AIR QUALITY
IN HONG KONG 2010

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) (2010)

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Security Classification	:	Unrestricted

Summary

This report summarises the 2010 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 (RSP) and sulphur dioxide (SO_2) at roadside have reduced substantially over the past decade. However, the level of roadside nitrogen dioxide (NO_2) has shown an upward trend during the period. Additional control measures are being introduced to bring down the concentration of this pollutant.

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 SO_2 and RSP have also reduced in recent years. However, concentrations of ozone, a major constituent of photochemical smog, have been 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 2010 remained at levels well below their respective Air Quality Objectives limits.

Hong Kong experienced an unprecedented dust plume episode on 21- 23 March 2010, which was caused by sand and dust originated from sandstorms over northern China that reached the coast of Guangdong. Exceptionally high levels of RSP have been recorded at all the air quality monitoring stations during that period.

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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.

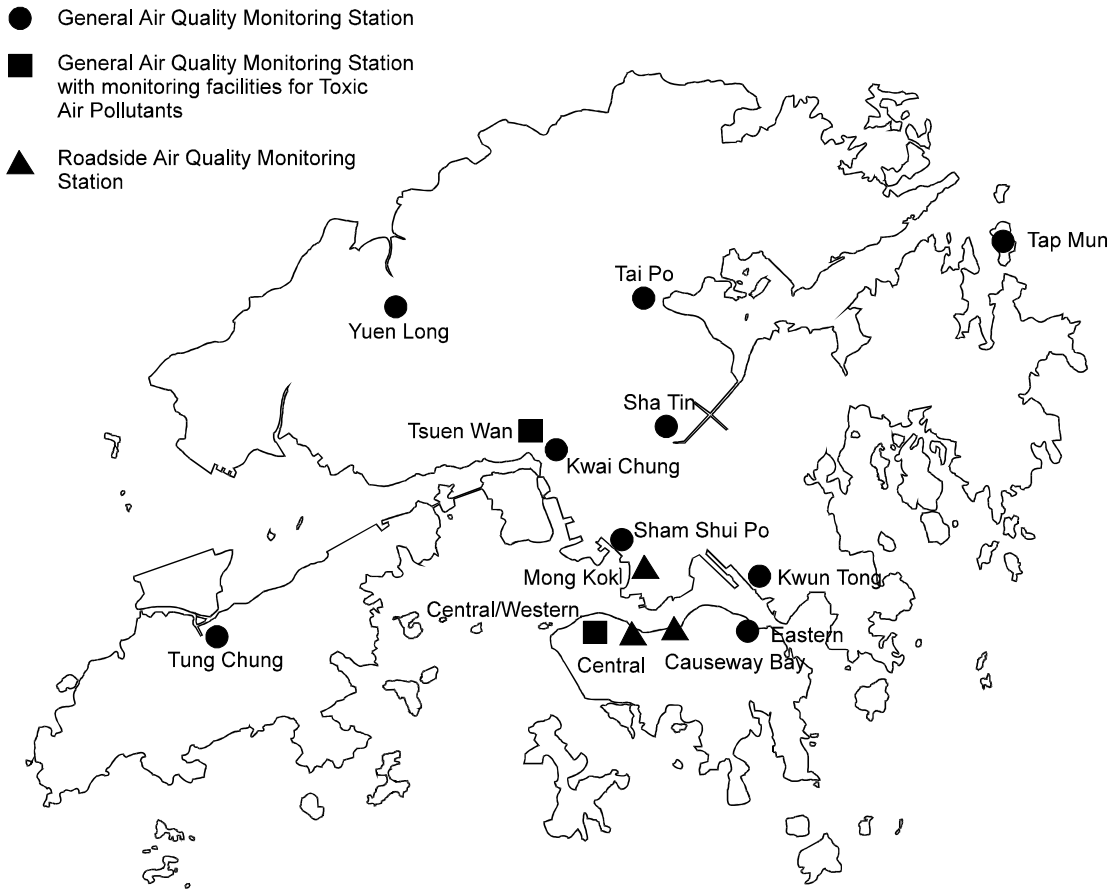


Figure 1: Location of EPD's Air Quality Monitoring Stations (2010)

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 2010 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 source 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 2010
(1-Hour Average Statistics)

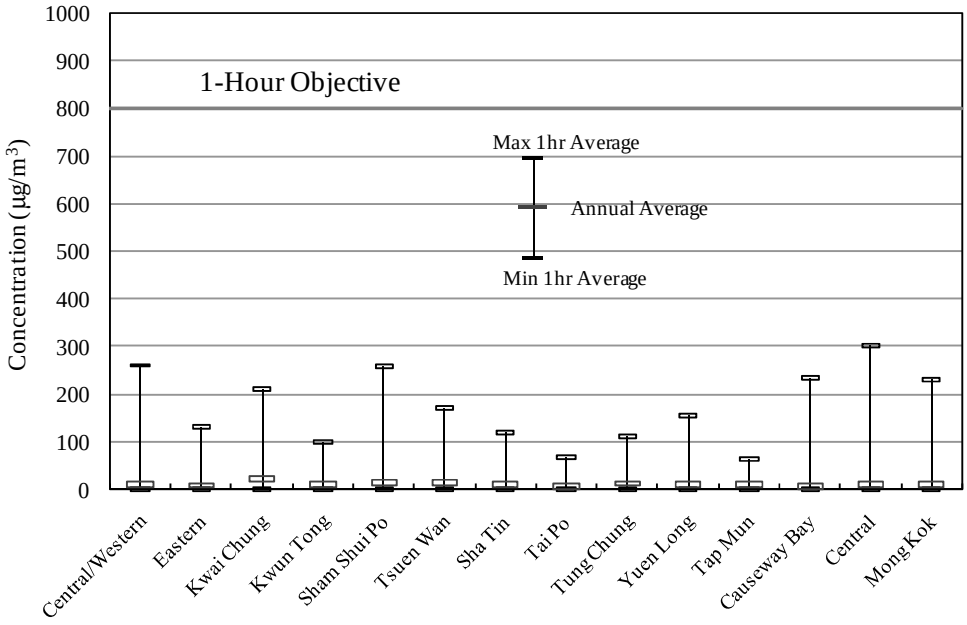


Figure 2b: Sulphur Dioxide Monitoring 2010
(24-Hour Average Statistics)

