AIR QUALITY
IN HONG KONG 2009

Air Science Group

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Environmental Protection Department

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The Government of the Hong Kong
Special Administrative Region

A report on the results from the Air Quality Monitoring Network (AQMN) (2009)

Report Number	:	EPD/TR 01/10
Report Prepared by	:	Danny Yau
Work Done by	:	Air Science Group
Checked by	:	W. M. Pun
Approved by	:	Dave Ho
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Summary

This report summarises the 2009 air quality monitoring data collected by the Environmental Protection Department's monitoring network.

As a result of the enhanced vehicle emission control programme implemented by the Government since 2000, concentrations of respirable suspended particulates, nitrogen oxides and sulphur dioxide at roadside have reduced over the past decade.

Concentrations of ozone, a major constituent of photochemical smog, have been on a slow rising trend over the past years. The Hong Kong Special Administrative Region Government and the Guangdong Provisional Government are implementing a Regional Air Quality Management Plan to alleviate photochemical smog and ozone problem in the Pearl River Delta Region.

As in previous years, concentrations of sulphur dioxide, carbon monoxide and lead remained at levels well below their respective Air Quality Objectives limits in 2009.

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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.

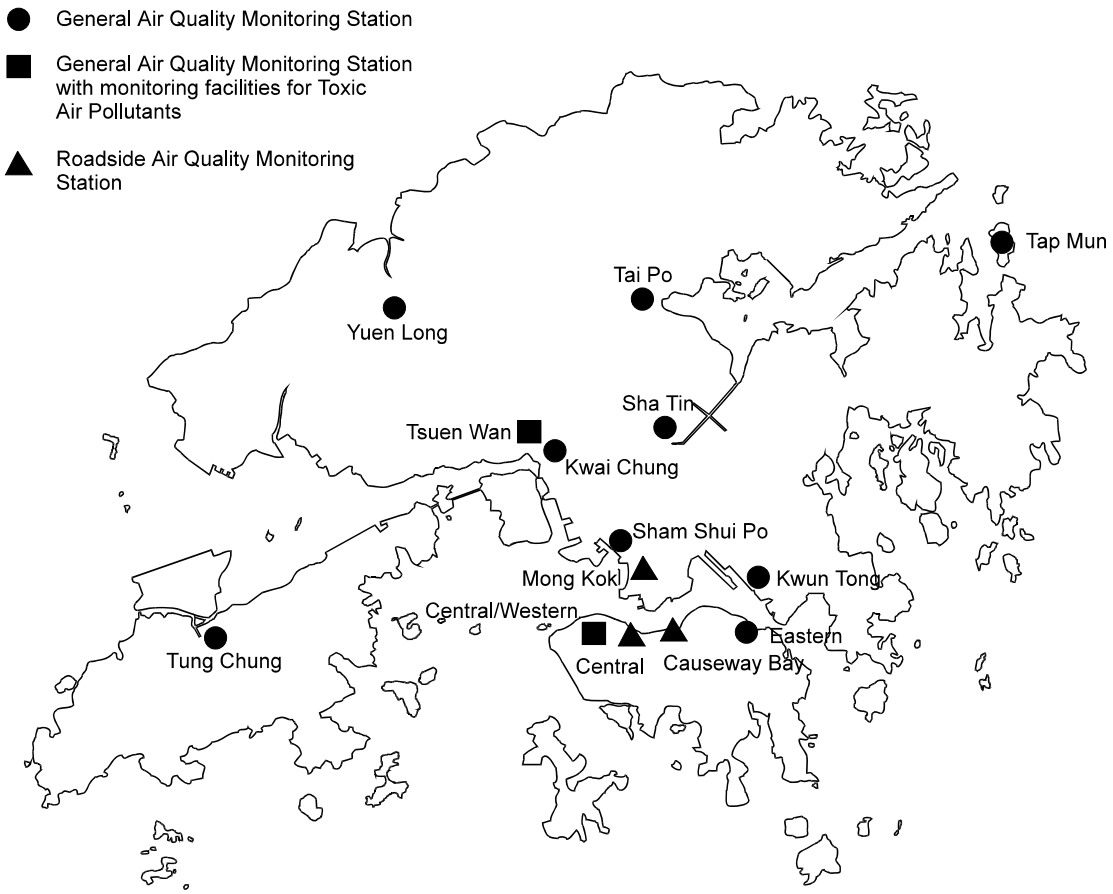


Figure 1: Location of EPD's Air Quality Monitoring Stations (2009)

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 2009 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 are the major sources of SO_2, followed by marine vessels, fuel combustion 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 2009
(1-Hour Average Statistics)

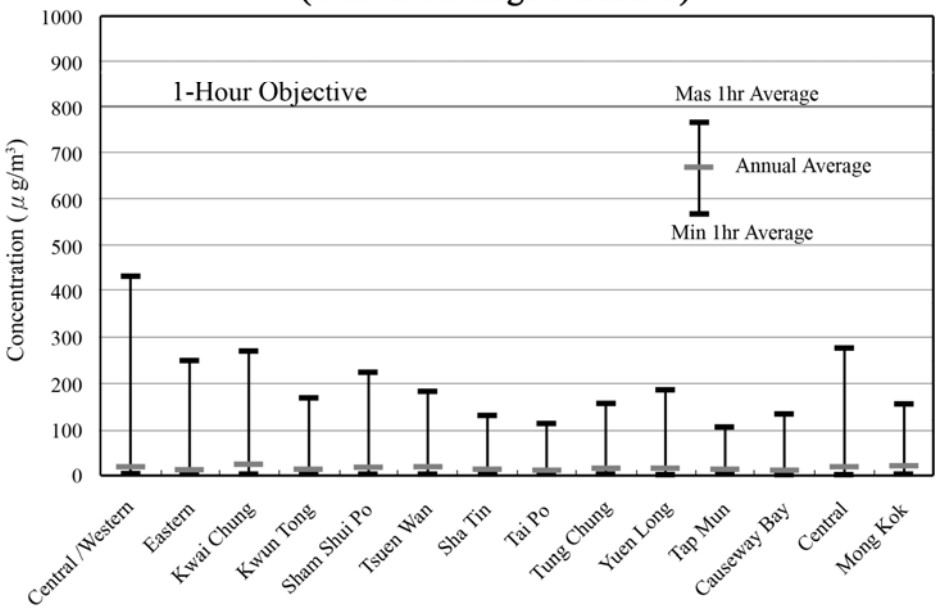


Figure 2b: Sulphur Dioxide Monitoring 2009
(24-Hour Average Statistics)

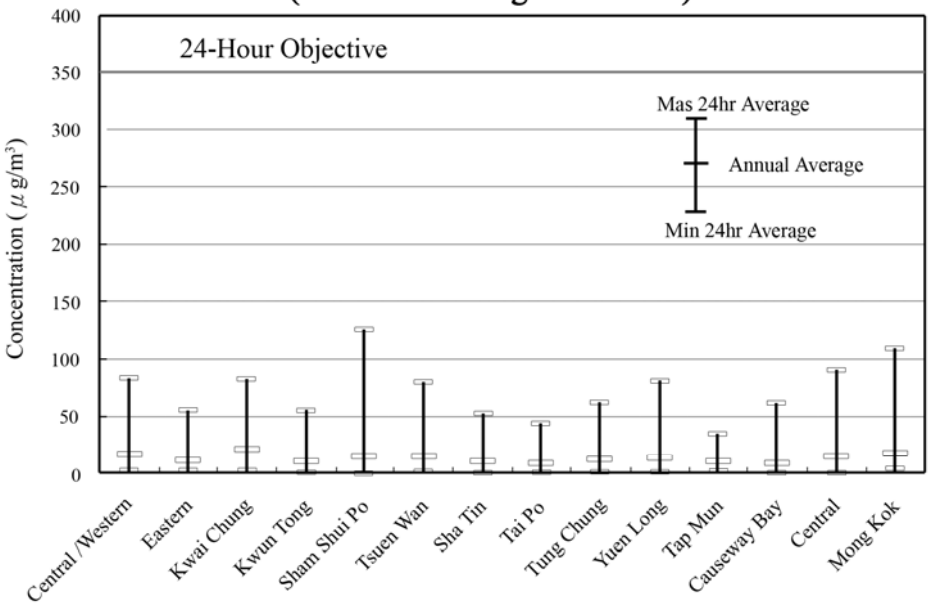
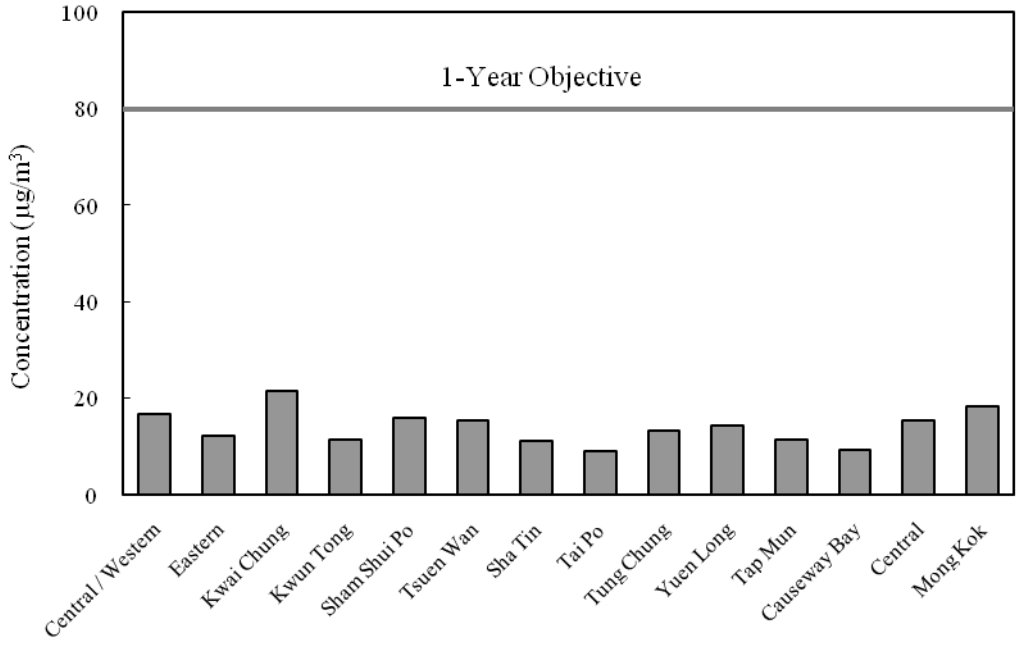


Figure 2c: Sulphur Dioxide Monitoring 2009 (Annual Average)



Sulphur dioxide was continuously measured at all the 14 monitoring stations during 2009. As in previous years, SO_2 concentrations remained low throughout the territory in 2009. All of the 14 monitoring stations complied with the relevant short and long term Hong Kong Air Quality Objectives[1] (AQOs) for SO_2. The highest 1-hour average (433 μg/m^3) was recorded at the Central/Western station. The Sham Shui Po station had the highest 24-hour average (125 μg/m^3) in the year. As for the annual average, the Kwai Chung station recorded the highest value (21 μg/m^3) in the year. The highest 1-hour average, 24-hour average and the highest annual average were well below their respective AQO limits.

2.2 Nitrogen Oxides (NO_x) 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). These two gases, which are often mentioned jointly in the air pollution literature as NO_x, usually enter the atmosphere as a result of combustion processes. Emissions from power stations and motor vehicles are the two major sources of NO_x in Hong Kong. NO_x emissions from motor vehicles have great impact on roadside air quality.

Nitrogen dioxide (NO_2) is mainly formed from oxidation of nitric oxide (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.

Nitrogen dioxide was continuously measured at all the 14 monitoring stations during 2009. In 2009, the highest 1-hour average (445 μg/m^3) and the highest 24-hour average (241 μg/m^3) were both recorded at the Central roadside station. All the general stations complied with both the 1-hour AQO (i.e., no general station recorded more than 3 counts of exceedance with the 1-hour AQO limit in the year) and the 24-hour AQO for NO_2 (i.e., no general station recorded more than one count of exceedance with the 24-hour AQO limit in the year). However, both the 1-hour and 24-hour AQO for NO_2 were violated at all the three roadside stations.

[1] The Hong Kong Air Quality Objectives can be found in Appendix A.

As in previous years, all general stations complied with the annual AQO for NO_2 in 2009 while non-compliance was observed at the three roadside stations. The highest annual average (112 $\mu g/m^3$) was recorded at the Central roadside station in the year.

Figure 3a: Nitrogen Dioxide Monitoring 2009
(1-Hour Average Statistics)

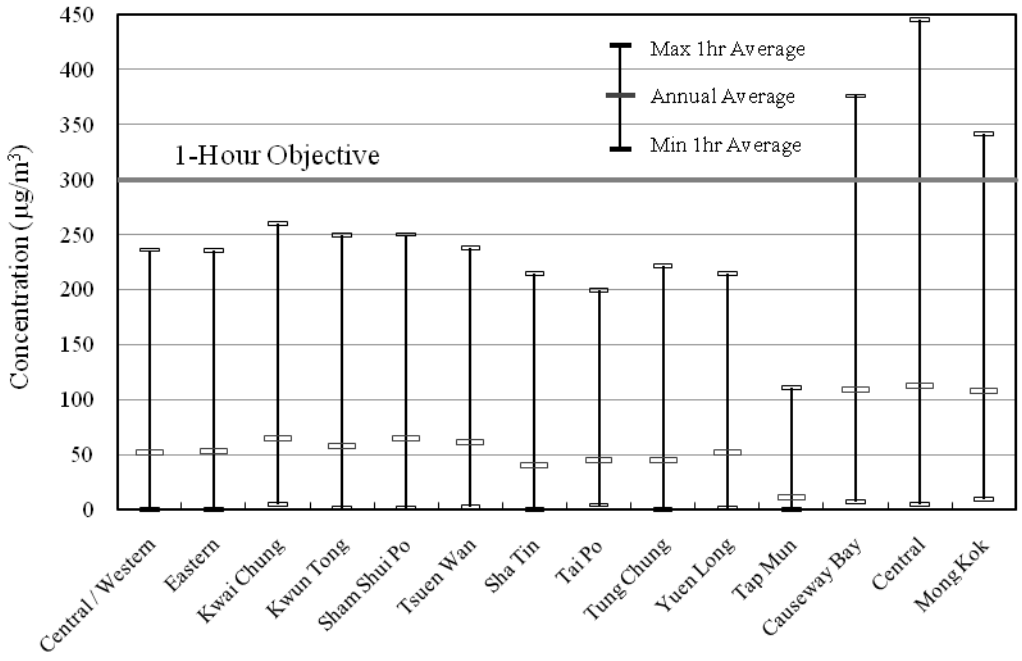


Figure 3b: Nitrogen Dioxide Monitoring 2009
(24-Hour Average Statistics)

