AIR QUALITY
IN HONG KONG 2014

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) (2014)

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Summary

This report summarises the 2014 air quality monitoring data collected by the Environmental Protection Department's monitoring network comprising 12 general stations and 3 roadside stations.

On 1 January 2014, an updated Hong Kong's Air Quality Objectives (AQOs) have been put in force. The new AQOs are used to determine the compliance status of air quality in different districts in Hong Kong.

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 been reduced substantially over the past decade. The increasing trend of roadside nitrogen dioxide (NO_2) in the past years was, by and large, stabilised although its concentrations remained high in 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, RSP and FSP have also been 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 2014 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 15 air quality monitoring stations for measuring concentrations of major air pollutants. It consists of twelve general stations for monitoring ambient air quality and three roadside stations for measuring street level air quality in 2014. 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 Central/Western and Tsuen Wan monitoring stations since 1997.

Figure 1: Location of EPD's Air Quality Monitoring Stations (2014)

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 can be found at the power companies web sites at the following links:

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/air-quality-monitoring-statistics

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 2014
(10-Minute Average Statistics)

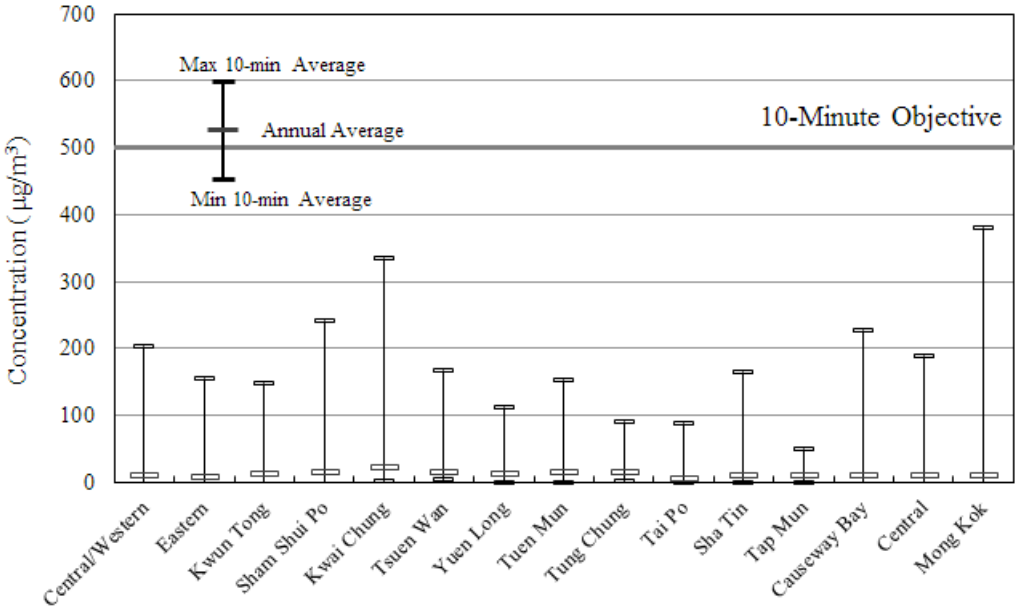
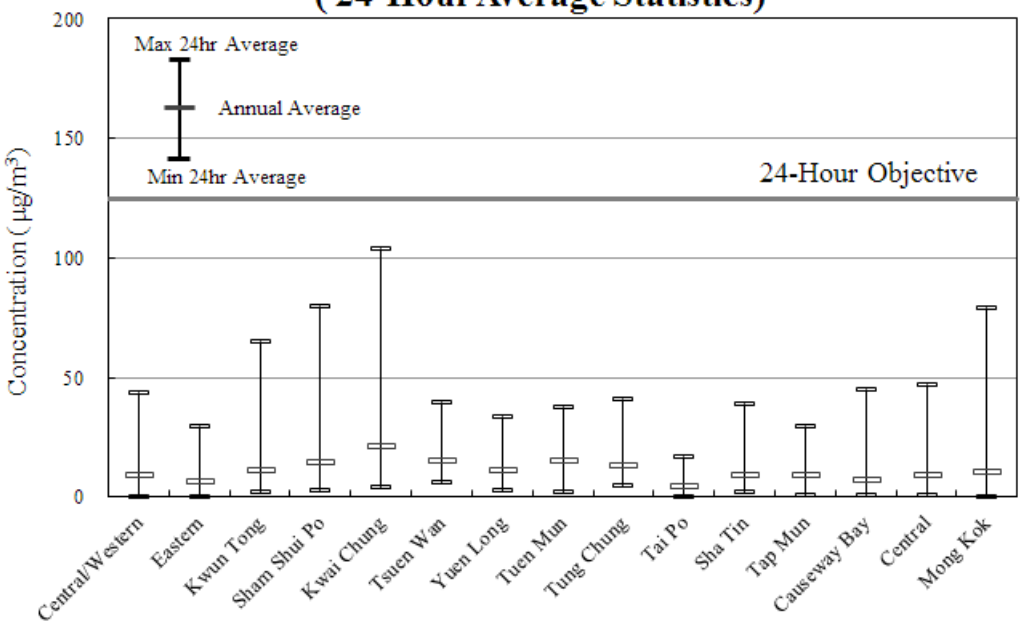


Figure 2b: Sulphur Dioxide Monitoring 2014
(24-Hour Average Statistics)



Sulphur dioxide was continuously measured at all the 15 monitoring stations during 2014. As in previous years, SO_2 concentrations remained low throughout the territory. Excluding Tuen Mun Station with insufficient data, all other monitoring stations complied with the relevant Hong Kong Air Quality Objectives[1] (AQOs) for SO_2. The highest 10-minute average (380 μg/m^3) was measured at Mong Kok roadside station and the highest 24-hour average (104 μg/m^3) in the year was recorded at the Kwai Chung general station. The highest 10-minute average and 24-hour average SO_2 concentrations were 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 15 monitoring stations during 2014. In 2014, the highest 1-hour average (429 μg/m^3) was recorded at Causeway Bay roadside station. The highest annual average (104 μg/m^3) was recorded at the Central roadside station. As regards the 1-hour AQO (200 μg/m^3) with allowance of exceedance for eighteen occasions), all general stations (excluding Tuen Mun Station with insufficient data), except Kwun Tong, Sham Shui Po and Kwai Chung, were in compliance in the year. For the annual AQO, only Tap Mun was in compliance. Non-compliance with the 1-hour and annual AQOs for NO_2 were recorded at all the three roadside stations.

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

Figure 3a: Nitrogen Dioxide Monitoring 2014
(1-Hour Average Statistics)

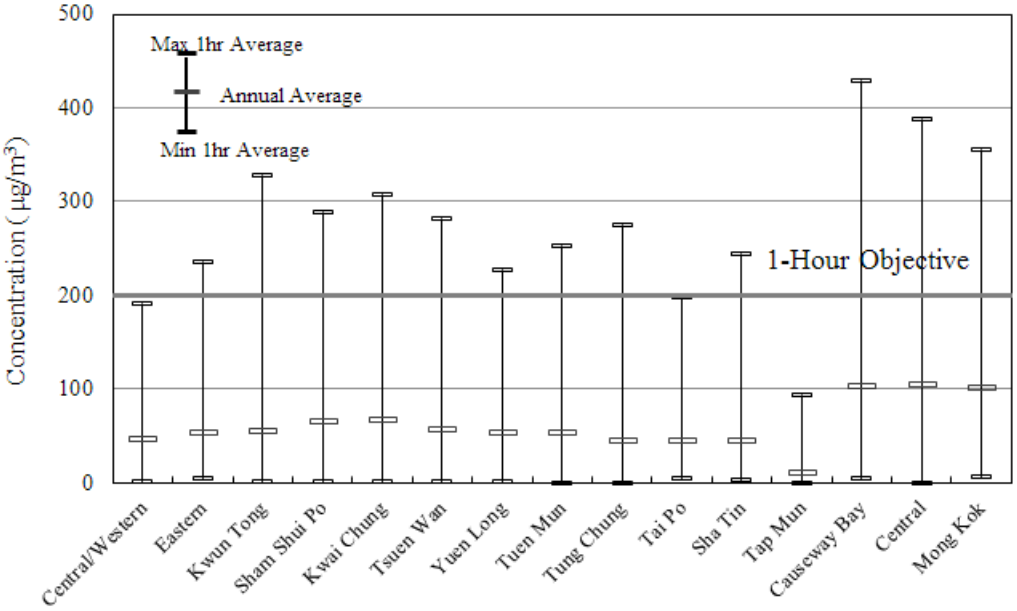
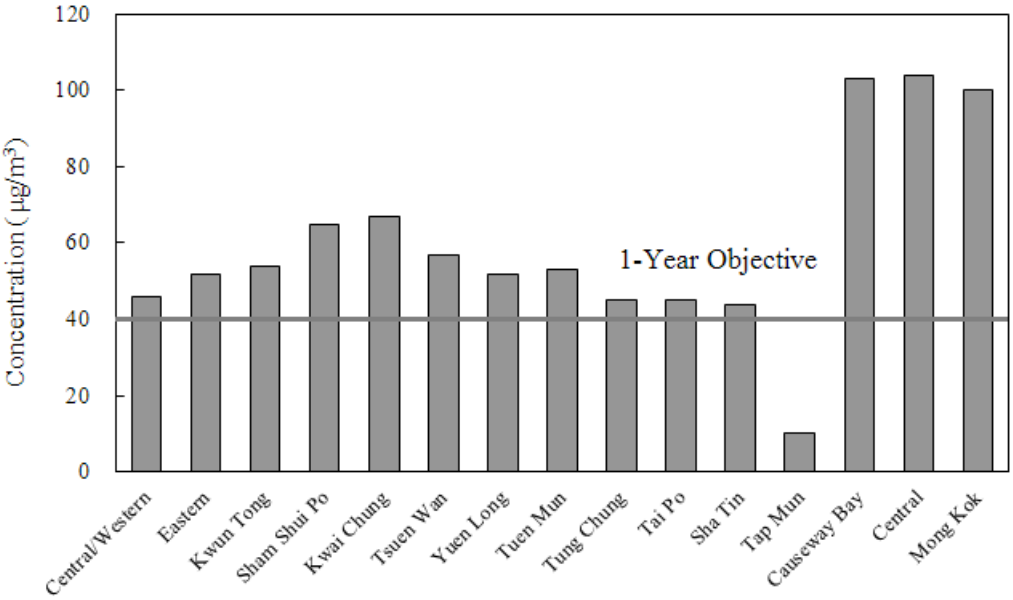


Figure 3b: Nitrogen Dioxide Monitoring 2014
(Annual Average)



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.

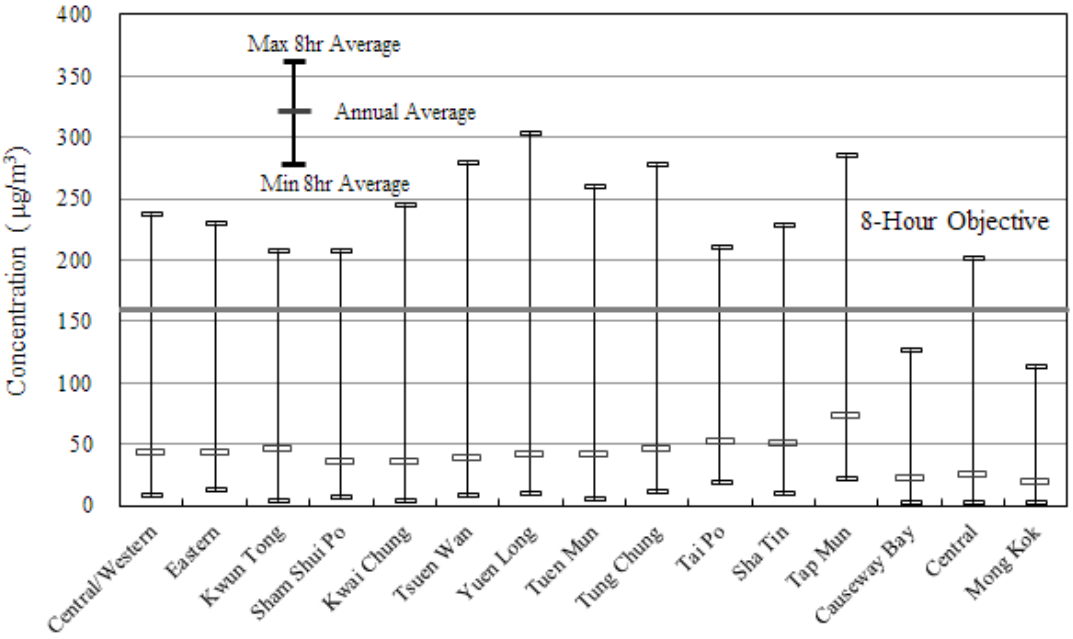
Being a strong oxidant, ozone can cause irritation to the eyes, nose and throat even at low concentrations. At elevated levels, it can increase a person's susceptibility to respiratory infections and aggravate pre-existing respiratory illnesses such as asthma.

Ozone was monitored at all of the general and roadside stations in 2014. Among the 12 general stations, five of them (namely Yuen Long, Tuen Mun with no data in November and December, Tung Chung, Sha Tin and Tap Mun) recorded non-compliance with the 8-hour AQO in 2014 (i.e., the 8-hour AQO limit was exceeded more than nine times in the year). The highest 8-hour average (304 $\mu g/m^3$) was recorded at the Yuen Long general station.