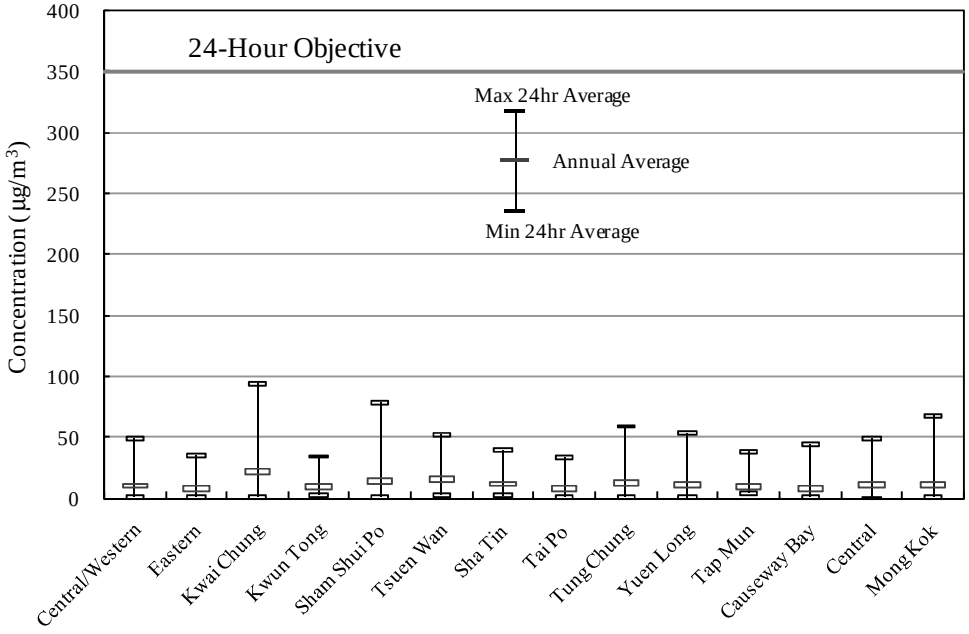
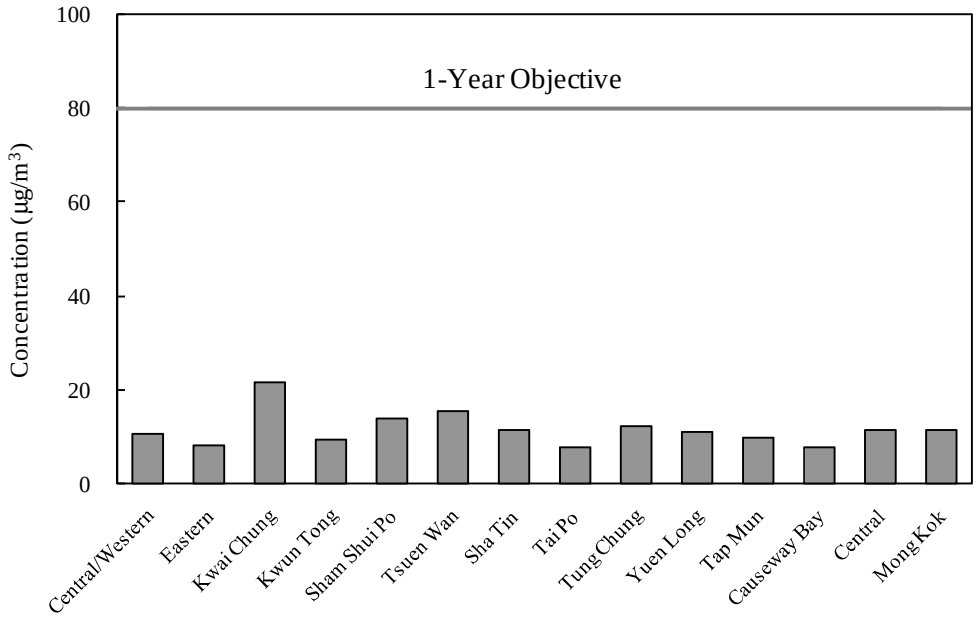


Figure 2c: Sulphur Dioxide Monitoring 2010
(Annual Average)



Sulphur dioxide was continuously measured at all the 14 monitoring stations during 2010. As in previous years, SO_2 concentrations remained low throughout the territory in 2010. 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 (303 μg/m^3) was recorded at the Central roadside station. The Kwai Chung general station had the highest 24-hour average (94 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.

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

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

Nitrogen dioxide (NO_2) is mainly formed from the 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 2010. In 2010, the highest 1-hour average (423 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). Non-compliance with the 1-hour and 24-hour AQO for NO_2 was recorded at all the three roadside stations.

As in previous years, all general stations complied with the annual AQO for NO_2 in 2010 while non-compliance was observed at all the three roadside stations. The highest annual average (122 μg/m^3) was recorded at the Central roadside station in the year.

Figure 3a: Nitrogen Dioxide Monitoring 2010
(1-Hour Average Statistics)

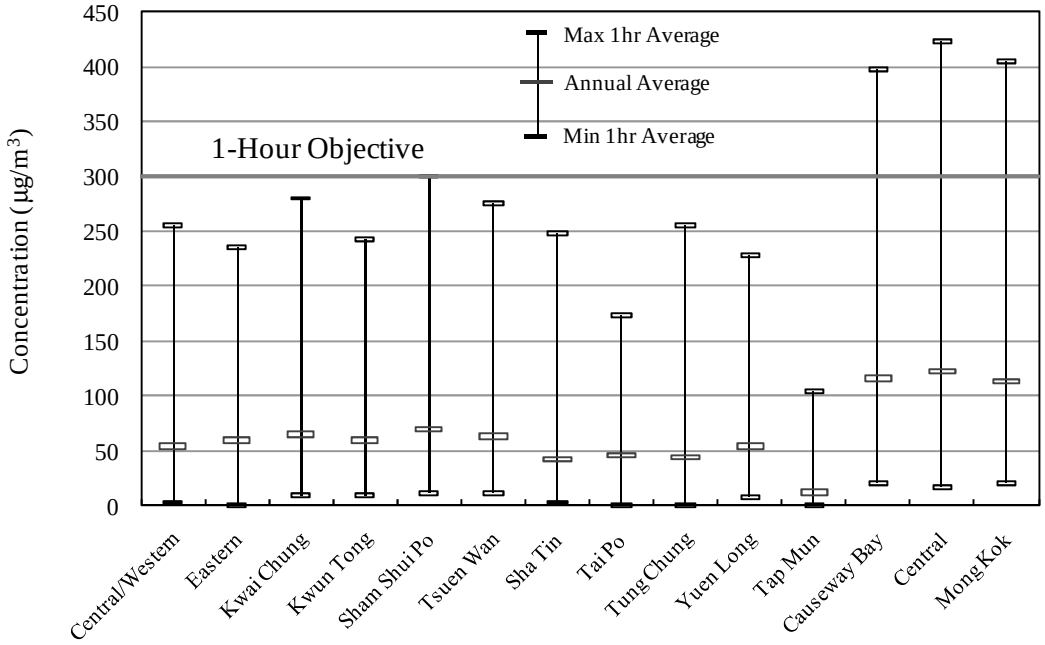


Figure 3b: Nitrogen Dioxide Monitoring 2010
(24-Hour Average Statistics)

