AIR QUALITY
IN HONG KONG 2012

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 (AQMN) (2012)

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Summary

This report summarises the 2012 air quality monitoring data collected by the Environmental Protection Department's monitoring network comprising 11 general stations and 3 roadside stations.

As a result of the enhanced vehicle emission control programme implemented by the Government since 2000, concentrations of nitrogen oxides (NOx), respirable suspended particulates (RSP) and sulphur dioxide (SO_2) at roadside have reduced substantially over the past decade. However, the level of roadside nitrogen dioxide (NO_2) has shown an upward trend during the period. Additional control measures are being introduced to reduce its concentration.

Thanks to the joint control efforts of the Hong Kong Special Administrative Region Government and the Guangdong Provincial Government in cutting emissions in the Pearl River Delta (PRD) Region, the ambient levels of NOx, SO_2 and RSP have also reduced in recent years. However, concentrations of ozone, a major constituent of photochemical smog, were on a slow rising trend over the past years. The two governments will continue to implement measures to alleviate photochemical smog and ozone problem in the PRD Region.

As in previous years, concentrations of carbon monoxide and lead in 2012 remained at levels well below their respective Air Quality Objectives limits.

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1. Introduction

The Environmental Protection Department (EPD) operates a network of 14 air quality monitoring stations for measuring concentrations of major air pollutants. It consists of 11 general stations for monitoring ambient air quality and three roadside stations for measuring street level air quality. Details of these monitoring stations are shown in Table B1 of Appendix B.

Additional monitoring facilities specifically designed for collecting Toxic Air Pollutants (TAPs) samples have been installed at the Tsuen Wan and Central/Western monitoring stations since 1997.

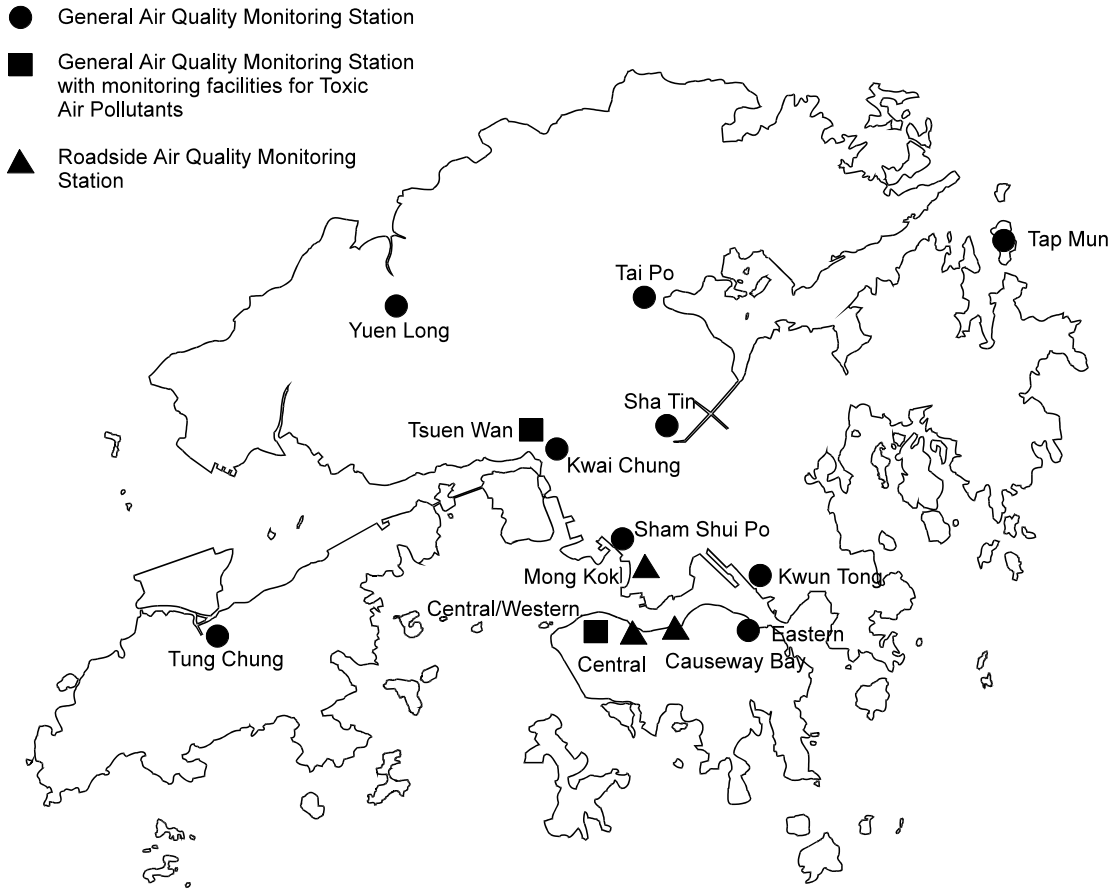


Figure 1: Location of EPD's Air Quality Monitoring Stations (2012)

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 sulphur dioxide and nitrogen dioxide in the vicinity of their power generating stations. The locations of these monitoring stations and the relevant monitoring results in 2012 are at Appendix D.

2. Gaseous Pollutants

2.1 Sulphur Dioxide (SO_2)

Sulphur dioxide (SO_2) is formed primarily from the combustion of sulphur-containing fossil fuels. In Hong Kong, power stations and marine vessels are the major source 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. Prolonged exposure at lower levels may also increase the risk of developing chronic respiratory diseases.

Figure 2a: Sulphur Dioxide Monitoring 2012
(1-Hour Average Statistics)

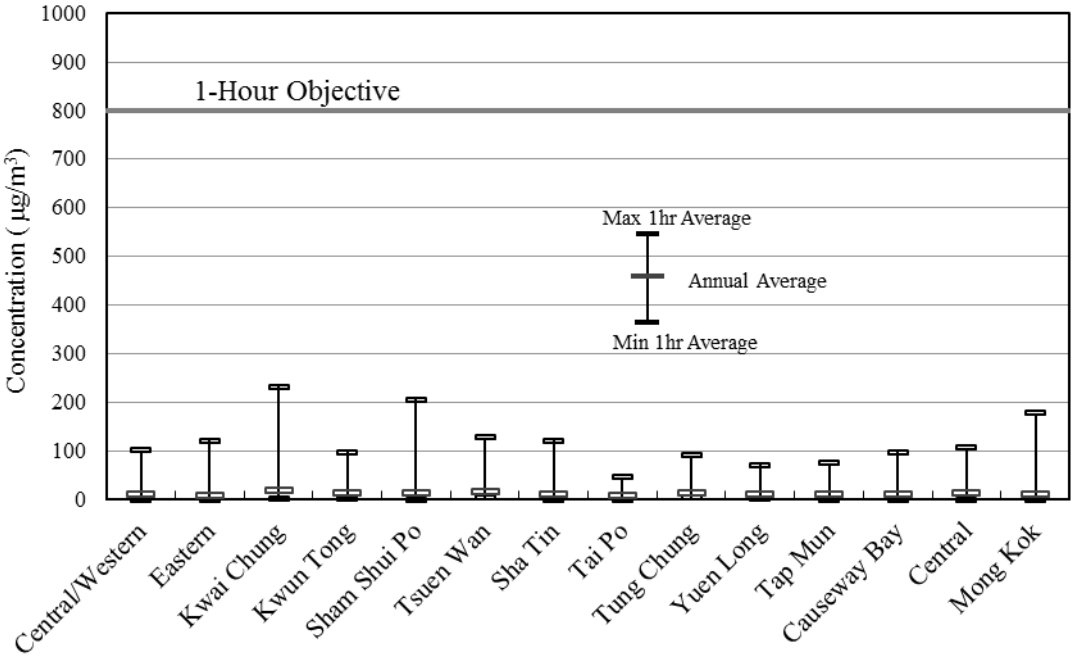


Figure 2b: Sulphur Dioxide Monitoring 2012
(24-Hour Average Statistics)

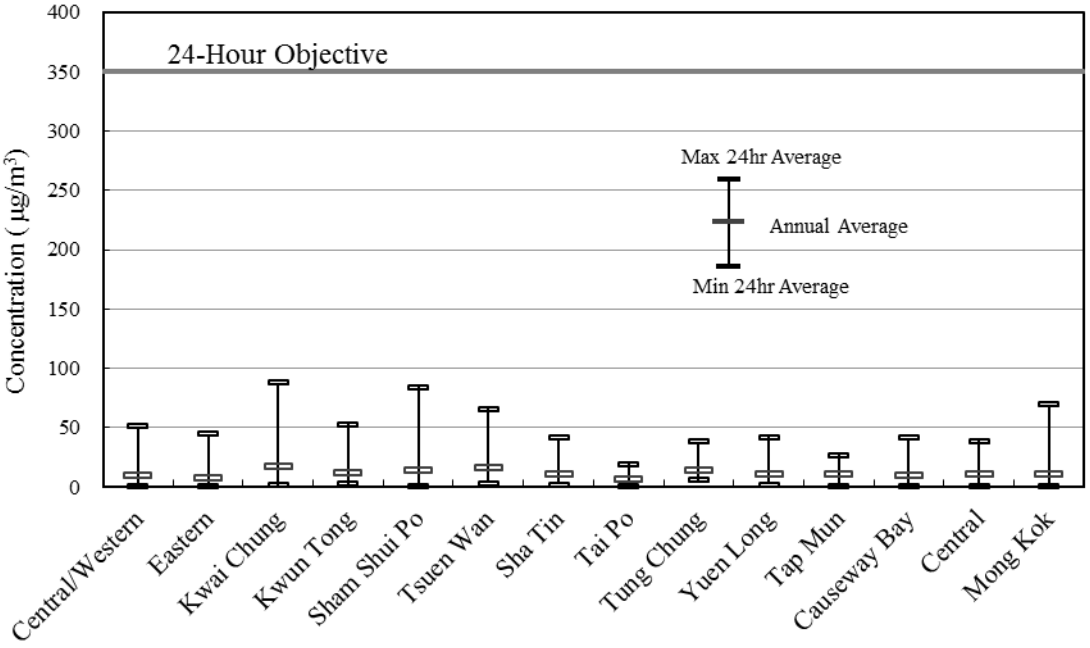
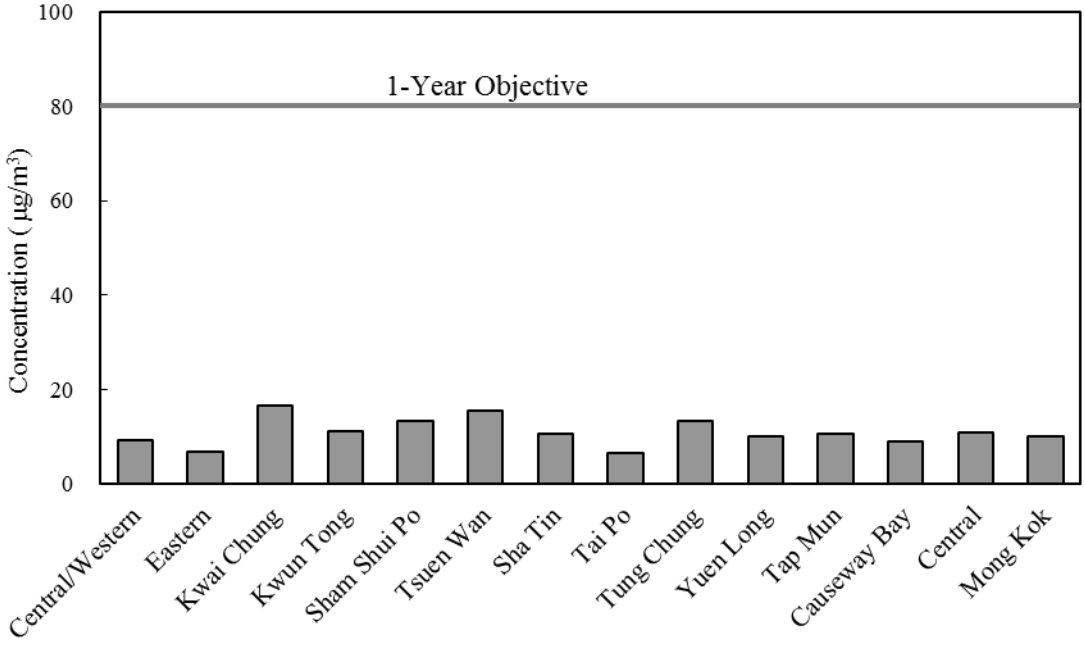


Figure 2c: Sulphur Dioxide Monitoring 2012 (Annual Average)



Sulphur dioxide was continuously measured at all the 14 monitoring stations during 2012. As in previous years, SO_2 concentrations remained low throughout the territory. All of the 14 monitoring stations complied with the relevant short and long term Hong Kong Air Quality Objectives[1] (AQOs) for SO_2. Both the highest 1-hour average (232 μg/m^3) and the highest 24-hour average (88 μg/m^3) in the year were recorded at the Kwai Chung general station. As for the annual average, the Kwai Chung and Tsuen Wan stations both recorded the highest value (16 μg/m^3) in the year. The highest 1-hour average, 24-hour average and annual average were all well below their respective AQO limits.

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

The various chemical species of the oxides of nitrogen are collectively termed as nitrogen oxides. From an air pollution standpoint, the most important nitrogen oxides in the atmosphere are nitric oxide (NO) and nitrogen dioxide (NO_2). In the context of air pollution, these two gases are often mentioned as nitrogen oxides (NOx). They are usually produced in combustion processes. Emissions from power stations, marine vessels and motor vehicles are the major sources of NOx in Hong Kong. NOx emissions from motor vehicles have greater impact on roadside air quality.

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 continuously measured at all the 14 monitoring stations during 2012. In 2012, the highest 1-hour average (528 μg/m^3) and the highest 24-hour average (266 μg/m^3) were recorded at the Central roadside station. As regards the 1-hour AQO, all general stations were in compliance except Kwun Tong general station which recorded more than 3 counts of exceedance with the 1-hour AQO limit in the year. For the 24-hour AQO, all general

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

stations were in compliance except the general stations of Kwun Tong and Sham Shui Po where they recorded more than one count of exceedance with the 24-hour AQO limit in the year. Non-compliance with the 1-hour and 24-hour AQOs for NO_2 was recorded at all the three roadside stations.

As in previous years, all general stations complied with the annual AQO for NO_2 in 2012 while non-compliance was observed at all the three roadside stations. The highest annual average (120 μg/m^3) was recorded at the Mong Kok roadside station in the year.

Figure 3a: Nitrogen Dioxide Monitoring 2012
(1-Hour Average Statistics)

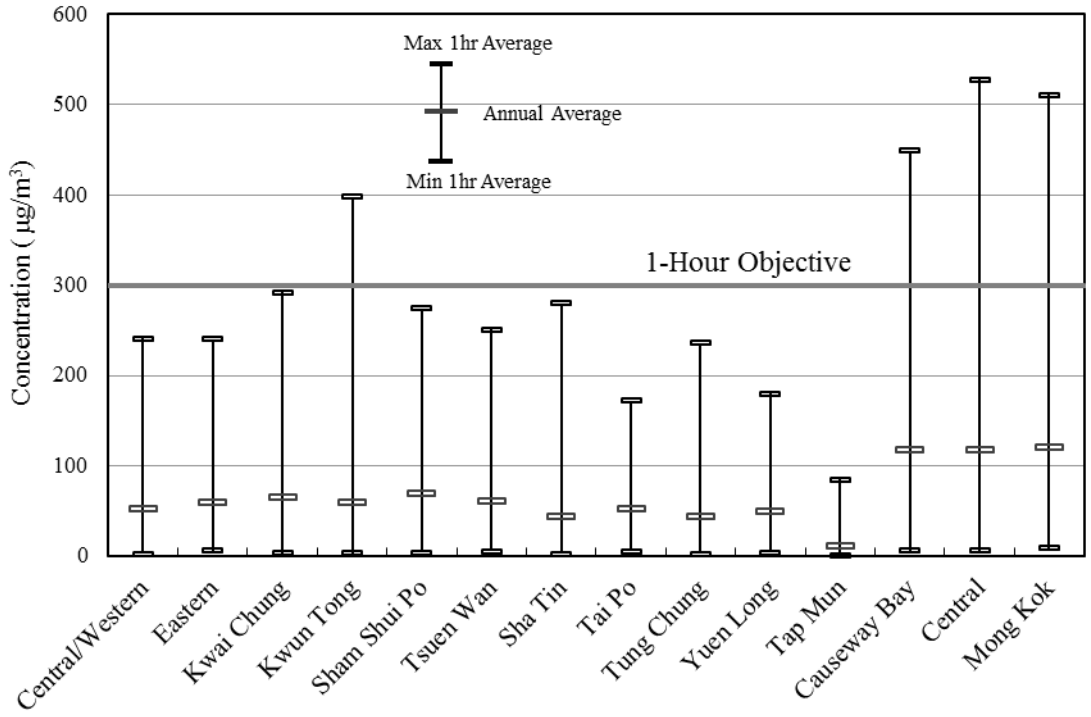


Figure 3b: Nitrogen Dioxide Monitoring 2012
(24-Hour Average Statistics)