All the three roadside stations complied with the 8-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 2014
(Maximum 8-Hour Average Statistics)

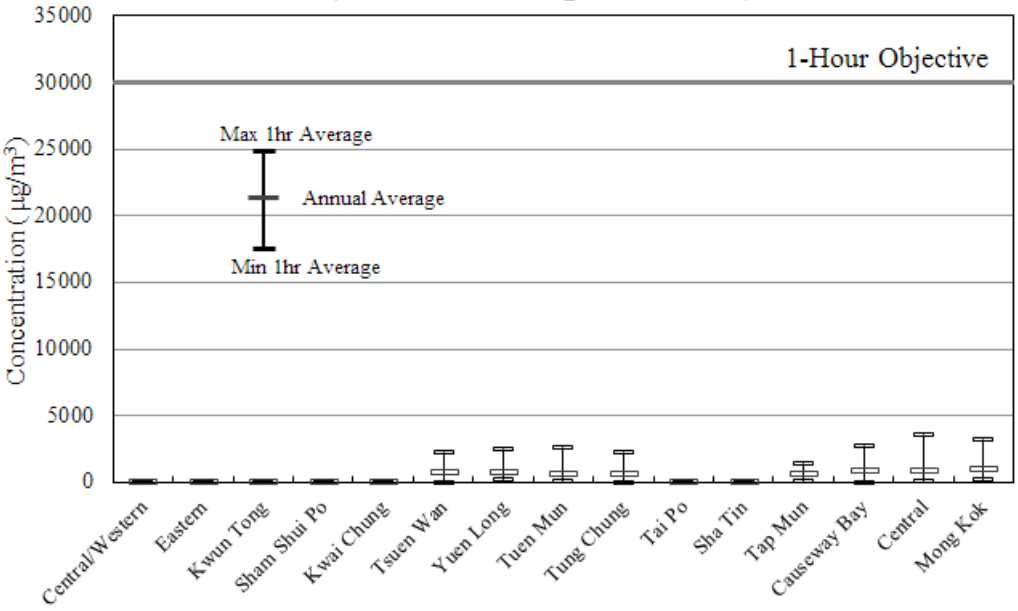


2.4 Carbon Monoxide (CO)

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.

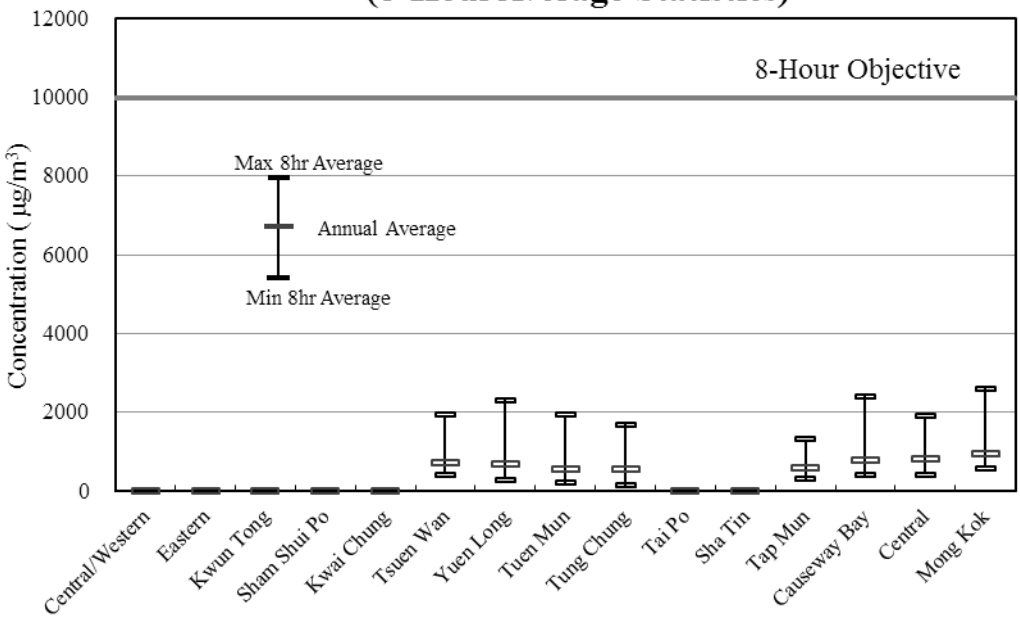
Carbon monoxide was continuously monitored at eight stations including five general stations and three roadside stations during 2014. Similar to previous years, both the ambient and roadside CO concentrations remained very low throughout the year. Excluding Tuen Mun Station with insufficient data, all the other seven monitoring stations complied with the 1-hour and 8-hour AQOs for CO. In 2014, the highest 1-hour average (3590 μg/m^3) and the highest 8-hour average (2609 μg/m^3) were both recorded respectively at the Central and Mong Kok roadside stations and were well below the respective AQO limits.

Figure 5a: Carbon Monoxide Monitoring 2014 (1-Hour Average Statistics)



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

Figure 5b: Carbon Monoxide Monitoring 2014 (8-Hour Average Statistics)



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

3. Suspended Particulates

3.1 Respirable Suspended Particulates (RSP)

Respirable suspended particulates (RSP or PM_{10}) refer to those suspended particulates with nominal aerodynamic diameters of 10 micrometres or less. In Hong Kong, the ambient particulate matters including RSP and FSP are contributed mainly by the regional sources. Combustion sources, in particular marine vessels, diesel vehicles and power plants, are the major regional and local sources of RSP and FSP. Besides, RSP and FSP can also 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 15 monitoring stations during 2014. Most of these stations were also equipped with high-volume sampler to collect particulate samples for chemical analysis.

In 2014, 6 general stations complied with the 24-hour AQO of RSP (100 $\mu g/m^3$ with allowance of nine exceedances per year) out of the 12 general stations. Six general stations (namely Central/Western, Kwun Tong, Yuen Long, Tuen Mun, Tung Chung and Tap Mun) have exceeded the 24-hour AQO of RSP with the highest 24-hour average (169 $\mu g/m^3$) recorded at the Tuen Mun station with no data in November and December. Two roadside stations (namely Causeway Bay and Central) out of the 3 roadside stations, have exceeded the 24-hour AQO of RSP with the highest 24-average (137 $\mu g/m^3$) recorded at Causeway Bay roadside station. As regards the annual AQO limit of RSP (50 $\mu g/m^3$), excluding Tuen Mun Station, non-compliance was observed at Kwun Tong general station and Causeway Bay roadside station with the highest annual average (57 $\mu g/m^3$) in the year.

Figure 6a: RSP Monitoring 2014
(24-Hour Average Statistics)

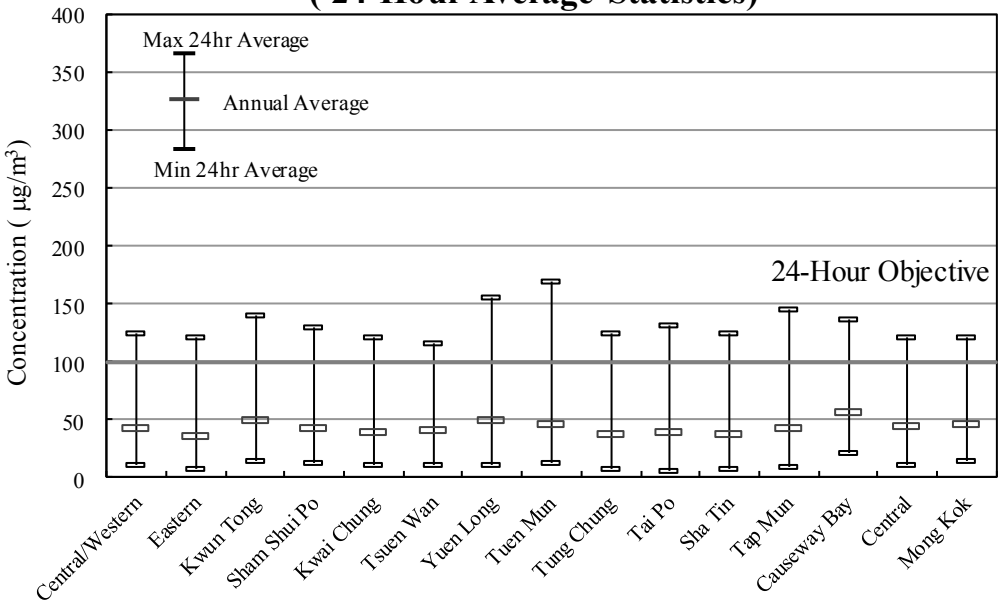
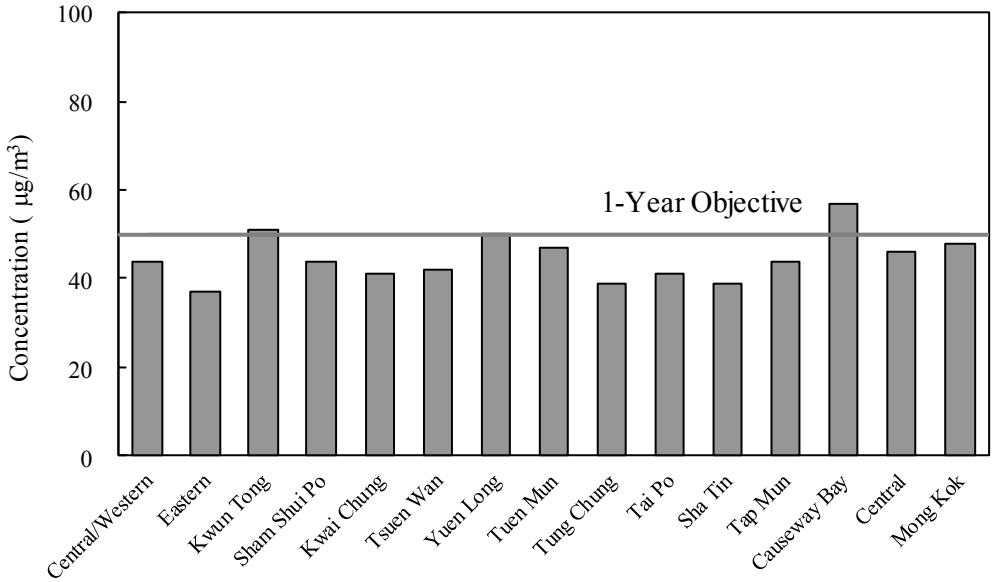


Figure 6b: RSP Monitoring 2014
(Annual Average)



3.2 Fine Suspended Particulates (FSP)

Fine suspended particulates (FSP or $PM_{2.5}$) 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.

In 2014, 10 general stations complied with the 24-hour AQO of FSP (75 µg/m^3 with allowance of nine exceedances per year) out of the 12 general stations. Two general stations (namely Yuen Long and Tuen Mun with no data in November and December) have exceeded the 24-hour AQO of FSP by 18 and 12 times respectively. The highest 24-hour average FSP of 119 µg/m^3 was recorded at both stations. Two roadside stations

complied with the 24-hour AQO of FSP. Non-compliance was observed at the Causeway Bay roadside station with the highest 24-hour average (107 mg/m3) recorded.

As regards the annual AQO limit of FSP (35 μg/m^3), excluding Tuen Mun Station, non-compliance was only observed at Causeway Bay roadside station with the highest annual average (38 μg/m^3) in the year.

Figure 7a: FSP Monitoring 2014
(24-Hour Average Statistics)

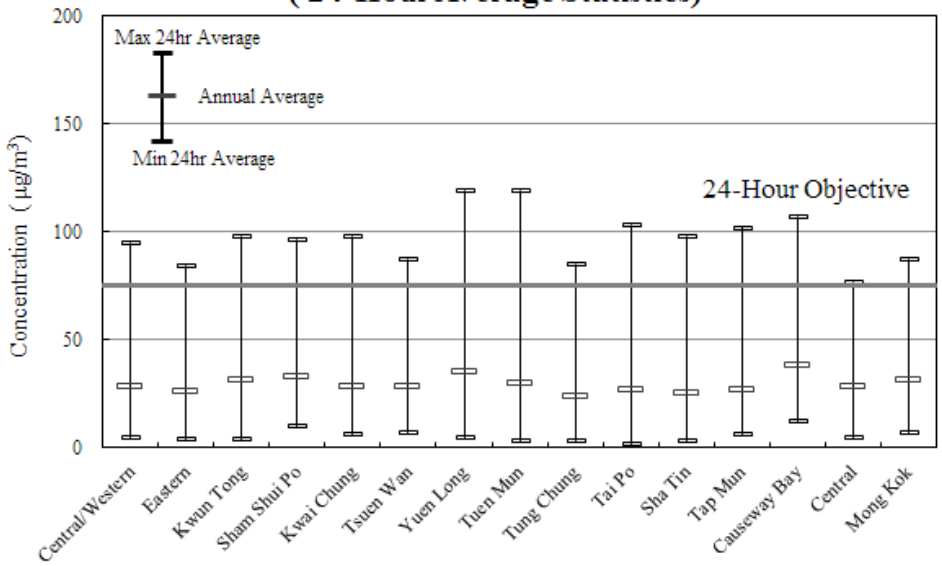
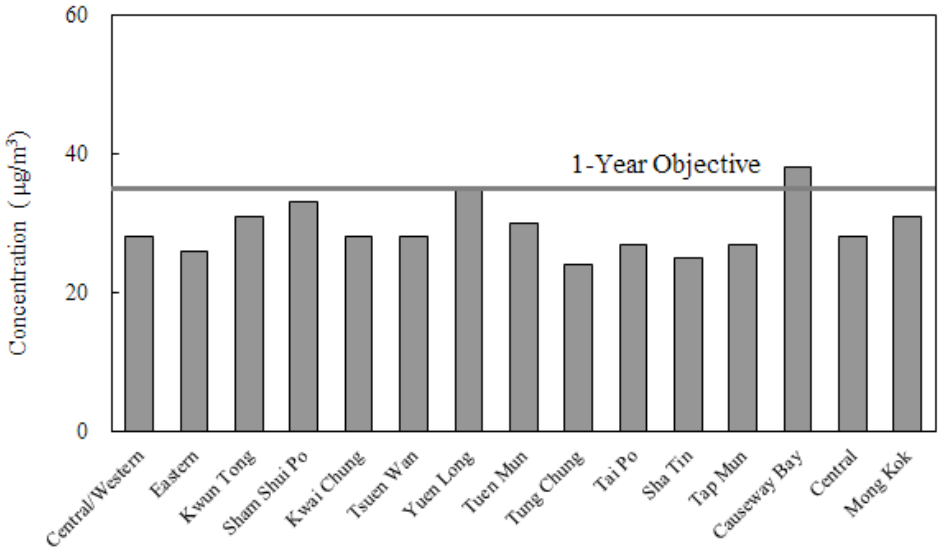


Figure 7b: FSP Monitoring 2014
(Annual Average)



3.3 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 2014. The overall annual averages, ranging from 29 ng/m^3 (at Central/Western, Kwai Chung and Mong Kok) to 35 ng/m^3 (Yuen Long), were well below the AQO limit of 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 2014, eight of them are considered more important in terms of their health impacts and their annual averages are summarised in Table C7. 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, 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 roadside, especially for NO_2.