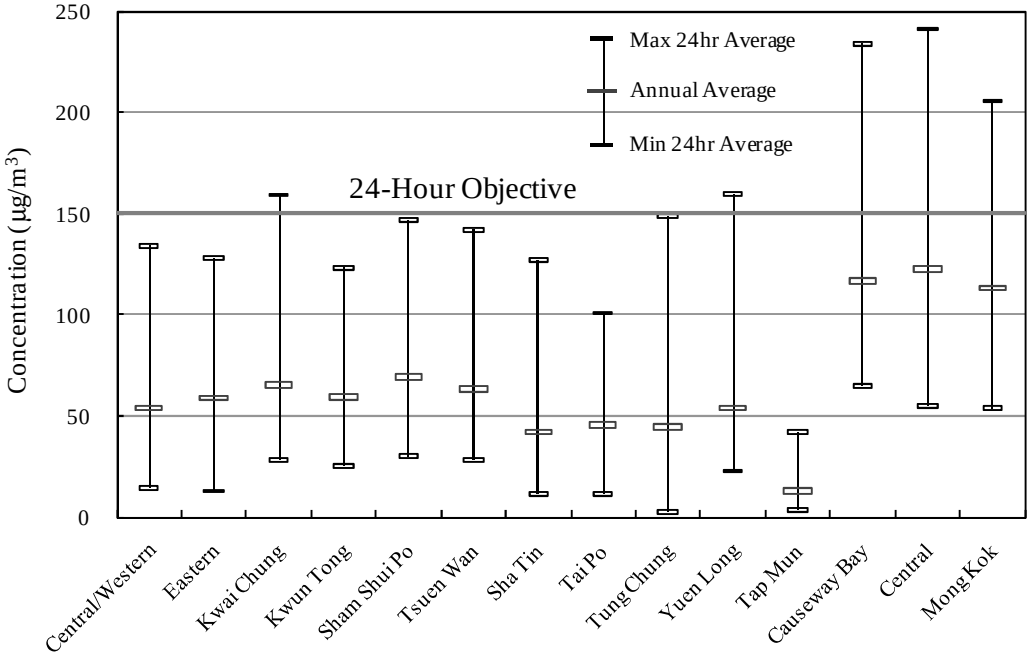
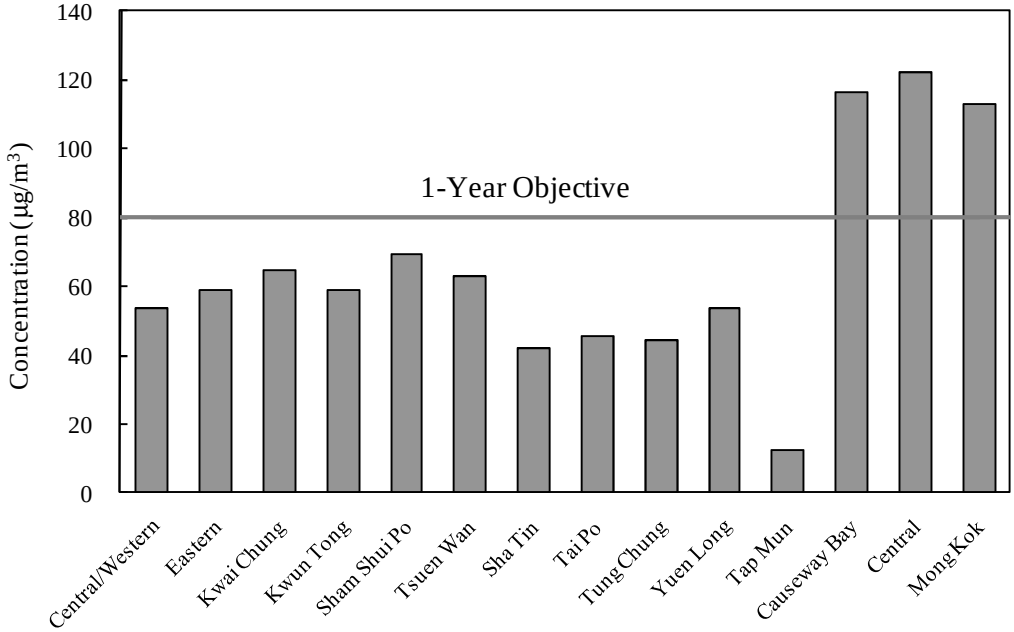


Figure 3c: Nitrogen Dioxide Monitoring 2010
(Annual Average)



2.3 Ozone (O_3)

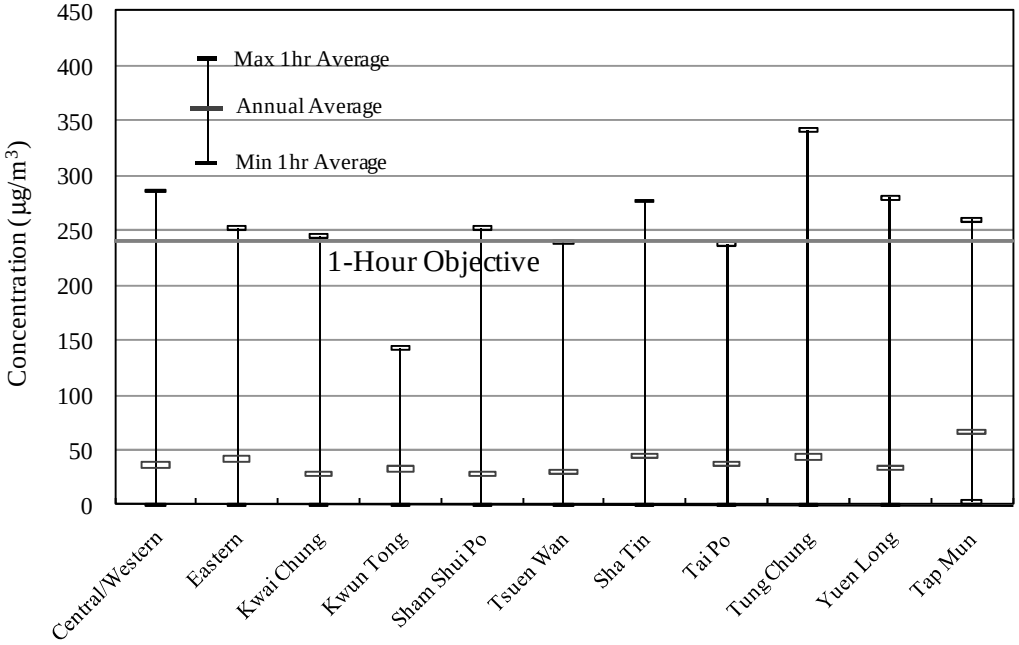
Ozone (O_3) is a major constituent of photochemical smog. It is not a pollutant directly emitted from man-made sources but formed by photochemical reactions of other primary pollutants such as nitrogen oxides (NOx) and volatile organic compounds (VOCs) under sunlight. As it takes several hours for these photochemical reactions to take place, ozone 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, four of them recorded non-compliance with the 1-hour AQO in 2010 (i.e., with the 1-hour AQO limit exceeded more than three times in the year). The highest 1-hour average (341 μg/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 2010
(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 2010. 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 2010, the highest 1-hour average (4710 $\mu g/m^3$) and the highest 8-hour average (3378 $\mu g/m^3$) were both recorded at the Causeway Bay station; these values were around one sixth and one third of the respective AQO limits.

Figure 5a: Carbon Monoxide Monitoring 2010
(1-Hour Average Statistics)

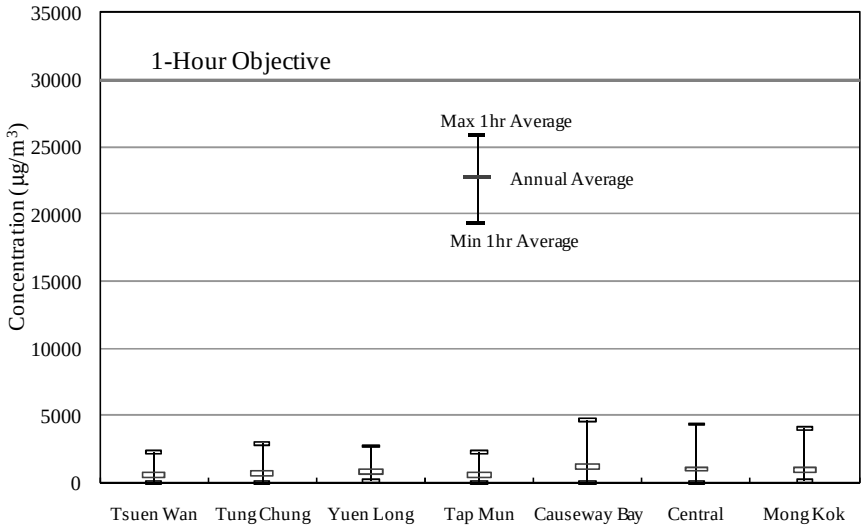
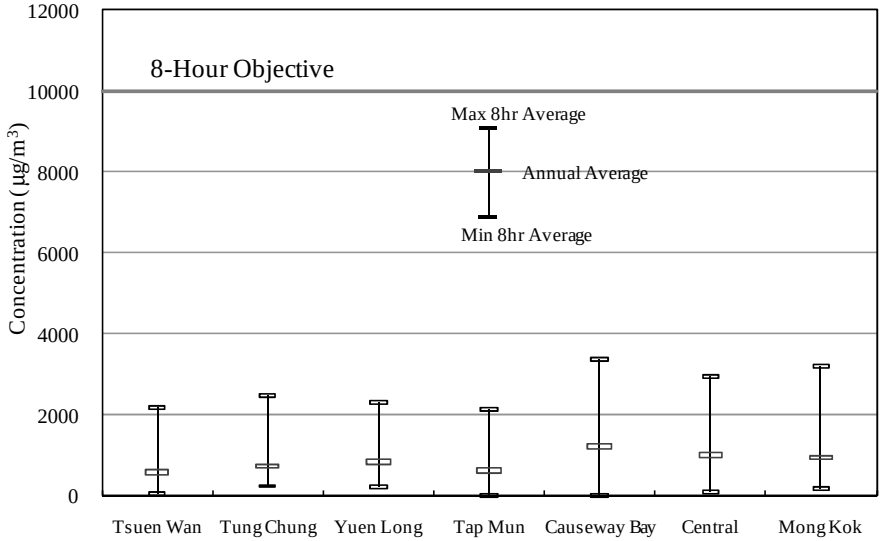