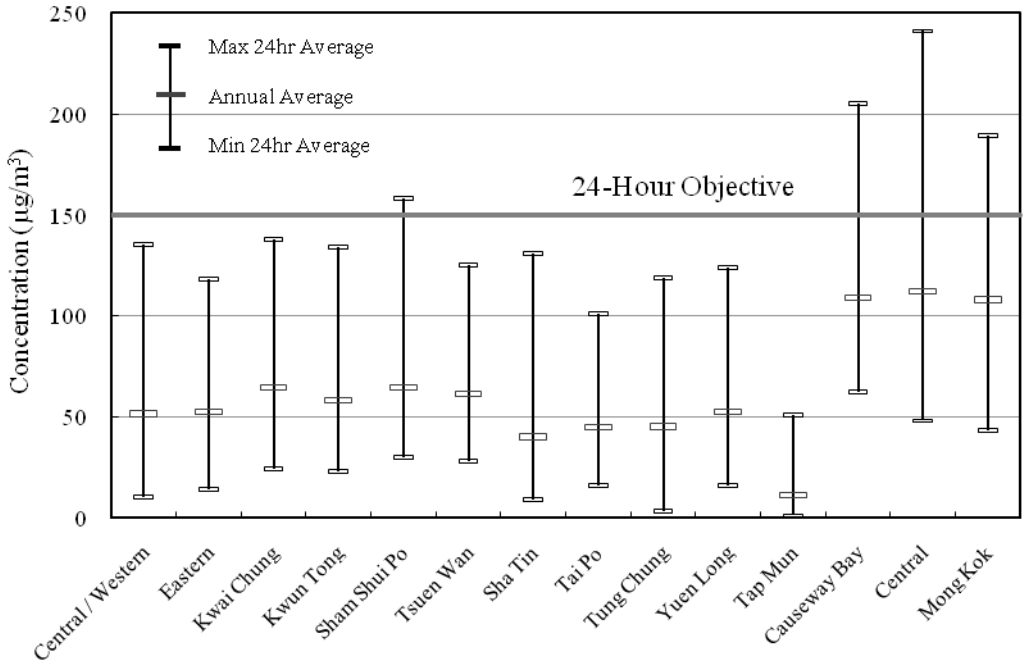
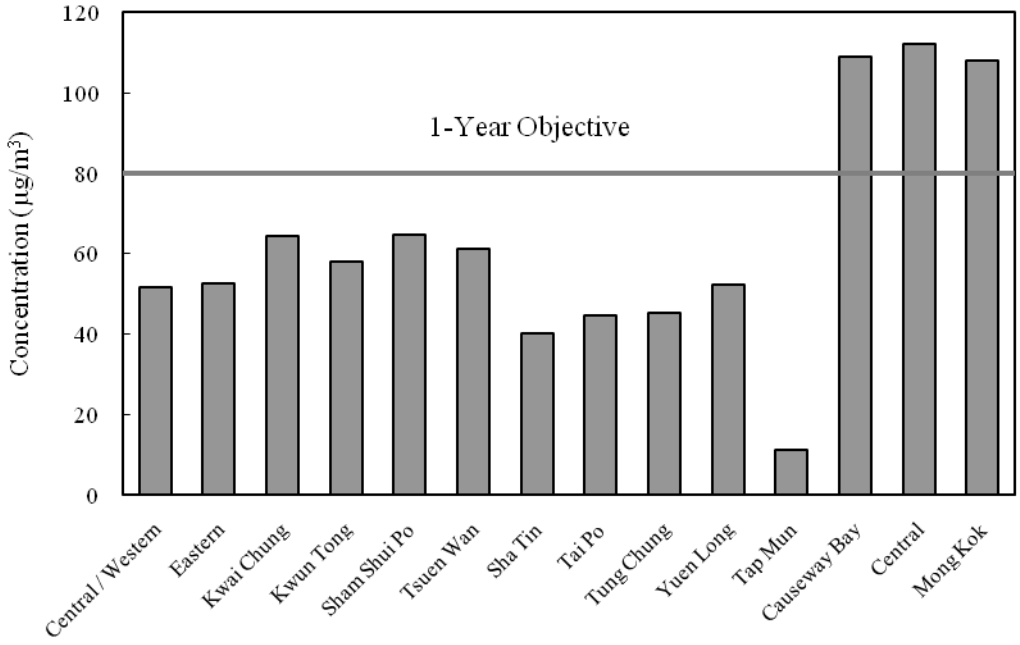


Figure 3c: Nitrogen Dioxide Monitoring 2009 (Annual Average)



2.3 Ozone (O_3)

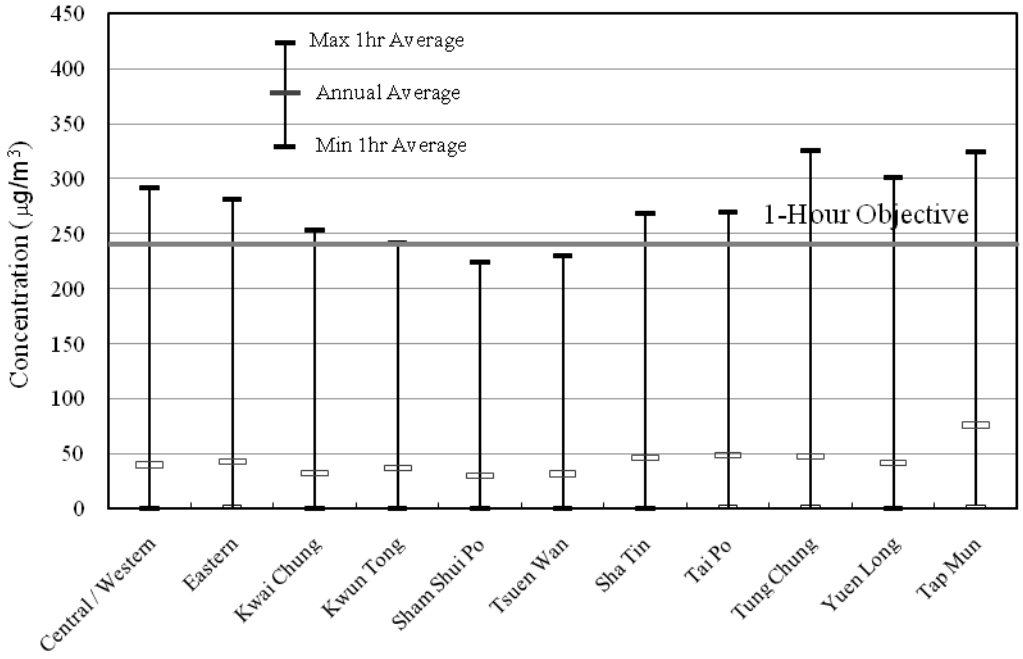
Ozone (O_3) is a major constituent of photochemical smog. It is not a pollutant directly emitted from man-made sources but formed by photochemical reactions of other primary pollutants such as nitrogen oxides (NOx) and volatile organic compounds (VOCs) under sunlight. As it takes several hours for these photochemical reactions to take place, O3 recorded in one place could be attributed to VOC and NOx emissions from places afar. Hence, ozone 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.

Among the 11 general stations with ozone measurement, six of them violated the 1-hour AQO in 2009 (i.e., with the 1-hour AQO limit exceeded more than three times in the year). The highest 1-hour average (325 $\mu g/m^3$) was recorded at the Tung Chung station.

In Hong Kong, elevated ozone incidents are mostly associated with very hot, fine and calm weather conditions in the region which favour the photochemical formation 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 2009
(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 incomplete combustion of fuels from 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 2009. 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 2009, the highest 1-hour average (5520 $\mu g/m^3$) and the highest 8-hour average (3438 $\mu g/m^3$) were both recorded at the Causeway Bay station; these values were around one fifth and one third of the respective AQO limits.

Figure 5a: Carbon Monoxide Monitoring 2009
(1-Hour Average Statistics)

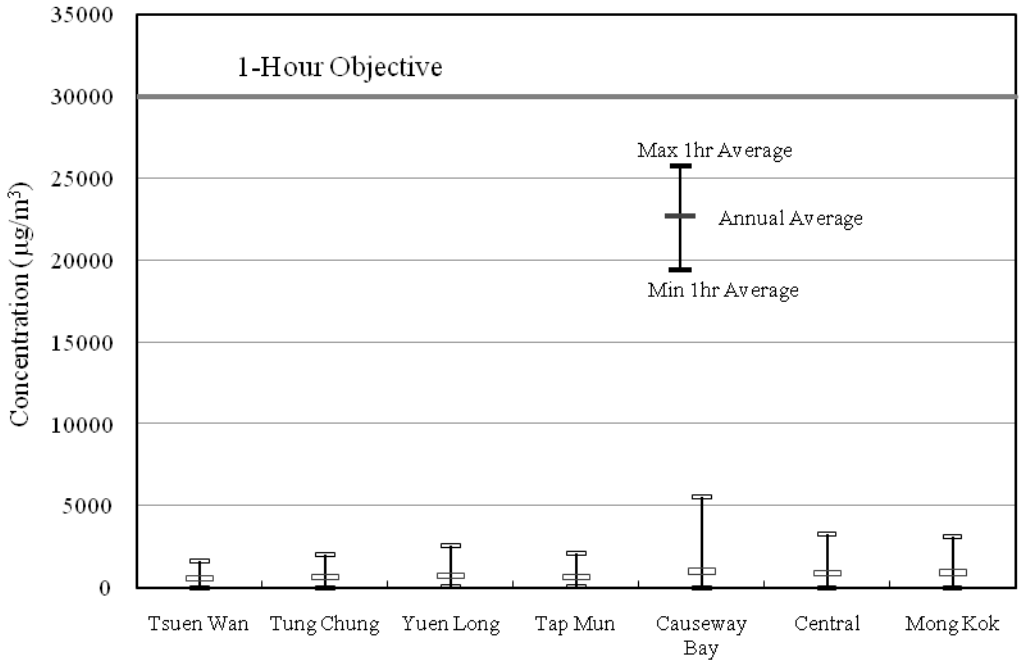
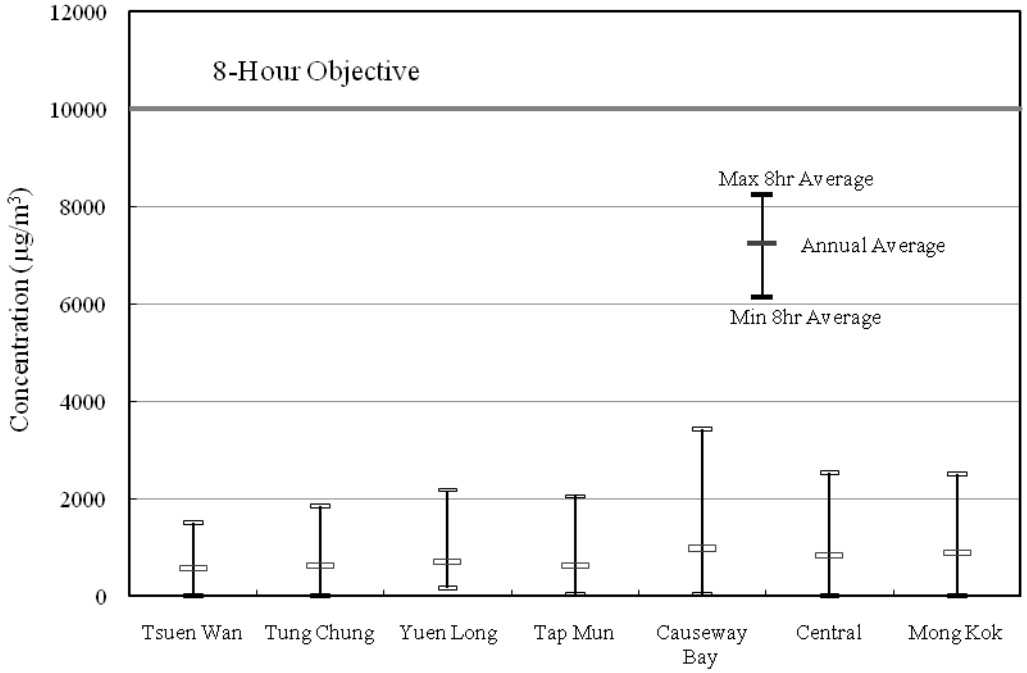


Figure 5b: Carbon Monoxide Monitoring 2009
(8-Hour Average Statistics)



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, construction activities and vehicle exhausts. TSP can be broadly divided into two major types. Suspended particulates with a nominal aerodynamic diameter of 10 micrometres or less are called respirable suspended particulates (RSP), or PM10 for short, and are usually of much greater health concern (see Section 3.2 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 nine general stations and one roadside station during 2009.

All stations complied with the 24-hour AQO (260 μg/m^3) for TSP in 2009. Both the highest 24-hour average (210 μg/m^3) and annual average (98 μg/m^3) were recorded at the Mong Kok roadside station in the year. Mongkok roadside station was the only station which violated the annual AQO for TSP (80 μg/m^3) in 2009, all other stations complied with the corresponding AQO.

Figure 6a: TSP Monitoring 2009
(24-Hour Average Statistics)

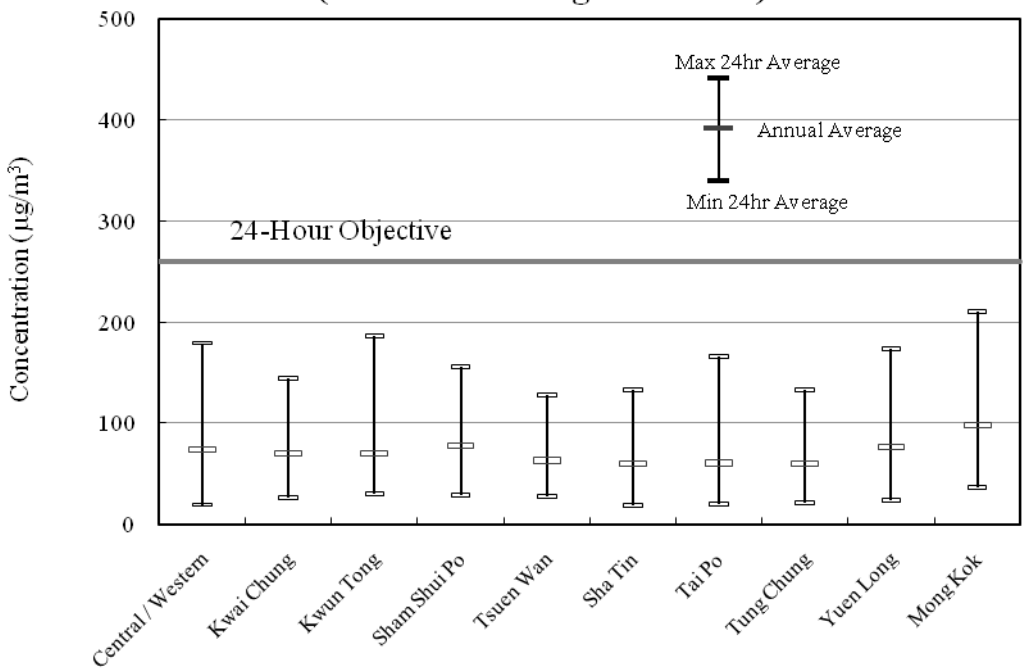
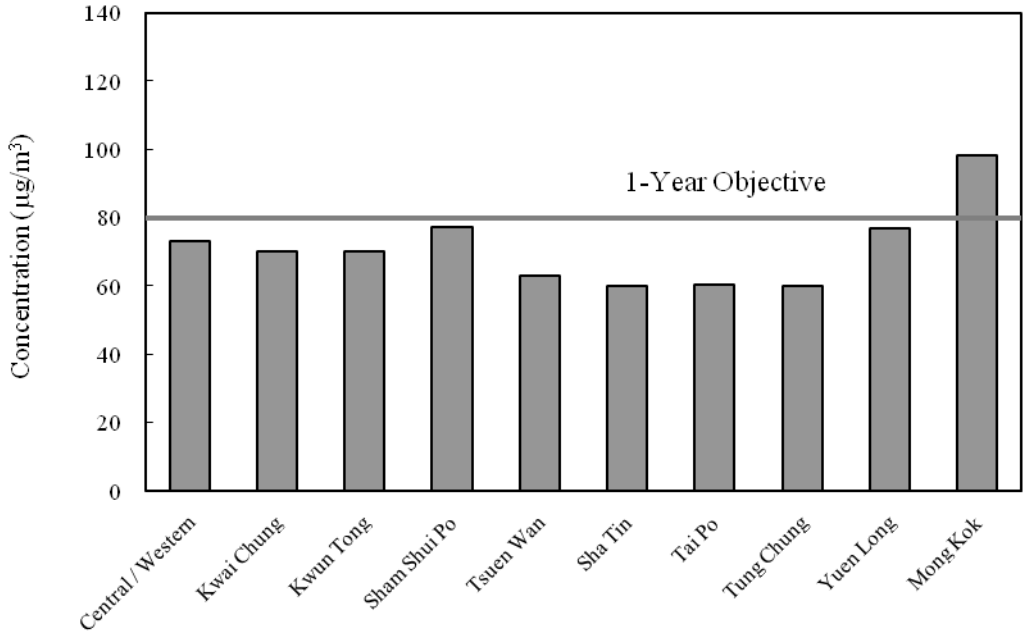


Figure 6b: TSP Monitoring 2009
(Annual Average)



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 diesel vehicle exhaust and emissions from 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. The smaller particulates in RSP have a major impact on visibility.