Figure 8: 2014 Diurnal variations of NO_2

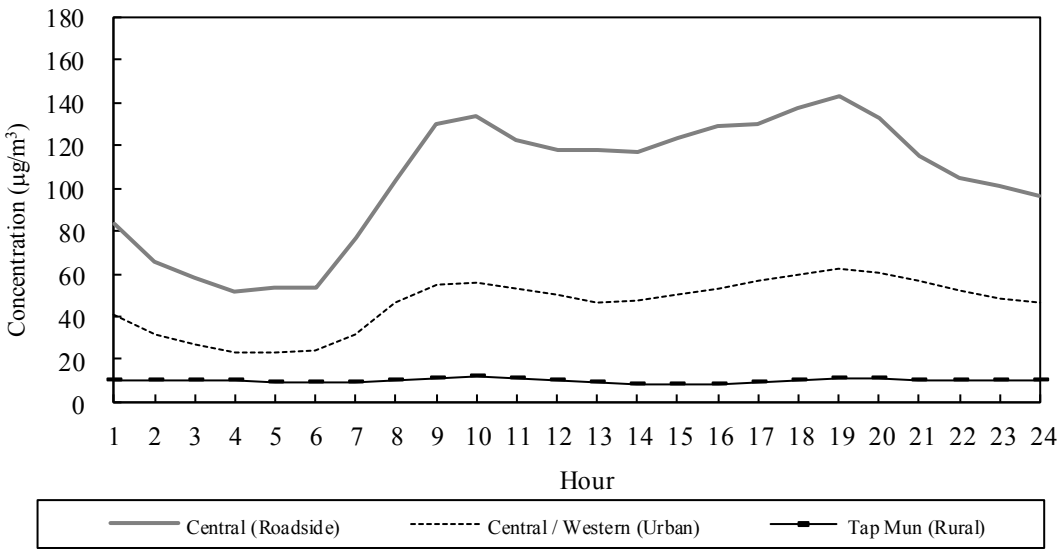


Figure 9: 2014 Diurnal variations of RSP

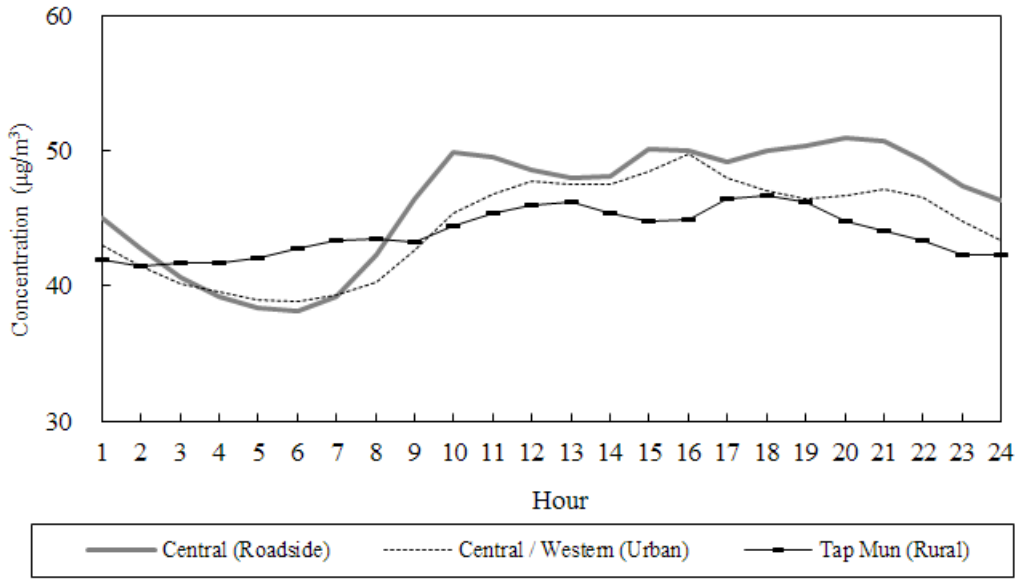
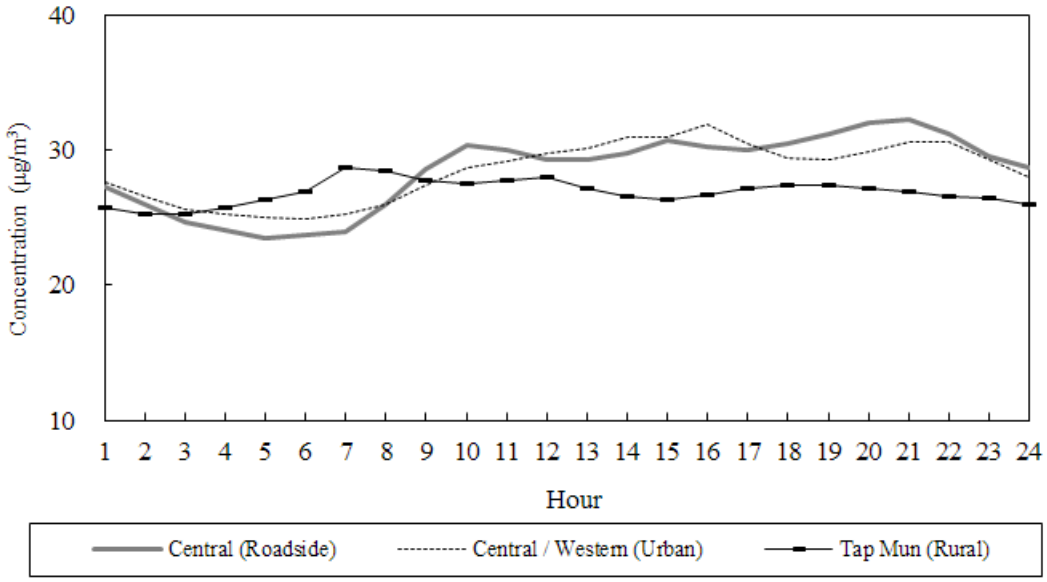
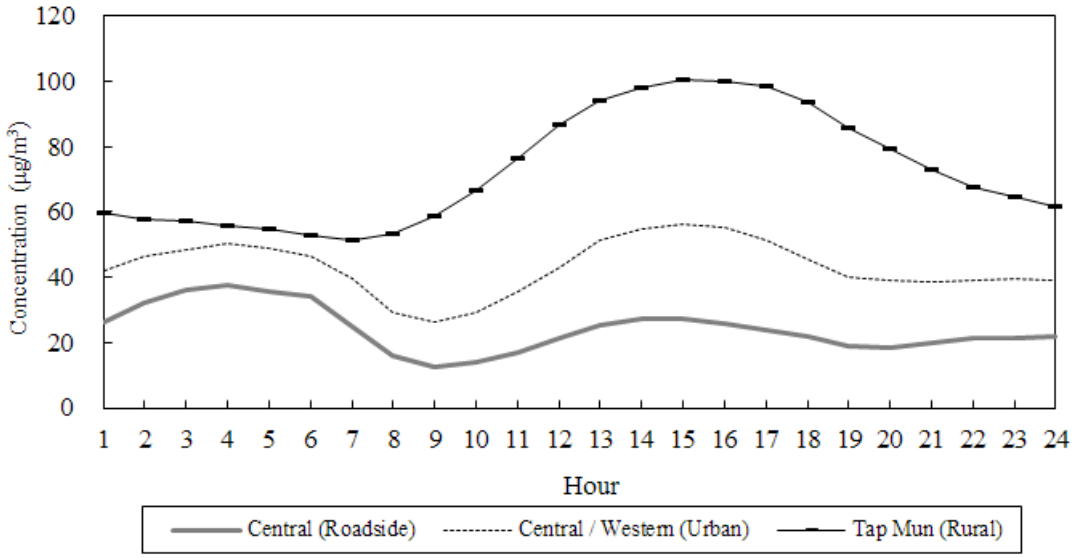


Figure 10: 2014 Diurnal variations of FSP



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.

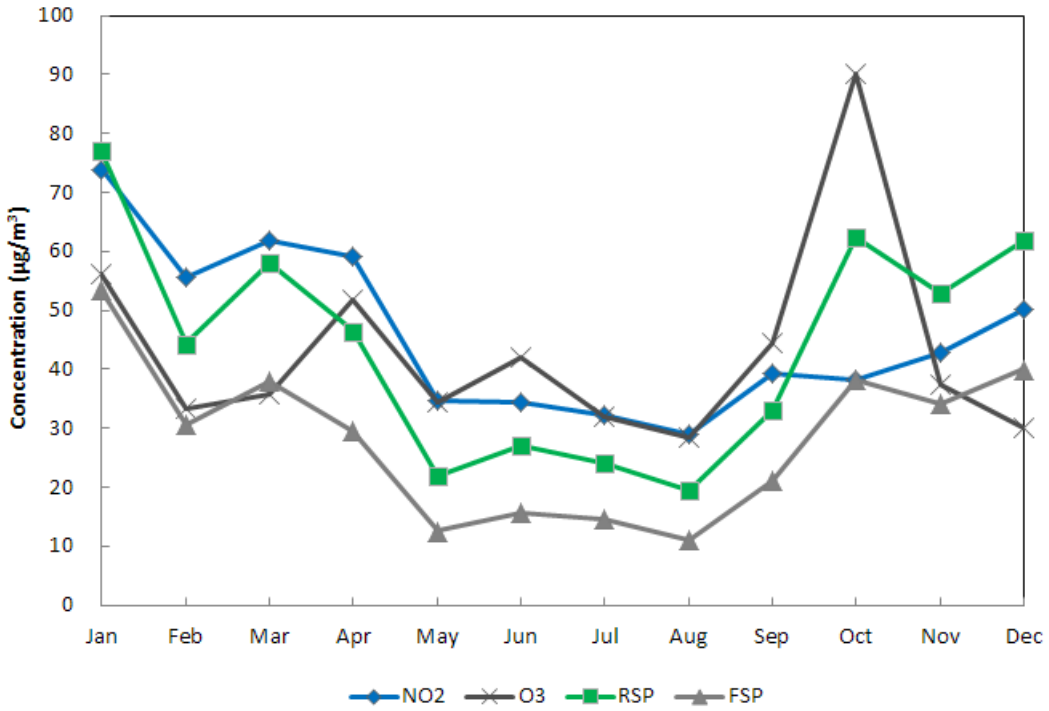
Figure 11: 2014 Diurnal variations of O_3



5.2 Over a Year

Concentrations of NO_2, RSP, FSPand O_3 are in general lower in summer (June to August) 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, O_3, RSP and FSP at Central/Western in 2014



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 and meteorological changes, such as stronger solar radiation which promotes photochemical smog formation or more rainfall that cleans the pollutants from the air, even though the emission levels remain more or less the same. Air quality is primarily affected by emission sources in the long run. Therefore a scientific way to assess air quality changes and the effectiveness of emission control measures is to examine the long-term trend of annual average pollutant concentrations over several years.

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, Yuen Long and Tuen Mun
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

The long term trends of most air pollutants are decreasing except O_3 in the general air and roadside NO_2.

As compared to 2013, the annual average NO_2, SO_2, CO, RSP and FSP concentrations recorded at general stations have decreased by 9%, 15%, 15%, 9% and 6% respectively. Whereas, the annual average O_3 concentration has increased by about 7% at general stations in 2014 as compared to 2013. This increase was likely attributable to the increasing influence of emissions outside Hong Kong and the fluctuation of meteorological conditions, e.g., an increase of sunshine, which would prone to higher photochemical air pollution formation.

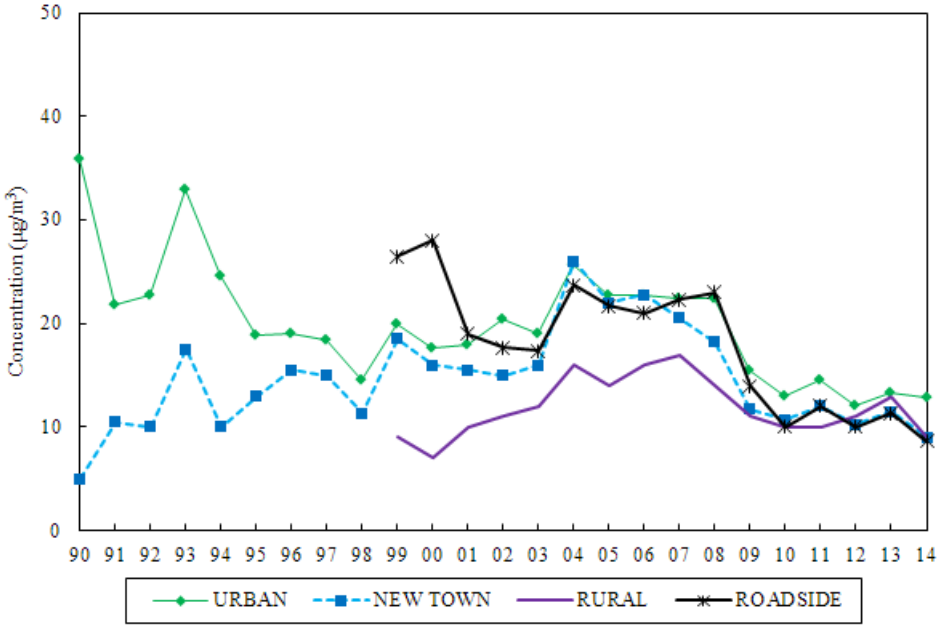
5.3.1 Sulphur Dioxide (SO_2)

Since the implementation of the Air Pollution Control (Fuel Restriction) Regulations in 1990 for restricting sulphur content of industrial fuels, the Air Pollution Control (Motor Vehicle Fuel) Regulations in 1995 for controlling motor vehicle fuel quality and the latest Air Pollution Control (Marine Light Diesel) Regulation in April 2014, SO_2 concentrations in Hong Kong have remained at levels well below AQO limit. 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 2014 (9 μg/m^3) dropped by 67% as compared with the 1999 value (27 μg/m^3).