Figure 5b: Carbon Monoxide Monitoring 2010
(8-Hour Average Statistics)



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 2010. Samples are taken for 24 hours at a frequency of one sample per six days.

Hong Kong experienced an unprecedented dust plume episode on 21- 23 March 2010, which was caused by sand and dust originated from sandstorms over northern China that reached the coast of Guangdong. High levels of particulates were recorded at monitoring stations taking TSP samples during the episode. The highest 24-hour average (743 $\mu g/m^3$) was recorded at the Mong Kok roadside station in the episode period on 22 March.

For annual average, the highest (102 $\mu g/m^3$) was also recorded at the Mong Kok roadside station in the year which exceeded the annual AQO for TSP (80 $\mu g/m^3$) in 2010. All other stations complied with the AQO.

Figure 6a: TSP Monitoring 2010
(24-Hour Average Statistics)

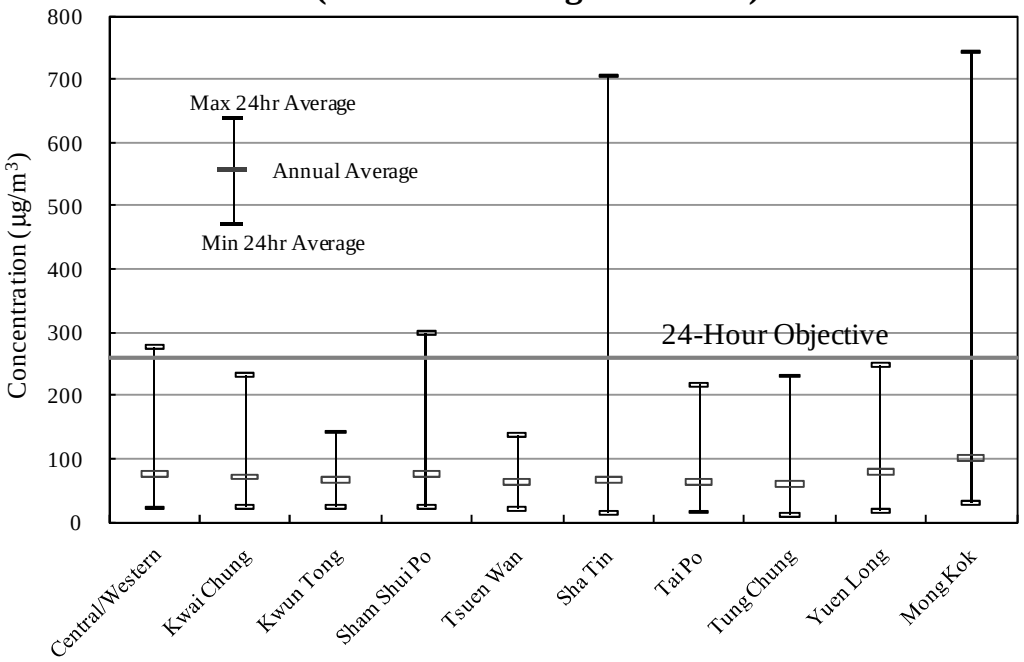
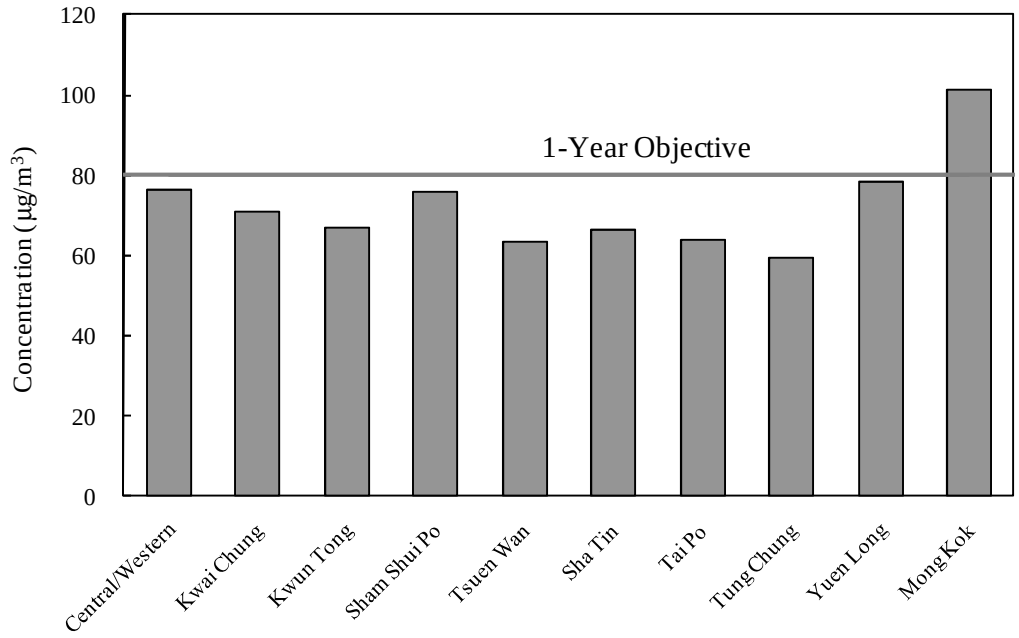


Figure 6b: TSP Monitoring 2010
(Annual Average)



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 2010. Most of these stations were also equipped with high-volume sampler to collect particulate samples for chemical analysis.

During the serious dust plume episode on 21-23 March 2010 as mentioned in paragraph 3.1 above, respirable suspended particulates levels in the territories have increased significantly, with the highest hourly concentration at 785 $\mu g/m^3$ recorded at the Kwun Tong general monitoring station on 22 March. All roadside stations and eight general air quality monitoring stations recorded exceedance of the 24-hour AQO limit of RSP for more than 1 day in the period, resulting in non-compliance with the respective AQO in 2010. The highest 24-hour average (691 $\mu g/m^3$) was recorded at the Eastern general station on 22 March.

Despite the serious dust episode in March as mentioned above, all the general air monitoring stations complied with the annual AQO limit of RSP (55 μg/m^3) in the year. However, the annual AQO limit was exceeded at the Causeway Bay and Central roadside stations in the year. The highest annual concentration at 66 μg/m^3 was recorded at the Causeway Bay roadside station.