RSP was continuously measured at all 14 monitoring stations during 2009. Most of these stations were also equipped with high-volume sampler to collect particulate samples for chemical analysis.

In 2009, all stations complied with the 24-hour AQO of RSP (i.e., no stations recorded more than one count of exceedance with the 24-hour AQO limit in the year). The annual AQO limit of RSP (55 $\mu g/m^3$) was exceeded at two roadside stations (Causeway Bay and Central) in the year. The highest 24-hour average (212 $\mu g/m^3$) and the highest annual average (71 $\mu g/m^3$) were both recorded at the Causeway Bay roadside station.

Figure 7a: RSP Monitoring 2009
(24-Hour Average Statistics)

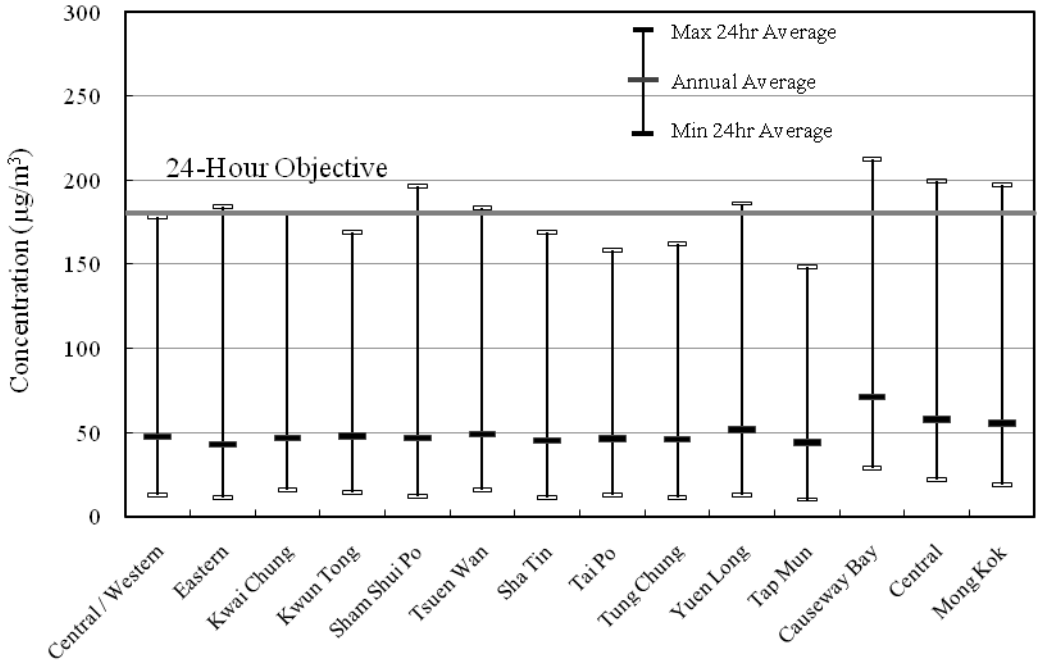
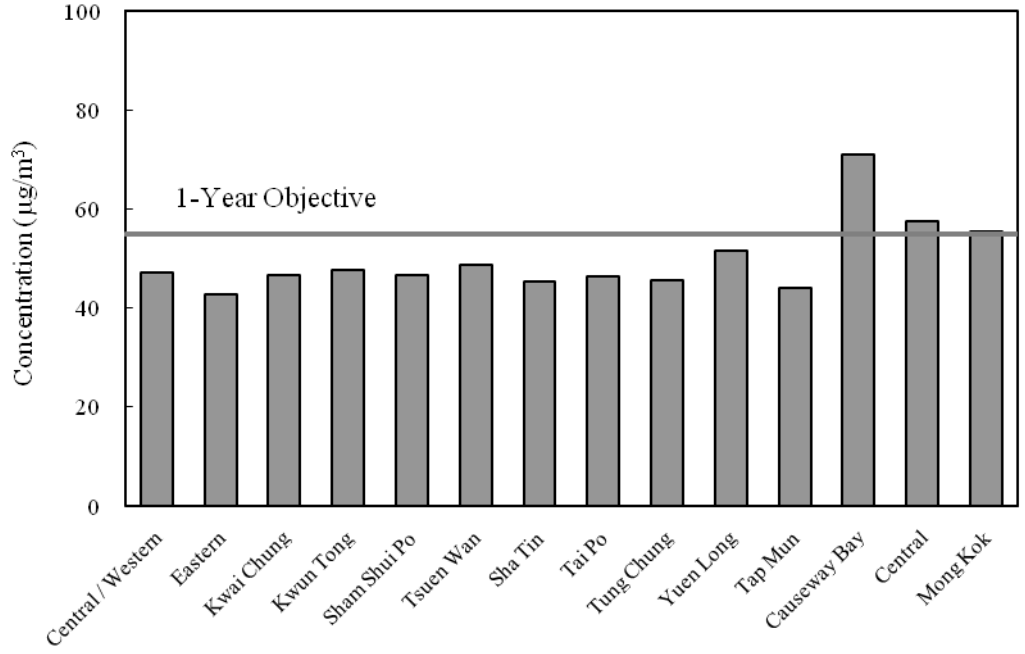


Figure 7b: RSP Monitoring 2009
(Annual Average)



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 2009. The overall 3-month averages, ranging from nine ng/m^3 (Kwun Tong and Tung Chung) to 86 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 2009, eight of them are considered more important in terms of their health impacts and their annual averages are summarised in Table C8. 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. To no surprise, this type of traffic induced diurnal pattern is much more distinct for pollutant levels at roadside.

Figure 8: 2009 Diurnal variations of NO_2

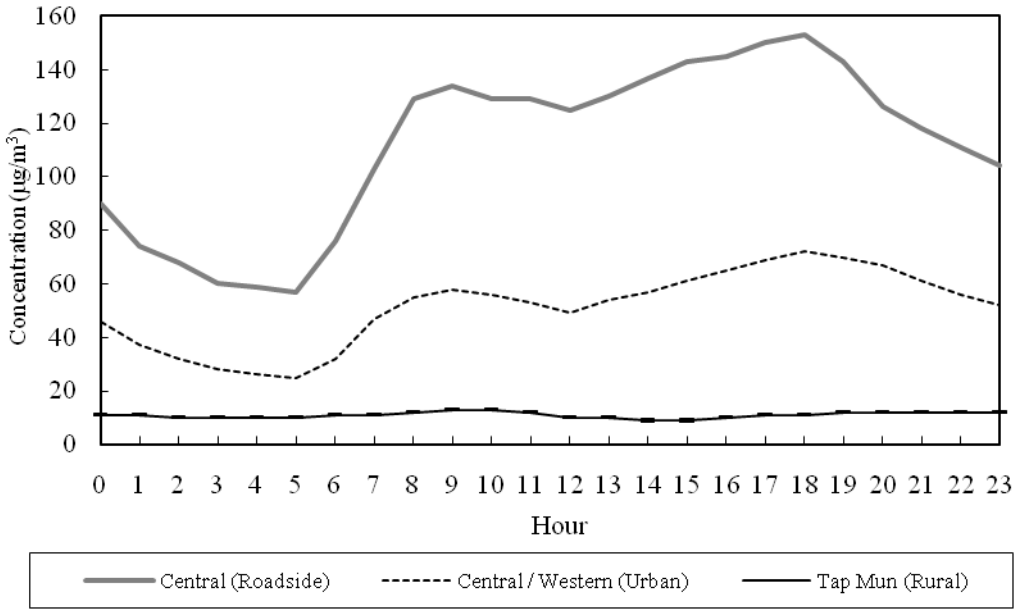
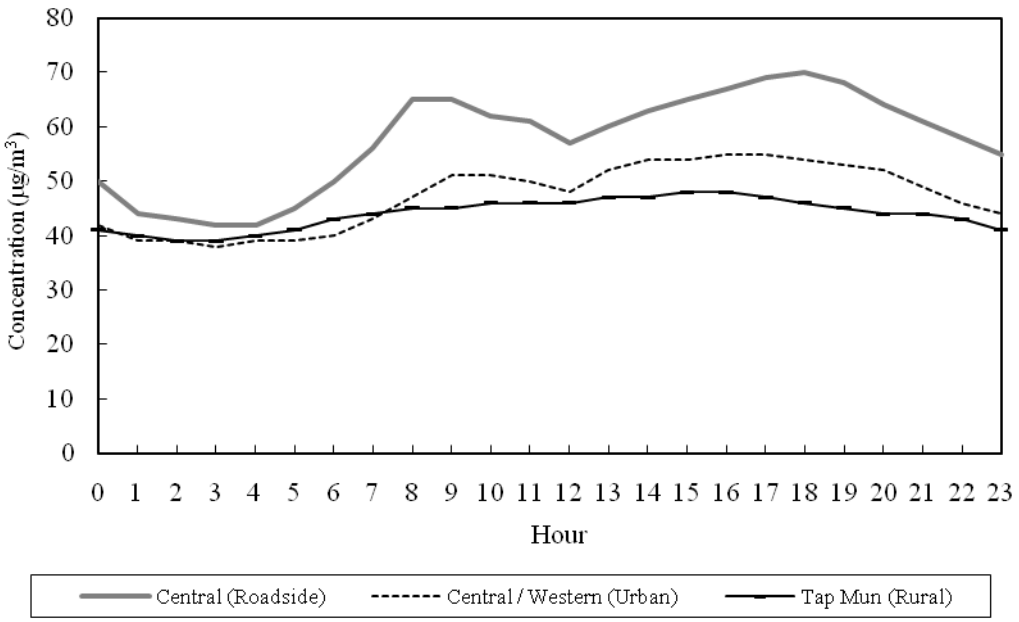
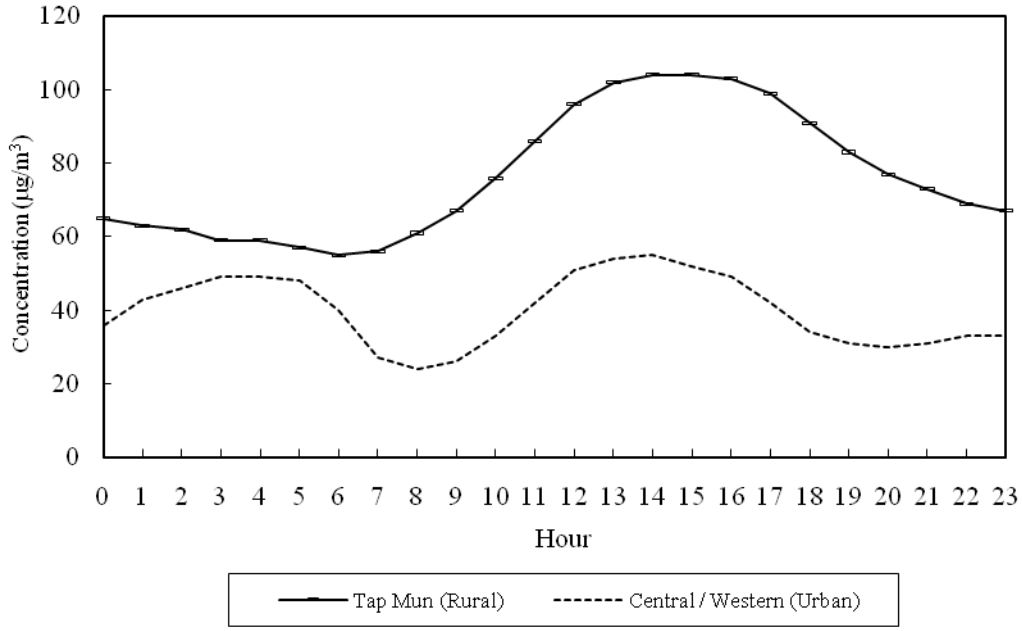


Figure 9: 2009 Diurnal variations of RSP



The diurnal pattern of ozone is different from that of NO_2 and RSP. Ozone is formed by photochemical reactions of its precursor pollutants such as NOx and volatile organic compounds (VOCs) under sunlight. Outside urban centres the ambient ozone levels start to build up before noon and peak in the afternoon, when precursor pollutants are accumulated and sunlight is strong. In urban areas, the lowest ozone concentrations are often observed during the rush hours. This is because a large amount of nitric oxide from the rush-hour traffic acts as an efficient scavenger of ozone, and sunlight is not strong enough for photochemical reactions to take place.

Figure 10: 2009 Diurnal variations of O_3



5.2 Over a Year

Concentrations of NO_2, RSP and O_3 are substantially lower in summer months (June to August) due to a number of reasons. The higher temperatures in summer months induce larger mixing heights, which favours the dispersion of pollutants. The rains in summer help to wash out pollutants more frequently. The south-westerly monsoon in summer also helps to replenish the region with cleaner oceanic air.