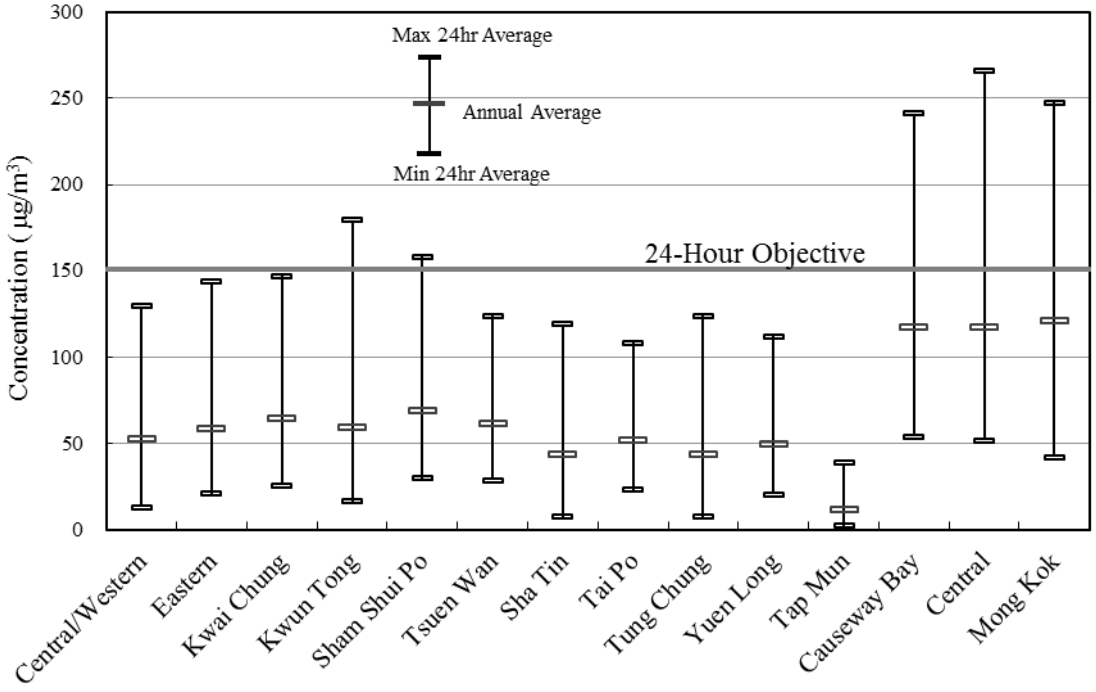
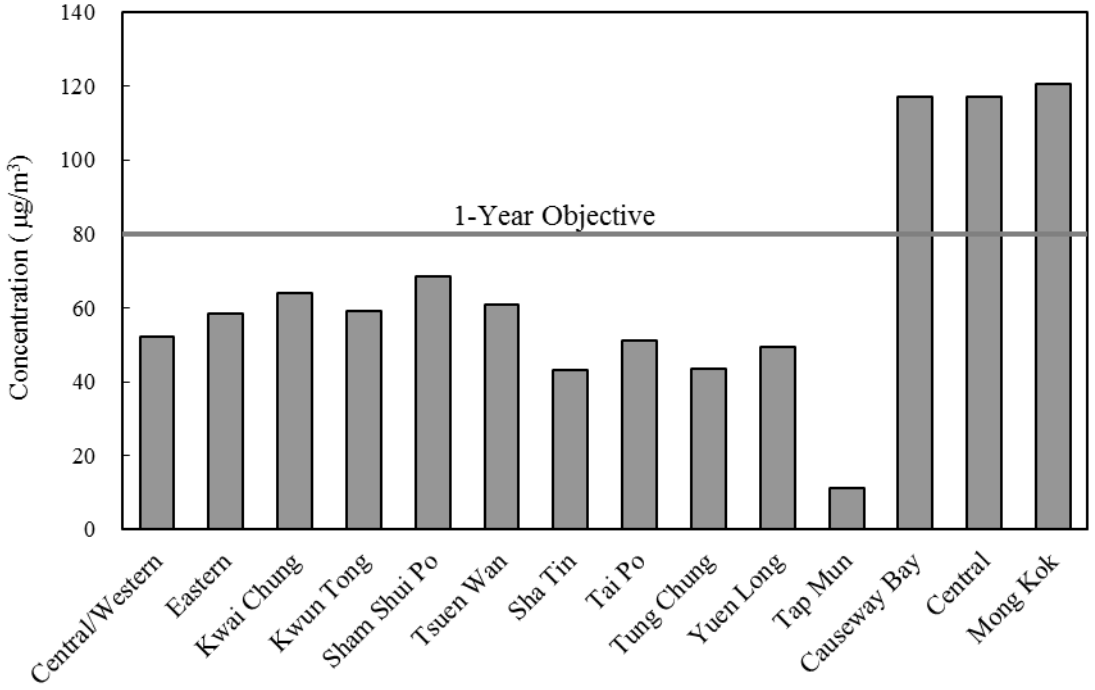


Figure 3c: Nitrogen Dioxide Monitoring 2012
(Annual Average)



2.3 Ozone (O_3)

Ozone (O_3) is a major constituent of photochemical smog. It is not a pollutant directly emitted from man-made sources but formed by photochemical reactions of primary pollutants such as 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 VOC and NOx emissions from places afar. Hence, O_3 is a regional air pollution problem.

Being a strong oxidant, ozone 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.

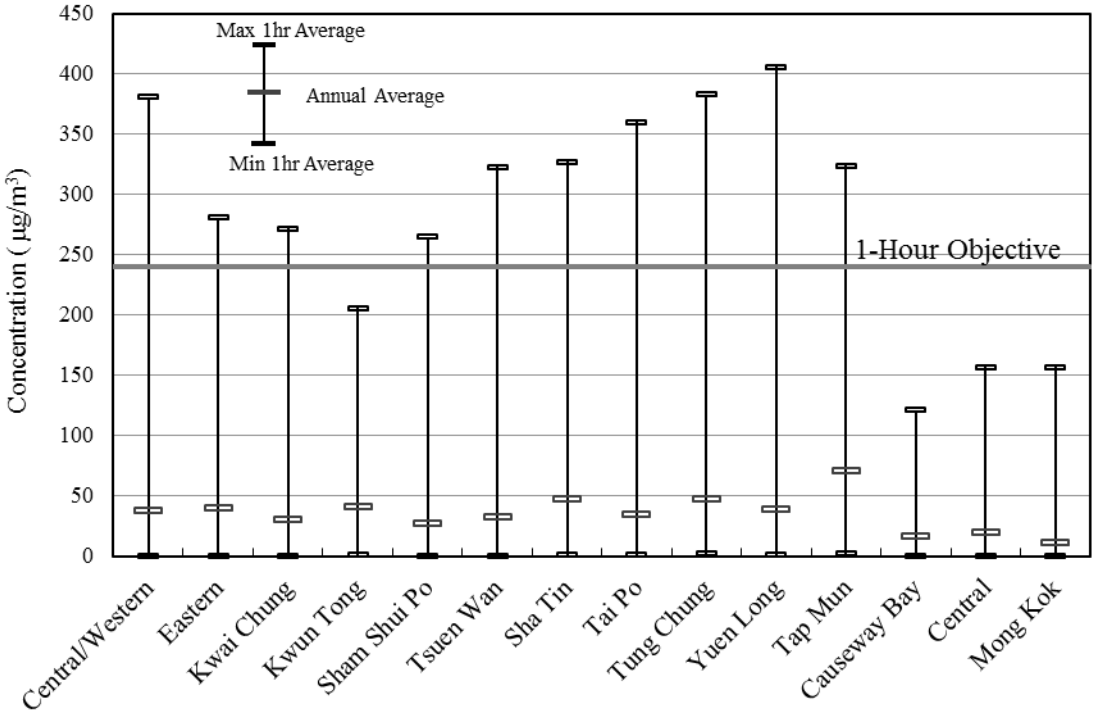
Ozone was monitored at all of the general and roadside stations in 2012. Among the 11 general stations, nine of them recorded non-compliance with the 1-hour AQO in 2012 (i.e., the 1-hour AQO limit was exceeded more than three times in the year). The highest 1-hour average (406 $\mu g/m^3$) was recorded at the Yuen Long station.

All the three roadside stations complied with the 1-hour AQO in the year. At the roadside, the NOx 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 are significantly lower than those at the general stations.

In Hong Kong, elevated O_3 incidents are mostly associated with very hot, fine and calm weather conditions in the region, which favour the formation via photochemical reactions and accumulation of ozone. Such weather conditions mostly occur in summer and autumn, especially when Hong Kong and the Pearl River Delta Region is under the

influence of subsiding air induced by a tropical cyclone located in the Western Pacific Ocean near Taiwan.

Figure 4a: Ozone Monitoring 2012
(1-Hour Average Statistics)



2.4 Carbon Monoxide (CO)

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

Carbon monoxide was continuously monitored at seven stations including four general stations and three roadside stations during 2012. Similar to previous years, both the ambient and roadside CO concentrations remained very low throughout the year. All the seven monitoring stations complied with the 1-hour and 8-hour AQOs for CO. In 2012, the highest 1-hour average (3810 $\mu g/m^3$) and the highest 8-hour average (3018 $\mu g/m^3$) were both recorded at the Causeway Bay roadside station; these values were around one eighth and one third of the respective AQO limits.

Figure 5a: Carbon Monoxide Monitoring 2012
(1-Hour Average Statistics)

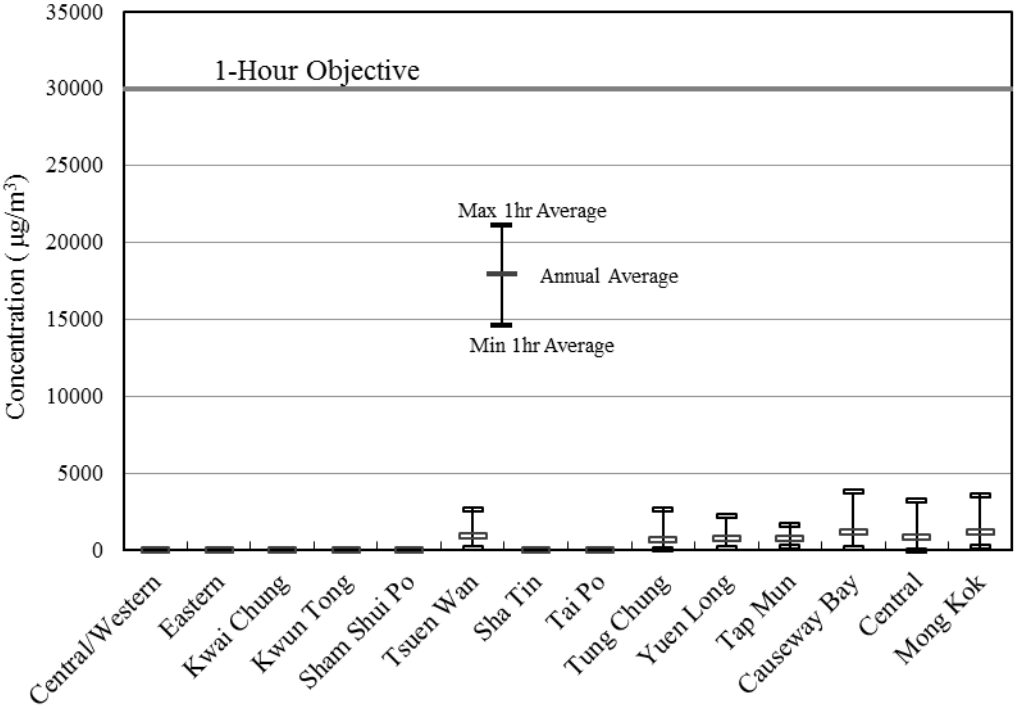
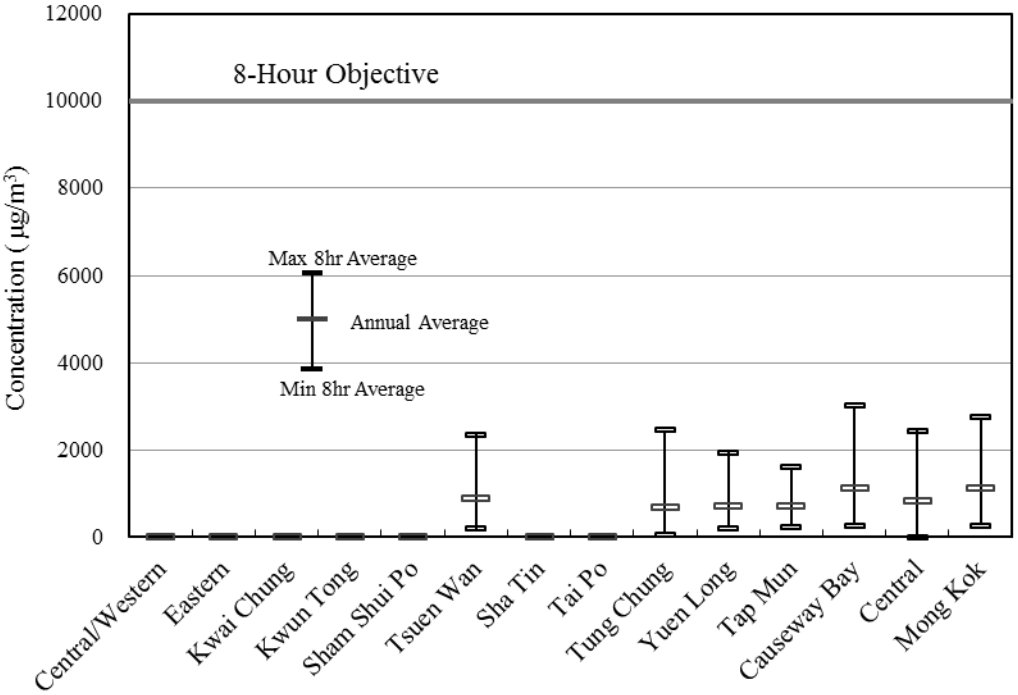


Figure 5b: Carbon Monoxidee Monitoring 2012
(8-Hour Average Statistics)



3. Suspended Particulates

3.1 Total Suspended Particulates (TSP)

Total suspended particulates (TSP) are small airborne particulates such as dust, fume and smoke with diameters less than 100 micrometres. Major sources of TSP include power stations, marine vessels, construction activities and vehicle exhausts. TSP can be further divided into different categories according to the sizes. Particulates with a nominal aerodynamic diameter of 10 micrometres or less are called respirable suspended particulates (RSP or PM10 for short) while the sizes of 2.5 micrometres or less are named fine suspended particulates (FSP or PM2.5 for short). The smaller the size of particulate, the greater is the concern on its health impact (see Sections 3.2 and 3.3 below). On the other hand, suspended particulates that are larger than 10 micrometres in diameter mainly cause soiling and dust nuisance.

TSP measurement was conducted by sampling using high-volume samplers at seven general stations and one roadside station throughout 2012. Samples are taken for the duration of 24 hours at a frequency of about one sample per six days.

All stations complied with the 24-hour AQO (260 μg/m^3) for TSP in 2012. The highest 24-hour average (176 μg/m^3) was recorded at Tung Chung general station while the highest annual average (83 μg/m^3) was recorded at the Mong Kok roadside station in the year. Mong Kok roadside station was also the only station that could not comply the annual AQO for TSP (80 μg/m^3) in 2012.

Figure 6a: TSP Monitoring 2012
(24-Hour Average Statistics)

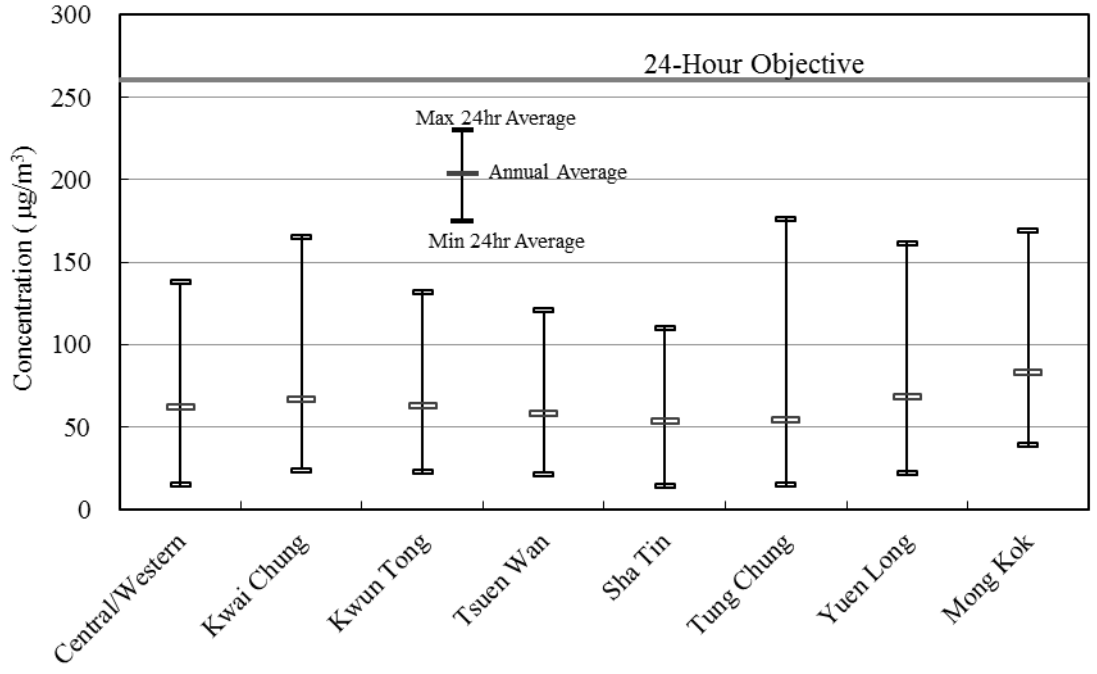
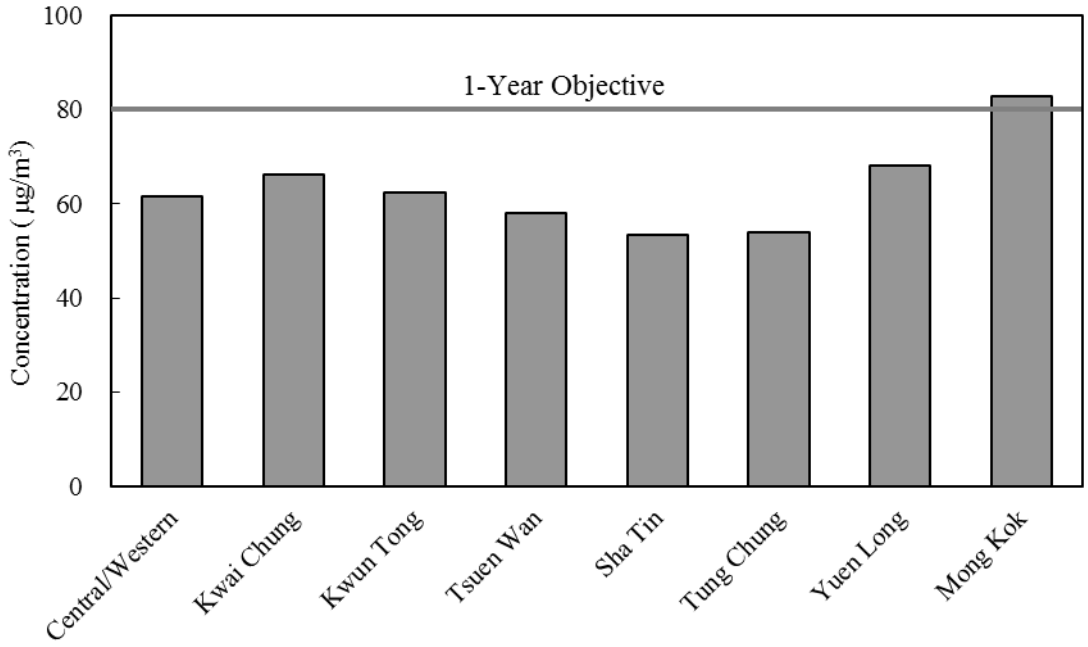


Figure 6b: TSP Monitoring 2012
(Annual Average)



3.2 Respirable Suspended Particulates (RSP)

Respirable suspended particulates (RSP) refer to those suspended particulates with nominal aerodynamic diameters of 10 micrometres or less. Combustion sources, in particular marine vessels, diesel vehicle and power plants, are the major sources of RSP in Hong Kong. Besides, RSP can be formed by photochemical reactions of nitrogen oxides and volatile organic compounds and atmospheric oxidation of gaseous pollutants such as sulphur dioxide and nitrogen oxides. Although to a lesser extent, crustal derived dust and marine aerosols are also sources of RSP.

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

RSP was continuously measured at all 14 monitoring stations during 2012. Most of these stations were also equipped with high-volume sampler to collect particulate samples for chemical analysis.

In 2012, all stations complied with the 24-hour AQO of RSP and the highest 24-hour average (176 $\mu g/m^3$) was recorded at the Mong Kok roadside station. As regard the annual AQO limit of RSP (55 $\mu g/m^3$), the Causeway Bay roadside station recorded the highest annual average (61 $\mu g/m^3$) in the year.