Figure 7a: RSP Monitoring 2010
(24-Hour Average Statistics)

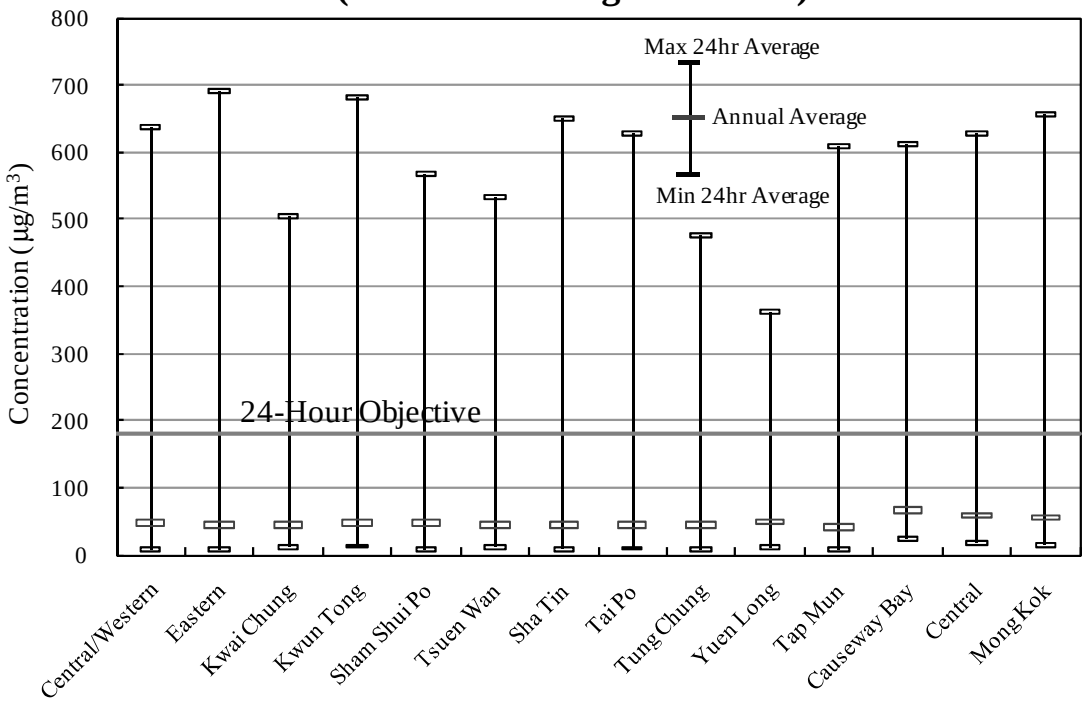
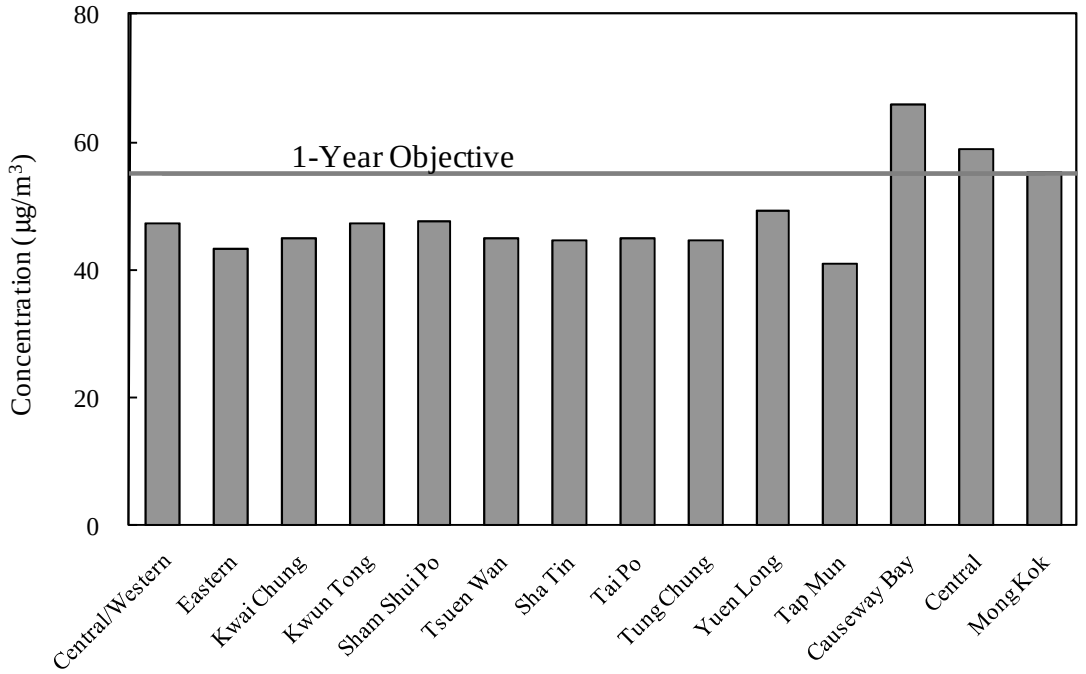


Figure 7b: RSP Monitoring 2010
(Annual Average)



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 2010. The overall 3-month averages, ranging from 11 ng/m^3 (Kwun Tong and Central/Western) to 105 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 2010, 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: 2010 Diurnal variations of NO_2