Figure 11: Monthly variations of NO_2 and RSP at Central / Western in 2009

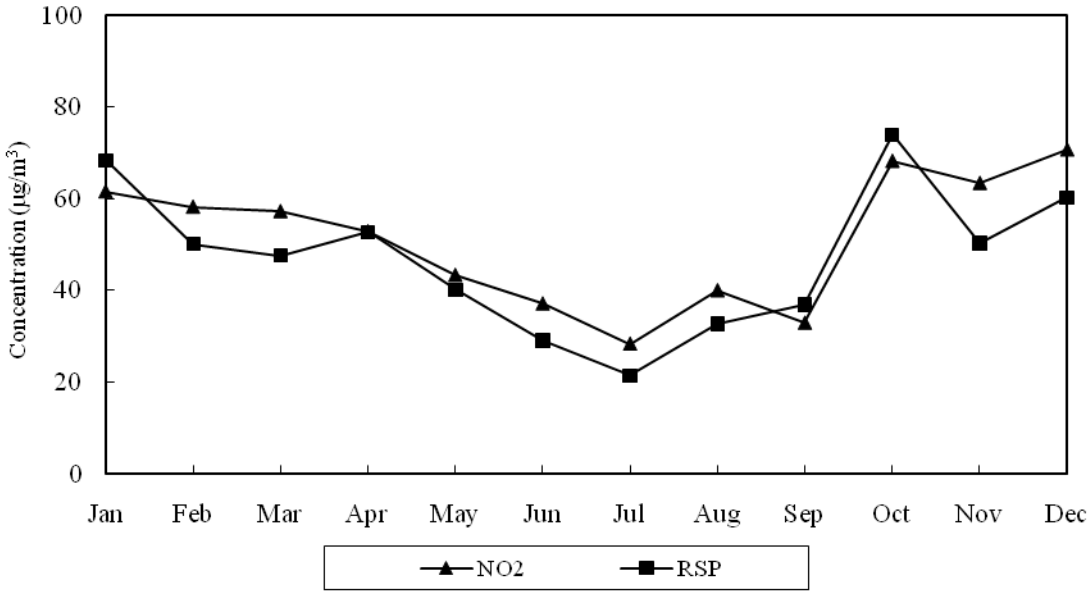
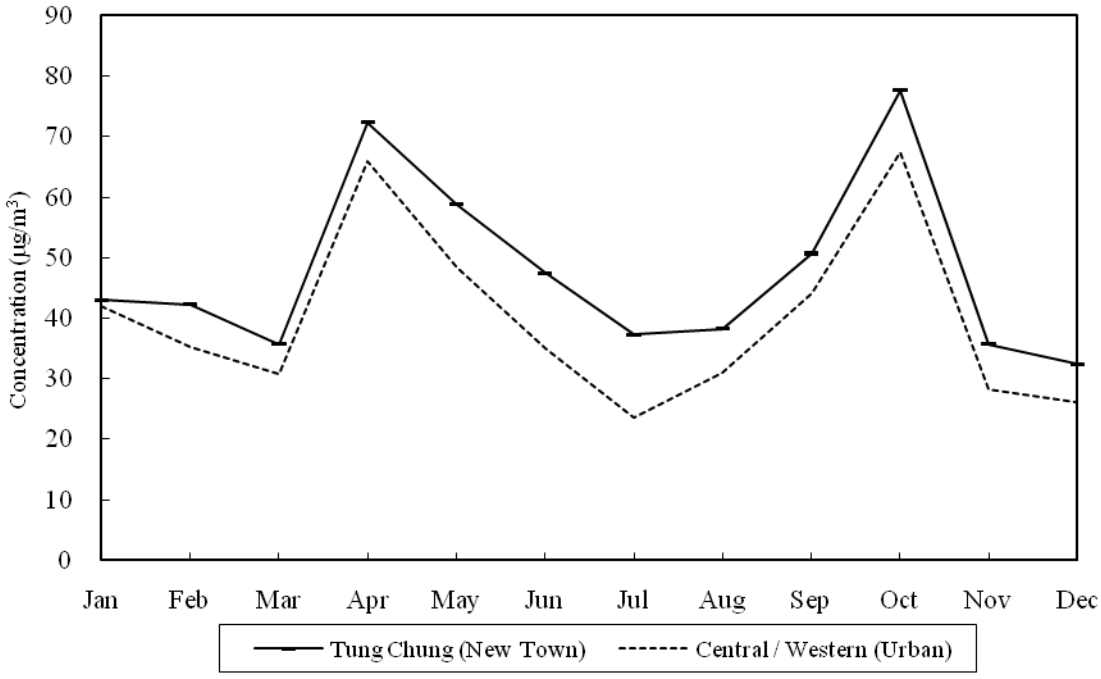


Figure 12: Monthly variations of O_3 in 2009



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

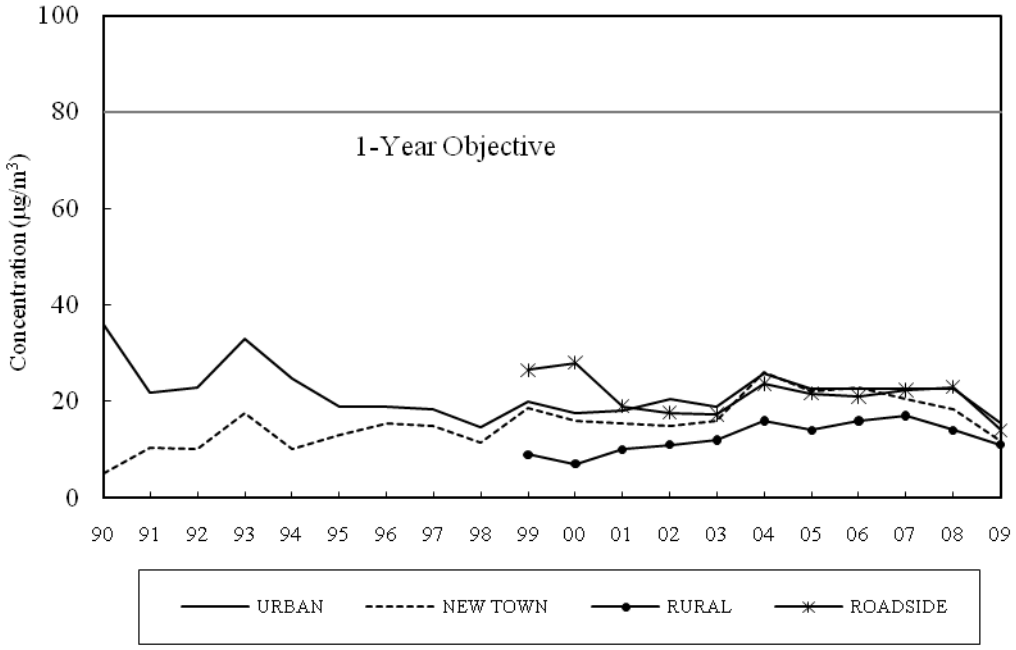
Land Use Type	Land Use Characteristics	Air Monitoring Stations
Urban	Densely populated residential areas mixed with some commercial and/or industrial areas	Central/Western, Eastern, Kwai Chung, Kwun Tong, Sham Shui Po and Tsuen Wan
New Town	Mainly residential areas	Sha Tin, Tai Po, Tung Chung and Yuen 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 has been noted in 2009 probably 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, the average SO_2 concentration at roadside in 2009 (14 $\mu g/m^3$) dropped by 48% as compared with the 1999 value (27 $\mu g/m^3$).

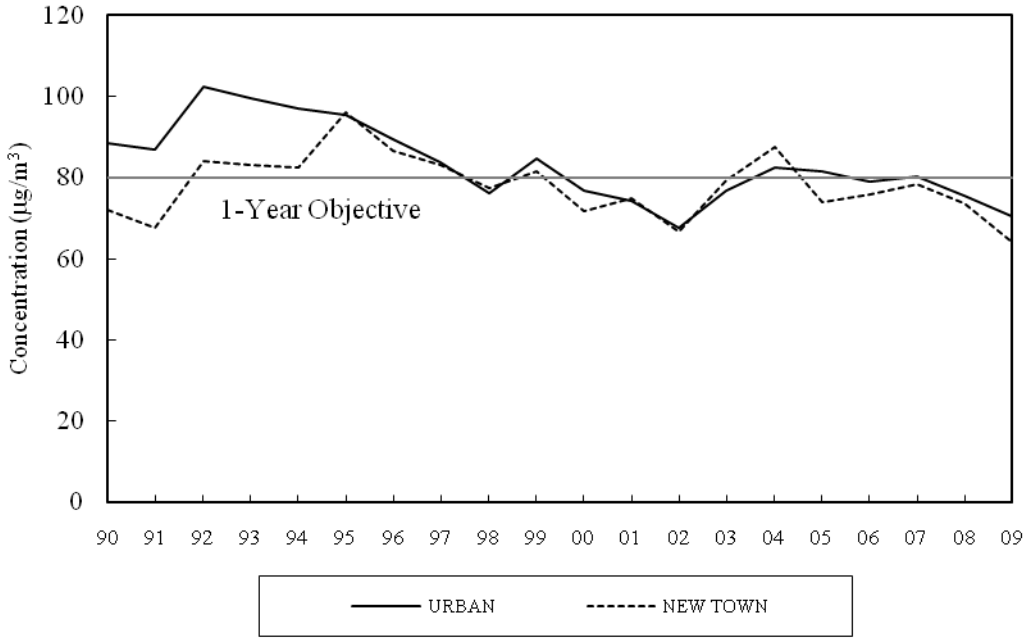
Figure 13: SO_2 long term trend



5.3.2 Total Suspended Particulates (TSP)

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

Figure 14: TSP long term trend

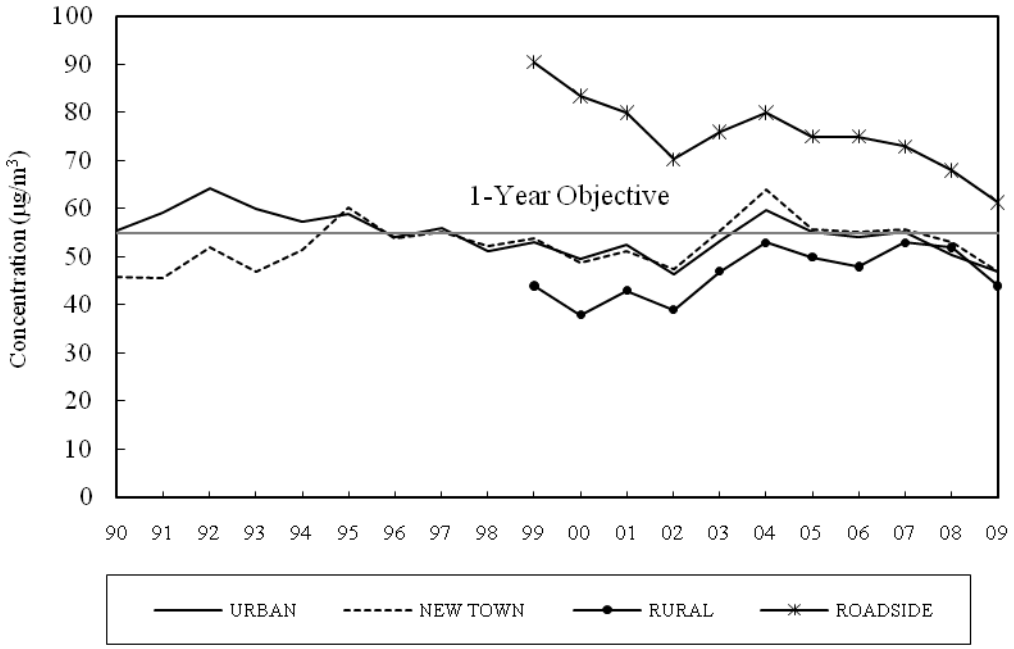


5.3.3 Respirable Suspended Particulates (RSP)

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 2009 had reduced by 33% when compared with the 1999 value.

Figure 15: RSP long term trend



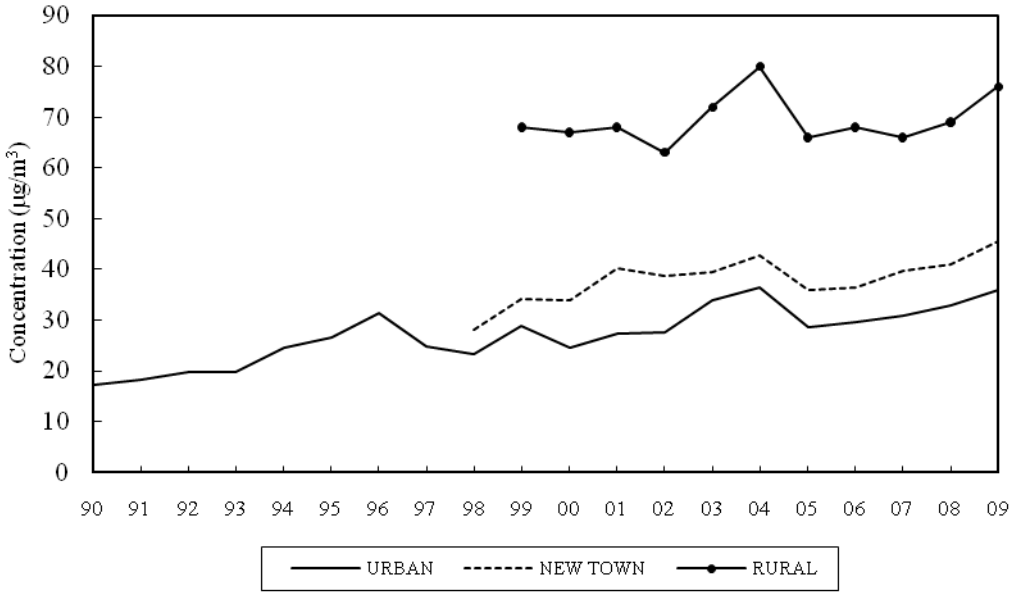
5.3.4 Ozone (O_3)

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

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

Ozone, 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 ozone levels in the Pearl River Delta region.