Figure 7a: RSP Monitoring 2012
(24-Hour Average Statistics)

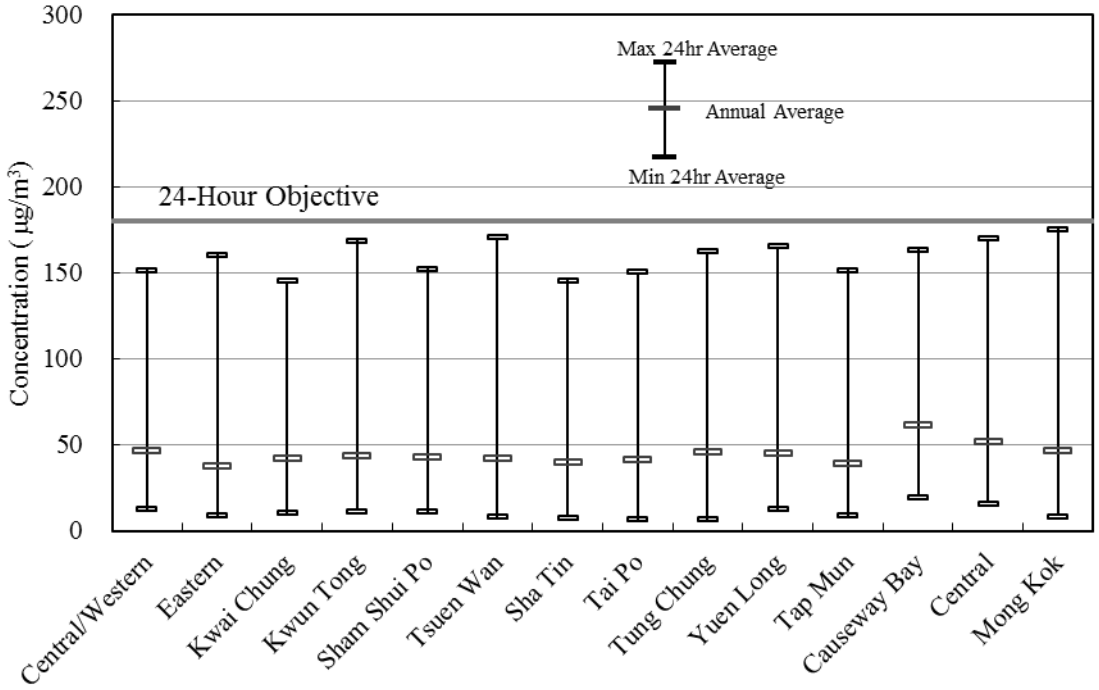
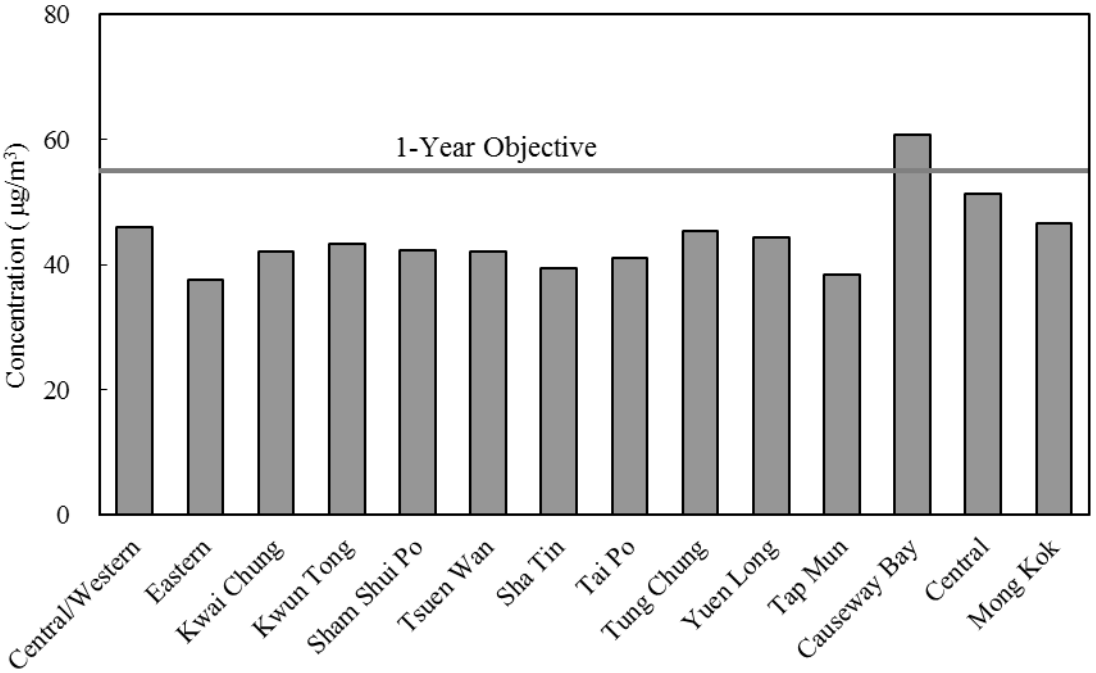


Figure 7b: RSP Monitoring 2012
(Annual Average)



3.3 Fine Suspended Particulates (FSP)

Fine suspended particulates (FSP or PM2.5) refer to those suspended particulates with nominal aerodynamic diameters of 2.5 micrometres or less, which is the finer component of RSP. FSP is able to penetrate to the deepest parts of the lung because of its small size, hence poses a higher risk to health. Besides, FSP also causes visibility impairment in air.

FSP was continuously measured at all 14 monitoring stations during 2012. In the year, the highest 24-hour average (103 μg/m^3) was recorded at the Tung Chung general station while the highest annual average (42 μg/m^3) was recorded at the Causeway Bay roadside station.

Figure 8a: FSP Monitoring 2012
(24-Hour Average Statistics)

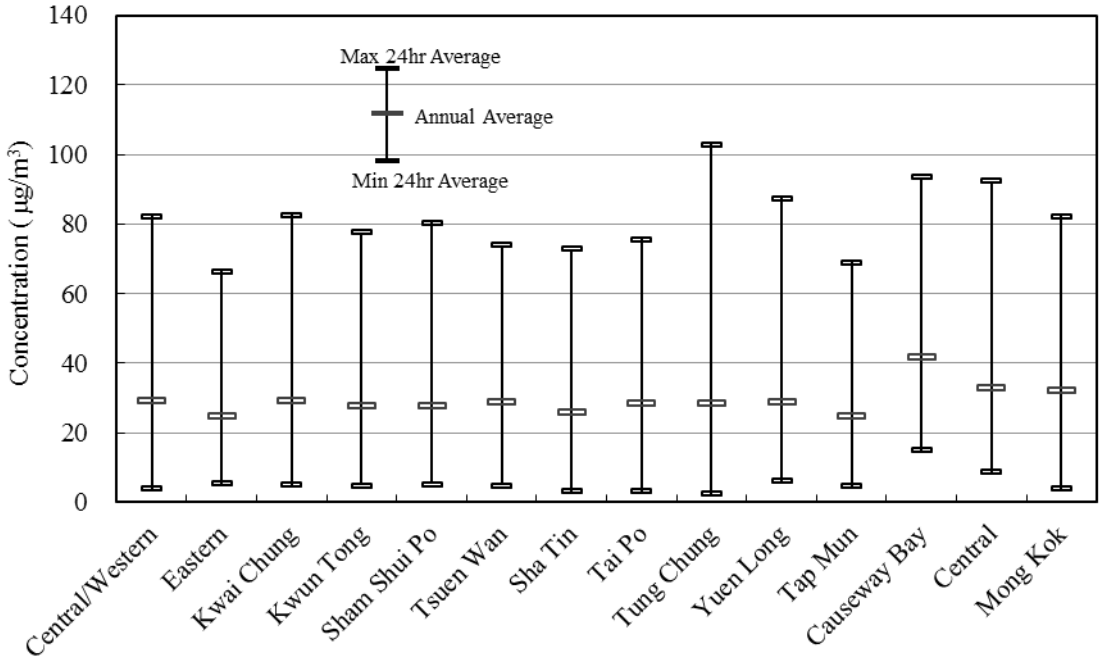
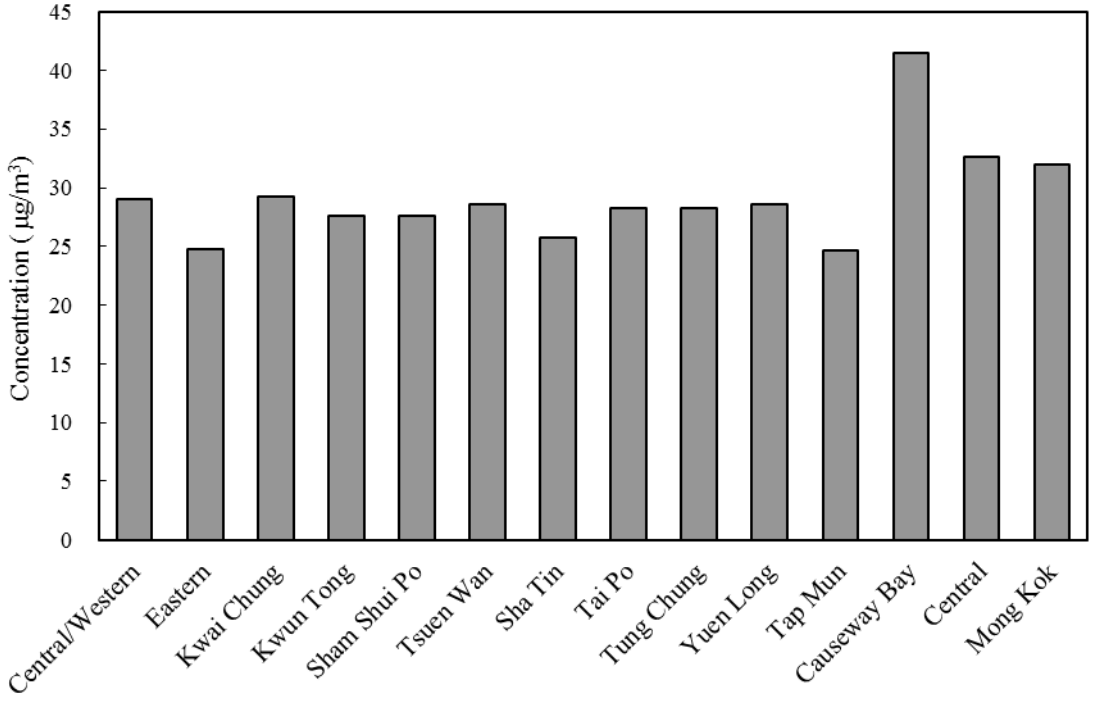


Figure 8b: FSP Monitoring 2012
(Annual Average)



3.4 Lead (Pb)

Lead is the only one criteria pollutant included in the AQO that is also a toxic air pollutant. In Hong Kong, the sale and supply of leaded petrol, which is a known major source of lead, was banned from 1 April 1999. As in previous years, the ambient lead concentrations continued to linger at very low levels during 2012. The overall 3-month averages, ranging from 11 ng/m^3 (Tung Chung) to 57 ng/m^3 (Yuen Long), were well below the AQO limit of 1,500 ng/m^3.

4. Toxic Air Pollutants (TAPs)

Two groups of toxic air pollutants (TAPs), viz. heavy metals and organic substances, were regularly monitored at the Central/Western and Tsuen Wan stations since mid 1997. Among the various TAPs monitored in 2012, eight of them are considered more important in terms of their health impacts and their annual averages are summarised in Table C10. Detailed description of the TAPs monitoring operation is given in Appendix B4. The monitoring data collected so far indicate that the levels of toxic air pollutants in Hong Kong are comparable to those observed in other major cities.

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.

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 and RSP 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 roadside.

Figure 9: 2012 Diurnal variations of NO_2

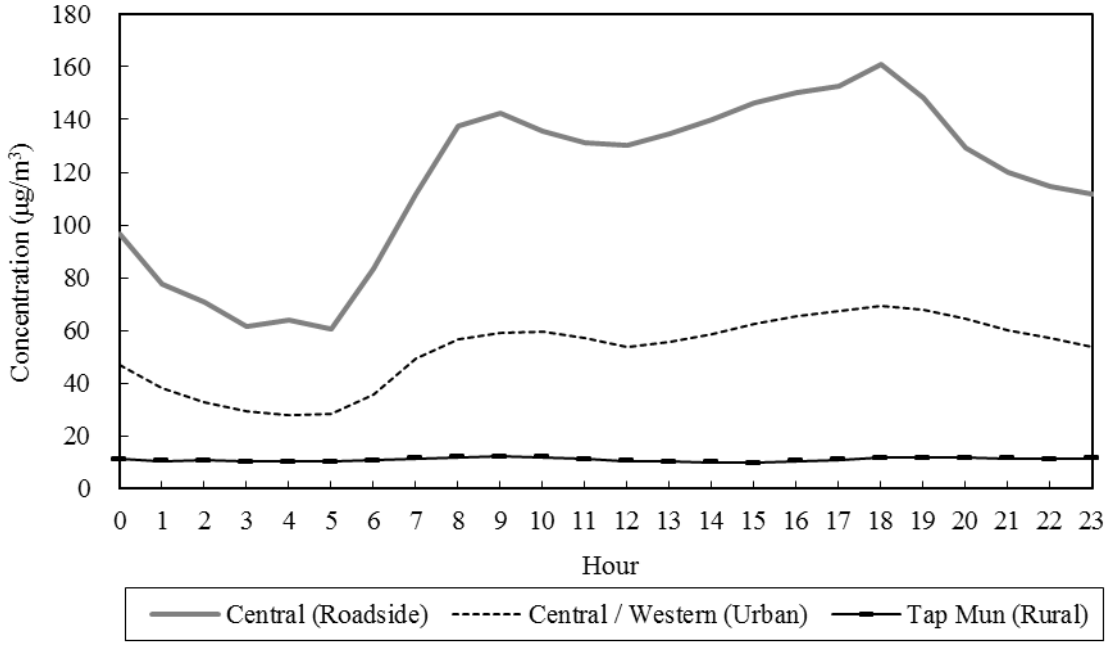
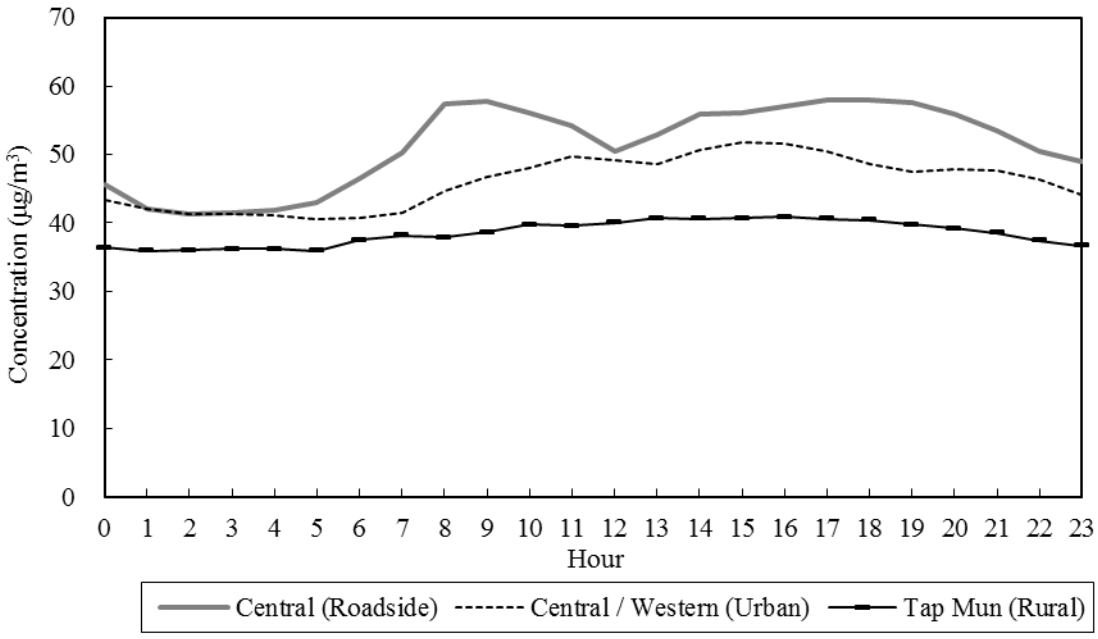
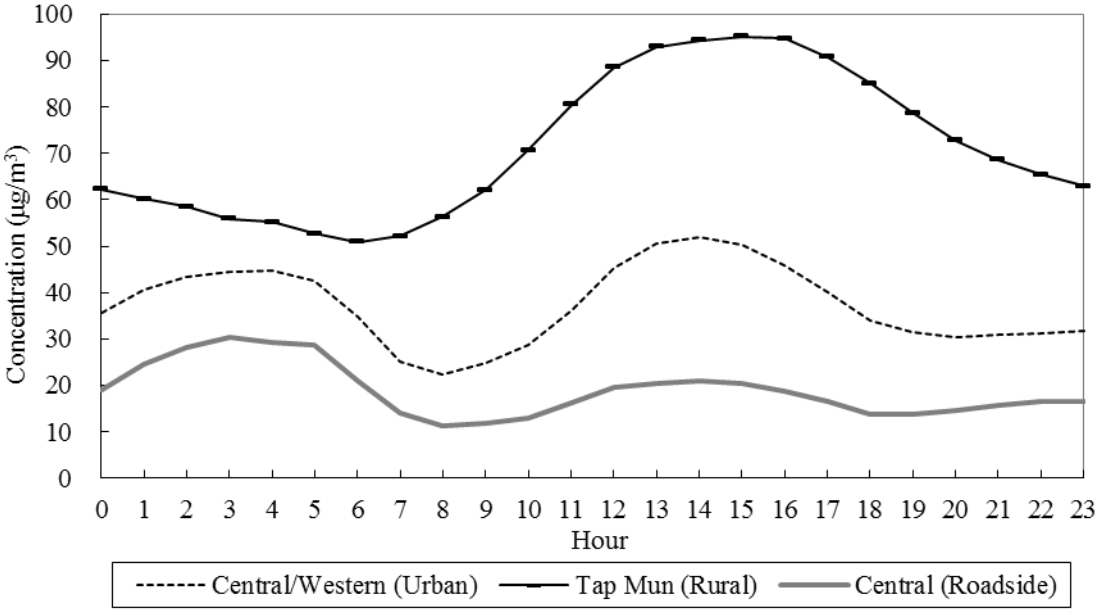


Figure 10: 2012 Diurnal variations of RSP



The diurnal pattern of O_3 is different from that of NO_2 and RSP. 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 roadside, the lowest O_3 concentrations are often observed during rush hours. This is because a large amount of nitric oxide from rush-hour traffic acts as an efficient scavenger of O_3. At the roadside, O_3 levels are significantly lower than those at the general stations because of the scavenging effect due to higher concentrations of NOx from vehicular emissions.

Figure 11: 2012 Diurnal variations of O_3



5.2 Over a Year

Concentrations of NO_2, RSP and O_3 are in general lower in summer (May to July) than autumn and winter due to 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.