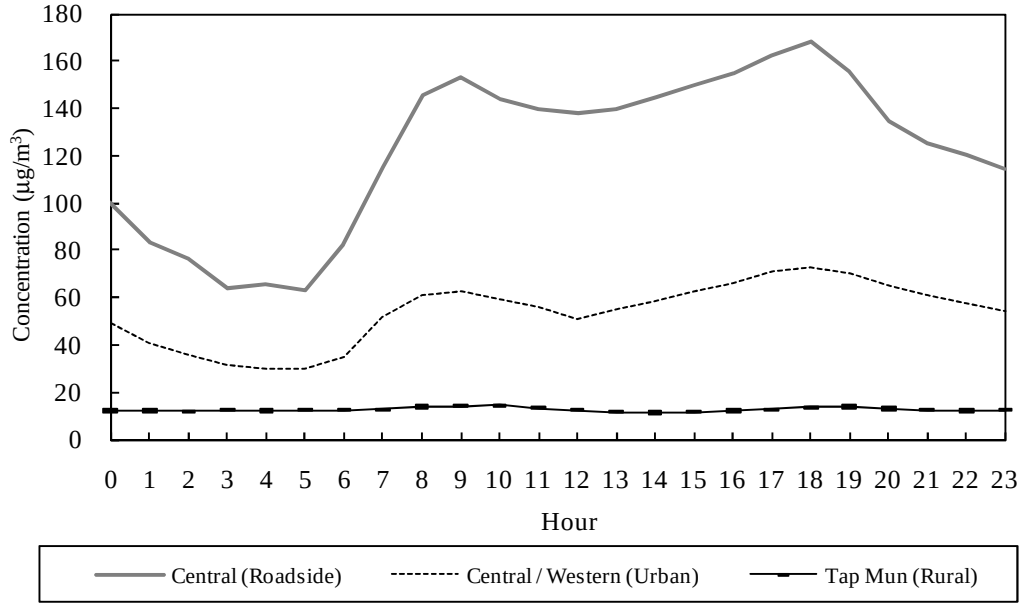
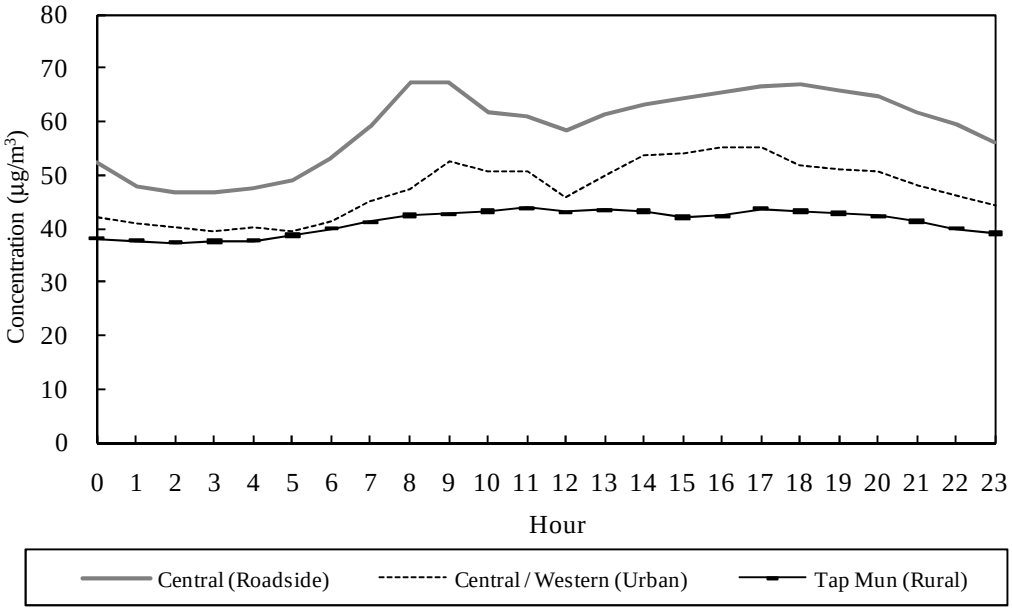
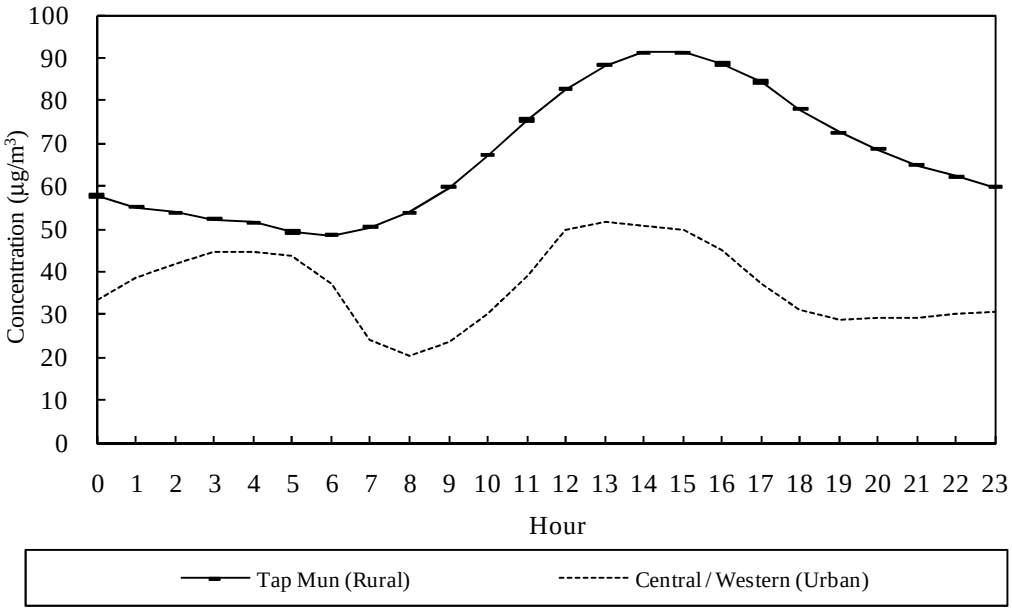


Figure 9: 2010 Diurnal variations of RSP



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: 2010 Diurnal variations of O_3



5.2 Over a Year

Concentrations of NO_2, RSP and 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 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 2010

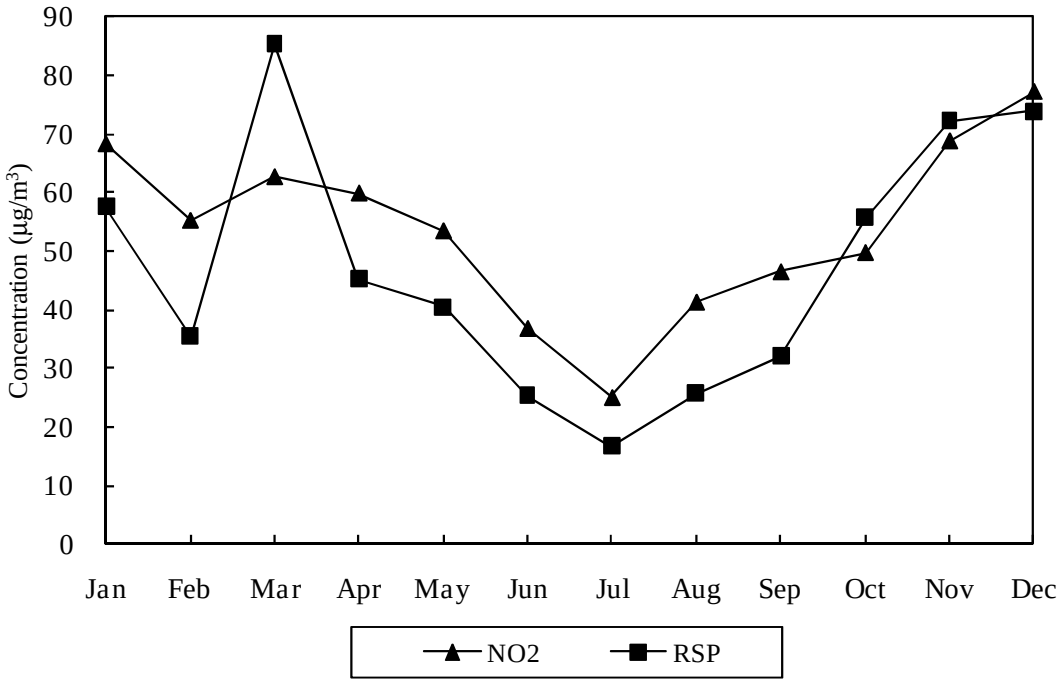
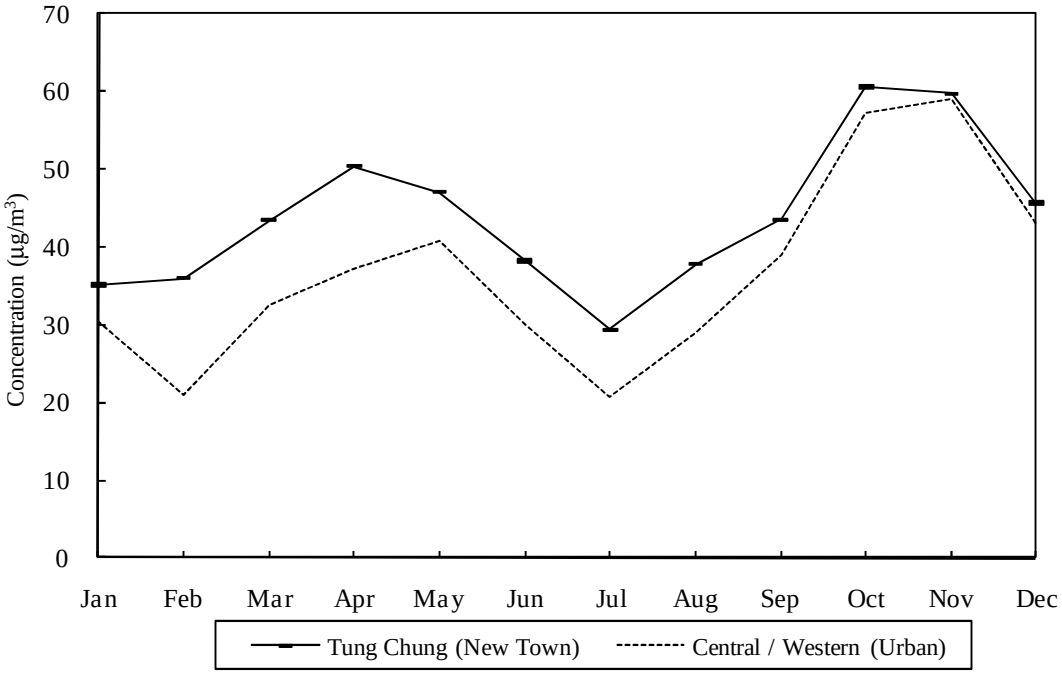