Figure 13: SO_2 long term trend

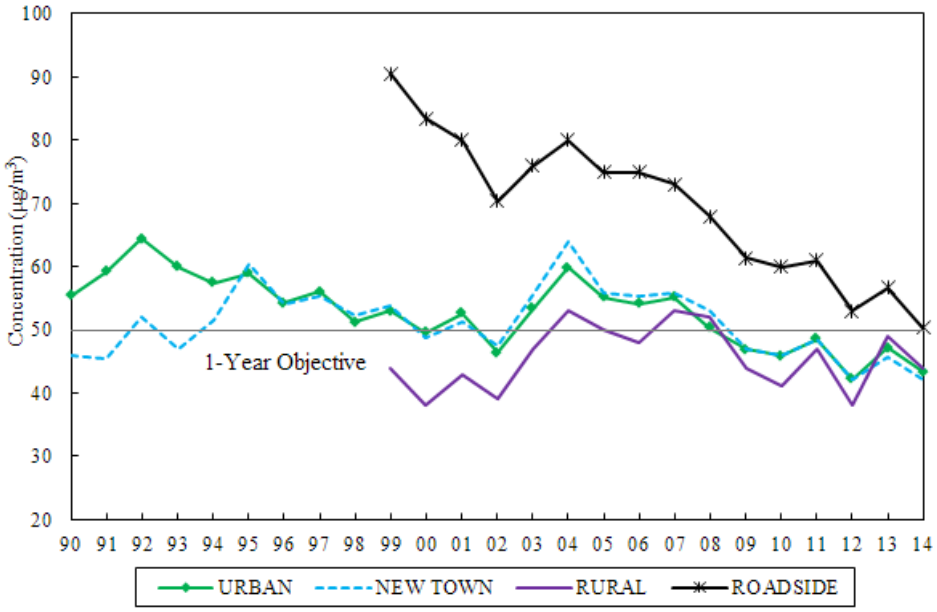


5.3.2 Respirable Suspended Particulates (RSP)

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 which was caused by the increase in regional background RSP levels. The RSP concentrations then dropped to a level below the annual AQO limit from 2009 onwards, 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 2014 had been reduced by 45% when compared with the 1999 value.

Figure 14: RSP long term trend

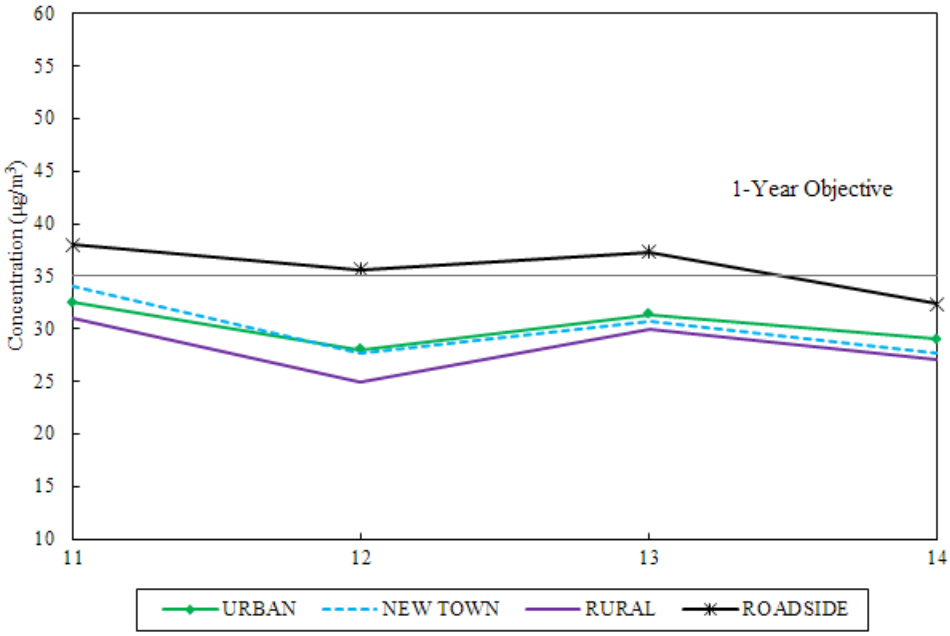


5.3.3 Fine Suspended Particulates (FSP)

We started to monitor FSP at our monitoring stations in 2011. The ambient concentrations of FSP in the territory showed an overall downward trend between 2011 and 2014, reflecting a reduction in regional background FSP levels in the past few years.

In Hong Kong, high level of roadside FSP, 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 FSP concentration at roadside in 2014 had dropped to a level below the annual AQO limit and reduced by about 16% when compared with the 2011 value.

Figure 15: FSP long term trend



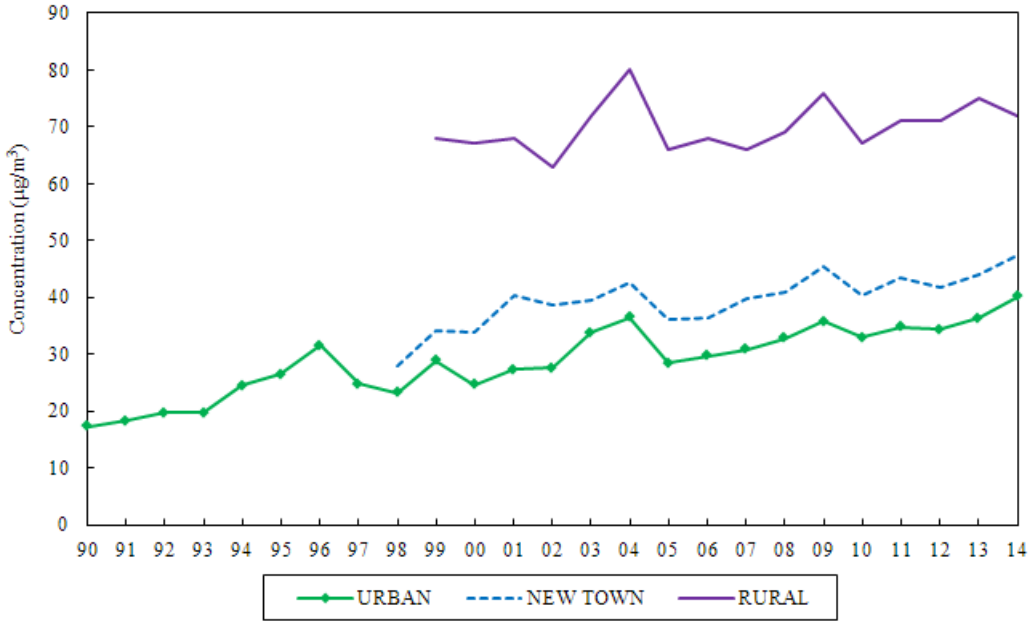
5.3.4 Ozone (O_3)

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, among others, alleviate photochemical smog problem by reducing O_3 levels in the Pearl River Delta region.

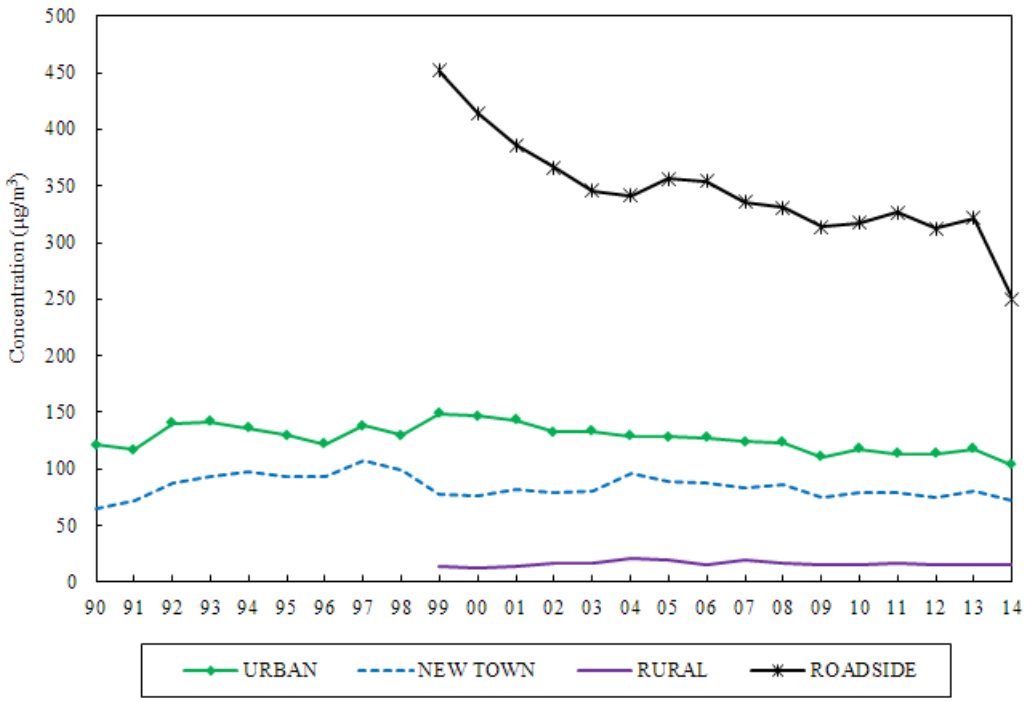
Figure 16: O3 long term trend



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

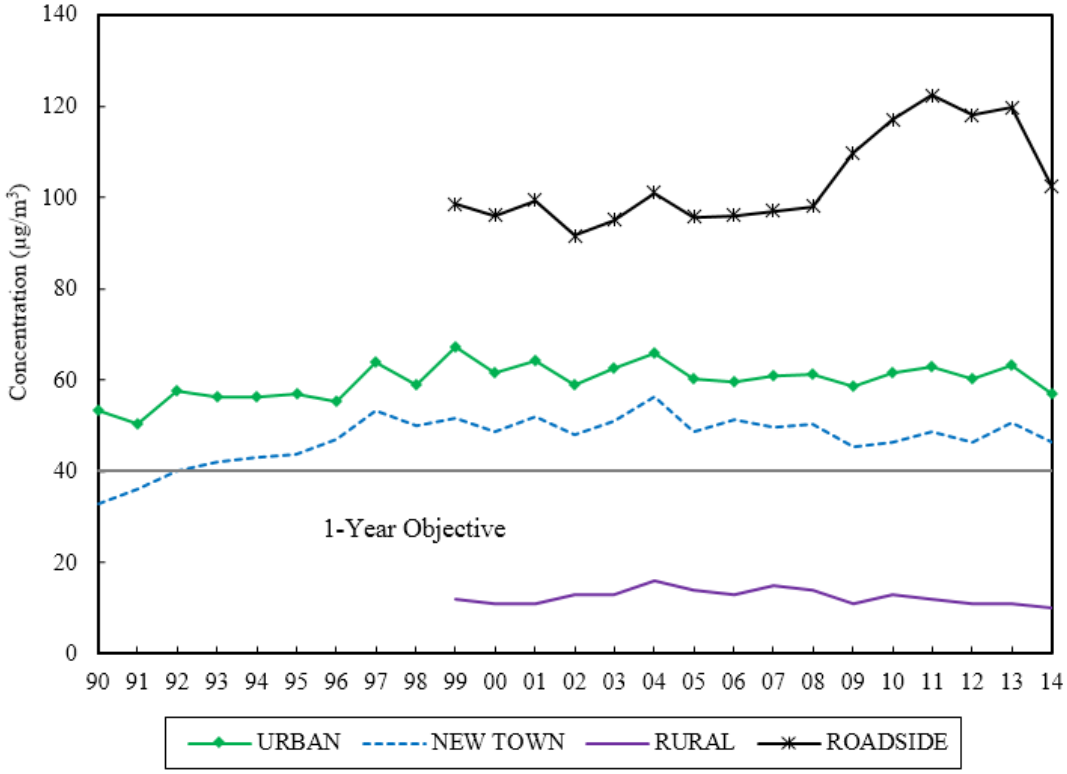
The annual average of NOx in urban areas exhibited a gradual declining trend between 1999 and 2014. During the same period, the roadside NOx concentration showed a more distinct decreasing trend, reflecting a reduction in vehicular NOx emission as a result of vehicle emission control measures implemented over the past decade. The roadside NOx concentration in 2014 was 45% lower than that in 1999.

Figure 17: 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 increasing trend of roadside NO_2 concentrations 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, was, by and large, stabilised in 2013. A slight increase in NO_2 concentrations at roadside by 3% was recorded in 2014 as compared to 1999. To address the problem of the elevated roadside NO_2 pollution, 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, stepping up the control on emissions from petrol and liquefied petroleum gas vehicles and providing incentives to accelerate the phasing out of old and polluting diesel commercial vehicles.

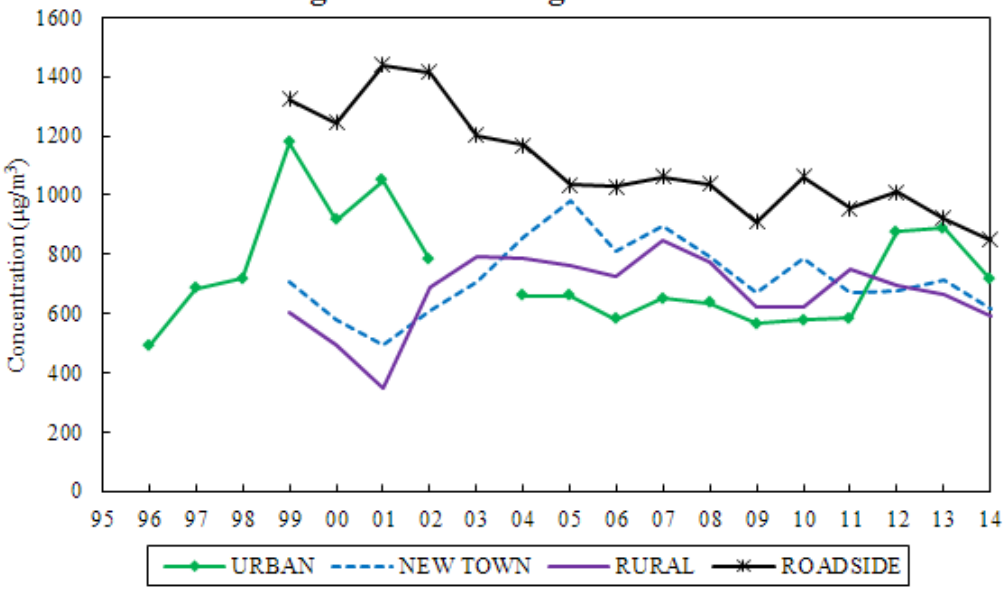
Figure 18: NO_2 long term trend



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.