Figure 12: Monthly variations of NO_2 and RSP at Central / Western in 2012

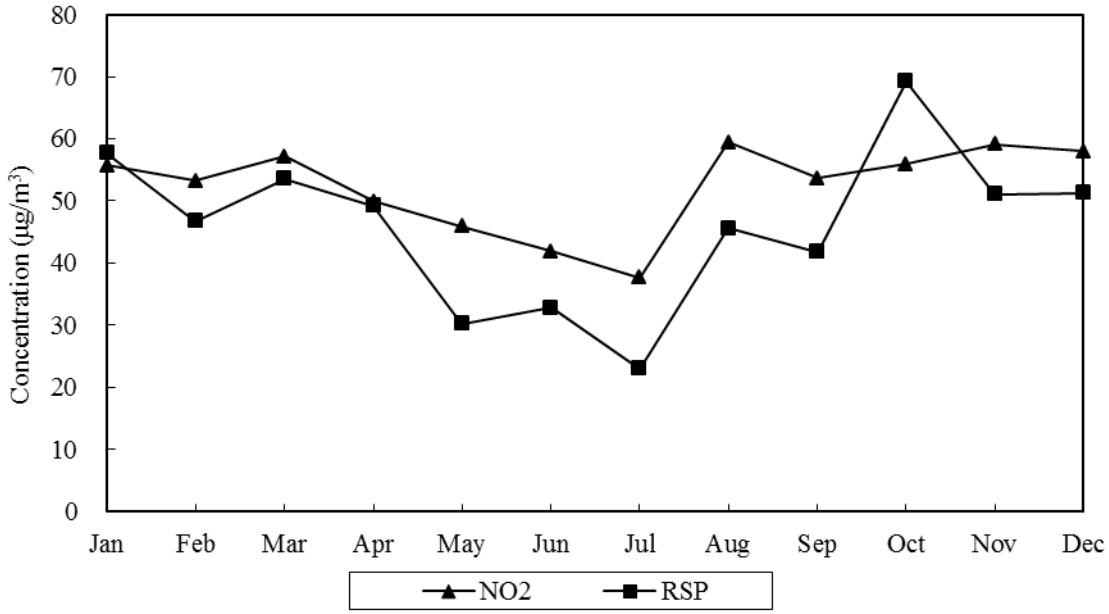
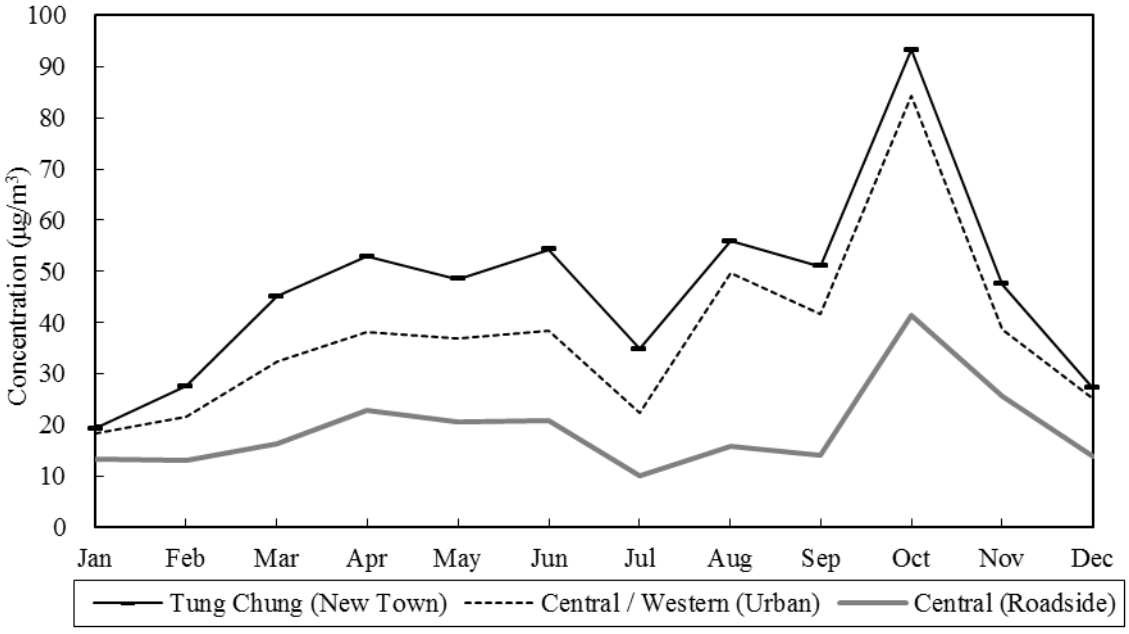


Figure 13: Monthly variations of O_3 in 2012



5.3 Long Term Trends

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

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

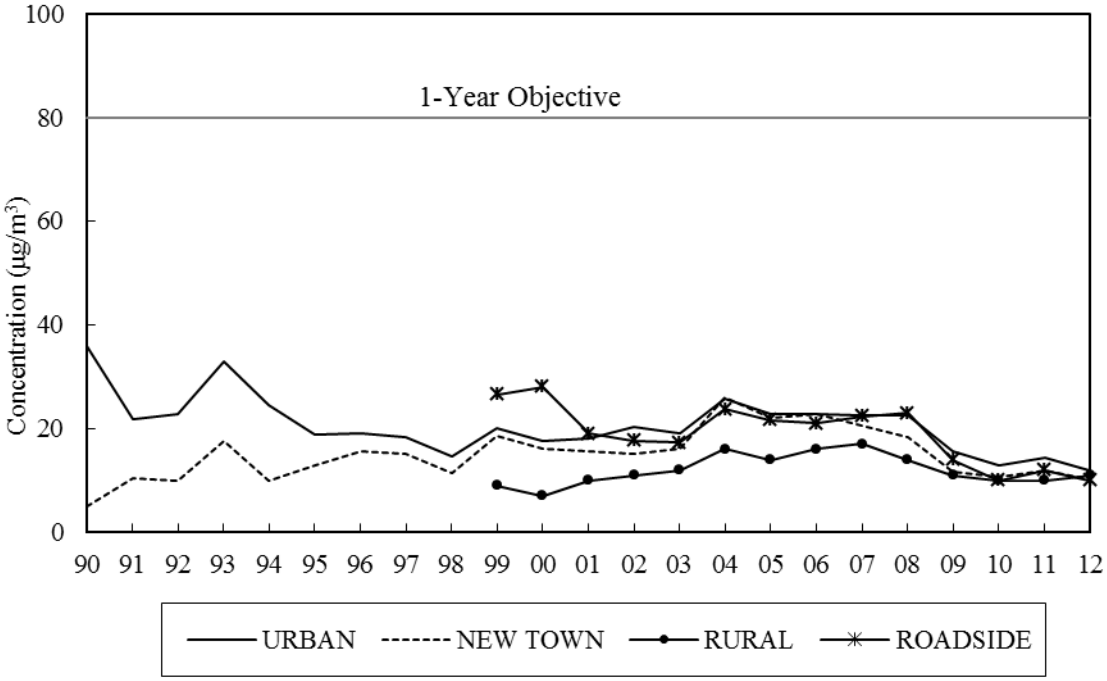
Land Use Type	Land Use Characteristics	Air Monitoring Stations
Urban	Densely populated residential areas mixed with some commercial and/or industrial areas	Central/Western, Eastern, Kwai Chung, Kwun Tong, Sham Shui Po and Tsuen Wan
New Town	Mainly residential areas	Sha Tin, Tai Po, Tung Chung and Yuen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

5.3.1 Sulphur Dioxide (SO_2)

Since the implementation of the Air Pollution Control (Fuel Restriction) Regulations in 1990 for restricting sulphur content of industrial fuels and the Air Pollution Control (Motor Vehicle Fuel) Regulations in 1995 for controlling motor vehicle fuel quality, SO_2 concentrations in Hong Kong have remained at levels well below the annual AQO limit of 80 $\mu g/m^3$. Significant improvement was noted in the past few years due to measures taken by Governments in Guangdong Province and Hong Kong, such as retrofitting power plants with flue gas desulphurization devices, phasing out highly polluting industrial plants in the Pearl River Delta, introducing fuels with lower sulphur content, etc.

As a result of the introduction of ultra-low sulphur diesel for vehicle fleet in late 2000 and the subsequent introduction of Euro V motor diesel in Dec 2007, the average SO_2 concentration at roadside in 2012 (10 $\mu g/m^3$) dropped by 63% as compared with the 1999 value (27 $\mu g/m^3$).

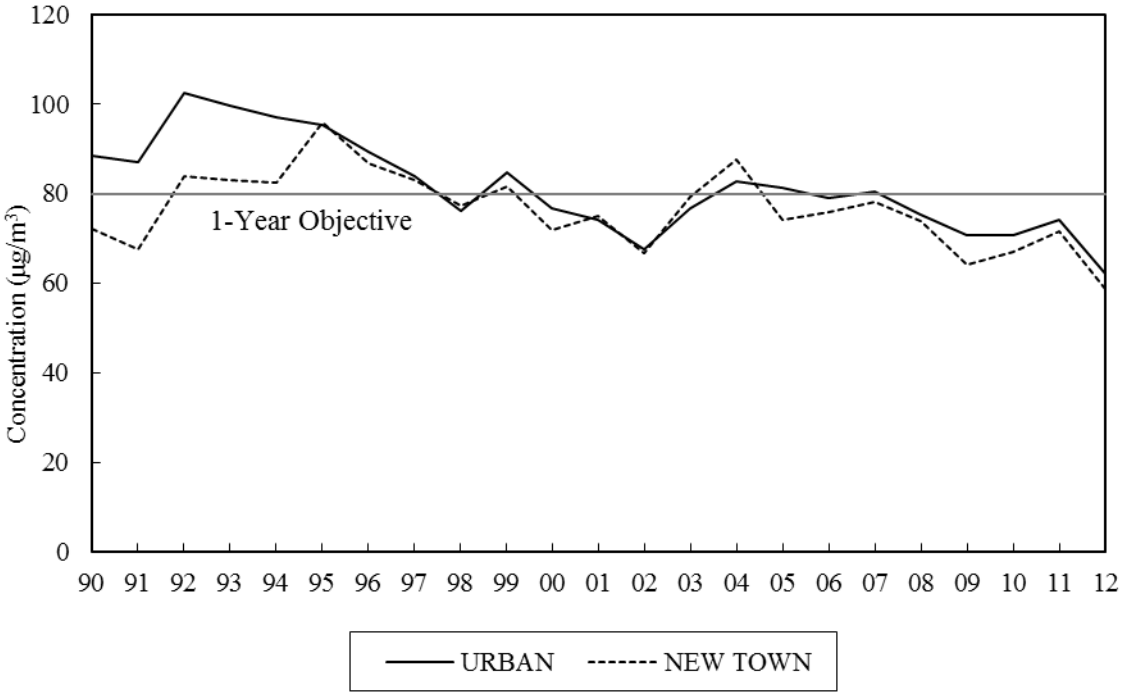
Figure 14: SO2 long term trend



5.3.2 Total Suspended Particulates (TSP)

The TSP concentrations in the territory exhibited a general declining trend from mid-1990s.

Figure 15: TSP long term trend

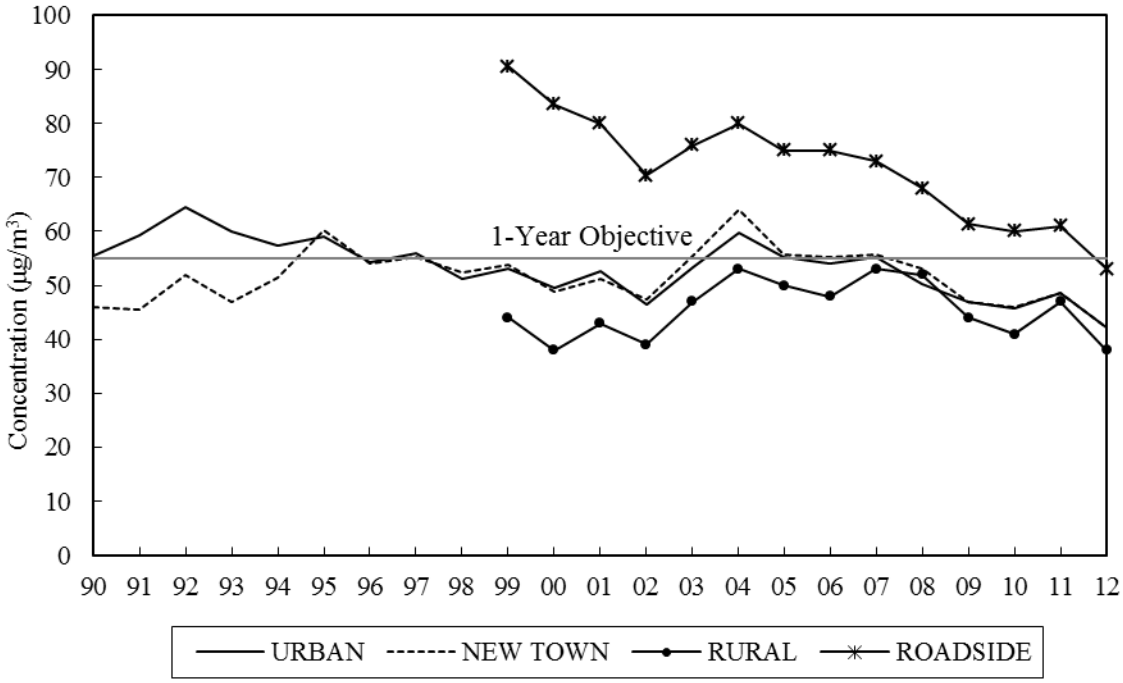


5.3.3 Respirable Suspended Particulates (RSP)

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 which was caused by the increase in regional background RSP levels. The RSP concentrations then dropped to a level below the annual AQO limit, reflecting a reduction in regional background RSP levels in the past few years.

In Hong Kong, high level of roadside RSP, caused mainly by the exhaust emissions of diesel vehicles, has long been a major air pollution concern. As a result of the implementation of various vehicle emission control measures in recent years, the annual average of RSP concentration at roadside in 2012 had reduced by 42% when compared with the 1999 value.

Figure 16: RSP long term trend



5.3.4 Ozone (O_3)

The O_3 concentrations in the territory have shown a moderate upward trend since 1990.

As nitric oxide emissions from motor vehicles can react with and remove O_3 in the air, regions with heavy traffic normally have lower O_3 levels than areas with light traffic. Hence, Tap Mun station has steadily recorded more than twice the O_3 levels measured in urban areas since the commencement of monitoring at rural area in 1999.

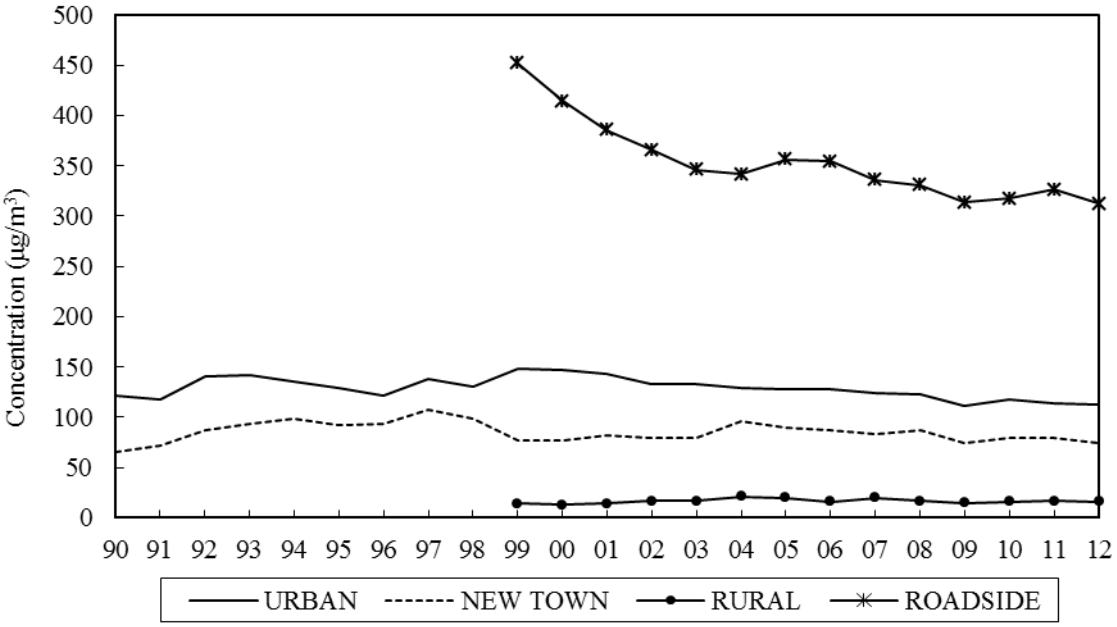
O_3, a major constituent of photochemical smog, is a regional air pollution issue. The Hong Kong Special Administrative Region Government and Guangdong Provincial Government are implementing a regional air quality management plan to alleviate photochemical smog problem and reduce O_3 levels in the Pearl River Delta region.

Figure 17: O_3 long term trend

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

The annual average of NOx in urban areas exhibited a gradual declining trend over the past decade. During the same period, the roadside NOx concentration showed a more distinct decreasing trend, reflecting a reduction in vehicular NOx emission as a result of vehicle emission control measures implemented in the past decade. The roadside NOx concentration in 2012 was 31% lower than that in 1999.

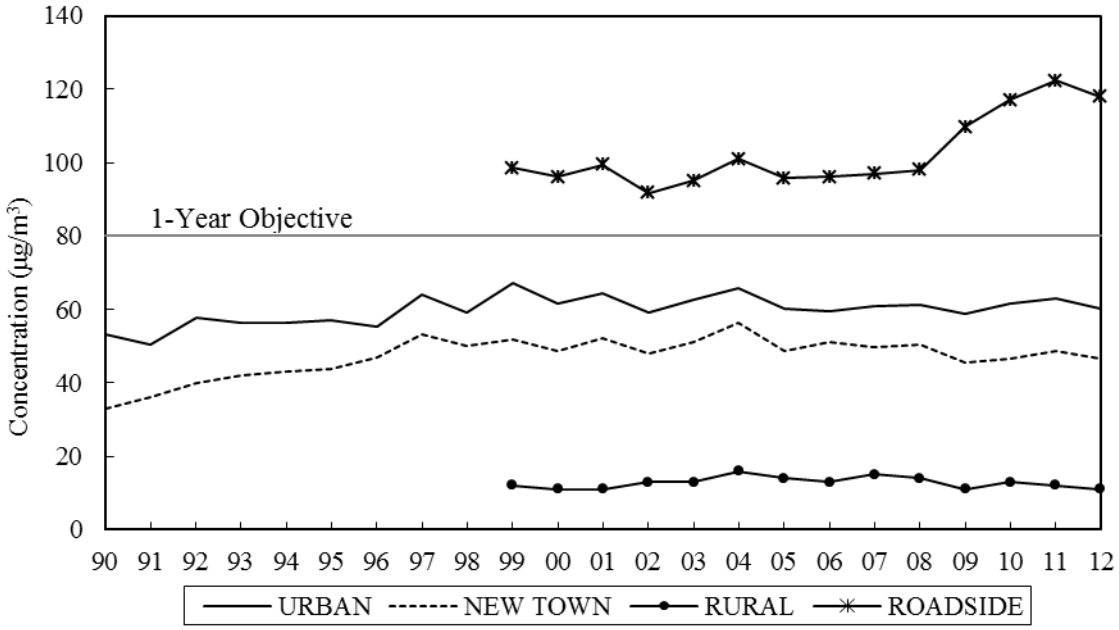
Figure 18: NOx long term trend



NO_2 is mainly formed from the oxidation of nitric oxide, a major component of NOx. The oxidation can be promoted by the presence of more ozone and VOCs in the ambient air. The ambient NO_2 levels have exhibited slow rising trends since 1990 but the trends have levelled off in recent years. The roadside NO_2 concentrations have shown an overall increasing trend over the past years, 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 ozone concentration promoting the conversion of nitric oxide emitted from motor vehicles to NO_2. To address the problem of the rising roadside NO_2 concentration in recent years, the government has put forward additional measures including supporting the transport trades to test green vehicles, testing the feasibility of installing after-treatment devices to franchised buses to reduce their NOx emissions and stepping up the control on emissions from petrol and liquefied petroleum gas vehicles.