Figure 12: Monthly variations of O_3 in 2010



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

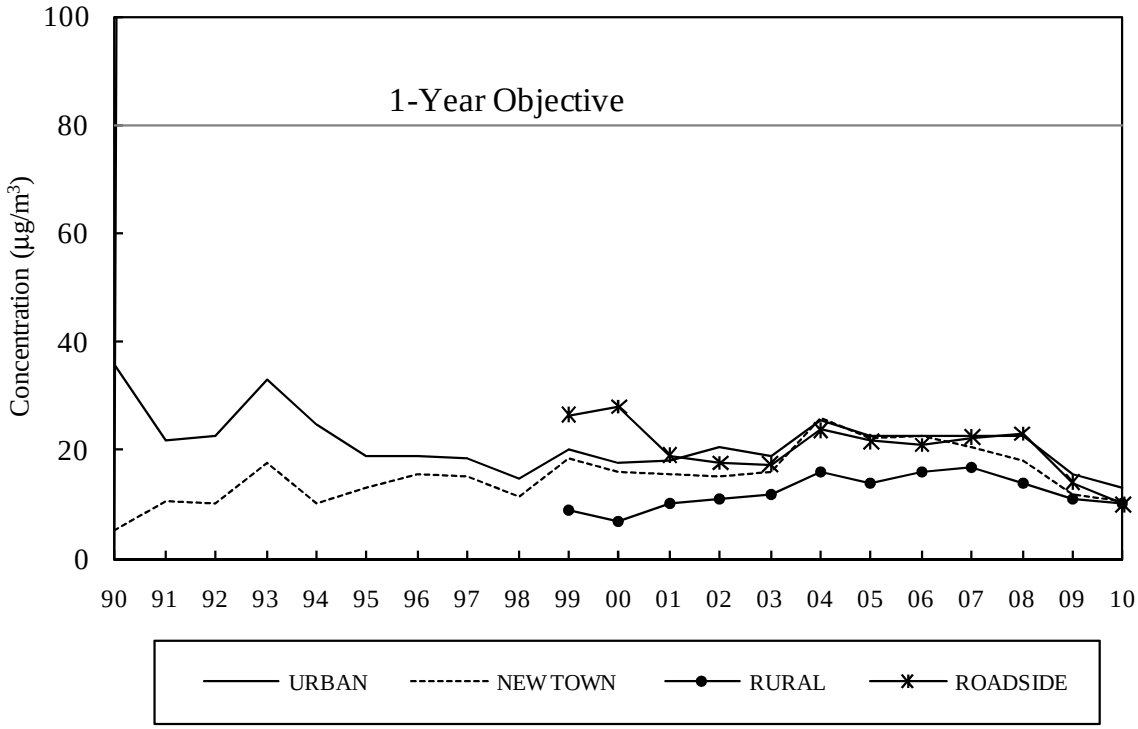
Land Use Type	Land Use Characteristics	Air Monitoring Stations
Urban	Densely populated residential areas mixed with some commercial and/or industrial areas	Central/Western, Eastern, Kwai Chung, Kwun Tong, Sham Shui Po and Tsuen Wan
New Town	Mainly residential areas	Sha Tin, Tai Po, Tung Chung and Yuen 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 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, the average SO_2 concentration at roadside in 2010 (10 $\mu g/m^3$) dropped by 63% as compared with the 1999 value (27 $\mu g/m^3$).