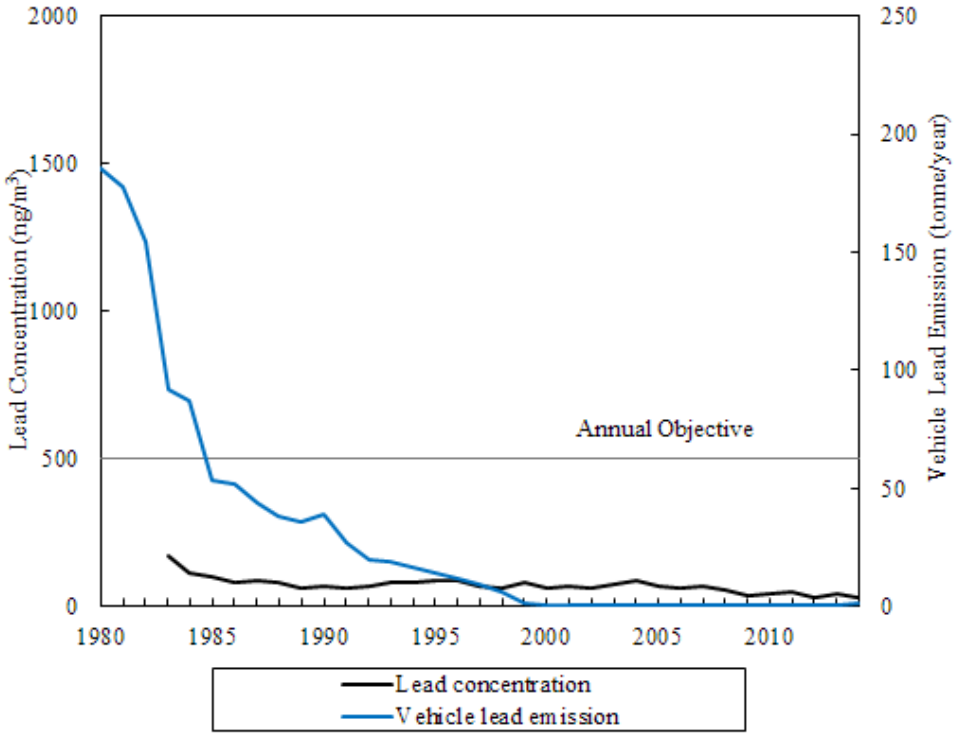
Figure 19: CO long term trend



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 20: Vehicle lead emission and lead concentration



Appendix A

Air Quality Objectives and their Compliance Status

Hong Kong Air Quality Objectives (AQOs) for seven major air pollutants were set at levels to protect public health in 1987. This set of AQOs was reviewed and updated with effect on 1 January 2014. 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 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 mean 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 µg 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 of the monitoring stations in 2014. Tuen Mun general station was not in operation from November and December 2014 and the data monitored were insufficient and unevenly distributed. Even with insufficient data, Tuen Mun Station was non-compliance with 8-hour AQO for O_3 and 24-hr AQO for RSP and FSP. For other stations, seven of the general stations and all 3 roadside stations complied with the 8-hour AQO for O_3. Eight general stations complied with the 1-hour AQO for NO_2 while all the three roadside stations were non-compliance with the 1-hour AQO for NO_2. Five general and two roadside stations were non-compliance with the 24-hour AQO for RSP. 10 general stations complied with the 24-hour AQO for FSP whereas one roadside station was non-compliance with the 24-hour AQO for FSP. Eleven general and all roadside stations complied with the short term AQO for SO_2 and CO.

Table A2: Compliance Status of Short-Term Air Quality Objectives in 2014

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	✓	✓	×	✓	✓	✓	--	--
	Eastern	✓	✓	✓	✓	✓	✓	--	--
	Kwun Tong	✓	×	×	✓	✓	✓	--	--
	Sham Shui Po	✓	×	✓	✓	✓	✓	--	--
	Kwai Chung	✓	×	✓	✓	✓	✓	--	--
	Tsuen Wan	✓	✓	✓	✓	✓	✓	✓	✓
	Yuen Long	×	✓	×	×	✓	✓	✓	✓
	Tuen Mun#	×	NA	×	×	NA	NA	NA	NA
	Tung Chung	×	✓	×	✓	✓	✓	✓	✓
	Tai Po	✓	✓	✓	✓	✓	✓	--	--
	Sha Tin	×	✓	✓	✓	✓	✓	--	--
	Tap Mun	×	✓	×	✓	✓	✓	✓	✓
Roadside Station	Causeway Bay	✓	×	×	×	✓	✓	✓	✓
	Central	✓	×	×	✓	✓	✓	✓	✓
	Mong Kok	✓	×	✓	✓	✓	✓	✓	✓

Notes: "✓" Complied with the AQO "×" Violated the AQO "--" Not measured
"#" Tuen Mun Station – Not in operation from November to December 2014
"NA" Measured data either insufficient or unevenly distributed for compliance assessment

Compliance with the long-term AQO

Table A3 shows the compliance status of the long-term (annual) AQO for all 15 monitoring stations in 2014. All monitoring stations achieved full compliance with the long term AQO for lead in 2014. Non-compliance with the annual AQO for NO_2 was recorded at 14 out of 15 stations. For RSP, 12 out of the 14 stations (excluding Tuen Mun Station with no data in November and December) complied with the annual AQO. The annual AQO for FSP was complied with at 13 out of 14 stations (excluding Tuen Mun Station with no data in November and December) in 2014.

Table A3: Compliance Status of Long-Term (Annual) Air Quality Objectives in 2014

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

Notes: "✓" Complied with the AQO "×" Violated the AQO "--" Not measured
"#" Tuen Mun Station – Not in operation from November to December 2014
"NA"Measured data either insufficient or unevenly distributed for compliance assessment

Appendix B

Air Quality Monitoring Operation

B.1 Network Operation

The air quality monitoring network of 15 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 15 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 Air Quality Health Index ## (AQHI) reporting for individual station
- Monthly release of the AQHI 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

Note: The Air Pollution Index (API) has been replaced by the Air Quality Health Index (AQHI) on 30 December 2013.

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 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 2014, 516 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 2014, 2800 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 -5.7% 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
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
Kwai Chung (Kwai Chung Police Station)	999 Kwai Chung Road, Kwai Chung	Urban : Mixed residential/ commercial/industrial	19m	13m (2 floors)	Jan 99
Tsuen Wan (Princess Alexandra Community Centre)	60 Tai Ho Road, Tsuen Wan	Urban : Mixed residential/ commercial/industrial	21m	17m (4 floors)	Aug 88
Yuen Long (Yuen Long District Branch Offices Bldg.)	269 Castle Peak Road Yuen Long	New Town : Residential	31m	25m (6 floors)	July 95
Tuen Mun (Tuen Mun Public Library)	1 Tuen Hi Road, Tuen Mun	New Town : Residential	31.32m	26.32m (4 floors)	Dec 13
Tung Chung (Tung Chung Health Centre)	6 Fu Tung Street, Tung Chung	New Town : Residential	34.5m	27.5m (4 floors)	Apr 99
Tai Po (Tai Po Govt. Office Bldg.)	1 Ting Kok Road, Tai Po	New Town : Residential	31m	25m (6 floors)	Feb 90
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
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

Table B2: Summary of the Parameters Monitored in the Network (2014)

	PARAMETERS										
STATIONS	SO_2	NO_x	NO	NO_2	CO	O_3	FSP	RSP		TSP	MET [3]
								Cont [1]	Hi-Vol [2]		
Central/ Western	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Eastern	✓			✓		✓	✓	✓			✓
Kwun Tong	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Sham Shui Po	✓	✓	✓	✓		✓	✓	✓			✓
Kwai Chung	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Tsuen Wan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yuen Long	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tuen Mun	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Tung Chung	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tai Po	✓			✓		✓	✓	✓			✓
Sha Tin	✓	✓	✓	✓		✓	✓	✓		✓	✓
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	API 100E, API T100, API T100U, TECO 43A, TECO 43i
NO, NO_2, NO_x	Chemiluminescence	API 200A, API T200, TECO 42i
O_3	UV absorption	API 400, API 400A, API T400, TECO 49i
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, TECO 48C,
TSP	Gravimetric	General Metal Works GS2310, Tisch High Vol+
RSP (PM10)	a) Gravimetric b) Oscillating microbalance c) Beta Attenuation	Graseby Andersen PM10, Tisch PM10+,R&P TEOM Series 1400a-AB-PM10, Thermo Scientific TEOM 1405-DF, Met One BAM 1020, T-API 602 Beta Plus
FSP (PM2.5)	a) Gravimetric b) Oscillating microbalance c) Beta Attenuation	Thermo Scientific Partisol-Plus 2025, R&P TEOM Series 1400a-AB-PM2.5, 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	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 / ATEC 2200	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 / Xontech 924	Bicarbonate Impregnated Filter	Once per month	24 hours

Figure B1: Accuracy of Air Quality Monitoring Network, 2014

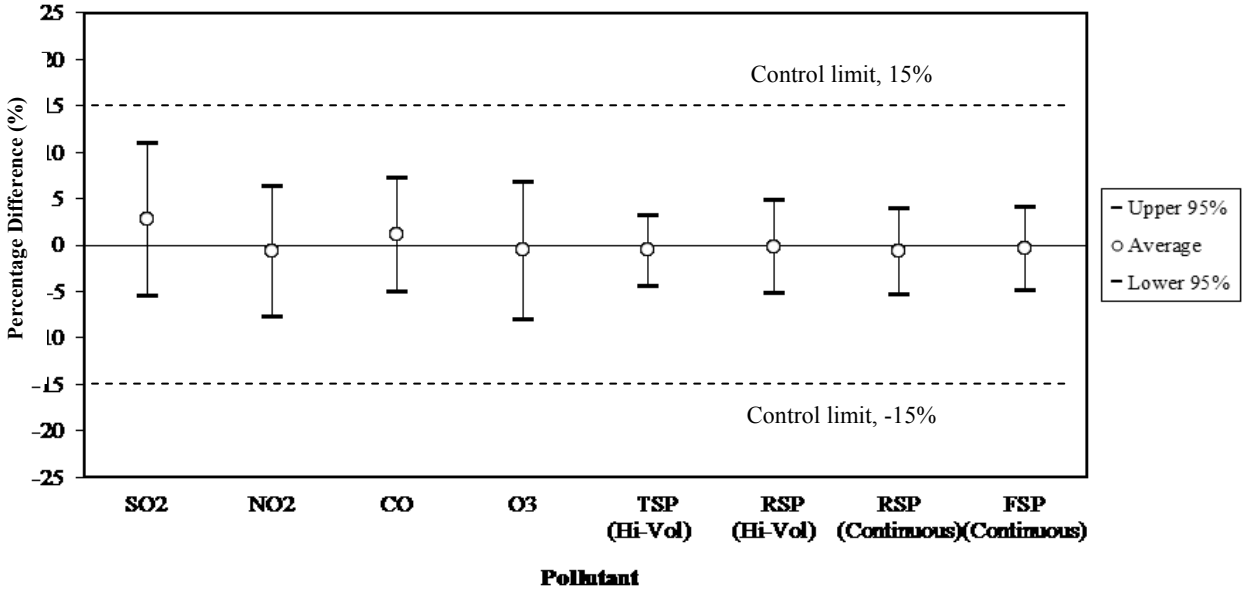
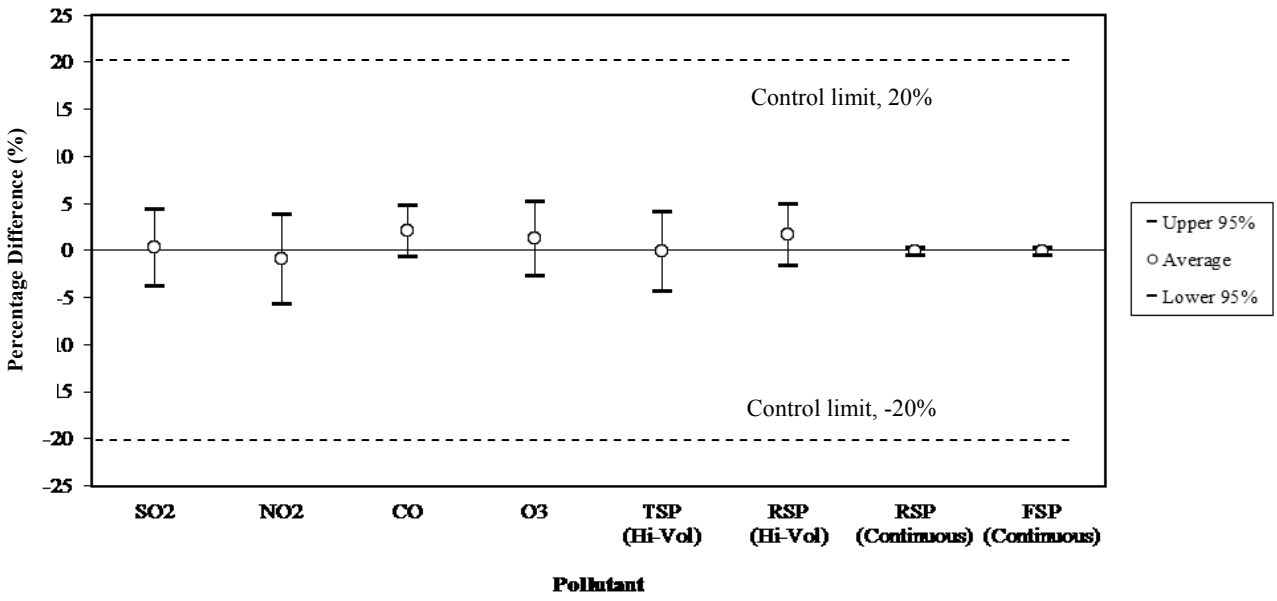