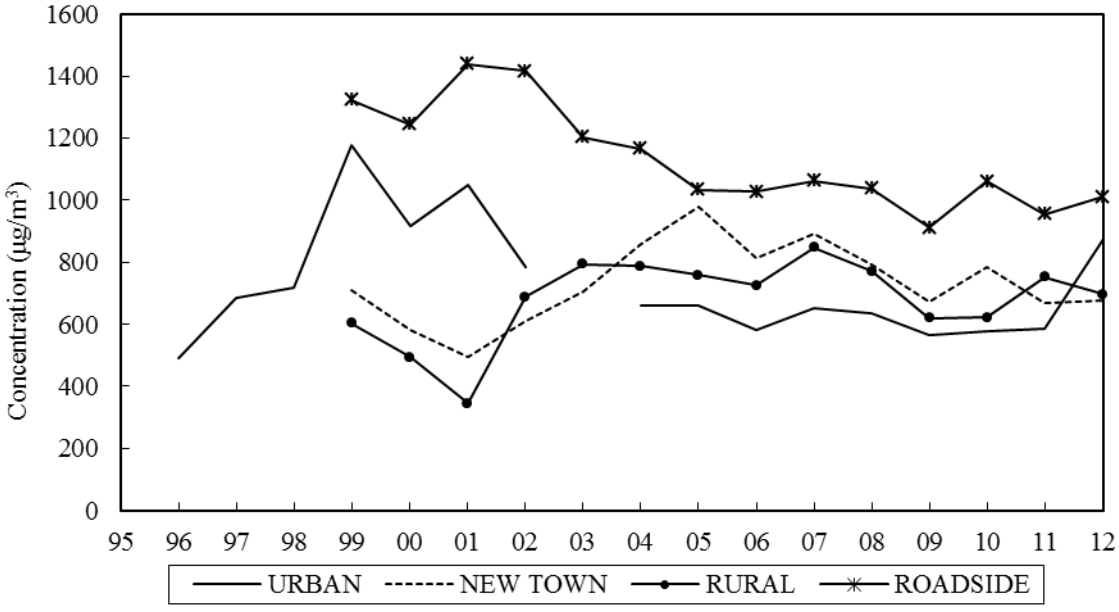
Figure 19: NO_2 long term trend



5.3.6 Carbon Monoxide (CO)

The concentrations of CO in Hong Kong remained at very low levels in the past several years. Even at the roadside close to the vehicular emission sources, the CO levels were well within the 1-hour AQO (30,000 μg/m^3) and 8-hour AQO (10,000 μg/m^3) levels.

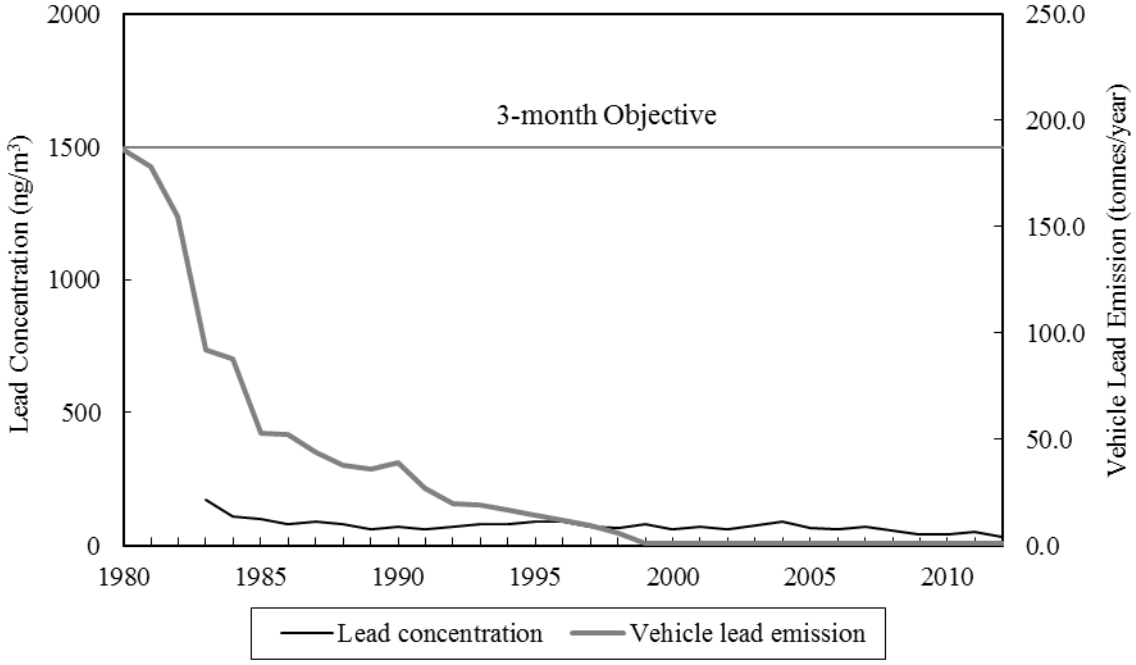
Figure 20: CO long term trend



5.3.7 Lead (Pb)

The ambient lead concentrations have been lingering at very low levels since the oil companies took voluntary action in reducing the lead content of petrol in the early eighties. Lead 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 was banned in April 1999.

Figure 21: Vehicle lead emission and lead concentration



Appendix A

Air Quality Objectives and their Compliance Status

Established in 1987, the Hong Kong Air Quality Objectives (AQO) for seven major air pollutants were set at levels to protect public health. The compliance status of the AQO has been used as the indicator of air quality in different districts in Hong Kong.

Table A1: Hong Kong Air Quality Objectives (AQO)

Concentration in micrograms per cubic metre [1]

Pollutant	Averaging Time				
	1 hour [2]	**8 hours** [3]	**24 hours** [3]	**3 months** [4]	**1 year** [4]
Sulphur dioxide (SO_2)	800		350		80
Total suspended particulates (TSP)			260		80
Respirable suspended particulates (RSP) [5]			180		55
Nitrogen dioxide (NO_2)	300		150		80
Carbon monoxide (CO)	30000	10000			
Photochemical oxidants (as ozone (O_3) [6])	240				
Lead (Pb)				1.5	

[1] Measured at 298K (25°C) and 101.325 kPa (one atmosphere).
[2] Not to be exceeded more than three times per year.
[3] Not to be exceeded more than once per year.
[4] Arithmetic means.
[5] Respirable suspended particulates mean suspended particulates in air with a nominal aerodynamic diameter of 10 micrometres or smaller.
[6] Photochemical oxidants are determined by measurement of ozone only.

Compliance with the short-term AQO

Table A2 shows the percentage time of compliance with the short-term AQO (i.e. 1-hour to 24-hour AQO) recorded at each of the monitoring stations in 2012. For NO_2, the compliance percentages of the 24-hour AQO were above 98% for general stations and between 85% to 89% for roadside stations; its 1-hour AQO compliance rates were above 99% at all stations. As regards TSP and RSP, the compliance percentage of their 24-hr AQOs achieved 100% at all stations. The compliance levels of 1-hour AQO for O_3 were over 99% at all monitoring stations. The compliance percentage of SO_2 reached 100% for all stations. For CO, all monitoring stations achieved full compliance with AQO in 2012.

Table A2: Percentage Time in compliance with Short-Term Air Quality Objectives in 2012

Station		O_3	NO_2		TSP	RSP	SO_2		CO	
		1-hr	1-hr	24-hr	24-hr	24-hr	1-hr	24-hr	1-hr	8-hr
General Station	Central/Western	99.79	100	100	100	100	100	100	--	--
	Eastern	99.95	100	100	--	100	100	100	--	--
	Kwai Chung	99.92	100	100	100	100	100	100	--	--
	Kwun Tong	100	99.95	98.36	100	100	100	100	--	--
	Sham Shui Po	99.98	100	99.45	--	100	100	100	--	--
	Tsuen Wan	99.92	100	100	100	100	100	100	100	100
	Sha Tin	99.78	100	100	100	100	100	100	--	--
	Tai Po	99.88	100	100	--	100	100	100	--	--
	Tung Chung	99.44	100	100	100	100	100	100	100	100
	Yuen Long	99.61	100	100	100	100	100	100	100	100
	Tap Mun	99.70	100	100	--	100	100	100	100	100
Roadside Station	Causeway Bay	100	99.16	88.43	--	100	100	100	100	100
	Central	100	99.24	86.34	--	100	100	100	100	100
	Mong Kok	100	99.31	85.16	100	100	100	100	100	100

Notes: "--" *Not measured*

Compliance with the long-term AQO

Table A3 shows the compliance status of the long-term (annual) AQO for all 14 monitoring stations in 2012. Similar to previous years, all monitoring stations achieved full compliance with the long-term AQO for SO_2 and lead in 2012. Compliance with the annual AQO for NO_2 was recorded at 11 out of 14 stations. For TSP, 7 out of the 8 stations complied with the annual AQO. The annual AQO for RSP was complied at 13 out of 14 stations in 2012.

Table A3: Compliance Status of Long-Term (Annual) Air Quality Objectives in 2012

Station		NO_2	TSP	RSP	SO_2	Lead
		1-year	1-year	1-year	1-year	3-months
General Station	Central/Western	✓	✓	✓	✓	✓
	Eastern	✓	--	✓	✓	--
	Kwai Chung	✓	✓	✓	✓	✓
	Kwun Tong	✓	✓	✓	✓	✓
	Sham Shui Po	✓	--	✓	✓	--
	Tsuen Wan	✓	✓	✓	✓	✓
	Sha Tin	✓	✓	✓	✓	--
	Tai Po	✓	--	✓	✓	--
	Tung Chung	✓	✓	✓	✓	✓
	Yuen Long	✓	✓	✓	✓	✓
	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 quality monitoring network of 14 monitoring stations is operated by the Air Science Group of the Environmental Protection Department. Table B1 shows the station site information. The measurement of ambient concentrations of total suspended particulates (TSP), respirable suspended particulates (RSP), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3) and carbon monoxide (CO) have been accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) since August 1995.

In order to provide good representation of the air quality in areas of high population density, the locations of the 14 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 for 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 concentration of gaseous pollutants, RSP and FSP are determined continuously by automatic analysers. Manually operated high volume samplers using the gravimetric methods are also used regularly to measure the TSP and RSP. In addition, meteorological parameters, including temperature and solar radiation, wind speed and direction, are also recorded continuously at each station as appropriate.

Wet and dry deposition samples are collected at three stations: Central/Western, Kwun Tong and Yuen Long. The parameters measured for all wet and dry samples include: 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 telephone lines for further processing. After careful checking and validation, the monitoring data are disseminated to the public in the following manner:-

- Hourly API reporting for individual station
- Monthly release of the Air Pollution Index (API) summary for all monitoring stations
- Monthly updating the data in the Environmental Protection Interactive Centre (EPIC) for the public to download air quality monitoring data (http://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 API 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 on 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. Similar to overseas standards, control limits of ±15% and ±10% are adopted for the gaseous pollutants and particulates (TSP, RSP and FSP) respectively. In 2012, 533 audit checks were carried out on the stations' analysers and samplers. Based on the 95% probability limits, the accuracy of the network was within the specified control limits 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 2012, 2693 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 -6.4% and 5.2%, which was again within the control limits of ±20% and ±10% for the gaseous pollutants and particulates (TSP, RSP and FSP) respectively.

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 target TAPs (please refer to Table B4 for details). All these methods have stringent QA/QC criteria to ensure the 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 (Above P.D.H.K.)	Above Ground	Date Start Operation
Central/Western (Sai Ying Pun Community Complex)	2 High Street, Sai Ying Pun	Urban : Mixed residential/ commercial	82m	16m (5 floors)	Oct 09
Eastern (Sai Wan Ho Fire Station)	20 Wai Hang Street, Sai Wan Ho	Urban : Residential	28m	15m (4 floors)	Jan 99
Kwai Chung (Kwai Chung Police Station)	999 Kwai Chung Road, Kwai Chung	Urban : Mixed residential/ commercial/industrial	19m	13m (2 floors)	Jan 99
Kwun Tong (Yue Wah Mansion)	407-431 Kwun Tong Road, Kwun Tong	Urban : Mixed residential/ commercial/industrial	34m	25m	Apr 12
Sham Shui Po (Police Station)	37A Yen Chow Street, Sham Shui Po	Urban : Mixed residential/ commercial	21m	17m (4 floors)	Jul 84
Tsuen Wan (Princess Alexandra Community Centre)	60 Tai Ho Road, Tsuen Wan	Urban : Mixed residential/ commercial/industrial	21m	17m (4 floors)	Aug 88
Sha Tin (Sha Tin Govt. Secondary School)	11-17 Man Lai Road, Tai Wai, Sha Tin	New Town : Residential	31m	25m (6 floors)	Jul 91
Tai Po (Tai Po Govt. Office Bldg.)	1 Ting Kok Road, Tai Po	New Town : Residential	31m	25m (6 floors)	Feb 90
Tung Chung (Tung Chung Health Centre)	6 Fu Tung Street, Tung Chung	New Town : Residential	34.5m	27.5m (4 floors)	Apr 99
Yuen Long (Yuen Long District Branch Offices Bldg.)	269 Castle Peak Road Yuen Long	New Town : Residential	31m	25m (6 floors)	July 95
Tap Mun (Tap Mun Police Station)	Tap Mun	Background : Rural	26m	11m (3 floors)	Apr 98
Causeway Bay	1 Yee Woo Street, Causeway Bay	Urban Roadside : Mixed commercial/ residential area surrounded by many tall buildings	6.5m	3m	Jan 98
Central	Junction of Des Voeux Road Central and Chater Road, Central	Urban Roadside : Busy commercial/ financial area surrounded by many tall buildings	8.5m	4.5m	Oct 98
Mong Kok	Junction of Nathan Road and Lai Chi Kok Road	Urban Roadside : Mixed commercial/ residential area surrounded by many tall buildings	8.5m	3m	Jan 01

Note: P.D. = Principal Datum
Kwun Tong general air monitoring station was removed from Kwun Tong City District Office to Yue Wah Mansion in the vicinity in April 2012.

Table B2: Summary of the Parameters Monitored in the Network (2012)

STATIONS	PARAMETERS										
	SO_2	NO_x	NO	NO_2	CO	O_3	FSP	RSP		TSP	MET [3]
								Cont [1]	Hi-Vol [2]		
Central/ Western	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Eastern	✓			✓		✓	✓	✓			✓
Kwai Chung	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Kwun Tong	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Sham Shui Po	✓	✓	✓	✓		✓	✓	✓			✓
Tsuen Wan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sha Tin	✓	✓	✓	✓		✓	✓	✓		✓	✓
Tai Po	✓			✓		✓	✓	✓			✓
Tung Chung	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yuen Long	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tap Mun	✓	✓	✓	✓	✓	✓	✓	✓			
Causeway Bay	✓	✓	✓	✓	✓	✓	✓	✓			
Central	✓	✓	✓	✓	✓	✓	✓	✓			
Mong Kok	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note:
[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.

Table B3 List of Equipment Used in Measuring Air Pollutant Concentration

Pollutants	Measurement Principle	Commercial Instrument
SO_2	UV fluorescence	TECO 43A, API 100E, TECO 43I
NO, NO_2, NO_x	Chemiluminescence	API 200A
O_3	UV absorption	API 400, API 400A
SO_2, NO_2, O_3	Differential Optical Absorption Spectroscopy	Opsis AR 500 System
CO	Non-dispersive infra-red absorption with gas filter correlation	TECO 48C, API 300
TSP	Gravimetric	General Metal Works GS2310
RSP (PM10)	a) Gravimetric b) Oscillating microbalance	Graseby Andersen PM10 R&P TEOM Series 1400a-AB-PM10 Thermo Scientific TEOM 1405-DF
FSP (PM2.5)	a) Gravimetric b) Oscillating microbalance	Thermo Scientific Partisol-Plus 2025 R&P TEOM Series 1400a-AB-PM2.5 Thermo Scientific TEOM 1405-DF

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	Canister	Twice per month	24 hours
Perchloro-ethylene	USEPA Method TO-14A	Xontech 910A / RM 910A	Canister	Twice per month	24 hours
1,3-Butadiene	USEPA Method TO-14A	Xontech 910A / RM 910A	Canister	Twice per month	24 hours
Formaldehyde	USEPA Method TO-11A	Xontech 925 / RM 925	DNPH coated silica gel cartridge	Once per month	24 hours
Benzo(a)pyrene	USEPA Method TO-13	Graseby GPS1 / Tisch TE-1000	Quartz fibre filter and polyurethane foam with XAD-2 resin	Once per month	24 hours
Dioxin	USEPA Method TO-9A	Graseby GPS1 / Tisch TE-1000	Quartz fibre filter and polyurethane foam	Once per month	24 hours
Hexavalent Chromium	CARB SOP MLD 039	Xontech 920	Bicarbonate Impregnated Filter	Once per month	24 hours