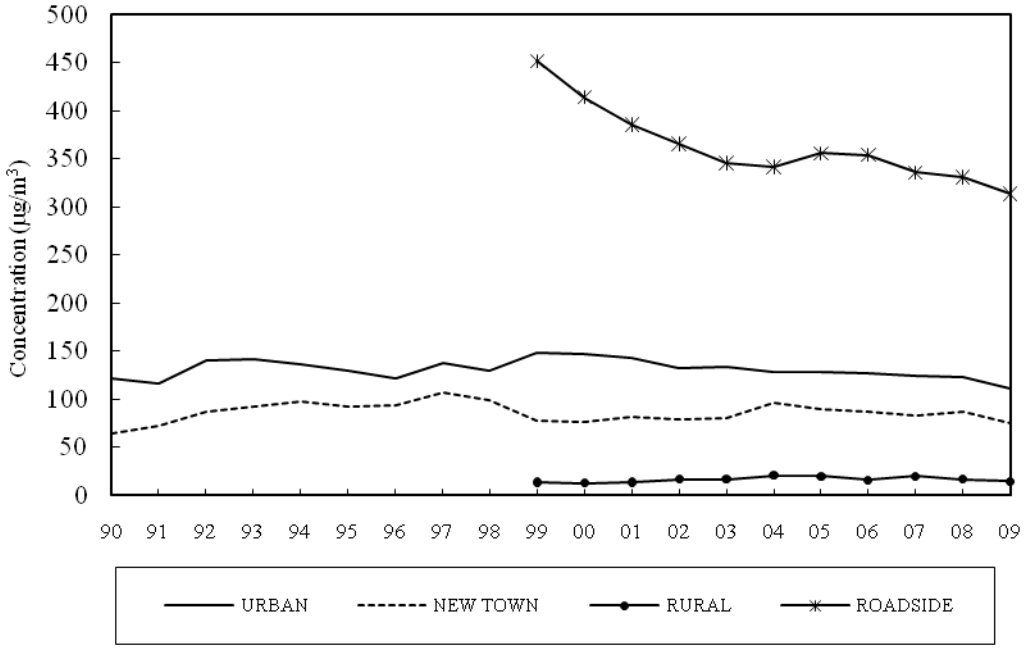
Figure 16: O_3 long term trend



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

The annual average of NO_x in urban areas has remained quite constant over the past decade. During the same period, the roadside NO_x concentration has generally shown a 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 2009 was 31% lower than its 1999 value.

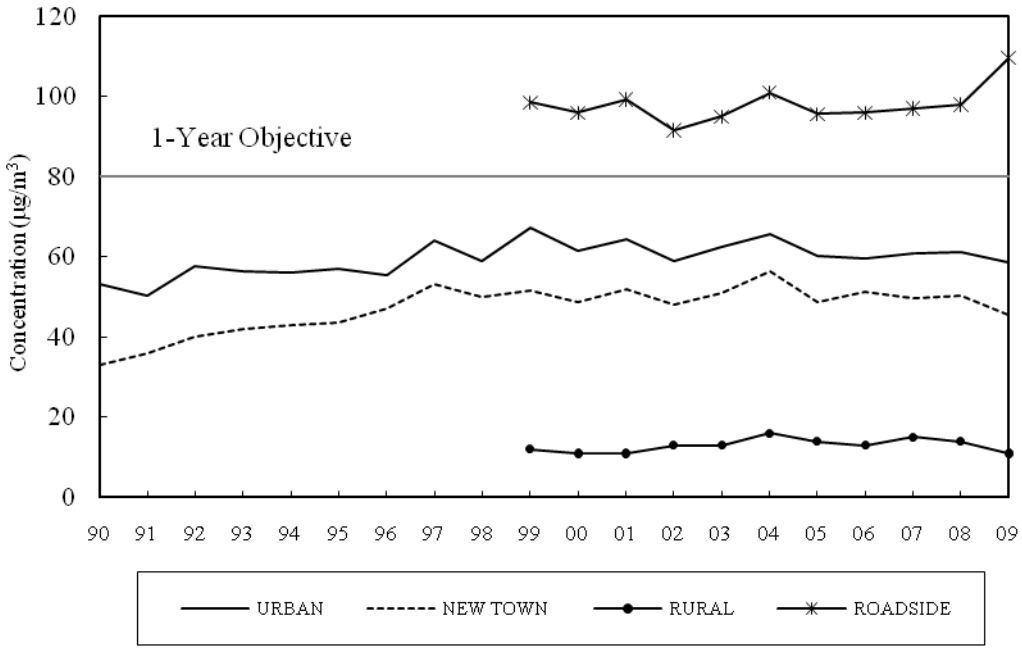
Figure 17: NOx long term trend



NO_2 is mainly formed from the oxidation of nitric oxide, a major component of NO_x. 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 has shown an overall increasing trend over the past

years, which could be caused by a rise in background ozone concentration promoting the conversion of nitrogen monoxide emitted from motor vehicles to NO_2 at the roadside.

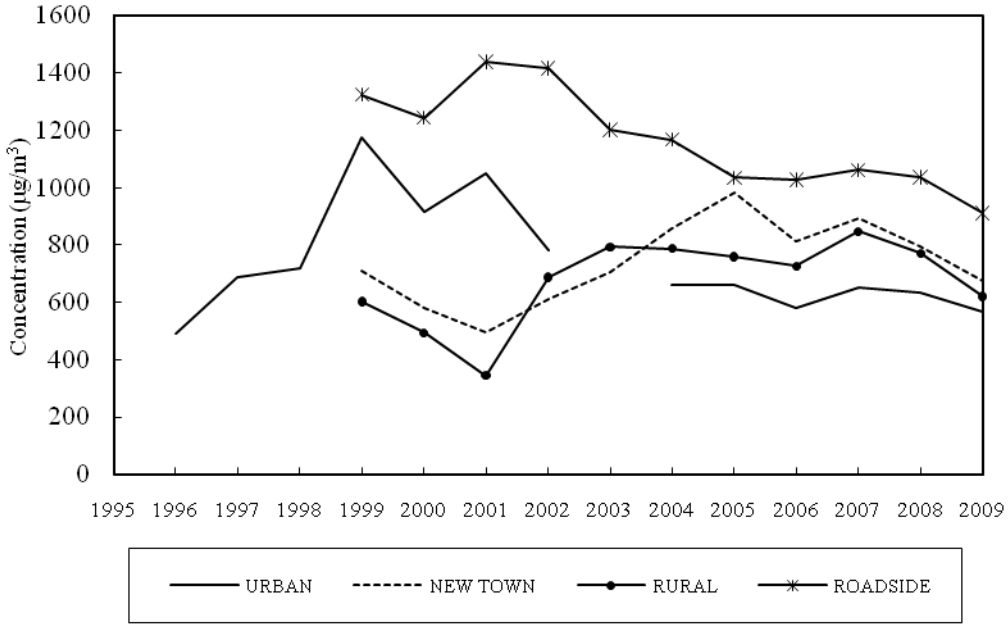
Figure 18: NO_2 long term trend



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.

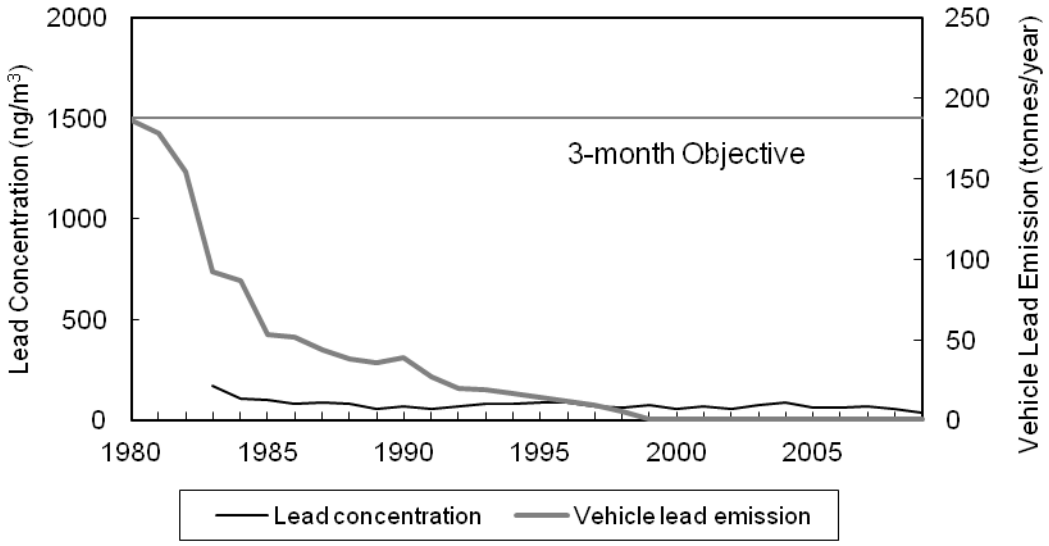
Figure 19: CO long term trend



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

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^{o}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.

Table A2: Percentage Time in compliance with Short-Term Air Quality Objectives in 2009

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	99.93	100	100	100	100	100	100	--	--
	Eastern	99.98	100	100	--	99.73	100	100	--	--
	Kwai Chung	99.99	100	100	100	100	100	100	--	--
	Kwun Tong	99.99	100	100	100	100	100	100	--	--
	Sham Shui Po	100	100	99.72	100	99.72	100	100	--	--
	Tsuen Wan	100	100	100	100	99.72	100	100	100	100
	Sha Tin	99.92	100	100	100	100	100	100	--	--
	Tai Po	99.91	100	100	100	100	100	100	--	--
	Tung Chung	99.76	100	100	100	100	100	100	100	100
	Yuen Long	99.86	100	100	100	99.72	100	100	100	100
	Tap Mun	99.87	100	100	--	100	100	100	100	100
Roadside Station	Causeway Bay	--	99.84	93.04	--	99.73	100	100	100	100
	Central	--	99.64	87.57	--	99.72	100	100	100	100
	Mong Kok	--	99.85	93.35	100	99.73	100	100	100	100

Notes: "--" *Not measured*

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 2009. For NO_2, the compliance percentages of the 24-hour AQO were above 99% for general stations and between 87% to 93% for roadside stations; its 1-hour AQO compliance rates were above 99% at all stations. Regarding RSP, the compliance percentages for its 24-hour AQO were above 99% at all stations. The compliance levels of 1-hour AQO for O_3 were over 99% at all monitoring stations. For TSP, the compliance percentage of its 24-hr AQO also achieved 100% at all stations. The compliance percentage of SO_2 reached 100% for all stations. For CO, all monitoring stations achieved full compliance with those short-term AQO in 2009.

Compliance with the long-term AQO

Table A3 shows the compliance status of the long-term (annual) AQO for all 14 monitoring stations in 2009. Similar to previous years, all monitoring stations achieved full compliance with the long-term AQO for SO_2 and lead in 2009. Compliance with the annual AQO for NO_2 was recorded at 11 out of 14 stations, same as 2008. For TSP, nine out of the 10 stations complied with the annual AQO. The annual AQO for RSP was complied at 12 out of 14 stations in 2009, as compared with a compliance rate of 10 out of 14 stations in 2008.

Table A3: Compliance Status of Long-Term (Annual) Air Quality Objectives in 2009

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. 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 and RSP 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:-

- Monthly release of the monitoring data recorded at the Mong Kok, Kwai Chung and Central/Western stations (up to June 1998)
- Monthly release of the Air Pollution Index (API) summary for all monitoring stations (since July 1998)
- Daily API reporting and forecast for three categories of land-use areas, viz., urban, industrial, and new development (from 6 June 1995 to 14 June 1998)
- Daily API reporting and forecast for individual station (from 15 June 1998 to 30 June 1999)
- Hourly API reporting for individual station (since 1 July 1999)
- 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

- Establishment of the Environmental Protection Interactive Centre (EPIC) for the public to download air quality monitoring data (since March 2004)
  (http://www.epd.gov.hk/epd/epic/english/epichome.html)

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 respectively. In 2009, 475 audit checks were carried out on the stations' analysers and samplers. As shown in Figure B1 and based on the 95% probability limits, the accuracy of the network was within the specified control limits.

The precision, a measure of the repeatability, of the measurements is checked in accordance with EPD's quality manuals. In 2009, 2094 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 -7.1 % and 4.6 %, which was again within target limits.

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 has installed in July 1997 additional monitoring facilities at the 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 (City District Office)	6 Tung Yan Street, Kwun Tong	Urban : Mixed residential/ commercial/industrial	34m	25m (6 floors)	Jul 83
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

Table B2. Summary of the Parameters Monitored in the Network (2009)

	PARAMETERS									
STATIONS	SO_2	NO_x	NO	NO_2	CO	O_3	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	a) Gravimetric b) Oscillating microbalance	Graseby Andersen PM10 R&P TEOM Series 1400a-AB-PM10

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
Perchloroethylene	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, 2009

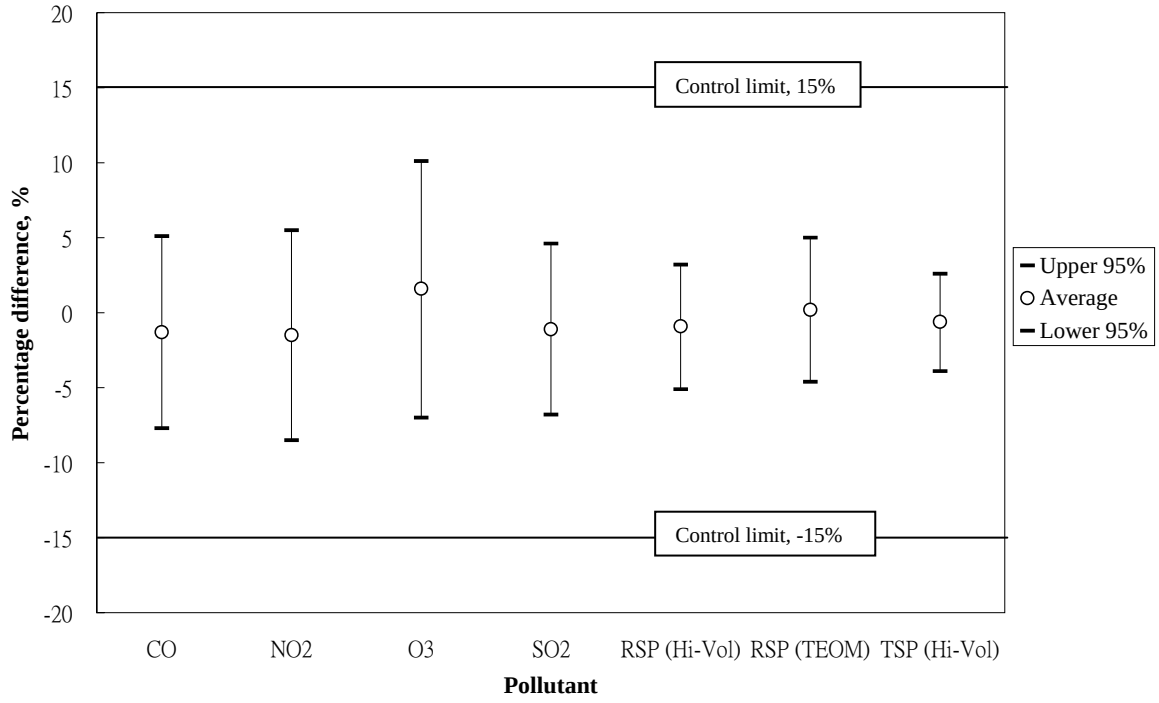
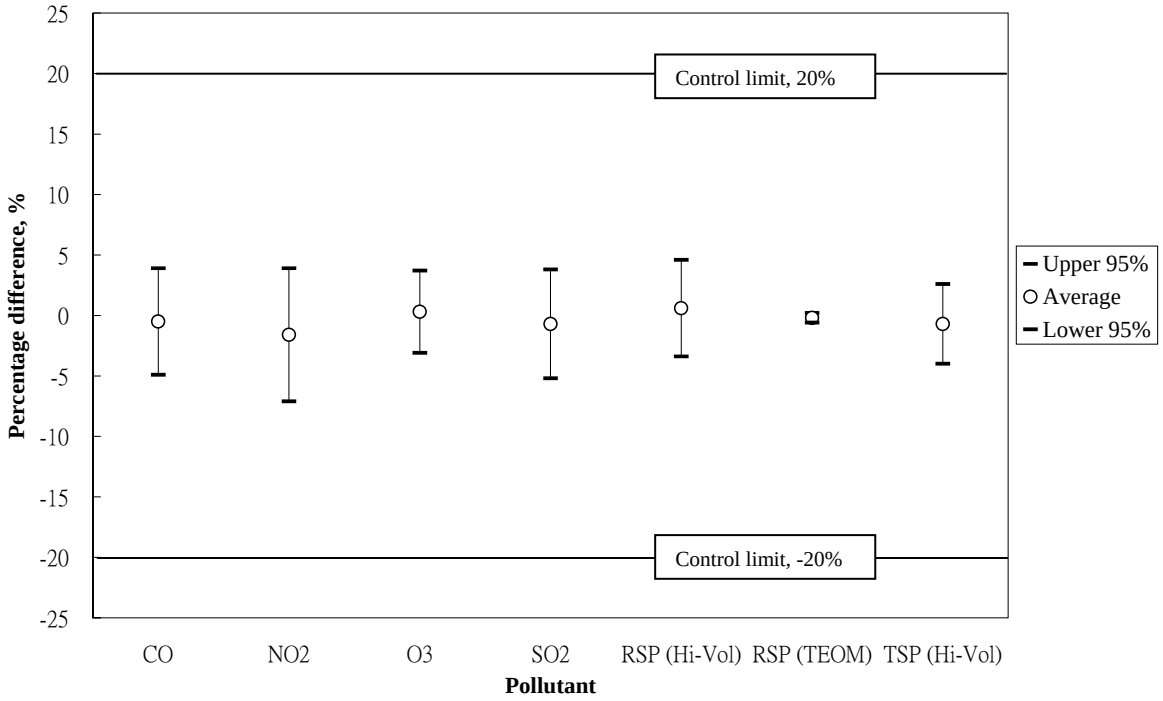