Figure B2: Precision of Air Quality Monitoring Network, 2014



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: 2014 Exceedance of Short Term Limits of Air Quality Objectives

Pollutant: Sulphur Dioxide

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

Station	No. of exceedance	1st High	2nd High	3rd High	4th High
Central/Western	0	202	172	167	160
Eastern	0	156	131	126	123
Kwun Tong	0	147	139	134	125
Sham Shui Po	0	242	236	230	229
Kwai Chung	0	334	317	314	305
Tsuen Wan	0	167	154	150	149
Yuen Long	0	112	102	95	92
Tuen Mun	0	153	150	149	128
Tung Chung	0	91	87	87	86
Tai Po	0	89	86	78	70
Sha Tin	0	164	108	108	107
Tap Mun	0	51	51	48	46
Causeway Bay	0	226	183	170	160
Central	0	190	153	147	140
Mong Kok	0	380	322	266	258

Pollutant: Carbon Monoxide

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

Station	No. of exceedance	1st High
Tsuen Wan	0	2320
Yuen Long	0	2560
Tuen Mun	0	2610
Tung Chung	0	2230
Tap Mun	0	1370
Causeway Bay	0	2700
Central	0	3590
Mong Kok	0	3230

Pollutant: Sulphur Dioxide

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

Station	No. of exceedance	1st High	2nd High	3rd High	4th High
Central/Western	0	44	38	32	32
Eastern	0	30	30	29	27
Kwun Tong	0	65	42	39	38
Sham Shui Po	0	80	74	67	64
Kwai Chung	0	104	89	87	76
Tsuen Wan	0	40	40	37	36
Yuen Long	0	34	31	30	27
Tuen Mun	0	38	34	34	33
Tung Chung	0	41	37	35	35
Tai Po	0	17	17	16	15
Sha Tin	0	39	36	29	28
Tap Mun	0	30	26	26	24
Causeway Bay	0	45	40	37	26
Central	0	47	33	32	29
Mong Kok	0	79	58	55	52

Pollutant: Carbon Monoxide

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

Station	No. of exceedance	1st High
Tsuen Wan	0	1933
Yuen Long	0	2319
Tuen Mun	0	1933
Tung Chung	0	1692
Tap Mun	0	1329
Causeway Bay	0	2419
Central	0	1916
Mong Kok	0	2609

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

Station	No. of exceedance	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	191	190	188	188	186	183	182	181	181	181	178	178	177	176	176	175	174	173	173
Eastern	7	236	232	229	218	204	202	202	198	197	195	186	182	181	181	179	178	177	176	175
Kwun Tong	28	329	312	302	294	292	290	287	272	261	256	249	244	235	234	234	233	232	222	217
Sham Shui Po	19	289	282	278	273	272	266	256	250	244	240	224	222	218	213	209	209	207	206	201
Kwai Chung	39	307	299	289	276	266	259	259	248	247	245	244	240	239	239	237	237	237	237	235
Tsuen Wan	13	282	259	243	226	225	212	209	207	207	207	206	204	201	200	199	195	193	193	192
Yuen Long	4	227	219	209	201	200	199	190	189	185	184	175	175	172	171	171	170	169	168	165
Tuen Mun	10	253	241	238	226	223	219	209	207	204	202	200	192	190	189	188	187	186	185	184
Tung Chung	14	275	262	258	234	231	229	221	217	213	212	212	210	209	208	200	200	199	199	198
Tai Po	0	199	192	184	174	170	167	156	156	154	153	152	151	150	150	148	147	147	147	145
Sha Tin	6	245	243	233	232	224	203	190	186	182	179	179	176	176	175	173	173	172	172	171
Tap Mun	0	94	93	83	81	73	72	71	70	70	70	68	65	62	62	62	62	62	61	61
Causeway Bay	437	429	428	395	365	364	361	357	351	351	350	349	348	347	347	344	344	342	342	340
Central	375	388	384	371	369	368	351	350	346	345	344	327	324	320	319	317	316	315	313	312
Mong Kok	163	355	340	335	324	320	318	315	315	312	311	311	307	304	296	294	294	294	288	288

Table C1 (Cont.): 2014 Exceedance of Short Term Limits of Air Quality Objectives

Pollutant: Ozone (Daily maximum 8-hour limit = 160 μg/m³ ; allowable no. of exceedance = 9)

Station	No. of exceedance	1st High	2nd High	3rd High	4th High	5th High	6th High	7th High	8th High	9th High	10th High
Central/Western	8	237	176	173	171	171	170	165	161	147	147
Eastern	2	230	178	153	151	148	148	138	137	135	132
Kwun Tong	2	207	171	151	149	147	139	137	134	134	133
Sham Shui Po	2	208	165	160	157	150	146	144	140	136	132
Kwai Chung	1	245	135	134	132	130	128	127	123	120	115
Tsuen Wan	4	279	180	177	165	155	144	144	142	142	142
Yuen Long	13	304	229	221	212	203	190	187	186	180	177
Tuen Mun	12	260	209	202	198	188	173	172	171	171	168
Tung Chung	18	278	261	236	227	214	193	192	191	188	175
Tai Po	5	211	191	178	168	162	157	149	148	145	144
Sha Tin	12	229	209	206	198	189	175	174	173	166	164
Tap Mun	26	285	235	226	200	196	196	192	184	183	181
Causeway Bay	0	127	124	116	116	111	109	106	100	98	97
Central	1	202	156	146	143	141	135	124	120	119	117
Mong Kok	0	113	111	108	106	105	104	99	99	96	95

Pollutant: Respirable Suspended Particulates (PM_{10}) (24-hour limit = 100 μg/m³ ; allowable no. of exceedance = 9)

Station	No. of exceedance	1st High	2nd High	3rd High	4th High	5th High	6th High	7th High	8th High	9th High	10th High
Central/Western	11	125	123	121	118	112	108	107	105	105	104
Eastern	3	121	113	111	99	98	96	95	93	93	90
Kwun Tong	13	140	139	138	137	129	127	124	123	114	110
Sham Shui Po	8	130	127	127	120	117	106	105	102	100	100
Kwai Chung	5	121	120	117	109	106	95	94	93	92	91
Tsuen Wan	4	116	113	110	102	100	96	94	91	90	88
Yuen Long	21	156	144	137	136	134	134	132	129	125	124
Tuen Mun	17	169	148	144	143	139	136	131	131	129	125
Tung Chung	10	125	124	120	116	113	111	110	103	103	101
Tai Po	9	131	118	116	114	111	105	104	103	101	92
Sha Tin	7	125	117	109	108	102	101	101	100	97	93
Tap Mun	11	146	142	138	134	129	124	117	112	103	102
Causeway Bay	13	137	135	135	125	116	116	115	113	112	109
Central	11	121	120	118	114	114	108	106	106	104	103
Mong Kok	5	121	116	115	113	112	100	100	100	98	97

Pollutant: Fine Suspended Particulates ($PM_{2.5}$) (24-hour limit = 75 μg/m³ ; allowable no. of exceedance = 9)

Station	No. of exceedance	1st High	2nd High	3rd High	4th High	5th High	6th High	7th High	8th High	9th High	10th High
Central/Western	6	95	93	86	83	81	76	73	72	70	70
Eastern	2	84	83	72	66	65	64	60	59	56	55
Kwun Tong	7	98	98	94	89	84	82	76	75	71	68
Sham Shui Po	4	96	93	89	82	74	74	74	74	70	68
Kwai Chung	4	98	96	94	82	73	73	70	68	68	62
Tsuen Wan	2	87	82	75	68	68	66	63	63	60	59
Yuen Long	18	119	103	101	98	96	95	92	89	87	86
Tuen Mun	12	119	104	101	98	93	92	91	90	86	83
Tung Chung	3	85	80	77	74	70	68	68	66	66	65
Tai Po	6	103	89	86	80	80	76	72	71	66	63
Sha Tin	6	98	89	77	77	76	76	69	68	68	67
Tap Mun	7	102	99	90	85	82	76	76	70	65	65
Causeway Bay	10	107	104	94	94	85	84	83	83	78	77
Central	1	77	74	72	70	68	68	67	63	63	60
Mong Kok	5	87	85	81	77	76	73	73	71	65	64

Notes:

1. All concentration units are in microgram per cubic metre (μg/m³).
2. Shaded no. of exceedance are above their respective allowable limits.
3. Shaded concentrations are above their respective limits of air quality objectives.

Table C2: 2014 Monthly and Annual Averages of Air Pollutants

Pollutant: Sulphur Dioxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	14	7	10	7	5	8	9	7	10	8	8	12	9
Eastern	11	5	6	6	4	5	7	5	8	7	6	8	6
Kwun Tong	19	12	12	7	6	8	11	10	12	12	9	11	11
Sham Shui Po	22	16	16	16	12	14	18	13	13	11	10	12	14
Kwai Chung	19	13	14	17	29	30	32	33	23	12	14	16	21
Tsuen Wan	21	14	16	14	14	15	15	14	14	12	12	16	15
Yuen Long	19	11	10	10	8	9	8	9	10	9	9	11	11
Tuen Mun	19	12	15	14	7	15	18	19	16	11	--	--	15 *
Tung Chung	26	16	15	13	9	7	8	7	10	12	14	18	13
Tai Po	7	4	4	3	3	3	5	4	4	3	2	4	4
Sha Tin	14	8	9	8	8	7	9	11	8	8	9	12	9
Tap Mun	14	8	10	10	9	9	10	11	7	7	7	11	9
Causeway Bay	12	5	10	7	4	5	7	5	7	6	6	10	7
Central	13	8	11	8	7	8	8	6	8	8	8	14	9
Mong Kok	14	11	13	12	8	8	12	8	10	8	6	11	10

Pollutant: Nitrogen Oxides

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	97	92	121	87	54	51	52	49	52	42	52	66	68
Kwun Tong	119	103	111	79	135	125	125	127	94	61	67	91	103
Sham Shui Po	147	126	155	123	108	96	99	98	94	95	103	102	112
Kwai Chung	149	121	158	130	159	152	148	146	140	109	110	127	138
Tsuen Wan	124	101	146	101	103	90	91	94	89	75	84	95	99
Yuen Long	136	87	91	78	66	68	73	73	80	70	86	109	85
Tuen Mun	145	110	113	99	68	65	62	65	64	64	--	--	86 *
Tung Chung	116	86	86	78	36	39	44	41	53	54	71	89	66
Sha Tin	101	58	62	56	59	67	68	70	67	56	56	73	66
Tap Mun	20	16	19	17	18	15	11	14	12	15	12	17	15
Causeway Bay	335	270	312	236	247	273	271	257	265	82	121	242	242
Central	318	272	281	235	221	223	236	235	232	173	281	303	251
Mong Kok	317	274	313	298	287	287	281	261	241	122	191	215	257

Pollutant: Nitrogen Dioxide (Annual limit = 40 μg/m³)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	74	56	62	59	35	34	32	29	39	38	43	50	46
Eastern	69	54	62	61	42	41	41	39	47	52	53	57	52
Kwun Tong	69	51	53	48	54	57	60	57	55	46	45	53	54
Sham Shui Po	91	65	73	75	56	53	51	48	56	71	70	71	65
Kwai Chung	88	60	64	69	57	64	62	54	72	78	68	73	67
Tsuen Wan	83	55	63	59	46	48	49	46	56	59	58	63	57
Yuen Long	78	46	56	53	39	41	42	39	49	55	58	67	52
Tuen Mun	88	56	60	63	40	41	39	37	46	55	--	--	53 *
Tung Chung	83	52	51	50	25	27	27	22	38	46	53	66	45
Tai Po	66	42	45	43	39	39	39	35	44	47	47	52	45
Sha Tin	63	37	39	37	40	42	44	42	47	46	40	51	44
Tap Mun	13	8	12	10	10	8	9	10	9	9	10	15	10
Causeway Bay	156	107	119	110	93	104	94	88	108	66	79	114	103
Central	145	102	105	111	81	85	83	81	102	98	127	129	104
Mong Kok	137	101	109	124	91	91	87	83	98	86	95	101	100

Pollutant: Carbon Monoxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tsuen Wan	1079	701	711	798	607	565	467	487	815	783	715	850	716
Yuen Long	1028	731	758	730	532	505	429	472	617	744	749	919	684
Tuen Mun	890	720	645	613	350	311	287	314	566	628	--	--	534 *
Tung Chung	664	583	505	480	261	420	448	438	547	738	732	733	546
Tap Mun	643	576	610	528	572	557	646	546	595	648	611	530	589
Causeway Bay	1241	940	1150	755	557	686	629	556	647	578	699	818	771
Central	900	833	987	1011	724	758	585	594	713	769	999	959	819
Mong Kok	1325	864	1025	1003	801	751	939	865	728	922	1049	1156	954

Table C2 (Cont.): 2014 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	56	33	36	52	34	42	32	28	45	90	37	30	43
Eastern	51	31	32	48	36	42	30	27	43	80	46	42	43
Kwun Tong	61	39	44	61	28	30	20	16	40	93	61	53	46
Sham Shui Po	44	29	30	43	24	29	21	17	36	72	40	38	35
Kwai Chung	48	34	37	45	21	25	15	12	26	71	49	44	36
Tsuen Wan	51	36	37	49	25	29	21	18	36	75	47	40	39
Yuen Long	46	35	38	50	33	37	28	24	45	79	42	34	41
Tuen Mun	38	25	30	40	29	45	40	29	48	81	--	--	41 *
Tung Chung	50	38	45	51	42	47	36	29	48	87	46	37	46
Tai Po	51	47	50	60	38	43	39	38	53	87	60	58	52
Sha Tin	61	48	54	68	38	39	30	24	44	91	60	52	51
Tap Mun	97	68	74	88	54	55	50	39	68	110	86	79	72
Causeway Bay	20	15	18	27	14	13	8	8	12	66	34	22	22
Central	28	21	24	31	18	15	14	15	22	62	20	21	24
Mong Kok	23	13	13	16	9	12	8	8	16	57	23	21	18