Figure B1: Accuracy of Air Quality Monitoring Network, 2012

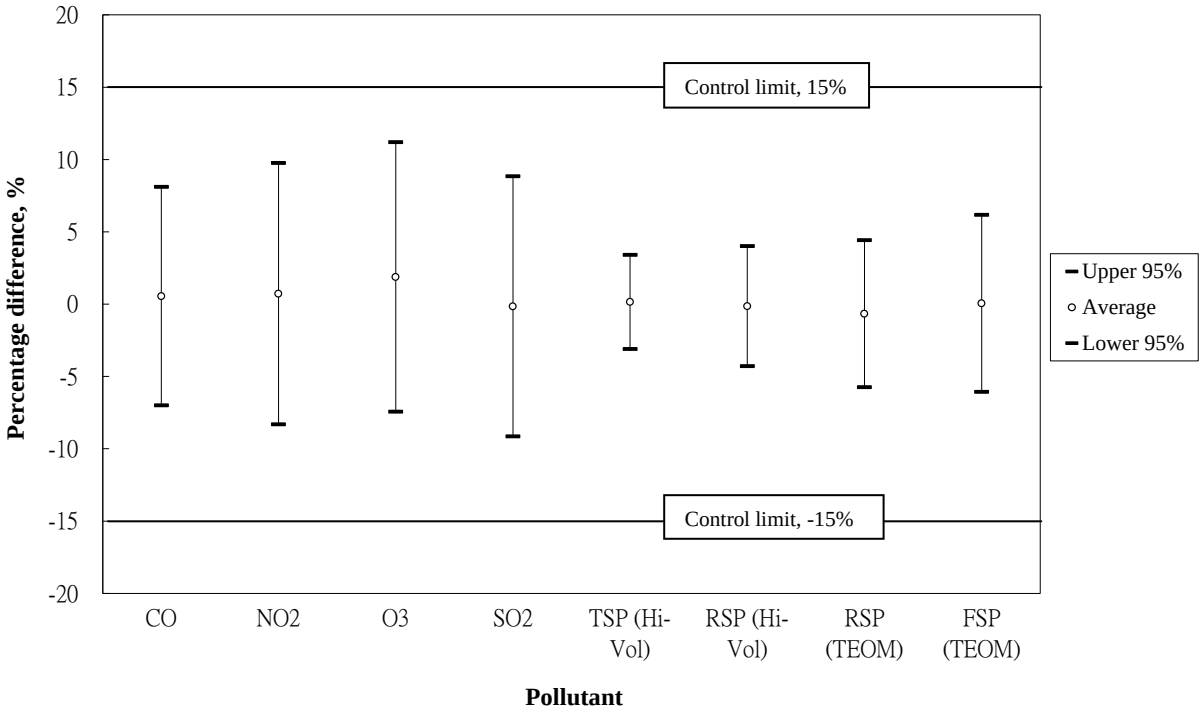
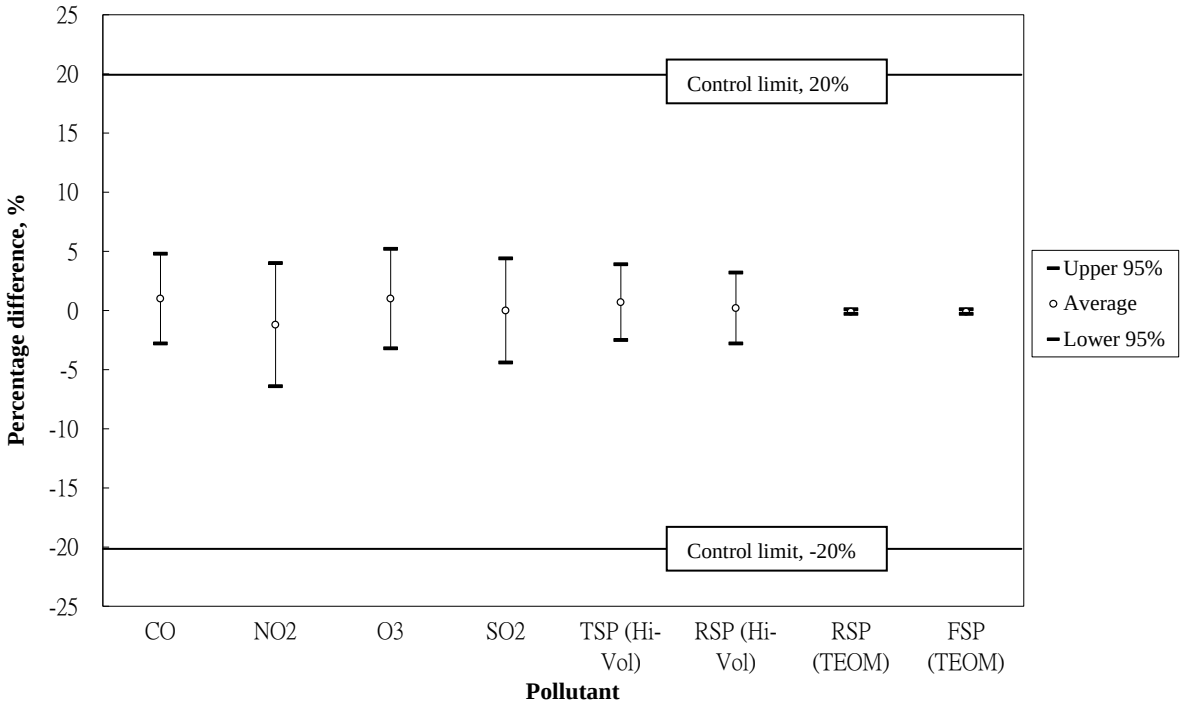


Figure B2: Precision of Air Quality Monitoring Network, 2012



Note: The Control Limits for TSP, RSP and FSP are ±10% for both Accuracy and Precision.

Appendix C

Tables of Air Quality Data

TABLE C1: THE HIGHEST 4 HOURLY POLLUTANT CONCENTRATIONS MEASURED IN 2012

Pollutant: Sulphur Dioxide *
(1-hour AQO = 800)

Station	1st High	2nd High	3rd High	4th High
Central / Western	101	98	84	82
Eastern	121	108	87	69
Kwai Chung	232	177	167	163
Kwun Tong	98	94	87	84
Sham Shui Po	206	192	190	175
Tsuen Wan	128	106	95	89
Sha Tin	121	119	98	97
Tai Po	46	43	43	42
Tung Chung	91	81	80	78
Yuen Long	71	68	66	63
Tap Mun	75	56	49	48
Causeway Bay	98	90	85	83
Central	106	103	86	85
Mong Kok	178	168	149	147

Pollutant: Nitrogen Dioxide *
(1-hour AQO = 300)

Station	1st High	2nd High	3rd High	4th High
Central / Western	241	227	225	221
Eastern	240	237	233	229
Kwai Chung	292	282	274	273
Kwun Tong	398	349	326	304
Sham Shui Po	274	271	265	259
Tsuen Wan	251	218	205	203
Sha Tin	280	258	251	250
Tai Po	172	171	167	161
Tung Chung	236	211	206	202
Yuen Long	180	179	179	179
Tap Mun	85	80	76	76
Causeway Bay	449	432	405	391
Central	528	510	497	451
Mong Kok	511	448	429	425

Pollutant: Nitrogen Oxides

Station	1st High	2nd High	3rd High	4th High
Central / Western	1007	927	782	755
Kwai Chung	1397	1300	1186	1135
Kwun Tong	1321	1237	1179	906
Sham Shui Po	1150	1114	1094	1038
Tsuen Wan	1048	1015	980	979
Sha Tin	601	509	486	484
Tung Chung	631	593	541	529
Yuen Long	447	433	432	426
Tap Mun	130	124	117	117
Causeway Bay	1476	1407	1304	1283
Central	1531	1506	1484	1440
Mong Kok	1320	1173	1168	1090

Pollutant: Nitric Oxide

Station	1st High	2nd High	3rd High	4th High
Central / Western	545	503	419	385
Kwai Chung	770	725	649	634
Kwun Tong	745	693	656	497
Sham Shui Po	653	622	603	580
Tsuen Wan	579	565	544	541
Sha Tin	319	262	257	255
Tung Chung	329	314	278	251
Yuen Long	241	235	232	231
Tap Mun	62	48	46	44
Causeway Bay	796	712	658	646
Central	870	846	790	771
Mong Kok	742	648	631	606

Pollutant: Carbon Monoxide *
(1-hour AQO = 30000)

Station	1st High	2nd High	3rd High	4th High
Tsuen Wan	2670	2660	2580	2530
Tung Chung	2660	2640	2600	2560
Yuen Long	2200	2140	2120	2100
Tap Mun	1680	1660	1620	1620
Causeway Bay	3810	3780	3710	3700
Central	3200	3120	3010	2900
Mong Kok	3590	3120	3090	3080

Pollutant: Ozone *
(1-hour AQO = 240)

Station	1st High	2nd High	3rd High	4th High
Central / Western	381	356	350	336
Eastern	281	279	250	241
Kwai Chung	272	272	270	266
Kwun Tong	206	195	195	190
Sham Shui Po	265	248	240	239
Tsuen Wan	323	277	273	273
Sha Tin	327	320	313	297
Tai Po	360	341	326	326
Tung Chung	383	373	370	363
Yuen Long	406	406	358	357
Tap Mun	324	305	305	304
Causeway Bay	121	114	107	105
Central	157	154	153	143
Mong Kok	157	122	119	114

Pollutant: Respirable Suspended Particulates (PM10)

Station	1st High	2nd High	3rd High	4th High
Central / Western	195	190	188	188
Eastern	195	195	194	193
Kwai Chung	179	178	177	176
Kwun Tong	210	205	203	201
Sham Shui Po	188	186	186	185
Tsuen Wan	223	220	215	214
Sha Tin	194	190	189	187
Tai Po	196	195	195	187
Tung Chung	274	269	269	260
Yuen Long	245	232	224	217
Tap Mun	205	198	194	194
Causeway Bay	210	209	206	204
Central	215	211	208	203
Mong Kok	222	221	220	218

Pollutant: Fine Suspended Particulates (PM2.5)

Station	1st High	2nd High	3rd High	4th High
Central / Western	166	151	149	144
Eastern	124	120	120	110
Kwai Chung	143	139	134	126
Kwun Tong	150	145	137	135
Sham Shui Po	144	136	125	124
Tsuen Wan	122	117	116	113
Sha Tin	131	131	127	122
Tai Po	135	135	131	130
Tung Chung	210	189	171	165
Yuen Long	123	120	114	113
Tap Mun	97	94	92	92
Causeway Bay	155	142	141	139
Central	136	135	132	132
Mong Kok	141	132	131	130

Notes:

1. All concentration units are in microgram per cubic metre.
2. Shaded 1-hour averages are above their respective AQO.
3. Only the asterisked pollutants have hourly AQO.

TABLE C2: THE HIGHEST 2 DAILY POLLUTANT CONCENTRATIONS MEASURED IN 2012

Pollutant: Nitrogen Dioxide * (24-hour AQO = 150)

Station	1st High	2nd High
Central / Western	130	121
Eastern	144	115
Kwai Chung	147	146
Kwun Tong	179	178
Sham Shui Po	158	156
Tsuen Wan	124	118
Sha Tin	119	110
Tai Po	108	95
Tung Chung	124	117
Yuen Long	112	110
Tap Mun	39	38
Causeway Bay	241	226
Central	266	242
Mong Kok	247	239

Pollutant: Sulphur Dioxide * (24-hour AQO = 350)

Station	1st High	2nd High
Central / Western	51	40
Eastern	45	39
Kwai Chung	88	87
Kwun Tong	53	41
Sham Shui Po	84	71
Tsuen Wan	66	44
Sha Tin	42	39
Tai Po	20	19
Tung Chung	38	38
Yuen Long	42	30
Tap Mun	27	26
Causeway Bay	42	32
Central	39	37
Mong Kok	70	59

Pollutant: Respirable Suspended Particulates * (24-hour AQO = 180)

Station	1st High	2nd High
Central / Western	152	117
Eastern	160	122
Kwai Chung	145	112
Kwun Tong	169	123
Sham Shui Po	152	116
Tsuen Wan	171	127
Sha Tin	146	105
Tai Po	151	115
Tung Chung	162	147
Yuen Long	165	119
Tap Mun	152	113
Causeway Bay	164	132
Central	170	129
Mong Kok	176	131

Pollutant: Nitrogen Oxides

Station	1st High	2nd High
Central / Western	364	315
Kwai Chung	659	368
Kwun Tong	503	380
Sham Shui Po	513	346
Tsuen Wan	687	365
Sha Tin	251	224
Tung Chung	326	254
Yuen Long	243	241
Tap Mun	50	49
Causeway Bay	790	650
Central	777	688
Mong Kok	624	612

Pollutant: Nitric Oxide

Station	1st High	2nd High
Central / Western	192	149
Kwai Chung	352	183
Kwun Tong	269	143
Sham Shui Po	271	159
Tsuen Wan	374	178
Sha Tin	112	100
Tung Chung	132	119
Yuen Long	116	109
Tap Mun	17	13
Causeway Bay	422	331
Central	389	367
Mong Kok	319	263

Pollutant: Carbon Monoxide * (8-hour AQO = 10000)

Station	1st High	2nd High
Tsuen Wan	2345	2305
Tung Chung	2461	2455
Yuen Long	1945	1918
Tap Mun	1608	1605
Causeway Bay	3018	2959
Central	2440	2404
Mong Kok	2755	2725

Pollutant: Ozone

Station	1st High	2nd High
Central / Western	148	141
Eastern	123	115
Kwai Chung	131	120
Kwun Tong	143	142
Sham Shui Po	111	104
Tsuen Wan	125	114
Sha Tin	165	149
Tai Po	112	103
Tung Chung	158	138
Yuen Long	140	132
Tap Mun	188	177
Causeway Bay	68	56
Central	105	101
Mong Kok	55	50

Pollutant: Fine Suspended Particulates (PM2.5)

Station	1st High	2nd High
Central / Western	82	82
Eastern	66	66
Kwai Chung	83	78
Kwun Tong	78	76
Sham Shui Po	80	71
Tsuen Wan	74	72
Sha Tin	73	66
Tai Po	76	75
Tung Chung	103	87
Yuen Long	87	75
Tap Mun	69	65
Causeway Bay	93	92
Central	92	86
Mong Kok	82	78

Pollutant: Total Suspended Particulates * (24-hour AQO = 260)

Station	1st High	2nd High
Central / Western	138	131
Kwai Chung	166	129
Kwun Tong	132	125
Tsuen Wan	121	118
Sha Tin	110	110
Tung Chung	176	141
Yuen Long	161	149
Mong Kok	169	148

Notes:

1. All concentration units are in microgram per cubic metre.
2. Values for Carbon Monoxide are 8-hour averages.
3. Shaded 24-hour averages are above their respective AQO.
4. Only the asterisked pollutants have either 8-hour or 24-hour AQO.

TABLE C3: 2012 MONTHLY AND ANNUAL AVERAGES OF AIR POLLUTANTS

Pollutant: Sulphur Dioxide (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	12	9	9	13	6	6	8	15	8	8	7	9	9
Eastern	5	4	6	7	4	7	7	14	7	9	6	6	7
Kwai Chung	12	10	8	26	13	18	24	34	14	13	12	12	16
Kwun Tong	13	9	10	11	8	10	12	18	10	11	10	11	11
Sham Shui Po	14	10	12	19	8	10	15	29	13	11	8	10	13
Tsuen Wan	16	17	15	21	14	13	14	22	12	15	13	14	16
Sha Tin	10	8	8	12	7	7	8	19	13	13	10	11	11
Tai Po	3	3	4	6	8	6	6	7	7	9	10	9	7
Tung Chung	13	13	13	14	11	10	10	16	15	17	13	14	13
Yuen Long	11	10	10	11	8	9	9	16	9	11	9	9	10
Tap Mun	14	12	12	8	4	5	7	13	11	13	13	14	11
Causeway Bay	11	11	10	10	6	7	6	13	7	7	7	12	9
Central	13	8	10	12	10	9	9	14	11	12	11	11	11
Mong Kok	11	7	8	15	7	9	9	19	10	10	9	10	10

Pollutant: Nitrogen Oxides

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	105	104	110	90	67	62	75	89	77	64	88	94	85
Kwai Chung	145	158	129	146	113	122	130	153	124	111	129	131	132
Kwun Tong	129	127	131	131	94	120	140	172	85	75	91	95	116
Sham Shui Po	143	155	154	142	98	92	100	121	109	103	132	134	124
Tsuen Wan	130	156	130	120	90	90	93	107	88	89	108	114	109
Sha Tin	81	74	67	74	48	49	62	86	63	61	71	72	67
Tung Chung	113	86	90	62	44	37	42	64	59	59	75	93	69
Yuen Long	112	100	95	87	69	71	81	93	78	79	101	106	89
Tap Mun	20	19	19	18	11	12	14	22	11	10	13	16	16
Causeway Bay	419	311	369	311	252	264	286	393	298	253	265	336	313
Central	345	303	319	288	239	263	295	385	315	273	303	303	303
Mong Kok	293	288	308	350	319	317	322	365	332	299	337	328	321

Pollutant: Nitric Oxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	32	33	35	26	14	13	24	19	16	5	19	24	22
Kwai Chung	53	63	44	52	39	40	52	47	39	23	42	45	45
Kwun Tong	44	44	44	43	31	40	55	54	22	13	26	28	37
Sham Shui Po	46	53	50	45	26	23	34	32	29	17	38	41	36
Tsuen Wan	45	62	45	36	25	21	30	26	21	11	28	34	32
Sha Tin	22	20	17	19	11	10	19	19	14	8	17	16	16
Tung Chung	35	23	27	14	9	6	11	11	11	6	19	27	17
Yuen Long	39	31	28	24	19	19	29	25	21	15	31	33	26
Tap Mun	3	3	4	4	4	3	3	3	3	2	2	2	3
Causeway Bay	187	135	157	130	101	106	127	165	117	76	102	140	128
Central	146	125	130	118	95	105	134	159	123	83	117	124	122
Mong Kok	124	121	124	146	131	131	143	145	136	99	138	141	132

Pollutant: Nitrogen Dioxide (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	56	53	57	50	46	42	38	59	54	56	59	58	52
Eastern	61	61	67	59	47	47	41	62	59	68	68	61	58
Kwai Chung	64	62	62	66	54	61	50	81	64	76	64	62	64
Kwun Tong	61	60	63	65	45	59	56	89	50	56	51	52	59
Sham Shui Po	72	74	79	73	57	57	48	72	65	77	75	72	68
Tsuen Wan	61	62	62	64	52	58	47	68	56	72	65	63	61
Sha Tin	47	43	41	45	31	34	33	57	41	48	45	47	43
Tai Po	50	48	51	52	44	46	43	61	51	60	57	50	51
Tung Chung	60	51	49	41	31	28	25	46	43	50	46	52	43
Yuen Long	53	53	52	50	40	43	37	55	46	57	54	55	49
Tap Mun	15	14	13	11	6	7	10	17	7	7	10	13	11
Causeway Bay	134	105	129	113	98	102	92	141	120	137	109	123	117
Central	122	112	121	107	93	103	91	142	127	147	125	114	117
Mong Kok	103	104	117	127	119	116	104	143	124	148	127	113	120

Pollutant: Carbon Monoxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tsuen Wan	1143	1081	800	844	623	828	656	858	823	937	902	1018	877
Tung Chung	1245	969	780	419	368	468	440	638	464	719	765	780	671
Yuen Long	1021	905	756	592	400	450	448	631	600	715	858	874	686
Tap Mun	1066	790	652	644	552	588	584	648	503	859	819	653	697
Causeway Bay	1585	1423	1465	1211	799	746	834	981	824	860	1281	1340	1113
Central	1094	1053	1042	858	847	722	502	749	571	655	757	791	805
Mong Kok	1496	1501	1181	1114	840	946	844	1060	933	1055	1244	1152	1112

