27	27	25
Tap Mun	21	21	22	22	22	22	22	21	22	24	25	25	25	25	25	25	26	26	25	24	23	22	22	22
Causeway Bay	34	30	27	27	26	26	29	35	37	42	45	45	44	45	49	49	48	48	46	47	47	43	39	37
Central	28	27	26	25	25	24	25	28	30	31	31	32	32	33	33	33	32	33	33	34	34	33	30	29
Mong Kok	28	26	25	25	24	24	25	26	28	30	31	32	32	32	34	34	33	34	34	36	36	33	30	29

Pollutant: Fine Suspended Particulates ($PM_{2.5}$)

Station	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23	Hr24
Central/Western	15	14	14	14	14	14	14	14	15	16	16	16	16	17	17	17	16	16	16	17	17	17	16	15
Southern	12	12	12	11	11	11	11	12	12	13	14	14	13	13	13	13	13	13	13	13	13	13	13	12
Eastern	14	14	14	14	14	14	14	14	15	15	15	14	15	14	14	15	15	16	16	16	16	16	16	15
Kwun Tong	16	15	15	15	15	15	15	16	17	17	18	18	18	18	18	18	18	18	18	19	19	18	17	16
Sham Shui Po	13	13	13	13	13	13	12	12	13	13	13	13	13	14	14	14	15	15	15	15	16	16	15	14
Kwai Chung	15	15	14	14	14	14	14	15	15	16	16	16	17	17	17	17	17	17	17	18	18	18	17	16
Tsuen Wan	15	14	14	13	13	13	14	14	15	15	15	16	16	17	17	17	17	18	18	19	19	18	16	15
Tseung Kwan O	13	13	13	12	12	12	13	13	13	12	12	12	13	13	13	13	13	14	14	14	14	14	14	13
Yuen Long	17	16	16	15	16	16	16	16	16	16	16	16	16	17	17	17	18	19	19	19	19	18	18	17
Tuen Mun	19	18	18	17	17	17	18	18	19	19	19	19	19	20	20	20	21	21	21	22	22	22	21	20
Tung Chung	16	15	15	14	15	15	15	15	16	16	17	17	17	18	19	19	19	19	18	17	17	17	17	16
Tai Po	15	15	15	14	15	14	15	15	16	16	16	16	16	16	16	16	16	16	16	17	17	17	16	16
Sha Tin	14	14	13	12	13	13	13	14	14	15	15	14	14	14	14	13	13	13	13	14	14	15	14	14
North	15	15	14	14	14	14	14	14	14	14	15	15	15	14	14	15	15	15	16	16	16	16	16	15
Tap Mun	12	12	13	13	13	13	13	13	13	14	15	15	15	15	14	14	14	14	14	14	13	13	13	13
Causeway Bay	20	18	16	16	16	15	17	21	22	24	25	25	26	27	28	28	28	27	28	30	30	27	25	22
Central	17	16	16	15	15	15	15	17	18	19	19	19	20	20	21	20	19	20	20	21	21	20	18	18
Mong Kok	17	16	15	15	15	15	15	16	17	18	19	19	20	20	21	21	20	20	21	23	24	21	19	18

Note:

1. All concentration units are in microgram per cubic metre ($\mu g/m^3$).

Table C5: 2021 Total Wet and Dry Deposition

(a) Wet Deposition

	Monitoring Station	Central/Western	Kwun Tong	Yuen Long
	Wet Deposition (tonne/ha)	24731	25119	15785
	Weighted Mean pH (based on volume-weighted mean hydrogen ion concentrations ($[H^+]$)	5.19	5.12	5.09
	Weighted Mean pH (based on volume-weighted mean pH)	5.41	5.37	5.35
	Number of Samples	100	107	94
Filtrate (kg/Ha)	**NH_4^+**	4.99	6.02	4.46
	NO_3^-	22.43	25.47	19.63
	SO_4^{2-}	14.93	14.96	8.63
	Cl^-	31.08	33.70	8.47
	F^-	0.66	0.78	0.45
	Na^+	18.92	20.26	6.03
	K^+	6.19	6.28	3.91
	Formate	4.68	5.02	3.44
	Acetate	4.11	4.09	2.79
	Ca^{2+}	3.80	3.53	3.27
	Mg^{2+}	2.17	2.38	0.73

** Note:* *The weighted mean pH is calculated from the pH values measured by the Government Laboratory.*

(b) Dry Deposition

	Monitoring Station	Central/Western	Kwun Tong	Yuen Long
	Number of Samples	26	25	26
Filtrate (kg/Ha)	**NH_4^+**	0.23	0.14	0.15
	NO_3^-	10.21	9.77	10.33
	SO_4^{2-}	3.18	3.45	2.41
	Cl^-	7.62	7.63	4.91
	F^-	0.034	0.038	0.036
	Na^+	5.32	4.84	2.83
	K^+	0.43	0.43	0.44
	Formate	0.19	0.18	0.21
	Acetate	0.16	0.16	0.15
	Ca^{2+}	4.43	5.15	4.91
	Mg^{2+}	0.78	0.68	0.49

Table C6: 2021 Ambient levels of Toxic Air Pollutants (TAPs)

Toxic Air Pollutants	Concentration Unit	Annual Averages [1]	
		Tsuen Wan	Central/Western
Heavy Metals			
Hexavalent chromium	ng/m^3	0.11	0.11
Lead [3]	ng/m^3	10	10
Organic Substances			
Benzene	$\mu g/m^3$	0.45	0.67
Benzo[a]pyrene	ng/m^3	0.05	0.09
1,3-Butadiene	$\mu g/m^3$	0.04	0.04
Formaldehyde [2]	$\mu g/m^3$	6.46	0.99
Perchloroethylene	$\mu g/m^3$	0.30	0.28
Dioxins [4]	pg I-TEQ/m^3	0.018	0.016

Notes:

[1] For TAP concentrations that are lower than the method detection limit (MDL), one half of the MDL is used in calculating the annual averages.

[2] From March to May 2021, the formaldehyde measurements at Tsuen Wan Station were influenced by the construction works at Princess Alexandra Community Centre. The affected measurement results during the period are not reported.

[3] For lead, the reported figures are the respective 2021 annual average concentrations in the elemental analysis of respirable suspended particulates.

[4] The ambient level of dioxins is expressed here as toxic equivalent (I-TEQ) concentration of 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) based on the International Toxic Equivalency Factors (I-TEF) of the North Atlantic Treaty Organisation (NATO/CCMS).