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

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	77	44	58	47	22	27	24	20	33	62	53	62	44
Eastern	66	35	45	40	19	23	20	16	29	53	45	56	37
Kwun Tong	89	48	57	55	33	34	32	26	41	69	57	67	51
Sham Shui Po	77	40	51	48	31	35	32	28	38	62	42	50	44
Kwai Chung	70	36	47	41	28	30	28	23	36	57	45	56	41
Tsuen Wan	69	36	48	40	26	32	30	24	36	59	47	53	42
Yuen Long	94	49	54	46	25	30	28	21	38	67	60	82	50
Tuen Mun	99	51	56	47	24	30	29	23	42	74	--	--	47 *
Tung Chung	76	38	44	35	16	22	21	15	29	56	52	67	39
Tai Po	75	40	47	40	20	26	27	19	34	57	48	58	41
Sha Tin	70	35	45	37	21	25	24	18	31	55	47	57	39
Tap Mun	84	46	54	43	23	25	21	16	33	61	50	66	44
Causeway Bay	87	51	69	62	40	46	43	37	52	64	57	70	57
Central	78	47	65	51	28	33	27	21	36	54	48	58	46
Mong Kok	71	45	58	54	32	36	33	28	42	63	56	63	48

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

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central/Western	53	31	38	29	13	16	14	11	21	38	34	40	28
Eastern	43	24	30	26 *	--	15	13	9	20	35	31	35	26 *
Kwun Tong	57	32	39	33	18	21	19	14	23	42	36	39	31
Sham Shui Po	53	30	36	38	24	27	25	22	31	46	32	36	33
Kwai Chung	52	27	33	27	17	20	18	15	25	38	32	37	28
Tsuen Wan	46	26	33	28	16	20	19	14	25	38	32	35	28
Yuen Long	65	34	37	32	15	21	19	13	26	47	45	59	35
Tuen Mun	66	36	37	30	11	18	17	11	26	48	--	--	30 *
Tung Chung	50	25	27	22	9	13	12	8	19	33	32	41	24
Tai Po	52	28	32	27	12	15	17	10	22	37	32	38	27
Sha Tin	50	24	29	24	12	15	14	10	21	36	31	39	25
Tap Mun	54	27	31	27	13	15	15	11	23	32	35	39	27
Causeway Bay	60	36	47	43	27	31	29	23	35	40	37	46	38
Central	47	30	40	32	17	19	16	12	23	35	32	38	28
Mong Kok	44	27	34 *	37	20	24	21	18	29	42	39	43	31

Notes:

1. All concentration units are in microgram per cubic metre (μg/m³).
2. Shaded annual averages are above their respective limits of air quality objectives.
3. Monthly average marked with asterisk denotes the data for calculation could not meet the 66% data capture target.
4. Annual average marked with asterisk denotes the data for calculation did not evenly distribute in the year.
5. Owing to maintenance, monthly averages were not available for PM2.5 at Eastern monitoring station in May 2014 and for all pollutants at Tuen Mun monitoring station in November and December 2014.

Table C3: 2014 Hourly Statistics of Air Pollutants

Pollutant: Sulphur Dioxide

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	8658	98.8	2	4	6	10	18	26	35	49	76	9	143
Eastern	8630	98.5	1	2	4	8	13	20	27	38	54	6	106
Kwun Tong	8588	98.0	4	6	9	13	19	25	34	44	72	11	118
Sham Shui Po	8544	97.5	5	7	10	15	26	40	61	90	136	14	197
Kwai Chung	8618	98.4	4	6	11	27	55	71	86	105	148	21	284
Tsuen Wan	8590	98.1	7	8	11	17	27	35	45	57	76	15	130
Yuen Long	8537	97.5	5	6	8	13	19	24	29	36	48	11	87
Tuen Mun	7307	83.4	5	8	13	18	26	32	39	49	65	15	89
Tung Chung	8568	97.8	6	7	10	16	23	29	35	45	58	13	82
Tai Po	8627	98.5	1	2	2	5	8	12	15	19	28	4	65
Sha Tin	8594	98.1	3	5	7	11	18	25	31	41	63	9	106
Tap Mun	8535	97.4	5	7	9	11	15	18	21	27	34	9	41
Causeway Bay	8554	97.6	2	3	5	8	15	21	29	40	61	7	118
Central	8636	98.6	3	4	6	10	19	26	35	45	69	9	118
Mong Kok	8639	98.6	3	4	6	10	20	31	47	75	118	10	301

Pollutant: Nitrogen Oxides

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	8660	98.9	15	27	49	81	133	193	265	379	582	68	1031
Kwun Tong	8580	97.9	27	43	74	134	219	274	346	449	686	103	899
Sham Shui Po	8611	98.3	33	65	99	135	183	246	333	475	713	112	963
Kwai Chung	8615	98.3	41	75	117	176	248	301	363	482	825	138	1753
Tsuen Wan	8574	97.9	30	59	84	118	170	230	291	391	602	99	1251
Yuen Long	8524	97.3	33	48	72	104	149	190	239	305	431	85	681
Tuen Mun	7299	83.3	25	42	68	107	165	216	269	349	493	86	744
Tung Chung	8541	97.5	14	27	49	88	140	175	216	273	387	66	534
Sha Tin	8570	97.8	19	27	48	81	142	191	234	293	405	66	538
Tap Mun	8522	97.3	6	10	13	19	26	33	43	56	83	15	204
Causeway Bay	8592	98.1	67	110	200	337	482	575	657	768	993	242	1345
Central	8637	98.6	69	127	216	329	471	584	690	848	1061	251	1835
Mong Kok	8594	98.1	76	142	261	342	419	484	560	676	918	257	1281

Pollutant: Nitrogen Dioxide (1-hour limit = 200 $\mu g/m^3$; allowable no. of exceedance = 18)

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles---------->									Arithmetic mean	Highest 1-hour	No. of exceed -ance
			10	25	50	75	90	95	97.5	99	99.8			
Central/Western	8660	98.9	14	23	41	62	86	103	120	141	173	46	191	0
Eastern	8613	98.3	21	33	49	66	82	95	112	131	176	52	236	7
Kwun Tong	8580	97.9	21	32	49	69	90	111	134	164	221	54	329	28
Sham Shui Po	8611	98.3	28	41	61	85	105	119	132	154	205	65	289	19
Kwai Chung	8615	98.3	30	45	63	83	108	130	149	178	237	67	307	39
Tsuen Wan	8574	97.9	24	38	53	71	93	110	126	150	193	57	282	13
Yuen Long	8524	97.3	25	34	47	65	85	99	116	136	168	52	227	4
Tuen Mun	7299	83.3	20	31	46	70	94	111	128	153	187	53	253	10 *
Tung Chung	8541	97.5	10	20	38	62	89	108	126	149	199	45	275	14
Tai Po	8627	98.5	20	29	40	55	75	90	102	117	146	45	199	0
Sha Tin	8570	97.8	16	24	38	55	82	101	120	139	172	44	245	6
Tap Mun	8522	97.3	3	5	8	13	18	24	30	43	61	10	94	0
Causeway Bay	8592	98.1	41	64	96	132	172	201	228	266	342	103	429	437
Central	8637	98.6	41	64	99	136	172	195	222	258	313	104	388	375
Mong Kok	8594	98.1	46	70	97	126	155	174	192	218	288	100	355	163

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

Station	No. of hourly data	Data capture rate (%)	<----------Percentiles---------->									Arithmetic mean	Highest 1-hour	No. of exceed -ance
			10	25	50	75	90	95	97.5	99	99.8			
Tsuen Wan	8581	98.0	430	520	690	860	1040	1150	1260	1420	1790	716	2320	0
Yuen Long	8546	97.6	390	490	640	820	1030	1170	1300	1540	1889	684	2560	0
Tuen Mun	7334	83.7	220	320	510	680	870	1000	1140	1380	1750	534	2610	0 *
Tung Chung	8571	97.8	310	380	490	690	860	980	1080	1230	1420	546	2230	0
Tap Mun	8521	97.3	390	480	560	690	790	890	1010	1100	1230	589	1370	0
Causeway Bay	8515	97.2	410	530	700	940	1240	1430	1590	1800	2199	771	2700	0
Central	8631	98.5	480	610	790	990	1190	1320	1443	1620	1937	819	3590	0
Mong Kok	8636	98.6	630	760	920	1100	1310	1450	1590	1810	2315	954	3230	0

Table C3 (Cont.): 2014 Hourly Statistics of Air Pollutants

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	8641	98.6	5	17	35	61	93	109	126	145	201	43	324
Eastern	8630	98.5	12	23	36	58	79	96	113	131	174	43	300
Kwun Tong	8560	97.7	5	13	38	73	97	112	123	137	160	46	304
Sham Shui Po	8554	97.6	5	11	27	52	78	95	109	130	184	35	311
Kwai Chung	8603	98.2	4	8	26	56	81	96	107	121	150	36	343
Tsuen Wan	8581	98.0	7	12	29	59	84	100	115	140	190	39	351
Yuen Long	8523	97.3	6	12	30	58	90	109	137	176	257	41	389
Tuen Mun	7336	83.7	6	16	30	55	88	109	137	176	259	41	328
Tung Chung	8554	97.6	6	16	36	67	98	118	146	178	275	46	355
Tai Po	8627	98.5	15	25	45	73	99	113	129	149	189	52	286
Sha Tin	8550	97.6	4	13	40	81	112	129	148	167	217	51	327
Tap Mun	8513	97.2	21	40	66	99	130	149	165	183	225	72	346
Causeway Bay	8447	96.4	2	4	11	32	57	73	87	104	126	22	173
Central	8614	98.3	3	7	14	32	61	81	98	121	149	24	298
Mong Kok	8453	96.5	3	5	10	24	47	64	77	94	125	18	151

Pollutant: Respirable Suspended Particulates (PM_{10})

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	8437	96.3	14	21	41	60	79	95	112	131	163	44	214
Eastern	8505	97.1	11	17	34	51	68	83	95	109	142	37	167
Kwun Tong	8452	96.5	19	29	47	66	87	104	119	139	178	51	225
Sham Shui Po	8252	94.2	22	28	39	55	73	89	105	126	166	44	226
Kwai Chung	8505	97.1	17	25	37	53	71	86	101	117	153	41	187
Tsuen Wan	8527	97.3	16	24	37	54	74	88	102	121	149	42	293
Yuen Long	8497	97.0	16	24	43	67	94	112	130	151	183	50	258
Tuen Mun	7236	82.6	16	22	39	64	90	112	135	155	205	47	386
Tung Chung	8689	99.2	11	16	33	54	78	95	115	134	175	39	247
Tai Po	8575	97.9	14	21	37	55	75	88	104	124	160	41	242
Sha Tin	8541	97.5	13	20	35	52	71	85	99	115	149	39	203
Tap Mun	8420	96.1	13	20	39	61	82	97	112	136	163	44	237
Causeway Bay	8472	96.7	27	39	53	70	89	104	119	141	182	57	214
Central	8329	95.1	16	26	43	61	80	96	112	129	156	46	201
Mong Kok	8514	97.2	20	29	45	63	80	92	105	126	165	48	215

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

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	8439	96.3	7	12	26	39	53	64	78	95	122	28	164
Eastern	7176	81.9	6	11	25	36	48	56	65	76	99	26	123
Kwun Tong	8452	96.5	9	16	28	42	55	66	79	93	122	31	155
Sham Shui Po	8422	96.1	17	22	30	41	53	64	76	92	121	33	151
Kwai Chung	8515	97.2	10	16	25	37	50	62	75	91	124	28	150
Tsuen Wan	8338	95.2	10	15	25	37	49	59	70	83	104	28	163
Yuen Long	8521	97.3	9	15	30	48	66	79	95	108	132	35	160
Tuen Mun	7238	82.6	7	11	25	43	59	77	94	108	143	30	235
Tung Chung	8664	98.9	5	9	19	34	50	61	75	90	121	24	169
Tai Po	8579	97.9	7	12	24	37	51	62	75	90	120	27	162
Sha Tin	8541	97.5	6	11	22	35	49	60	72	86	118	25	143
Tap Mun	8506	97.1	8	12	23	36	52	62	72	91	110	27	129
Causeway Bay	8472	96.7	16	25	35	48	62	74	87	106	139	38	172
Central	8107	92.5	8	15	26	38	52	61	71	82	106	28	156
Mong Kok	8037	91.7	11	17	29	42	55	64	75	90	121	31	160

Notes:

1. All concentration units are in microgram per cubic metre ($\mu g/m^3$).
2. Shaded no. of exceedance are above their respective allowable limits.
3. No. of exceedance marked with asterisk denotes the data for calculation could not meet the 90% data capture target in the year.