TABLE C3 (Cont.) : 2012 MONTHLY AND ANNUAL AVERAGES OF AIR POLLUTANTS

Pollutant: Ozone

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	18	22	32	38	37	38	22	50	42	84	39	25	37
Eastern	24	25	36	39	44	43	28	49	44	76	40	29	40
Kwai Chung	20	23	34	30	29	24	14	25	34	67	37	25	30
Kwun Tong	27	29	38	37	46	36	17	28	49	87	50	37	40
Sham Shui Po	16	16	22	21	25	25	14	32	36	65	28	17	27
Tsuen Wan	18	20	33	31	32	29	18	34	39	71	38	25	32
Sha Tin	29	34	51	51	54	47	25	43	54	91	52	38	47
Tai Po	27	34	41	38	31	31	21	42	35	52	30	25	34
Tung Chung	19	28	45	53	49	54	35	56	51	93	47	27	47
Yuen Long	21	22	35	38	42	41	27	52	49	77	35	24	39
Tap Mun	49	52	65	70	75	70	45	71	82	131	77	62	71
Causeway Bay	12	15	21	22	18	15	9	9	14	32	15	10	16
Central	13	13	16	23	21	21	10	16	14	41	26	14	19
Mong Kok	6	6	10	10	10	10	7	10	12	26	14	8	11

Pollutant: Respirable Suspended Particulates (Annual AQO = 55)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	58	47	54	49	30	33	23	46	42	69	51	51	46
Eastern	41	36	48	40	27	28	17	37	39	57	42	41	38
Kwai Chung	52	43	46	42	28	32	23	45	37	65	46	45	42
Kwun Tong	46	39	50	46	30	34	26	49	40	66	48	45	43
Sham Shui Po	47	42	51	46	30	32	24	45	39	63	47	44	42
Tsuen Wan	52	44	49	43	30	32	23	44	37	62	45	43	42
Sha Tin	48	38	44	38	25	28	19	42	44 *	61	45	46	39
Tai Po	54	42	47	40	25	26	18	46	35	64	49	48	41
Tung Chung	67	49	57	41	25	28	18	41	40	73	55	51	45
Yuen Long	53	42	50	37	27	30	24	49	45	70	52	53	44
Tap Mun	42	37	47	38	27	28	18	39	34	60	45	45	38
Causeway Bay	63	54	64	62	49	51	40	67	65	86	64	65	61
Central	57	48	60	54	37	39	30	56	50	75	56	53	51
Mong Kok	52	44	58	52	37	35	23	47	46	62	53	50	47

Pollutant: Fine Suspended Particulates (PM2.5)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	42	33	31	29	16	18	12	30	27	46	32	32	29
Eastern	31	25	27	24	17	18	11	25	24	39	28	27	25
Kwai Chung	39	31	28	28	18	21	14	33	27	47	33	32	29
Kwun Tong	33	27	29	28	19	22	16	33	27	42	29	27	28
Sham Shui Po	34	29	30	28	19	20	14	30	27	42	30	28	28
Tsuen Wan	38	30	30	28	20	22	15	31	27	45	31	30	29
Sha Tin	36	28	25	23	15	16	10	30	31 *	41	29	30	26
Tai Po	42	31	28	26	15	17	11	33	24	47	33	33	28
Tung Chung	47	33	30	24	13	14	9	27	27	49	34	31	28
Yuen Long	37	28	28	24	17	19	14	32	29	47	34	33	29
Tap Mun	31	25	27	23	16	16	10	27	24	39	28	28	25
Causeway Bay	44	37	36 *	45	37	34	23 *	43	43	58	45	43	42
Central	38	31	34	32	24	25	20	41	34	48	34	32	33
Mong Kok	37	31	34	34	24	22	14	34	33	49	38	36	32

Pollutant: Total Suspended Particulates (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	91	62	73	91	34	54	25	60	56	87	64	51	62
Kwai Chung	72	69	81	49	44	55	48	75	59	89	81	69	66
Kwun Tong	88	56	66	67	39	43	44	47	57	100	69	78	62
Tsuen Wan	76	80	65	50	40	40	31	53	53	85	60	68	58
Sha Tin	68	49	58	49	32	40	38	66	41	80	52	64	54
Tung Chung	84	55	74	31	31	36	22	50	51	76	64	62	54
Yuen Long	92	91	78	64	40	40	30	57	68	106	72	87	68
Mong Kok	93	87	103	98	63	65	--	77	62	102	80	82	83

Notes:

1. All units are in microgram per cubic metre.
2. Shaded annual averages are above their respective AQO.
3. Asterisked values are below their respective minimum data requirement of 66% for number of data within the period.

TABLE C4: 2012 HOURLY STATISTICS OF AIR POLLUTANTS

Pollutant: Sulphur Dioxide

Station	No. of hours	Data capture rate %	<----------Percentiles---------->								Arithmetic mean	Highest 1 hour	Highest 24 hour
			10	25	50	75	90	95	98	99			
Central / Western	8616	98.1	2	4	6	10	18	28	42	51	9	101	51
Eastern	8663	98.6	1	3	5	8	13	20	32	41	7	121	45
Kwai Chung	8675	98.8	3	5	8	17	45	60	77	96	16	232	88
Kwun Tong	8617	98.1	6	8	9	12	16	23	39	47	11	98	53
Sham Shui Po	8641	98.4	4	6	9	13	24	43	73	91	13	206	84
Tsuen Wan	8591	97.8	6	9	12	18	31	42	55	62	16	128	66
Sha Tin	8288	94.4	4	6	8	13	18	26	38	49	11	121	42
Tai Po	8544	97.3	2	3	6	9	11	14	18	23	7	46	20
Tung Chung	8581	97.7	7	8	11	15	21	26	37	46	13	91	38
Yuen Long	8635	98.3	4	6	8	12	18	22	31	40	10	71	42
Tap Mun	8349	95.0	4	7	10	13	17	20	24	26	11	75	27
Causeway Bay	8473	96.5	3	5	7	10	17	23	31	38	9	98	42
Central	8601	97.9	3	5	9	14	21	28	38	45	11	106	39
Mong Kok	8636	98.3	3	5	7	10	17	31	51	66	10	178	70

Pollutant: Nitrogen Oxides

Station	No. of hours	Data capture rate %	<----------Percentiles---------->								Arithmetic mean	Highest 1 hour	Highest 24 hour
			10	25	50	75	90	95	98	99			
Central / Western	8634	98.3	26	45	71	103	155	197	266	365	85	1007	364
Kwai Chung	8657	98.6	50	80	117	163	222	277	363	433	132	1397	659
Kwun Tong	8667	98.7	36	58	93	147	220	276	349	419	116	1321	503
Sham Shui Po	8633	98.3	42	75	114	152	197	244	325	413	124	1150	513
Tsuen Wan	8464	96.4	38	70	95	127	174	231	346	425	109	1048	687
Sha Tin	8288	94.4	21	30	49	83	138	187	253	292	67	601	251
Tung Chung	8566	97.5	17	30	51	91	144	183	234	276	69	631	326
Yuen Long	8630	98.2	37	53	76	109	157	197	252	300	89	447	243
Tap Mun	8264	94.1	7	9	13	18	28	36	49	60	16	130	50
Causeway Bay	8562	97.5	118	178	265	410	576	680	810	901	313	1476	790
Central	8646	98.4	107	172	274	393	535	630	764	862	303	1531	777
Mong Kok	8636	98.3	132	222	329	409	479	535	615	673	321	1320	624

Pollutant: Nitric Oxide

Station	No. of hours	Data capture rate %	<----------Percentiles---------->								Arithmetic mean	Highest 1 hour	Highest 24 hour
			10	25	50	75	90	95	98	99			
Central / Western	8634	98.3	2	4	10	25	51	78	119	162	22	545	192
Kwai Chung	8657	98.6	8	16	33	58	91	119	173	219	45	770	352
Kwun Tong	8667	98.7	5	10	23	50	86	114	153	192	37	745	269
Sham Shui Po	8633	98.3	4	12	27	46	70	97	151	202	36	653	271
Tsuen Wan	8464	96.4	4	10	21	37	63	94	163	217	32	579	374
Sha Tin	8288	94.4	1	2	5	17	43	69	108	134	16	319	112
Tung Chung	8566	97.5	2	3	6	19	47	69	99	121	17	329	132
Yuen Long	8630	98.2	4	8	17	33	58	81	114	141	26	241	116
Tap Mun	8264	94.1	1	2	3	3	4	6	9	14	3	62	17
Causeway Bay	8563	97.5	35	59	100	174	259	317	391	449	128	796	422
Central	8646	98.4	26	54	101	168	241	291	366	421	122	870	389
Mong Kok	8636	98.3	42	82	129	172	214	245	291	329	132	742	319

Pollutant: Nitrogen Dioxide

Station	No. of hours	Data capture rate %	<----------Percentiles---------->								Arithmetic mean	Highest 1 hour	Highest 24 hour
			10	25	50	75	90	95	98	99			
Central / Western	8634	98.3	21	32	50	67	84	100	119	136	52	241	130
Eastern	8663	98.6	27	39	57	74	90	101	116	133	58	240	144
Kwai Chung	8657	98.6	33	45	59	76	98	119	144	165	64	292	147
Kwun Tong	8667	98.7	26	38	54	72	92	112	154	191	59	398	179
Sham Shui Po	8633	98.3	32	45	65	88	107	120	139	159	68	274	158
Tsuen Wan	8464	96.4	30	43	57	74	96	111	129	144	61	251	124
Sha Tin	8288	94.4	18	25	37	53	76	93	118	136	43	280	119
Tai Po	8544	97.3	27	36	47	62	80	93	111	121	51	172	108
Tung Chung	8566	97.5	13	24	38	57	79	96	116	131	43	236	124
Yuen Long	8630	98.2	25	34	45	61	80	93	107	117	49	180	112
Tap Mun	8264	94.1	4	6	9	14	22	27	35	43	11	85	39
Causeway Bay	8562	97.5	52	77	111	146	187	215	262	293	117	449	241
Central	8646	98.4	56	78	110	146	184	213	256	290	117	528	266
Mong Kok	8636	98.3	58	85	118	149	181	202	234	269	120	511	247

Pollutant: Carbon Monoxide

Station	No. of hours	Data capture rate %	<----------Percentiles---------->								Arithmetic mean	Highest 1 hour	Highest 8 hour
			10	25	50	75	90	95	98	99			
Tsuen Wan	8576	97.6	560	690	850	1030	1210	1320	1540	1710	877	2670	2345
Tung Chung	8544	97.3	320	410	600	860	1160	1330	1530	1666	671	2660	2461
Yuen Long	8636	98.3	360	460	640	850	1070	1230	1450	1597	686	2200	1945
Tap Mun	8384	95.4	440	520	670	840	1010	1100	1240	1350	697	1680	1608
Causeway Bay	8519	97.0	590	770	1010	1370	1770	2040	2380	2600	1113	3810	3018
Central	8590	97.8	350	550	770	1030	1300	1450	1632	1821	805	3200	2440
Mong Kok	8635	98.3	740	900	1080	1300	1510	1640	1830	2017	1112	3590	2755

TABLE C4 (Cont.) : 2012 HOURLY STATISTICS OF AIR POLLUTANTS

Pollutant: Ozone

Station	No. of hours	Data capture rate %	<----------Percentiles---------->								Arithmetic mean	Highest 1 hour	Highest 24 hour
			10	25	50	75	90	95	98	99			
Central / Western	8579	97.7	3	10	26	54	88	106	135	152	37	381	148
Eastern	8663	98.6	11	19	33	54	81	95	113	127	40	281	123
Kwai Chung	8664	98.6	3	7	20	45	73	90	109	126	30	272	131
Kwun Tong	8605	98.0	6	12	30	62	91	106	120	133	40	206	143
Sham Shui Po	8602	97.9	3	7	17	37	62	81	106	131	27	265	111
Tsuen Wan	8582	97.7	4	9	21	46	78	95	118	138	32	323	125
Sha Tin	8222	93.6	4	12	35	71	109	129	151	174	47	327	165
Tai Po	8544	97.3	4	10	24	48	77	94	118	136	34	360	112
Tung Chung	8564	97.5	5	13	37	65	101	125	161	205	47	383	158
Yuen Long	8609	98.0	5	11	27	52	88	110	155	189	39	406	140
Tap Mun	8354	95.1	23	38	61	97	133	155	177	192	71	324	188
Causeway Bay	8311	94.6	4	5	10	22	39	49	62	72	16	121	68
Central	8580	97.7	3	5	11	25	47	64	85	97	19	157	105
Mong Kok	8487	96.6	2	3	6	14	25	36	50	57	11	157	55

Pollutant: Respirable Suspended Particulates

Station	No. of hours	Data capture rate %	<----------Percentiles---------->								Arithmetic mean	Highest 1 hour	Highest 24 hour
			10	25	50	75	90	95	98	99			
Central / Western	8690	98.9	16	25	40	62	84	94	112	129	46	195	152
Eastern	8488	96.6	12	20	33	50	70	81	94	109	38	195	160
Kwai Chung	8666	98.7	16	24	36	55	77	88	108	123	42	179	145
Kwun Tong	8637	98.3	16	25	38	56	78	90	107	129	43	210	169
Sham Shui Po	8673	98.7	17	25	37	55	76	86	101	115	42	188	152
Tsuen Wan	8711	99.2	15	23	36	55	77	90	108	124	42	223	171
Sha Tin	8075	91.9	12	20	33	54	75	86	99	113	39	194	146
Tai Po	8610	98.0	12	21	35	56	77	90	106	122	41	196	151
Tung Chung	8554	97.4	13	21	36	62	88	106	140	159	45	274	162
Yuen Long	8670	98.7	16	24	37	59	82	96	118	131	44	245	165
Tap Mun	8510	96.9	13	20	33	52	73	83	93	103	38	205	152
Causeway Bay	8396	95.6	28	41	57	77	99	112	131	145	61	210	164
Central	8625	98.2	21	31	46	67	88	100	118	134	51	215	170
Mong Kok	8214	93.5	19	28	42	61	80	91	110	125	47	222	176

Pollutant: Fine Suspended Particulates (PM2.5)

Station	No. of hours	Data capture rate %	<----------Percentiles---------->								Arithmetic mean	Highest 1 hour	Highest 24 hour
			10	25	50	75	90	95	98	99			
Central / Western	8680	98.8	8	13	25	40	57	66	78	90	29	166	82
Eastern	8658	98.6	8	12	21	34	47	55	64	71	25	124	66
Kwai Chung	8667	98.7	10	16	24	39	55	66	80	89	29	143	83
Kwun Tong	8666	98.7	10	16	24	37	50	59	71	80	28	150	78
Sham Shui Po	8700	99.0	10	15	24	37	50	58	69	76	28	144	80
Tsuen Wan	8461	96.3	10	16	24	38	54	62	73	81	29	122	74
Sha Tin	8076	91.9	6	12	21	35	52	61	74	82	26	131	73
Tai Po	8606	98.0	7	13	24	39	56	67	81	88	28	135	76
Tung Chung	8524	97.0	6	11	22	39	60	74	90	102	28	210	103
Yuen Long	8659	98.6	9	15	24	39	55	64	74	83	29	123	87
Tap Mun	8460	96.3	7	12	21	34	47	55	64	69	25	97	69
Causeway Bay	7479	85.1	19	28	39	53	67	76	89	99	42	155	93
Central	8591	97.8	13	19	29	43	56	66	79	88	33	136	92
Mong Kok	8330	94.8	11	18	29	43	57	66	78	87	32	141	82

Note: All concentration units are in microgram per cubic metre.

TABLE C5: 2012 DIURNAL VARIATIONS OF AIR POLLUTANTS

Pollutant: Sulphur Dioxide

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	8	8	8	8	8	8	8	10	10	10	11	10	10	10	10	10	10	9	9	10	9	9	9	9
Eastern	6	6	6	6	6	6	6	8	8	8	7	8	7	7	7	7	7	7	7	7	8	7	7	6
Kwai Chung	15	15	15	16	14	13	14	15	15	15	16	17	18	18	18	18	18	19	19	19	18	17	17	16
Kwun Tong	10	11	11	12	11	11	11	11	12	12	11	12	11	11	11	11	11	11	11	11	11	11	11	11
Sham Shui Po	13	13	13	15	13	12	12	13	14	14	13	14	13	13	13	13	14	14	13	13	14	14	14	13
Tsuen Wan	14	13	13	14	13	13	13	14	16	16	17	18	18	18	18	18	18	18	18	16	15	15	15	14
Sha Tin	9	9	9	12	10	9	9	10	10	11	10	10	11	11	11	12	12	13	13	12	12	11	11	10
Tai Po	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6
Tung Chung	11	11	11	14	12	11	11	13	15	16	16	16	16	16	16	15	14	13	13	12	12	12	12	11
Yuen Long	9	9	9	11	9	9	9	9	10	10	10	10	10	10	11	11	11	11	11	11	10	10	10	10
Tap Mun	10	9	10	11	10	10	10	11	12	12	12	12	12	11	11	11	11	10	10	10	10	9	9	9
Causeway Bay	8	9	8	8	8	8	9	9	11	11	10	10	9	10	9	9	9	9	9	9	8	8	8	8
Central	10	10	9	10	9	9	10	11	13	13	12	12	11	11	11	12	12	12	12	12	11	11	10	10
Mong Kok	9	9	9	9	9	9	9	10	11	11	11	11	10	11	11	11	11	11	11	11	11	11	10	10

Pollutant: Nitrogen Oxides

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	76	58	48	43	42	41	54	89	112	117	118	106	88	89	93	99	100	101	104	103	99	92	91	88
Kwai Chung	118	93	80	70	71	78	121	160	183	170	154	142	133	131	139	143	150	158	170	160	144	139	136	132
Kwun Tong	107	73	63	56	53	63	110	147	160	155	131	122	115	112	118	123	135	147	154	144	123	117	122	123
Sham Shui Po	112	79	66	63	60	63	104	144	166	159	143	134	125	128	131	139	148	158	160	152	138	134	134	129
Tsuen Wan	97	69	56	49	47	54	93	126	143	139	127	123	117	116	119	121	130	141	147	138	120	116	117	114
Sha Tin	78	66	57	49	48	52	73	94	88	73	62	54	51	49	52	54	60	68	76	81	83	83	83	83
Tung Chung	73	60	49	43	43	49	70	80	79	75	74	73	69	69	68	67	66	71	78	82	80	79	77	77
Yuen Long	97	82	72	59	56	60	87	115	106	90	86	79	76	77	79	85	95	102	109	112	106	101	104	105
Tap Mun	15	15	15	15	15	14	15	17	18	19	18	17	16	15	15	14	15	15	15	15	16	15	15	15
Causeway Bay	281	216	196	163	159	147	225	330	386	403	375	360	340	352	345	352	352	378	394	382	355	351	353	332
Central	254	190	162	143	145	136	204	321	437	420	389	345	319	327	330	341	356	376	414	392	344	319	306	307
Mong Kok	292	192	167	147	141	140	229	329	398	394	356	348	347	372	378	390	417	435	438	394	346	356	369	356