Figure B2: Precision of Air Quality Monitoring Network, 2009



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

Appendix C

Tables of Air Quality Data

TABLE C1: THE HIGHEST 4 HOURLY POLLUTANT CONCENTRATIONS MEASURED IN 2009

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

Station	1st High	2nd High	3rd High	4th High
Central / Western	433	321	305	303
Eastern	248	143	133	127
Kwai Chung	269	207	206	205
Kwun Tong	168	119	114	111
Sham Shui Po	226	207	189	182
Tsuen Wan	184	168	157	133
Sha Tin	132	102	100	98
Tai Po	114	110	108	105
Tung Chung	158	158	144	141
Yuen Long	187	171	153	141
Tap Mun	106	98	97	90
Causeway Bay	134	129	113	108
Central	277	230	226	220
Mong Kok	155	154	151	148

Pollutant: Nitrogen Oxides

Station	1st High	2nd High	3rd High	4th High
Central / Western	860	810	761	757
Kwai Chung	845	818	796	794
Kwun Tong	883	649	649	649
Sham Shui Po	997	845	820	816
Tsuen Wan	550	543	521	521
Sha Tin	563	554	527	515
Tung Chung	368	351	343	342
Yuen Long	731	528	513	501
Tap Mun	136	122	108	108
Causeway Bay	1424	1230	1218	1184
Central	1776	1699	1591	1505
Mong Kok	1145	1041	1007	1005

Pollutant: Nitric Oxide

Station	1st High	2nd High	3rd High	4th High
Central / Western	453	420	386	350
Kwai Chung	438	433	429	419
Kwun Tong	480	344	340	329
Sham Shui Po	521	461	427	426
Tsuen Wan	295	285	273	264
Sha Tin	299	283	277	276
Tung Chung	170	169	149	149
Yuen Long	406	266	264	261
Tap Mun	33	31	31	30
Causeway Bay	777	661	635	608
Central	978	927	881	799
Mong Kok	615	566	550	540

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

Station	1st High	2nd High	3rd High	4th High
Central / Western	236	232	222	220
Eastern	235	223	219	209
Kwai Chung	260	254	246	240
Kwun Tong	249	246	229	227
Sham Shui Po	250	247	245	231
Tsuen Wan	238	232	214	213
Sha Tin	214	209	205	202
Tai Po	199	197	192	181
Tung Chung	221	215	205	202
Yuen Long	215	205	201	197
Tap Mun	111	103	89	86
Causeway Bay	376	349	347	340
Central	445	439	395	390
Mong Kok	342	342	340	338

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

Station	1st High	2nd High	3rd High	4th High
Tsuen Wan	1620	1620	1610	1590
Tung Chung	2020	1970	1930	1910
Yuen Long	2540	2320	2320	2300
Tap Mun	2090	2080	2070	2050
Causeway Bay	5520	3790	3790	3790
Central	3220	3110	3110	2990
Mong Kok	3110	2990	2640	2640

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

Station	1st High	2nd High	3rd High	4th High
Central / Western	292	279	273	270
Eastern	281	259	229	225
Kwai Chung	253	205	201	175
Kwun Tong	242	212	175	165
Sham Shui Po	224	211	202	199
Tsuen Wan	230	206	196	193
Sha Tin	268	263	262	260
Tai Po	270	270	260	259
Tung Chung	325	292	292	289
Yuen Long	301	297	278	266
Tap Mun	324	320	319	312

Pollutant: Respirable Suspended Particulates

Station	1st High	2nd High	3rd High	4th High
Central / Western	223	211	210	198
Eastern	222	211	210	209
Kwai Chung	210	208	208	207
Kwun Tong	226	216	214	213
Sham Shui Po	226	222	221	221
Tsuen Wan	226	223	220	219
Sha Tin	207	206	201	199
Tai Po	202	201	198	196
Tung Chung	210	205	202	199
Yuen Long	225	223	217	212
Tap Mun	195	193	189	187
Causeway Bay	528	271	254	246
Central	257	243	240	234
Mong Kok	233	227	227	224

Note: 1. All concentration units are in micrograms 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 2009

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

Station	1st High	2nd High
Central / Western	83	81
Eastern	56	55
Kwai Chung	83	83
Kwun Tong	57	43
Sham Shui Po	125	73
Tsuen Wan	80	62
Sha Tin	54	47
Tai Po	44	38
Tung Chung	63	51
Yuen Long	81	52
Tap Mun	35	35
Causeway Bay	62	42
Central	91	67
Mong Kok	109	74

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

Station	1st High	2nd High
Central / Western	135	128
Eastern	118	101
Kwai Chung	138	129
Kwun Tong	134	113
Sham Shui Po	158	132
Tsuen Wan	125	122
Sha Tin	131	106
Tai Po	101	92
Tung Chung	119	118
Yuen Long	124	113
Tap Mun	51	41
Causeway Bay	205	204
Central	241	201
Mong Kok	189	187

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

Station	1st High	2nd High
Central / Western	178	152
Eastern	184	150
Kwai Chung	180	141
Kwun Tong	169	165
Sham Shui Po	196	149
Tsuen Wan	183	154
Sha Tin	169	149
Tai Po	158	155
Tung Chung	162	158
Yuen Long	186	158
Tap Mun	148	142
Causeway Bay	212	170
Central	199	173
Mong Kok	197	167

Pollutant: Nitrogen Oxides

Station	1st High	2nd High
Central / Western	344	311
Kwai Chung	345	340
Kwun Tong	290	284
Sham Shui Po	395	359
Tsuen Wan	242	242
Sha Tin	250	230
Tung Chung	194	189
Yuen Long	241	220
Tap Mun	60	51
Causeway Bay	753	738
Central	752	668
Mong Kok	583	561

Pollutant: Nitric Oxide

Station	1st High	2nd High
Central / Western	148	138
Kwai Chung	154	146
Kwun Tong	118	116
Sham Shui Po	158	158
Tsuen Wan	125	91
Sha Tin	97	92
Tung Chung	83	55
Yuen Long	84	84
Tap Mun	12	11
Causeway Bay	367	354
Central	365	353
Mong Kok	284	273

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

Station	1st High	2nd High
Central / Western	179	160
Kwai Chung	144	137
Kwun Tong	186	185
Sham Shui Po	155	153
Tsuen Wan	128	121
Sha Tin	133	121
Tai Po	166	146
Tung Chung	133	131
Yuen Long	173	163
Mong Kok	210	186

Pollutant: Ozone

Station	1st High	2nd High
Central / Western	140	121
Eastern	111	109
Kwai Chung	126	111
Kwun Tong	128	126
Sham Shui Po	99	98
Tsuen Wan	110	97
Sha Tin	150	145
Tai Po	142	128
Tung Chung	148	136
Yuen Long	131	130
Tap Mun	175	169

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

Station	1st High	2nd High
Tsuen Wan	1505	1496
Tung Chung	1864	1864
Yuen Long	2181	2179
Tap Mun	2050	2039
Causeway Bay	3438	3408
Central	2529	2515
Mong Kok	2514	2485

Note: 1. *All concentration units are in micrograms 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: 2009 MONTHLY AND ANNUAL AVERAGES OF GASEOUS POLLUTANTS

Pollutant: Sulphur Dioxide (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	23	17	19	16	12	17	14	23	17	16	13	15	17
Eastern	17	9	12	11	12	11	11	11	10	14	13	12	12
Kwai Chung	20	22	23	16	21	33	30	35	14	14	15	13	21
Kwun Tong	15	8	10	13	11	10	10	14	10	13	13	10	11
Sham Shui Po	18	10	16	15	16	21	12	23	10	18	15	16	16
Tsuen Wan	21	18	14	12	13	19	17	21	12	14	13	12	16
Sha Tin	14	6	9	8	10	14	10	18	10	11	13	12	11
Tai Po	10 *	7	8	8	8	9	8	12	8	9	11	11	9
Tung Chung	20	11	10	14	14	13	9	15	10	13	18	14	13
Yuen Long	22	14	13	10	11	15	11	18	13	17	14	12	14
Tap Mun	18	9	12	12	9	10	9	11	10	12	13	11	11
Causeway Bay	14	6	9	8	9	10	8	12	7	10	9	10	9
Central	26	15	13	11	10	17	18	20	11	15	11	16	15
Mong Kok	24	15	20	21	17	25	19	21	16	18	10	13	18

Pollutant: Nitrogen Oxides

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	101	99	102	73	65	66	53	76	51	90	107	141	86
Kwai Chung	144	151	138	112	119	160	123	153	109	124	139	148	135
Kwun Tong	130	110	114	96	86	130	107	119	84	93	117	120	109
Sham Shui Po	140	143	137	119	106	115	91	112	89	95	107	134	116
Tsuen Wan	118	124	113	94	89	109	95	121	95	97	119	122	108
Sha Tin	99	67	66	42	48	70	42	85	50	65	87	86	67
Tung Chung	95	75	78	59	49	52	35	64	44	68	88	102	68
Yuen Long	120	110	96	68	70	85	66	94	68	84	101	111	89
Tap Mun	16	11	19	13	12	15	14	20	13	12	16	15	15
Causeway Bay	393	341	344	273	301	328	305	343	253	277	307	341	317
Central	377	339	343	268	283	344	299	355	267	309	334	347	322
Mong Kok	305	332	319	305	311	317	289	314	259	295	270	311	302

Pollutant: Nitric Oxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	26	27	29	13	14	19	16	23	12	15	28	46	22
Kwai Chung	46	56	51	32	39	61	50	59	36	28	46	49	46
Kwun Tong	39	35	38	24	25	46	42	40	25	17	34	35	33
Sham Shui Po	39	47	45	29	28	38	33	37	24	15	28	39	33
Tsuen Wan	29	40	34	22	24	34	34	39	27	16	34	34	31
Sha Tin	30	20	18	7	11	21	12	26	11	11	25	23	18
Tung Chung	18	18	20	10	10	13	9	15	8	8	20	25	15
Yuen Long	32	34	28	13	17	26	23	27	17	15	30	31	24
Tap Mun	1	1	2	1	2	2	2	4	4	3	4	2	2
Causeway Bay	177	154	157	107	130	150	145	155	103	94	124	139	136
Central	163	153	153	101	119	160	142	165	110	104	135	142	137
Mong Kok	122	147	140	117	131	143	138	141	109	102	109	127	127

Pollutant: Nitrogen Dioxide (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	62	58	57	53	43	37	28	40	33	68	63	71	51
Eastern	66	59	58	59	50	39	32	39	42	61	57	61	53
Kwai Chung	73	65	60	63	60	66	46	64	54	81	69	72	64
Kwun Tong	71	56	56	59	48	60	43	57	46	67	65	67	58
Sham Shui Po	80	71	68	75	63	57	41	55	53	72	65	74	65
Tsuen Wan	73	63	61	60	53	57	42	61	53	72	67	70	61
Sha Tin	53	37	38	32	30	39	25	45	33	48	48	51	40
Tai Po	44 *	41	45	39	37	44	31	48	41	54	53	58	45
Tung Chung	67	48	48	44	33	31	22	41	32	55	57	63	45
Yuen Long	71	57	53	48	44	46	31	53	43	61	55	64	52
Tap Mun	14	9	15	11	9	12	10	14	8	7	10	12	11
Causeway Bay	123	105	105	109	102	98	83	106	96	134	117	128	109
Central	127	106	109	114	101	99	82	103	98	149	127	130	112
Mong Kok	118	108	105	126	111	98	78	98	92	138	104	116	108

Pollutant: Carbon Monoxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tsuen Wan	550	620	660	640	510	510	400	450	450	530	620	850	566
Tung Chung	930	920	790	450	390	390	350	430	430	750	820	970	635
Yuen Long	1030	840	880	730	530	530	390	600	620	590	790	990	711
Tap Mun	940	670	640	700	590	530	430	480	600	670	480	720	620
Causeway Bay	1580	1190	1260	880	560	660	810	930	810	890	950	1260	985
Central	990	1180	1040	750	750	690	780	1010	530	830	600	1000	845
Mong Kok	1350	1240	850	810	700	570	710	910	830	970	870	1030	902

Pollutant: Ozone

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	42	35	31	66	48	35	24	31	44	67	28	26	40
Eastern	48	40	37	60	50	39	23	33	41	69	36	35	43
Kwai Chung	36	33	30	59	38	16	14	17	32	57	30	30	33
Kwun Tong	43	39	31	60	45	19	13	21	36	68	34	34	37
Sham Shui Po	32	24	22	45	34	23	16	20	30	61	28	25	30
Tsuen Wan	32	26	26	55	39	21	16	20	32	58	28	26	32
Sha Tin	48	47	41	80	59	28	25	27	47	78	39	38	46
Tai Po	40 *	41	36	65	49	26	20	41	74	95	45	40	48
Tung Chung	43	42	36	72	59	47	37	38	51	78	36	32	47
Yuen Long	38	32	29	67	49	33	24	34	48	77	35	28	41
Tap Mun	87	75	65	106	87	55	42	57	75	120	72	71	76