Table C4: 2014 Diurnal Variations of Air Pollutants

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	9	8	8	9	8	8	9	10	11	11	10	10	9	9	8	9	8	8	9	9	9	8	8	8
Eastern	6	6	6	6	6	6	6	7	7	7	7	7	6	6	6	6	7	7	7	7	8	7	6	6
Kwun Tong	10	10	10	13	11	11	10	11	11	11	11	11	11	10	10	11	11	11	11	10	11	11	10	10
Sham Shui Po	15	15	14	17	14	14	15	14	15	15	15	14	13	13	13	13	13	13	15	15	15	15	15	15
Kwai Chung	21	20	19	19	17	17	17	17	17	19	21	21	22	23	24	24	26	27	27	25	22	21	21	21
Tsuen Wan	13	13	13	14	12	12	12	12	14	16	17	17	17	17	17	17	18	17	16	15	15	14	14	14
Yuen Long	10	10	9	14	10	9	9	10	11	11	11	10	10	11	11	11	11	11	11	11	11	11	11	10
Tuen Mun	14	14	14	12	12	12	12	14	15	16	15	15	15	16	16	16	16	15	15	15	15	15	15	15
Tung Chung	10	10	10	17	12	11	11	12	14	16	16	16	16	15	15	15	14	14	13	12	11	11	11	10
Tai Po	3	3	3	3	3	3	3	3	4	5	5	4	4	4	4	4	5	5	5	4	4	4	3	3
Sha Tin	8	8	8	10	8	8	8	9	9	9	10	9	9	9	10	10	10	11	11	10	10	9	9	9
Tap Mun	8	8	8	11	9	9	9	9	11	11	11	11	10	10	10	10	10	9	9	9	8	8	8	8
Causeway Bay	6	6	6	6	6	7	7	8	9	9	8	8	7	7	8	8	7	7	7	7	7	6	6	6
Central	8	8	7	8	7	7	8	10	12	12	10	10	9	9	9	9	9	9	10	10	10	9	9	8
Mong Kok	11	10	10	10	10	9	10	10	10	10	10	9	9	9	9	10	10	10	11	11	11	11	11	10

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	63	48	39	32	31	33	45	76	99	100	88	77	68	67	69	73	75	78	84	83	80	75	72	72
Kwun Tong	91	63	52	45	45	58	104	141	150	139	118	103	96	98	105	111	122	136	139	130	113	105	108	109
Sham Shui Po	104	72	60	56	53	64	105	136	152	144	123	114	107	110	115	120	129	141	149	142	130	124	123	121
Kwai Chung	119	88	73	61	56	69	114	167	199	189	165	152	142	147	156	162	172	177	183	163	141	136	137	135
Tsuen Wan	88	58	49	39	37	43	78	114	132	135	124	118	110	110	112	117	123	131	129	119	108	105	108	105
Yuen Long	82	69	58	48	44	54	89	122	120	96	85	76	69	75	77	81	88	94	102	104	103	100	99	97
Tuen Mun	79	68	54	45	43	53	81	113	114	106	96	87	77	75	78	81	88	100	110	110	108	103	100	93
Tung Chung	68	53	44	37	37	46	63	81	83	76	72	73	69	67	67	67	67	72	78	80	74	69	71	71
Sha Tin	79	64	53	44	43	47	69	94	87	69	56	48	45	45	47	50	56	65	77	88	90	92	91	87
Tap Mun	15	15	15	16	14	15	15	16	19	20	18	16	15	14	14	14	15	15	16	16	15	15	15	15
Causeway Bay	202	135	120	99	99	100	172	261	318	321	297	283	278	284	281	284	288	296	309	301	280	277	290	255
Central	191	142	117	102	106	107	177	281	403	379	329	292	272	262	270	286	295	330	356	329	275	246	244	236
Mong Kok	216	123	108	96	95	101	190	273	319	321	294	296	292	302	310	318	339	361	370	318	279	288	299	277

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	41	32	27	23	23	24	32	47	55	56	53	50	47	47	50	53	56	59	63	60	57	52	48	47
Eastern	47	37	31	28	27	30	45	58	62	60	56	53	50	51	55	59	64	67	65	63	61	59	55	53
Kwun Tong	49	37	31	28	28	34	49	61	64	61	55	52	52	54	59	62	67	73	76	70	62	58	57	57
Sham Shui Po	59	43	37	35	34	38	57	68	73	70	66	65	64	67	71	75	81	87	90	86	79	74	72	69
Kwai Chung	59	46	40	36	35	39	54	67	75	75	72	73	73	77	83	86	89	90	90	84	74	70	68	65
Tsuen Wan	51	37	31	27	26	29	46	57	61	62	60	61	62	64	67	71	75	79	80	75	67	63	62	59
Yuen Long	50	44	39	33	32	36	45	53	55	52	50	47	46	51	53	56	62	66	70	68	65	61	58	55
Tuen Mun	49	44	38	33	32	35	44	52	54	54	53	51	49	50	53	56	61	69	74	71	67	62	58	55
Tung Chung	44	37	33	29	28	33	38	43	46	46	45	47	47	48	50	51	52	55	57	57	53	49	48	47
Tai Po	46	39	33	30	30	34	44	53	51	44	38	35	34	35	37	41	47	56	64	63	59	55	54	51
Sha Tin	48	42	36	32	32	34	42	49	48	42	37	34	33	33	35	39	44	51	57	61	59	58	56	53
Tap Mun	10	10	10	10	9	10	10	10	11	12	11	10	9	9	8	9	9	10	11	11	10	10	10	10
Causeway Bay	86	62	56	49	49	50	76	102	114	120	115	116	119	125	126	128	130	130	135	130	120	116	120	106
Central	83	66	58	51	54	53	77	104	131	134	123	118	118	117	123	129	130	137	143	133	115	105	101	96
Mong Kok	86	60	54	50	50	52	76	93	104	106	107	112	115	120	126	129	134	138	137	124	113	111	111	102

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
Tsuen Wan	697	658	634	603	605	633	688	741	751	743	738	716	714	712	703	704	723	755	782	796	788	778	767	743
Yuen Long	711	681	651	623	607	616	670	720	717	676	669	646	638	644	640	646	659	684	732	764	766	753	756	739
Tuen Mun	542	514	504	478	493	501	530	585	575	543	523	509	496	494	499	500	508	532	572	582	594	591	583	564
Tung Chung	541	521	512	516	517	520	533	557	568	552	545	549	553	553	555	552	549	548	558	569	564	560	558	551
Tap Mun	583	575	572	579	578	581	602	603	600	598	594	594	595	594	589	589	592	590	589	589	587	589	587	589
Causeway Bay	801	807	757	709	657	633	635	670	714	745	786	801	790	807	778	771	758	795	817	864	906	905	821	782
Central	801	755	699	674	640	675	695	779	860	911	906	846	823	848	829	822	827	851	916	951	949	914	852	831
Mong Kok	939	938	900	841	857	838	828	865	907	946	925	905	916	979	995	1011	1039	1067	1124	1098	1061	1023	960	936

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	42	46	49	51	49	47	40	29	26	29	36	43	51	55	56	55	51	45	40	39	38	39	40	39
Eastern	40	43	45	46	46	43	34	28	28	32	39	46	52	55	55	53	49	45	44	42	40	38	39	38
Kwun Tong	42	49	51	52	51	45	35	29	30	36	44	51	57	58	59	58	53	45	41	41	43	43	41	39
Sham Shui Po	33	44	46	48	46	42	28	21	21	26	33	39	45	48	48	46	40	32	27	26	28	29	28	28
Kwai Chung	33	42	44	45	45	40	31	23	23	27	33	39	43	45	44	42	39	35	30	29	32	32	31	31
Tsuen Wan	33	45	47	49	48	45	30	24	26	31	37	43	49	53	53	51	46	39	32	30	31	32	30	30
Yuen Long	30	33	34	37	37	33	25	22	25	35	45	56	67	70	72	68	60	50	39	34	31	30	28	29
Tuen Mun	34	36	39	40	41	36	29	25	27	32	40	49	59	66	66	63	57	45	34	32	32	32	32	33
Tung Chung	38	42	44	44	43	37	32	30	32	38	45	52	60	69	73	72	67	57	47	41	40	41	38	38
Tai Po	42	44	46	46	44	41	34	32	39	49	59	68	76	78	79	76	71	61	50	46	45	43	41	41
Sha Tin	40	41	43	45	43	40	33	30	36	47	58	68	75	78	80	78	72	63	51	44	40	38	36	37
Tap Mun	60	58	57	56	55	53	51	53	59	67	76	87	94	98	100	100	98	94	86	79	73	68	64	62
Causeway Bay	22	28	30	33	33	31	23	16	13	14	16	19	21	22	23	22	22	21	19	18	19	19	17	19
Central	26	32	36	38	36	34	25	16	13	14	17	21	25	27	27	26	24	22	19	19	20	21	21	22
Mong Kok	17	26	29	32	31	30	18	11	10	12	15	17	20	21	21	19	17	14	13	14	15	14	12	13

Table C4 (Cont.): 2014 Diurnal Variations of Air Pollutants

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	43	41	40	40	39	39	39	40	43	45	47	48	48	48	48	50	48	47	46	47	47	47	45	43
Eastern	36	35	34	34	34	34	34	34	36	36	37	38	38	38	40	42	42	41	41	41	40	39	38	37
Kwun Tong	50	47	46	46	44	44	43	44	46	49	52	53	55	53	56	57	56	56	56	55	55	54	51	50
Sham Shui Po	45	43	41	40	39	38	39	40	41	42	42	42	42	42	43	47	49	50	50	51	53	52	49	46
Kwai Chung	39	38	37	36	35	35	36	38	40	42	42	43	43	43	45	46	47	47	46	45	45	43	42	41
Tsuen Wan	36	34	33	33	33	34	35	38	42	46	47	47	44	48	51	50	50	48	46	46	44	41	39	38
Yuen Long	47	46	45	43	43	42	43	44	48	51	53	54	54	54	55	56	54	54	53	53	53	51	49	48
Tuen Mun	45	44	43	42	41	42	42	44	46	48	49	50	51	51	52	52	52	51	51	51	51	50	48	46
Tung Chung	36	35	34	34	33	33	34	35	37	39	41	42	44	45	47	48	46	44	43	41	40	38	37	37
Tai Po	41	40	38	38	38	37	38	40	41	42	42	41	41	40	41	42	42	43	43	44	44	44	43	42
Sha Tin	39	38	37	36	36	35	36	37	39	39	38	38	38	38	39	40	41	41	42	42	43	41	41	40
Tap Mun	42	41	42	42	42	43	43	43	43	44	45	46	46	45	45	45	46	47	46	45	44	43	42	42
Causeway Bay	54	48	44	42	41	41	43	49	53	58	60	60	60	61	65	64	63	64	65	67	68	65	61	59
Central	45	43	41	39	38	38	39	42	46	50	50	49	48	48	50	50	49	50	50	51	51	49	47	46
Mong Kok	46	42	40	39	39	39	39	42	45	48	50	51	51	52	54	54	54	54	55	57	57	54	50	47

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	28	27	26	25	25	25	25	26	27	29	29	30	30	31	31	32	30	29	29	30	31	31	29	28
Eastern	26	25	24	24	24	24	24	24	25	26	25	26	26	26	27	28	28	27	28	28	28	27	27	26
Kwun Tong	31	27	28	28	28	28	28	29	30	31	31	31	31	31	32	33	33	33	34	34	35	35	33	31
Sham Shui Po	34	33	32	31	31	30	30	31	32	32	32	31	31	31	32	34	35	36	36	37	39	39	37	35
Kwai Chung	27	26	25	25	24	24	25	26	28	29	29	29	29	29	31	31	31	32	31	31	31	30	29	28
Tsuen Wan	25	24	23	23	23	24	25	26	28	29	30	30	28	30	31	32	33	33	32	32	31	29	28	26
Yuen Long	34	34	33	31	31	31	30	31	34	36	37	38	38	38	37	37	36	35	34	35	36	35	34	34
Tuen Mun	29	28	27	27	27	27	27	29	30	31	31	30	30	30	32	32	32	32	32	33	33	33	32	31
Tung Chung	23	22	21	21	21	21	21	22	23	24	24	25	26	27	29	29	28	27	27	26	25	24	24	23
Tai Po	27	26	25	25	25	25	25	26	28	28	27	26	26	26	27	27	28	28	28	29	30	29	29	28
Sha Tin	26	25	25	24	24	24	24	25	26	25	25	24	24	24	25	25	26	27	27	28	28	28	27	27
Tap Mun	26	25	25	26	26	27	29	28	28	27	28	28	27	27	26	27	27	27	27	27	27	27	26	26
Causeway Bay	37	32	29	27	27	27	28	32	35	38	38	38	39	42	43	42	42	44	45	48	48	46	43	41
Central	27	26	25	24	23	24	24	26	29	30	30	29	29	30	31	30	30	30	31	32	32	31	30	29
Mong Kok	30	27	25	25	25	25	25	28	30	31	31	31	33	34	35	35	34	35	36	38	39	37	34	31

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

Table C5: 2014 Total Wet and Dry Deposition

(a) Wet Deposition

	Monitoring Station	Central/Western	Kwun Tong	Yuen Long
	Wet Deposition (tonne/ha)	28045	29359	18590
	Weighted Mean pH (based on volume-weighted mean hydrogen ion concentrations ([H^+])	4.65	4.56	4.64
	Weighted Mean pH (based on volume-weighted mean pH)	4.90	4.98	4.80
	Number of Samples	107	112	98
Filtrate (Kg/Ha)	**NH_4^+**	10.87	13.78	8.12
	NO_3^-	28.98	41.50	21.87
	$SO_4^=$	36.68	44.76	21.02
	Cl^-	25.47	31.48	10.30
	F-	0.70	0.85	0.52
	Na^+	14.53	17.97	6.66
	K^+	7.02	7.40	4.64
	Formate	7.13	7.62	5.52
	Acetate	5.53	5.48	4.34
	Ca^{++}	4.25	5.19	3.00
	Mg^{++}	1.85	2.37	0.85

* *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	25	25	25
Filtrate (Kg/Ha)	**NH_4^+**	0.40	0.99	0.41
	NO_3^-	8.72	12.89	9.03
	$SO_4^=$	7.57	9.53	6.51
	Cl^-	9.43	12.38	4.69
	F-	0.074	0.099	0.097
	Na^+	5.93	7.85	2.93
	K^+	0.48	0.69	0.46
	Formate	0.17	0.17	0.20
	Acetate	0.16	0.16	0.16
	Ca^{++}	5.63	6.70	6.31
	Mg^{++}	0.86	1.10	0.53

TABLE C6: 2014 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	29
Organic Substances			
Benzene	$\mu g/m^3$	1.47	1.31
Benzo[a]pyrene	ng/m^3	0.16	0.13
1,3-Butadiene	$\mu g/m^3$	0.08	0.05
Formaldehyde [3]	$\mu g/m^3$	-	6.40
Perchloroethylene	$\mu g/m^3$	0.52	0.62
Dioxins [4]	$pgI\text{-}TEQ/m^3$	0.053	0.037

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 2014 annual average concentrations in the elemental analysis of respirable suspended particulates.

[3] The measurement of formaldehyde was affected by 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 2014.

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