Pollutant: Nitric Oxide

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	19	13	10	9	9	8	12	26	36	38	38	31	23	22	23	24	23	22	23	23	23	21	22	23
Kwai Chung	39	30	25	21	22	25	44	63	75	68	58	50	43	40	43	44	46	50	56	52	46	46	45	44
Kwun Tong	35	22	19	16	15	18	38	55	62	59	47	41	37	33	34	36	39	43	46	43	36	35	38	40
Sham Shui Po	32	21	16	17	15	15	31	50	61	57	48	42	36	36	36	38	40	44	44	41	37	36	37	37
Tsuen Wan	27	18	13	11	10	13	28	43	51	49	43	39	35	32	33	32	34	38	41	38	32	32	33	33
Sha Tin	21	17	15	12	12	13	21	30	27	20	16	13	11	9	10	10	10	11	13	15	18	19	20	21
Tung Chung	19	15	11	9	10	12	20	25	24	21	20	18	16	16	14	13	12	13	16	18	18	19	19	20
Yuen Long	31	25	22	17	16	17	30	43	37	29	26	22	20	19	19	20	23	25	28	30	30	29	32	33
Tap Mun	3	3	3	3	3	3	3	3	4	4	4	4	3	3	3	3	3	3	2	2	2	2	2	3
Causeway Bay	120	94	84	68	66	60	92	140	168	174	160	150	138	139	133	135	133	148	156	153	145	144	145	140
Central	103	73	60	53	53	50	79	137	196	182	165	140	123	126	125	128	135	146	166	159	140	130	125	128
Mong Kok	122	77	65	56	52	51	92	143	178	174	151	143	138	148	149	153	166	177	179	161	139	145	153	150

Pollutant: Nitrogen Dioxide

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	47	38	33	29	28	28	36	50	57	59	60	57	54	56	59	63	66	67	69	68	64	60	57	54
Eastern	55	45	38	33	32	36	50	63	65	65	62	61	59	60	64	67	73	74	73	71	71	66	63	60
Kwai Chung	58	47	42	38	38	40	53	63	68	67	66	66	67	70	73	76	80	83	84	80	73	69	67	64
Kwun Tong	54	40	34	31	30	35	52	63	66	64	59	59	59	61	66	69	76	80	83	78	67	64	64	62
Sham Shui Po	63	47	41	38	36	39	57	69	73	72	70	69	69	73	76	81	86	91	92	89	82	79	76	72
Tsuen Wan	56	42	36	32	31	34	50	61	65	64	62	63	64	67	69	72	77	83	85	80	72	68	67	64
Sha Tin	46	40	35	31	30	33	41	47	47	42	38	35	34	35	37	39	44	51	56	57	56	54	52	50
Tai Po	52	45	38	35	35	38	49	58	56	50	44	42	42	43	45	48	56	64	71	70	65	61	61	58
Tung Chung	44	38	32	29	29	31	38	41	43	43	43	45	44	46	46	47	47	50	54	55	52	50	48	46
Yuen Long	49	44	39	33	32	34	41	49	49	46	46	45	45	47	49	54	60	64	67	66	61	57	55	54
Tap Mun	11	11	11	10	10	10	11	11	12	12	12	11	10	10	10	10	11	11	12	12	12	12	11	11
Causeway Bay	98	73	68	58	58	56	84	116	130	137	131	131	129	139	142	146	149	152	155	149	134	131	131	118
Central	97	77	71	62	64	61	83	112	138	142	136	131	130	135	140	146	150	153	161	148	129	120	115	112
Mong Kok	106	74	68	62	61	62	88	111	125	128	125	129	136	146	150	156	163	166	164	148	133	134	135	126

Pollutant: Carbon Monoxide

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Tsuen Wan	847	804	778	748	750	780	844	894	912	903	909	888	882	882	886	882	897	922	966	969	950	934	926	896
Tung Chung	674	666	656	643	652	654	664	678	685	675	675	676	679	689	691	682	667	656	669	678	674	673	675	675
Yuen Long	720	678	653	617	603	607	647	695	690	663	663	645	653	657	657	667	687	708	746	777	769	750	764	748
Tap Mun	695	689	688	688	689	691	705	718	719	722	722	712	705	703	700	694	692	687	687	686	688	687	684	689
Causeway Bay	1235	1338	1282	1207	1117	1039	933	918	954	1031	1137	1144	1135	1140	1101	1072	1054	1049	1102	1160	1203	1180	1084	1110
Central	797	737	664	627	571	596	605	715	837	896	958	870	831	898	853	836	813	833	903	944	956	928	834	834
Mong Kok	1131	1164	1112	1008	1031	985	944	982	1041	1093	1095	1060	1069	1147	1172	1171	1189	1204	1251	1251	1202	1166	1116	1100

TABLE C5 (Cont.) : 2012 DIURNAL VARIATIONS OF AIR POLLUTANTS

Pollutant: Ozone

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	36	41	43	45	45	42	35	25	22	25	29	36	45	50	52	50	46	40	34	31	30	31	31	32
Eastern	37	40	42	44	43	40	32	26	27	30	36	41	48	52	52	50	47	44	41	39	37	36	36	36
Kwai Chung	26	34	36	37	36	32	24	19	19	23	28	33	39	43	43	41	37	30	25	24	25	26	25	24
Kwun Tong	37	43	46	46	45	41	31	26	27	31	38	43	49	53	53	51	46	40	36	36	38	38	35	35
Sham Shui Po	23	31	34	34	35	31	21	16	16	20	24	30	36	38	39	36	31	26	21	19	21	20	20	20
Tsuen Wan	27	37	39	41	40	36	24	20	21	25	31	37	43	46	47	45	39	33	26	24	26	25	24	24
Sha Tin	36	40	41	44	41	37	31	28	32	40	50	60	68	72	74	72	66	58	49	43	40	38	37	36
Tai Po	25	27	29	29	27	25	20	18	21	29	38	46	54	58	58	56	50	41	32	29	28	27	25	24
Tung Chung	37	41	43	44	44	39	32	31	33	38	43	51	60	69	73	73	68	58	47	41	40	39	38	37
Yuen Long	28	30	32	36	35	31	26	22	25	34	41	52	62	66	67	63	55	45	36	31	30	29	28	26
Tap Mun	62	60	58	56	55	53	51	52	56	62	71	81	89	93	94	95	95	91	85	79	73	69	65	63
Causeway Bay	15	18	19	23	23	24	18	12	11	11	12	14	15	16	17	16	17	16	16	15	15	15	14	15
Central	19	24	28	30	29	29	21	14	11	12	13	16	20	21	21	20	19	16	14	14	15	16	16	16
Mong Kok	8	13	16	19	19	19	12	7	6	8	9	11	12	13	13	12	10	8	7	7	8	8	7	6

Pollutant: Respirable Suspended Particulates

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	43	42	41	41	41	41	41	42	45	47	48	50	49	49	51	52	52	50	49	47	48	48	46	44
Eastern	34	34	33	34	34	34	35	36	37	38	39	39	39	40	41	42	42	41	40	40	40	38	37	35
Kwai Chung	40	39	37	37	36	36	37	39	41	43	43	43	44	46	47	47	47	47	46	46	45	44	42	41
Kwun Tong	38	37	37	37	37	37	39	41	44	46	46	46	45	47	48	49	49	50	49	48	46	43	42	40
Sham Shui Po	37	36	35	36	36	36	38	40	42	43	43	44	44	46	48	48	49	49	48	49	47	44	41	39
Tsuen Wan	37	35	35	34	35	35	37	39	41	44	44	45	45	47	48	49	48	49	48	48	46	43	40	38
Sha Tin	39	38	37	37	37	36	37	37	38	38	38	39	39	40	42	43	42	43	42	42	42	41	40	39
Tai Po	41	40	39	38	38	38	38	39	40	41	40	41	42	42	43	42	43	43	43	44	44	44	42	41
Tung Chung	42	41	41	41	41	40	41	41	43	44	46	48	50	52	54	54	52	50	48	47	46	44	44	43
Yuen Long	40	39	38	38	38	38	40	43	46	47	47	47	46	48	49	49	49	50	49	50	48	45	44	42
Tap Mun	36	36	36	36	36	36	37	38	38	39	40	40	40	41	41	41	41	41	40	40	39	39	37	37
Causeway Bay	52	44	42	42	41	43	49	56	61	64	63	64	64	71	73	72	73	75	76	77	73	67	64	60
Central	46	42	41	41	42	43	47	50	57	58	56	54	51	53	56	56	57	58	58	58	56	54	50	49
Mong Kok	41	37	36	36	36	36	38	42	46	48	49	48	49	52	54	54	55	54	54	55	55	51	48	44

Pollutant: Fine Suspended Particulates (PM2.5)

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	27	26	26	26	26	26	26	26	28	29	30	31	31	31	32	33	33	32	31	30	30	30	30	28
Eastern	22	22	22	22	22	23	24	25	25	25	25	25	25	26	27	27	27	27	27	27	27	26	25	23
Kwai Chung	28	27	26	25	25	25	26	27	29	30	30	30	30	32	32	32	32	32	32	32	32	31	30	29
Kwun Tong	25	24	23	24	24	24	26	27	28	28	28	28	28	29	30	30	31	31	32	32	30	29	27	26
Sham Shui Po	24	23	23	23	24	24	26	27	29	28	28	28	28	29	30	30	31	31	31	32	31	29	27	26
Tsuen Wan	25	24	24	23	24	24	26	28	29	30	29	30	29	31	31	32	32	32	32	33	32	30	28	27
Sha Tin	25	25	24	24	24	24	24	25	25	25	24	25	25	26	27	28	27	28	27	27	28	27	27	26
Tai Po	28	27	27	26	26	26	26	27	28	28	28	28	29	29	29	29	29	30	30	30	31	30	29	29
Tung Chung	26	26	26	25	25	25	25	26	26	27	28	29	30	32	34	33	33	31	30	30	29	28	28	27
Yuen Long	27	26	25	25	25	25	26	27	27	27	27	28	28	30	30	32	33	33	33	34	32	30	29	28
Tap Mun	23	23	23	23	23	24	25	25	25	25	26	26	25	26	26	26	26	26	26	26	25	25	24	23
Causeway Bay	37	30	28	28	28	29	33	38	41	43	41	41	42	46	47	47	49	51	53	54	52	48	45	43
Central	28	27	26	26	27	28	30	33	37	36	34	32	30	32	34	35	36	37	38	39	38	36	33	31
Mong Kok	28	25	24	24	24	25	27	29	32	33	33	32	33	35	36	37	37	38	38	40	40	37	34	31

Note: All concentration units are in microgram per cubic metre.

TABLE C6: 2012 TOTAL WET AND DRY DEPOSITION

(a) WET DEPOSITION

	Monitoring Station	Central/Western	Kwun Tong	Yuen Long
	WET DEPOSITION (TON/HA)	20254	19678	14903
	WEIGHTED MEAN pH (based on volume-weighted mean hydrogen ion concentrations ($[H^+]$)	4.62	4.69	4.64
	WEIGHTED MEAN pH (based on volume-weighted mean pH)	4.93	5.02	4.94
	NO. OF SAMPLES	107	111	95
Filtrate (Kg/Ha)	NH_4^+	7.93	6.11	5.41
	NO_3^-	24.40	20.27	16.80
	$SO_4^=$	32.88	25.83	17.70
	Cl^-	42.30	40.10	8.31
	F-	0.51	0.54	0.43
	Na^+	22.87	22.04	5.24
	K^+	5.04	4.88	3.67
	Formate	4.13	4.21	2.98
	Acetate	3.70	3.80	2.79
	Ca^{++}	4.36	3.88	2.12
	Mg^{++}	2.84	2.75	0.68

** 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
	NO. OF SAMPLES	26	25	23
Filtrate (Kg/Ha)	NH_4^+	0.40	1.18	0.28
	NO_3^-	10.07	13.94	7.26
	$SO_4^=$	9.31	10.56	6.09
	Cl^-	11.10	13.39	3.93
	F-	0.111	0.128	0.092
	Na^+	6.96	8.57	2.74
	K^+	0.63	0.68	0.37
	Formate	0.17	0.16	0.16
	Acetate	0.22	0.18	0.17
	Ca^{++}	6.19	6.17	4.60
	Mg^{++}	0.93	1.15	0.45

TABLE C7: 2012 AMBIENT LEVELS OF TOXIC AIR POLLUTANTS

Toxic Air Pollutants	Concentration Unit	Annual Averages [1]	
		Tsuen Wan	Central/Western
Heavy Metals			
Hexavalent chromium	ng/m^3	0.10	0.10
Lead [2]	ng/m^3	30	31
Organic Substances			
Benzene	$\mu g/m^3$	1.60	2.05
Benzo[a]pyrene	ng/m^3	0.15	0.08
1,3-Butadiene	$\mu g/m^3$	0.11	0.12
Formaldehyde [4]	$\mu g/m^3$	-	6.16
Perchloroethylene	$\mu g/m^3$	0.53	0.53
Dioxins [3]	$pgI\text{-}TEQ/m^3$	0.028	0.039

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] For lead the reported figures are the respective 2012 annual average concentrations in the elemental analysis of total suspended particulates.

[3] 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 Equivalent Factors (I-TEF) of the North Atlantic Treaty Organisation (NATO/CCMS).

[4] The measurement of formaldehyde was affected by influence from renovation works at Princess Alexandra Community Centre and the nearby buildings of Tsuen Wan Station. Hence, only formaldehyde concentration at the Central/Western station is reported in 2012.

Appendix D

Monitoring Results of Sulphur Dioxide and Nitrogen Dioxide by HEC and CLP

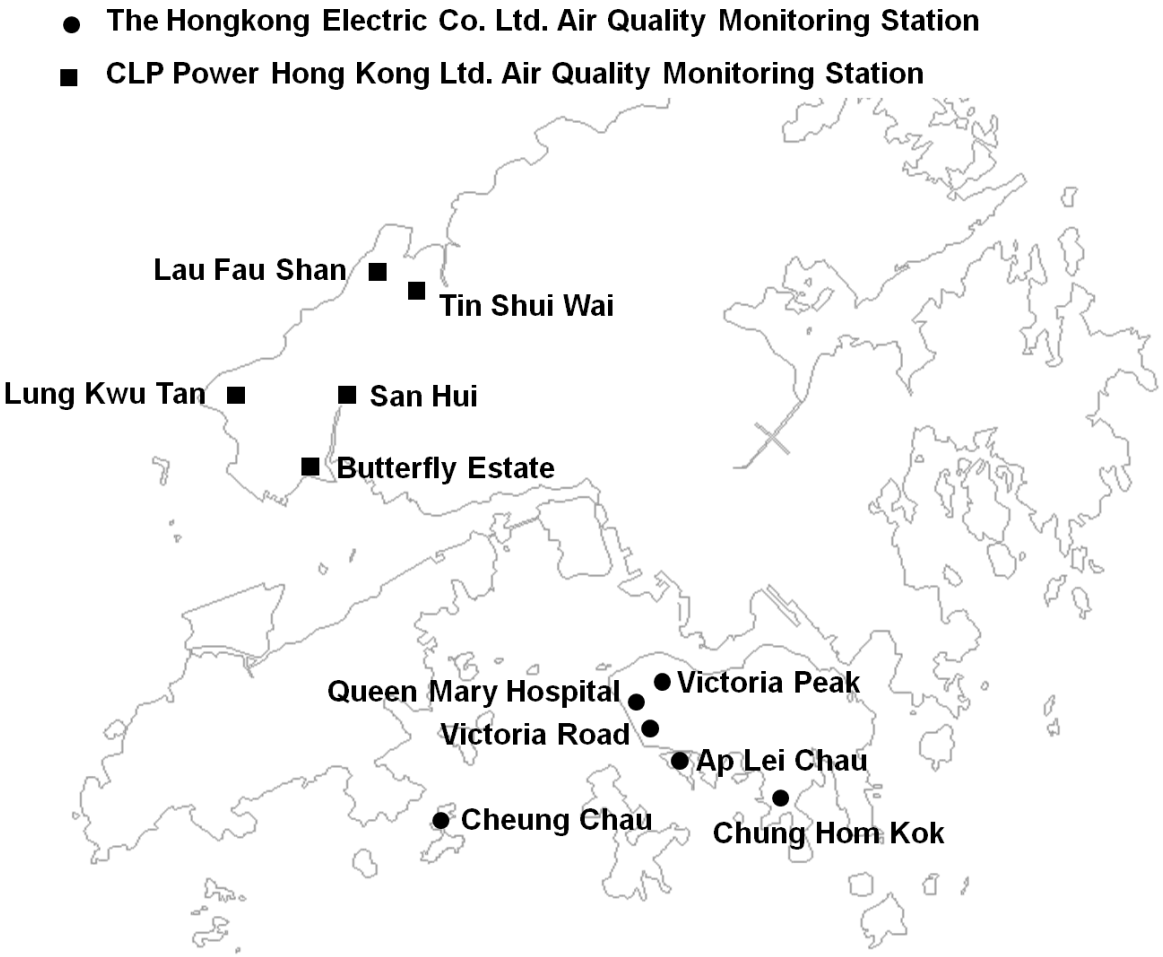


Figure D Location of HEC's & CLP's Air Quality Monitoring Stations for Sulphur Dioxide and Nitrogen Dioxide

D.1 The Hongkong Electric Co. Ltd. (HEC)

Air Quality Monitoring Stations	Annual Mean Concentration [1] [5]	Range of Monthly Mean Concentration [1] [5]
Sulphur Dioxide (SO_2) [2]		
Victoria Peak	4	1 - 7
Chung Hom Kok	4	1 - 10
Victoria Road	7	2 - 12
Queen Mary Hospital	8	3 - 12
Ap Lei Chau	9	3 - 19
Cheung Chau	8	2 - 10
Nitrogen Dioxide (NO_2) [2]		
Victoria Peak	30	15 - 49
Chung Hom Kok	18	7 - 30
Victoria Road	33	13 - 54
Queen Mary Hospital	27	12 - 45
Ap Lei Chau	24	8 - 41
Cheung Chau	24	8 - 43

D.2 CLP Power Hong Kong Ltd. (CLP)

Air Quality Monitoring Station	Annual Mean Concentration [1] [5]	Range of Monthly Mean Concentration [1] [5]
Sulphur Dioxide (SO_2) [2]		
San Hui *(Jan to Mar)* [3]	-- [4]	25 - 34
Tuen Mun Clinic *(Apr to Dec)* [3]	-- [4]	7 - 17
Tin Shui Wai	5	0 - 12
Butterfly Estate	8	4 - 12
Lung Kwu Tan	10	5 - 16
Lau Fau Shan	6	2 - 9
Nitrogen Dioxide (NO_2) [2]		
San Hui *(Jan to Mar)* [3]	-- [4]	71 - 87
Tuen Mun Clinic *(Apr to Dec)* [3]	-- [4]	42 - 83
Tin Shui Wai	32	18 - 44
Butterfly Estate	45	28 - 59
Lung Kwu Tan	26	16 - 37
Lau Fau Shan	30	15 - 40

Notes:

[1] All pollutant units are in micrograms per cubic metre.

[2] There was no exceedance of AQO limit for the pollutants in 2012.

[3] The monitoring station at San Hui was moved to the nearby Tuen Mun Clinic in April 2012.

[4] There was insufficient data for calculation of a representative annual average.

[5] The data are provided by the power companies. For details of monitoring results, please refer to their websites as follows:

HEC: http://www.hkelectric.com/web/EnvironmentQualityHealthAndSafety/EnvironmentalProtection/HowWeCareForOurEnvironment/AmbAirSummary_en.htm

CLP: https://www.clpgroup.com/poweru/eng/air_quality/airQuality_monitoring.aspx