Notes:

1. All units are in micrograms per cubic metre.

2. Asterisked values are below their respective minimum data requirement of 66% for number of data within the period.

3. Shaded monthly averages are below the minimum data requirements for number of data within a quarter.

4. Shaded annual averages are above their respective AQO.

TABLE C4: 2009 MONTHLY AND ANNUAL AVERAGES OF PARTICULATE POLLUTANTS

Pollutant: Total Suspended Particulates (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	115	69	85	66	74	44	22	48	54	109	90	94	73
Kwai Chung	97	77	65	63	52	44	43	70	64	85	84	91	70
Kwun Tong	86	84	68	62	51	51	38	47	58	111	90	98	70
Sham Shui Po	111	74	87	67	80	60	43	52	63	113	87	78	77
Tsuen Wan	79	72	48	61	47	36	48	50	52	82	75	100	63
Sha Tin	108	41	76	73	52	43	26	48	38	84	55	85	60
Tai Po	92	65	60	82	44	36	25	51	41	95	59	83	60
Tung Chung	98	52	42	59	39	30	26	73	57	81	76	86	60
Yuen Long	98	80	56	74	47	43	51	56	61	97	106	138	77
Mong Kok	159	85	128	124	92	71	49	68	68	124	93	127	98

Pollutant: Respirable Suspended Particulates (Annual AQO = 55)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	68	50	48	53	40	29	21	33	37	74	50	60	47
Eastern	62	49	44	51	38	25	20	28	33	65	43	53	43
Kwai Chung	66	46	44	47	37	35	28	41	38	69	50	57	47
Kwun Tong	66	51	49	55	42	34	26	37	39	69	47	57	48
Sham Shui Po	68	49	47	53	40	33	24	35	37	68	46	59	47
Tsuen Wan	73	49	48	53	39	34	26	37	40	75	51	58	49
Sha Tin	68	45	44	51	38	30	21	35	37	71	48	57	45
Tai Po	66	47	47	50	39	31	23	38	39	70	48	57	46
Tung Chung	72	39	41	49	36	28	19	35	38	74	55	60	46
Yuen Long	79	46	49	52	38	34	25	41	43	83	58	70	51
Tap Mun	67	47	46	53	38	26	20	30	37	68	44	52	44
Causeway Bay	91	75	67	77	67	60	51	61	65	97	66	75	71
Central	81	64	61	63	51	42	34	47	48	79	57	67	58
Mong Kok	73	59	59	62	50	41	33	42	48	78	53	65	55

Notes:

1. All units are in micrograms per cubic metre.

2. Asterisked values are below their respective minimum data requirement of 66% for number of data within the period.

3. Shaded monthly averages are below the minimum data requirements for number of data within a quater.

4. Shaded annual averages are above their respective AQO.

TABLE C5: 2009 HOURLY STATISTICS OF MAJOR AIR POLLUTANTS

Pollutant: Sulphur Dioxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8589	98.0	5	8	11	18	34	50	74	99	12	17	433	83
Eastern	8061	92.0	5	7	9	13	19	28	48	64	10	12	248	56
Kwai Chung	8543	97.5	5	7	10	24	58	78	102	124	13	21	269	83
Kwun Tong	8603	98.2	4	6	9	13	20	29	49	61	9	11	168	57
Sham Shui Po	8596	98.1	4	6	10	16	34	58	85	107	11	16	226	125
Tsuen Wan	8469	96.7	4	6	10	18	35	46	64	76	11	16	184	80
Sha Tin	8585	98.0	3	4	7	13	23	36	51	63	8	11	132	54
Tai Po	7960	90.9	3	4	7	11	17	23	35	47	7	9	114	44
Tung Chung	8509	97.1	4	6	9	15	27	37	53	72	10	13	158	63
Yuen Long	8325	95.0	5	7	10	17	28	37	55	72	11	14	187	81
Tap Mun	8533	97.4	5	7	9	13	20	25	33	43	10	11	106	35
Causeway Bay	8524	97.3	3	4	6	10	18	28	42	54	7	9	134	62
Central	8533	97.4	4	6	10	18	32	46	66	82	11	15	277	91
Mong Kok	8506	97.1	7	10	13	19	33	51	74	93	15	18	155	109

Pollutant: Nitrogen Oxides

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8488	96.9	23	39	64	105	173	228	312	403	63	86	860	344
Kwai Chung	8548	97.6	47	78	118	170	235	293	387	453	112	135	845	345
Kwun Tong	8602	98.2	36	63	94	138	200	241	301	351	89	109	883	290
Sham Shui Po	8594	98.1	36	73	108	141	182	225	328	434	96	116	997	395
Tsuen Wan	8428	96.2	36	71	99	134	181	218	281	325	92	108	550	242
Sha Tin	8597	98.1	15	25	45	81	150	217	303	352	45	67	563	250
Tung Chung	8496	97.0	18	30	52	92	140	173	211	235	51	68	368	194
Yuen Long	8462	96.6	36	51	74	108	159	209	277	319	74	89	731	241
Tap Mun	8537	97.5	6	8	11	17	26	36	53	64	12	15	136	60
Causeway Bay	8492	96.9	125	194	291	409	536	631	754	851	274	317	1424	753
Central	8574	97.9	104	180	297	426	568	665	807	903	267	322	1776	752
Mong Kok	8536	97.4	129	204	312	382	448	503	590	664	271	302	1145	583

Pollutant: Nitric Oxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8488	96.9	2	4	9	24	58	91	137	183	10	22	453	148
Kwai Chung	8548	97.6	7	17	33	61	98	131	178	219	30	46	438	154
Kwun Tong	8602	98.2	4	11	23	44	75	102	133	160	21	33	480	118
Sham Shui Po	8594	98.1	3	12	26	42	63	87	142	214	22	33	521	158
Tsuen Wan	8428	96.2	4	11	23	41	63	83	121	152	20	31	295	125
Sha Tin	8597	98.1	0	1	5	18	51	85	131	161	8	18	299	97
Tung Chung	8496	97.0	2	4	7	18	39	55	76	91	8	15	170	83
Yuen Long	8462	96.6	4	7	15	30	54	77	116	142	15	24	406	84
Tap Mun	8537	97.5	1	1	2	3	4	5	10	16	2	2	33	12
Causeway Bay	8492	96.9	40	69	118	183	254	308	374	430	108	136	777	367
Central	8574	97.9	28	60	118	190	269	329	402	463	100	137	978	365
Mong Kok	8536	97.4	41	77	128	167	205	233	282	320	107	127	615	284

Pollutant: Nitrogen Dioxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8488	96.9	17	27	46	68	93	112	137	151	42	51	236	135
Eastern	8061	92.0	24	35	51	66	82	96	114	132	47	53	235	118
Kwai Chung	8548	97.6	32	44	58	77	105	127	155	179	58	64	260	138
Kwun Tong	8602	98.2	26	39	54	71	92	111	135	158	51	58	249	134
Sham Shui Po	8594	98.1	29	42	61	83	103	119	141	158	57	65	250	158
Tsuen Wan	8428	96.2	27	41	57	75	100	118	141	153	54	61	238	125
Sha Tin	8597	98.1	13	21	33	49	78	101	124	140	32	40	214	131
Tai Po	7960	90.9	20	29	40	55	75	90	110	123	39	45	199	101
Tung Chung	8496	97.0	13	23	38	60	89	107	128	146	35	45	221	119
Yuen Long	8462	96.6	25	33	46	64	90	108	130	147	46	52	215	124
Tap Mun	8537	97.5	4	5	8	13	21	29	38	47	9	11	111	51
Causeway Bay	8492	96.9	54	77	106	135	165	189	220	243	99	109	376	205
Central	8574	97.9	53	74	106	141	177	201	236	264	101	112	445	241
Mong Kok	8536	97.4	53	76	102	136	167	188	214	240	98	108	342	189

Pollutant: Carbon Monoxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 8 hour
Tsuen Wan	8360	95.4	290	390	530	700	910	1030	1170	1270	514	566	1620	1505
Tung Chung	8495	97.0	290	380	590	830	1080	1230	1380	1490	555	635	2020	1864
Yuen Long	8320	95.0	370	480	660	890	1140	1310	1490	1640	646	711	2540	2181
Tap Mun	8515	97.2	370	460	580	760	930	1050	1200	1330	574	620	2090	2050
Causeway Bay	8439	96.3	460	690	920	1270	1610	1840	2180	2410	884	985	5520	3438
Central	8526	97.3	350	580	800	1150	1380	1610	1840	2070	737	845	3220	2529
Mong Kok	8561	97.7	460	690	920	1150	1380	1490	1610	1840	836	902	3110	2514

Pollutant: Ozone

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8558	97.7	4	13	31	59	87	104	125	140	26	40	292	140
Eastern	8061	92.0	12	23	40	60	78	90	105	117	35	43	281	111
Kwai Chung	8483	96.8	4	9	25	49	73	88	107	120	21	33	253	126
Kwun Tong	8533	97.4	3	11	30	57	80	94	111	122	24	37	242	128
Sham Shui Po	8552	97.6	4	9	22	44	67	82	107	124	19	30	224	99
Tsuen Wan	8429	96.2	5	10	23	46	72	88	107	122	21	32	230	110
Sha Tin	8489	96.9	2	10	35	75	107	125	143	159	25	46	268	150
Tai Po	7899	90.2	5	17	39	72	102	122	147	167	31	48	270	142
Tung Chung	8503	97.1	6	17	39	68	99	121	149	174	32	47	325	148
Yuen Long	8439	96.3	5	11	29	59	94	117	147	182	26	41	301	131
Tap Mun	8498	97.0	25	42	70	106	135	151	171	186	62	76	324	175

Pollutant: Respirable Suspended Particulates (Continuous monitoring)

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8589	98.0	16	25	41	63	84	101	128	154	39	47	223	178
Eastern	8689	99.2	15	22	37	57	77	89	120	146	35	43	222	184
Kwai Chung	8514	97.2	19	28	40	60	81	96	121	139	40	47	210	180
Kwun Tong	8548	97.6	19	28	42	62	82	96	127	147	41	48	226	169
Sham Shui Po	8536	97.4	18	26	40	60	81	96	128	152	39	47	226	196
Tsuen Wan	8571	97.8	20	28	41	64	86	101	129	153	41	49	226	183
Sha Tin	8617	98.4	16	24	39	60	82	97	121	142	38	45	207	169
Tai Po	8674	99.0	17	25	40	60	82	99	124	148	39	46	202	158
Tung Chung	8561	97.7	15	22	38	61	87	105	132	151	37	46	210	162
Yuen Long	8488	96.9	19	27	42	68	95	113	145	167	43	51	225	186
Tap Mun	8558	97.7	16	23	38	59	79	92	116	138	36	44	195	148
Causeway Bay	8600	98.2	33	50	68	88	110	125	153	176	64	71	528	212
Central	8500	97.0	26	36	52	72	94	112	142	163	51	58	257	199
Mong Kok	8530	97.4	24	35	50	70	92	106	139	160	48	55	233	197

Note: *1. All concentration units are in micrograms per cubic metre.*
2. Annual averages calculated from less than 8 representative months are not published.

TABLE C6: 2009 TOTAL WET AND DRY DEPOSITION

(a) WET DEPOSITION

	Monitoring Station	Central / Western	Kwun Tong	Yuen Long
	WET DEPOSITION (TON/HA)	14783	21874	14888
	WEIGHTED MEAN pH (based on volume-weighted mean hydrogen ion concentrations ($[H^+]$)	4.48	4.56	4.53
	WEIGHTED MEAN pH (based on volume-weighted mean pH)	4.68	4.82	4.73
	NO. OF SAMPLES	81	101	71
Filtrate (Kg/Ha)	**NH_4^+**	4.54	8.81	5.40
	NO_3^-	15.98	26.68	17.68
	$SO_4^=$	25.64	41.64	21.91
	Cl^-	26.95	52.57	9.75
	F-	0.40	0.62	0.44
	Na^+	15.37	29.00	6.08
	K^+	3.61	5.44	3.68
	Formate	3.51	4.65	3.95
	Acetate	2.90	3.94	3.01
	Ca^{++}	3.20	4.78	2.47
	Mg^{++}	2.25	3.63	0.74

(b) DRY DEPOSITION

	Monitoring Station	Central / Western	Kwun Tong	Yuen Long
	NO. OF SAMPLES	19	25	21
Filtrate (Kg/Ha)	**NH_4^+**	0.45	0.68	0.24
	NO_3^-	8.47	13.79	6.89
	$SO_4^=$	7.58	8.94	4.48
	Cl^-	10.18	11.76	3.45
	F-	0.092	0.124	0.096
	Na^+	6.60	7.68	2.32
	K^+	0.49	0.69	0.36
	Formate	0.14	0.16	0.13
	Acetate	0.12	0.16	0.13
	Ca^{++}	4.39	5.80	3.98
	Mg^{++}	0.81	1.05	0.38

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

TABLE C7: 2009 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	14	14	14	14	13	13	13	15	17	18	17	17	16	18	18	21	20	19	19	20	20	18	17	15
Eastern	11	11	11	10	10	10	11	13	13	14	13	13	12	12	12	12	13	13	12	13	14	13	12	12
Kwai Chung	20	19	18	18	16	15	16	16	17	19	22	22	24	25	26	27	29	28	27	25	23	22	21	20
Kwun Tong	10	10	10	11	10	9	10	11	12	12	12	11	11	12	12	13	12	13	13	12	12	11	11	11
Sham Shui Po	15	13	14	15	14	14	15	16	16	17	16	15	16	16	17	17	18	17	19	18	17	16	15	15
Tsuen Wan	13	12	12	13	12	11	12	13	14	16	17	19	19	19	19	19	20	20	19	17	16	14	14	13
Sha Tin	10	9	9	10	8	8	8	9	11	11	12	11	12	12	14	14	14	15	15	13	12	12	11	10
Tai Po	8	8	7	7	7	7	7	8	10	10	10	10	10	10	10	11	11	11	11	10	9	9	9	8
Tung Chung	12	11	10	12	10	10	10	11	13	15	15	16	17	17	17	17	16	15	13	13	13	13	12	12
Yuen Long	13	12	11	12	11	10	11	12	13	15	15	15	15	16	17	18	19	18	18	16	15	14	13	13
Tap Mun	10	9	9	11	10	10	10	11	13	15	16	15	14	13	12	12	11	11	11	10	10	10	10	10
Causeway Bay	8	8	8	7	7	7	8	10	11	12	11	11	11	11	11	10	10	10	10	9	10	9	8	8
Central	12	12	11	12	11	10	11	14	18	18	17	16	16	18	17	20	19	19	18	18	17	16	14	13
Mong Kok	17	15	14	13	14	14	16	18	19	20	19	18	18	20	20	21	22	22	22	21	20	19	18	18

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	57	49	44	41	39	50	84	117	126	113	98	81	89	92	96	101	106	109	106	103	96	90	84
Kwai Chung	119	84	72	65	63	72	116	165	190	186	154	141	136	133	142	149	157	165	182	174	153	143	140	135
Kwun Tong	93	63	52	48	48	57	104	145	160	152	127	111	103	104	114	121	131	142	148	139	122	112	112	110
Sham Shui Po	100	68	60	55	54	58	97	137	161	154	132	120	115	117	120	128	136	143	153	149	138	131	125	120
Tsuen Wan	92	61	52	42	41	48	87	122	152	149	133	124	115	115	119	124	131	139	148	137	122	115	117	110
Sha Tin	82	66	57	47	44	49	71	93	87	70	55	46	42	42	46	50	56	66	81	90	93	92	95	90
Tung Chung	74	57	45	37	37	45	66	82	80	71	69	70	66	64	64	63	64	71	82	88	86	82	81	76
Yuen Long	97	83	74	61	56	62	90	122	110	92	80	73	70	71	73	80	89	97	108	113	109	107	109	110
Tap Mun	15	14	13	14	13	14	15	16	17	18	19	16	14	14	13	13	13	14	14	14	15	15	15	15
Causeway Bay	272	204	187	166	157	157	231	365	428	427	394	360	337	347	335	353	349	357	385	382	373	366	363	326
Central	257	183	160	136	132	128	196	326	478	464	410	379	335	348	360	381	392	420	445	417	382	359	336	311
Mong Kok	278	187	171	146	138	139	228	318	361	365	324	306	318	337	349	361	383	405	416	374	333	338	347	341

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	14	12	10	10	9	12	25	41	44	37	29	21	23	23	23	23	24	24	23	24	23	22	21
Kwai Chung	41	26	21	19	18	22	43	67	80	77	58	49	44	40	43	44	47	51	61	60	51	48	49	47
Kwun Tong	27	16	12	11	12	15	35	55	62	58	45	36	31	30	32	34	37	40	42	40	35	32	33	33
Sham Shui Po	27	17	14	14	14	15	29	48	60	56	44	37	32	31	31	33	35	37	41	41	38	37	35	35
Tsuen Wan	25	13	11	8	8	10	25	42	57	55	46	40	32	30	30	31	33	36	40	37	32	31	33	31
Sha Tin	25	20	16	12	11	13	22	33	30	21	14	10	9	8	8	8	9	11	15	22	25	27	29	28
Tung Chung	18	12	8	6	6	9	18	26	24	19	17	16	14	12	11	10	9	11	15	17	18	18	19	18
Yuen Long	30	24	22	16	14	17	30	46	38	28	22	18	16	15	15	16	17	19	23	27	28	29	33	35
Tap Mun	2	2	2	2	2	2	2	3	4	4	4	3	3	2	2	2	2	2	2	2	2	2	2	2
Causeway Bay	119	87	79	69	65	65	98	165	199	196	178	157	143	145	136	143	141	146	161	162	160	160	158	142
Central	109	71	60	50	48	46	79	146	229	215	184	164	137	142	146	156	161	176	191	179	167	158	147	136
Mong Kok	120	76	68	56	52	53	96	143	166	166	141	127	129	136	140	146	156	168	176	158	138	143	150	149

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	46	37	32	28	26	25	32	47	55	58	56	53	49	54	57	61	65	69	72	70	67	61	56	52
Eastern	50	39	32	28	27	30	44	56	58	59	55	53	51	53	57	61	67	69	68	67	66	62	57	55
Kwai Chung	56	44	40	36	36	39	51	62	67	68	66	67	69	72	77	81	85	87	89	83	75	70	66	63
Kwun Tong	52	39	34	30	30	34	51	62	65	63	58	56	56	59	64	69	75	80	83	78	69	63	61	59
Sham Shui Po	58	43	38	34	33	35	52	64	69	68	65	64	65	69	72	78	82	86	90	87	80	75	71	67
Tsuen Wan	54	41	35	30	29	32	48	58	64	64	63	64	65	69	73	76	80	84	87	80	73	68	66	62
Sha Tin	43	36	32	28	27	29	37	43	42	38	34	30	29	30	34	37	43	50	57	57	54	52	50	47
Tai Po	46	39	34	31	31	33	41	48	47	42	37	34	34	36	38	42	49	58	66	64	60	55	53	50
Tung Chung	46	39	33	28	27	31	39	43	43	42	43	45	45	46	47	47	49	55	60	61	58	55	52	49
Yuen Long	51	46	41	36	35	36	43	52	51	49	46	45	46	48	51	56	63	68	73	72	67	62	59	57
Tap Mun	11	11	10	10	10	10	11	11	12	13	13	12	10	10	9	9	10	11	11	12	12	12	12	12
Causeway Bay	90	72	66	60	58	58	82	113	124	128	122	120	118	125	127	134	134	134	139	135	127	121	121	109
Central	90	74	68	60	59	57	76	103	129	134	129	129	125	130	137	143	145	150	153	143	126	118	111	104
Mong Kok	95	71	66	60	58	59	81	99	107	112	109	112	121	129	135	139	144	148	147	133	122	119	118	113

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	540	490	470	440	440	460	550	610	650	620	600	560	550	550	550	550	560	580	630	670	650	640	630	600
Tung Chung	630	620	610	600	600	600	610	630	640	640	650	650	640	640	650	640	630	640	650	660	670	660	660	650
Yuen Long	760	710	680	650	630	630	690	780	760	720	680	650	650	650	640	660	680	700	750	790	800	790	800	790
Tap Mun	600	600	600	600	600	610	620	630	630	650	650	650	640	630	620	620	620	620	620	620	620	610	600	600
Causeway Bay	1120	1210	1130	1030	950	910	780	780	880	930	1030	980	980	1000	940	950	920	890	970	1060	1100	1070	1010	1010
Central	840	710	620	550	530	510	570	690	850	950	980	900	860	930	920	930	880	930	990	990	1090	1130	1030	940
Mong Kok	930	1010	950	840	850	800	770	790	830	890	850	850	860	890	910	900	920	920	990	1030	1020	1000	940	900

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	43	46	49	49	48	40	27	24	26	33	42	51	54	55	52	49	42	34	31	30	31	33	33
Eastern	39	44	49	50	50	47	37	29	29	32	40	47	53	57	56	54	50	45	43	39	37	37	38	37
Kwai Chung	30	38	40	42	42	38	28	21	20	23	31	36	42	44	43	40	36	31	26	25	26	27	27	28
Kwun Tong	33	41	43	45	44	40	28	22	22	27	35	43	49	52	50	48	42	35	31	30	32	33	31	31
Sham Shui Po	25	36	39	42	41	38	25	18	17	21	28	35	40	43	43	40	36	28	22	19	20	21	21	22
Tsuen Wan	26	37	40	43	42	38	25	19	19	24	30	36	42	46	46	44	38	31	24	22	24	23	22	23
Sha Tin	34	38	40	41	40	36	29	26	31	41	52	63	71	76	76	74	67	56	45	40	37	35	33	34
Tai Po	37	40	42	43	42	39	33	30	35	44	56	67	74	78	78	75	67	55	45	40	39	38	37	36
Tung Chung	38	42	44	46	45	40	34	31	34	40	46	53	63	72	76	76	71	59	47	40	38	37	37	38
Yuen Long	29	31	33	34	34	31	26	22	27	35	46	59	68	73	75	72	63	51	38	31	30	29	29	28
Tap Mun	65	63	62	59	59	57	55	56	61	67	76	86	96	102	104	104	103	99	91	83	77	73	69	67

Pollutant: Respirable Suspended Particulates (Continuous Monitoring)

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	42	39	39	38	39	39	40	43	47	51	51	50	48	52	54	54	55	55	54	53	52	49	46	44
Eastern	39	38	37	37	37	37	38	40	41	43	44	45	45	45	47	48	48	48	47	47	46	44	42	41
Kwai Chung	40	38	37	37	37	39	42	45	47	49	47	47	46	49	52	53	55	55	56	56	53	49	46	44
Kwun Tong	42	40	39	38	39	39	42	45	48	50	50	50	50	52	53	55	56	56	56	55	52	48	46	45
Sham Shui Po	41	39	38	38	38	39	40	43	45	46	46	47	47	50	51	53	54	55	58	58	54	49	47	44
Tsuen Wan	43	40	39	39	39	40	42	44	46	49	50	51	51	52	56	56	58	59	59	58	55	51	48	46
Sha Tin	43	41	40	39	39	39	41	42	42	43	43	43	44	46	49	50	52	54	54	52	51	48	47	45
Tai Po	43	42	40	40	40	40	42	45	46	46	45	45	46	47	49	50	51	53	54	53	51	49	48	46
Tung Chung	43	41	39	39	38	39	40	42	43	45	45	47	49	51	52	53	53	52	50	49	48	47	46	45
Yuen Long	47	44	43	42	42	42	45	48	53	55	55	55	55	56	57	58	58	59	58	58	56	54	51	49
Tap Mun	41	40	39	39	40	41	43	44	45	45	46	46	46	47	47	48	48	47	46	45	44	44	43	41
Causeway Bay	61	50	47	45	45	46	53	65	72	76	74	73	72	79	80	82	85	88	93	95	89	82	78	73
Central	50	44	43	42	42	45	50	56	65	65	62	61	57	60	63	65	67	69	70	68	64	61	58	55
Mong Kok	47	41	40	39	39	41	45	52	57	58	58	57	56	61	62	63	65	67	69	71	67	62	57	53

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

TABLE C8: 2009 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	0.12	0.10
Lead [2]	ng/m^3	33	39
Organic Substances			
Benzene	$\mu g/m^3$	1.8	1.53
Benzo[a]pyrene	ng/m^3	0.18	0.15
1,3-Butadiene	$\mu g/m^3$	0.19	0.17
Formaldehyde	$\mu g/m^3$	15.9	4.36
Perchloroethylene	$\mu g/m^3$	0.6	0.59
Dioxins [3]	$pgI\text{-}TEQ/m^3$	0.053	0.049

Note:

[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 2009 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).

Appendix D

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

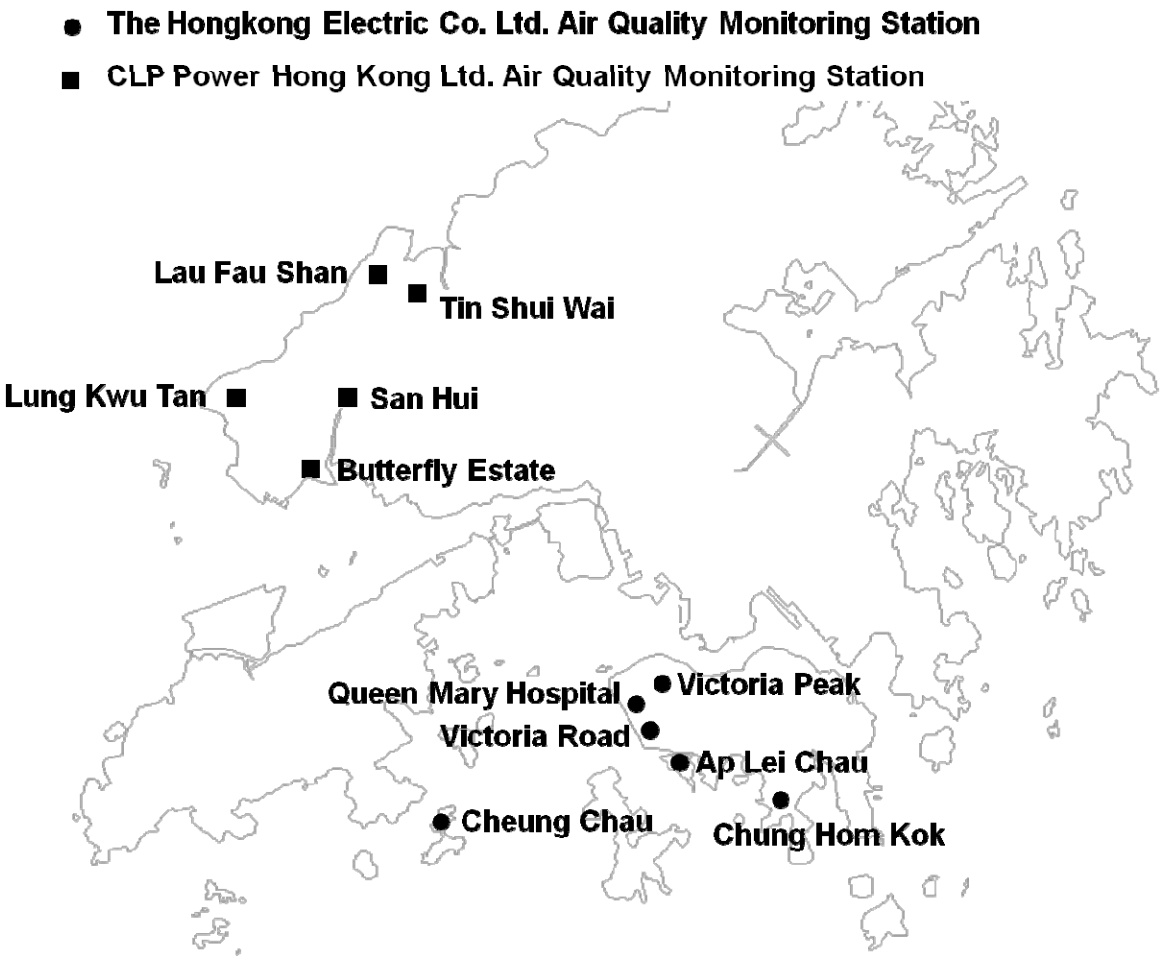


Figure D1 Location of HEC's & CLP's Air Quality Monitoring Stations for Sulphur Dioxide and Nitrogen Dioxide

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

Air Quality Monitoring Stations	Annual Mean Concentration [1]	Range of Monthly Mean Concentration [1]
Sulphur Dioxide (SO_2) [2]		
Victoria Peak	7	3 - 12
Chung Hom Kok	10	3 - 17
Victoria Road	15	8 - 27
Queen Mary Hospital	9	6 - 15
Ap Lei Chau	11	8 - 16
Cheung Chau	11	5 - 17
Nitrogen Dioxide (NO_2) [2]		
Victoria Peak	27	12 - 46
Chung Hom Kok	18	10 - 26
Victoria Road	32	17 - 51
Queen Mary Hospital	25	13 - 42
Ap Lei Chau	15	8 - 33
Cheung Chau	21	9 - 42

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

Air Quality Monitoring Station	Annual Mean Concentration [1]	Range of Monthly Mean Concentration [1]
Sulphur Dioxide (SO_2) [2]		
San Hui	11	3 - 23
Tin Shui Wai	8	4 - 16
Butterfly Estate	11	7 - 17
Lung Kwu Tan	19	11 - 27
Lau Fau Shan	17	7 - 50
Nitrogen Dioxide (NO_2)		
San Hui [3]	70	40 - 91
Tin Shui Wai	34	16 - 57
Butterfly Estate	35	18 - 50
Lung Kwu Tan	28	15 - 41
Lau Fau Shan	23	14 - 39

Notes:

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

[2] There was no exceedance of AQO limit for the pollutant in 2009.

[3] San Hui recorded one count of exceedance of 24-hr AQO limit for NO_2.