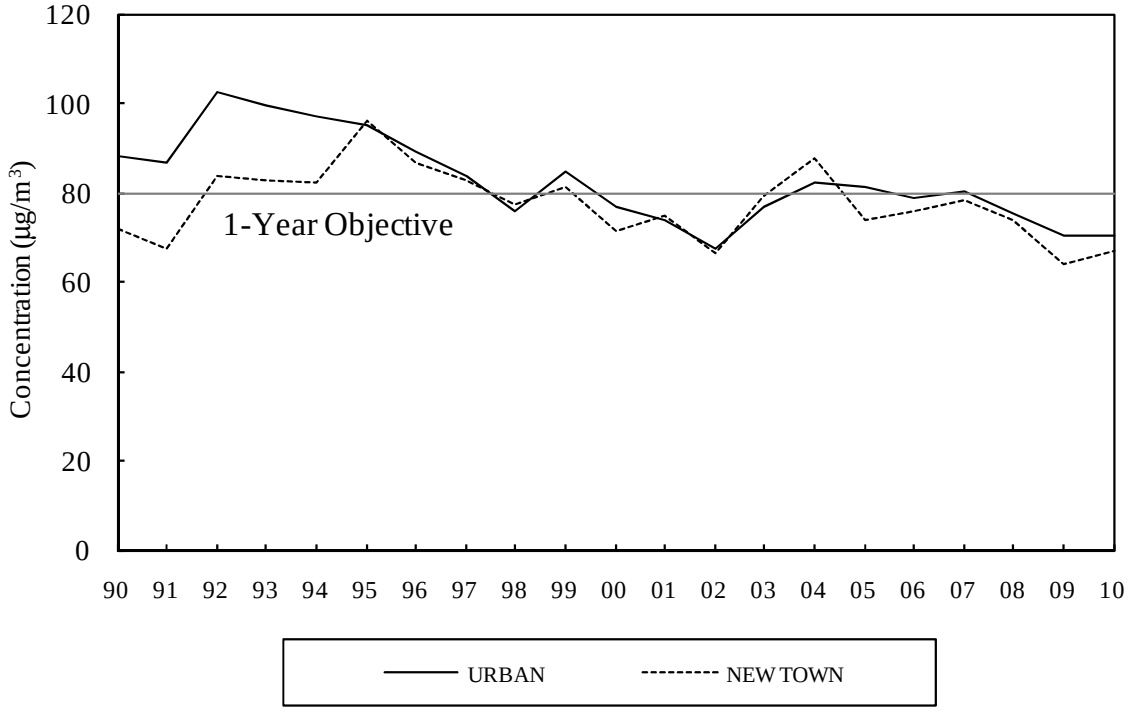
Figure 13: SO_2 long term trend



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

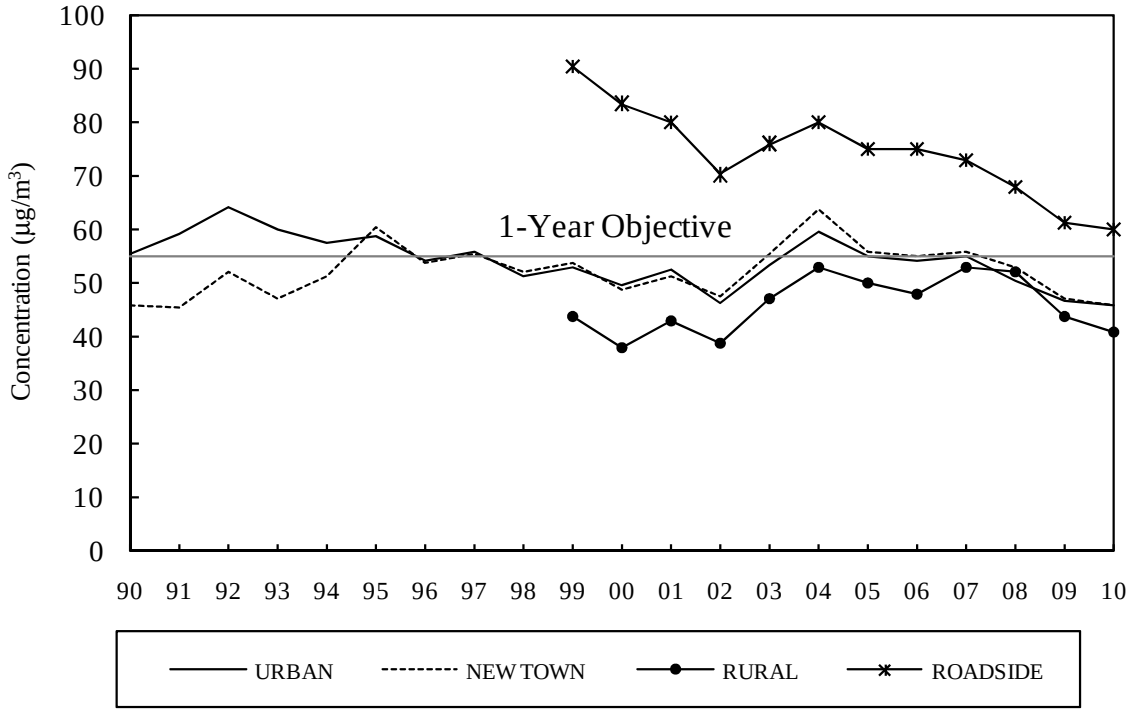


5.3.3 Respirable Suspended Particulates (RSP)

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 2010 had reduced by 34% when compared with the 1999 value.

Figure 15: RSP long term trend



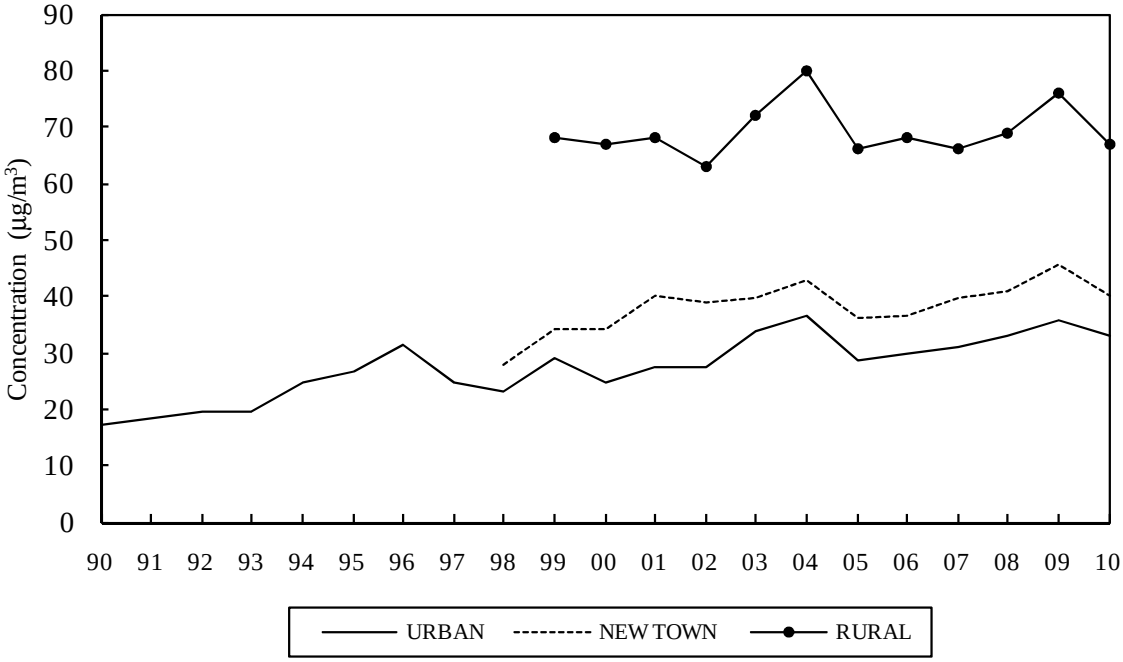
5.3.4 Ozone (O_3)

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.

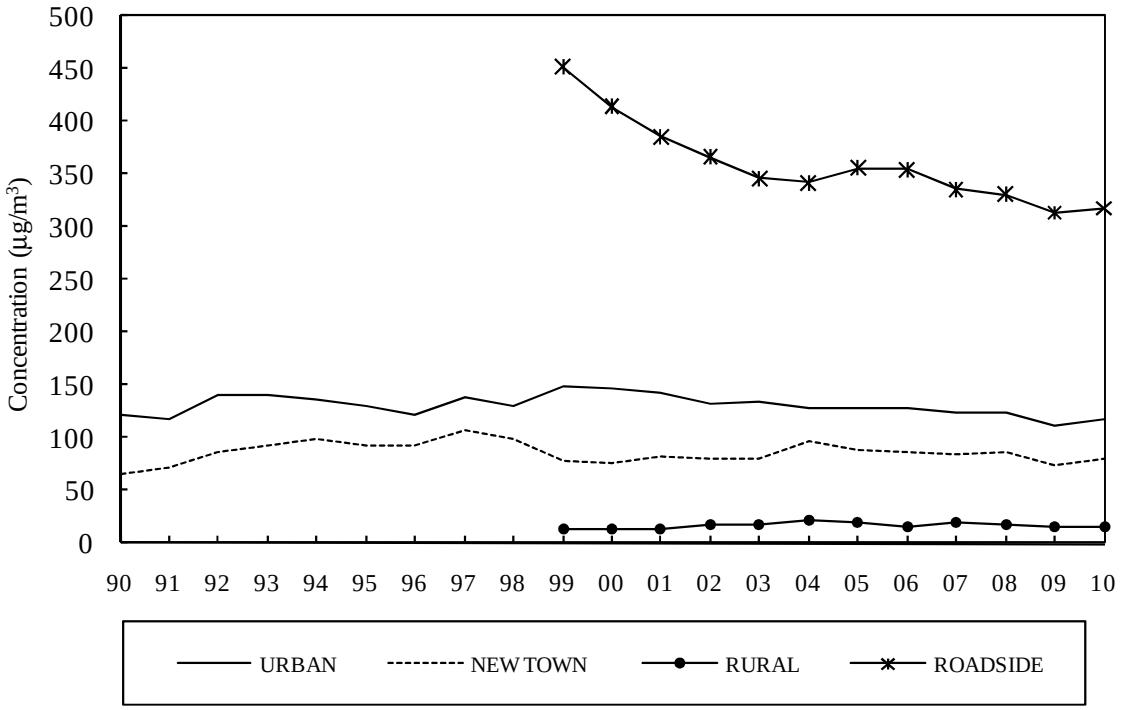
Figure 16: O_3 long term trend



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

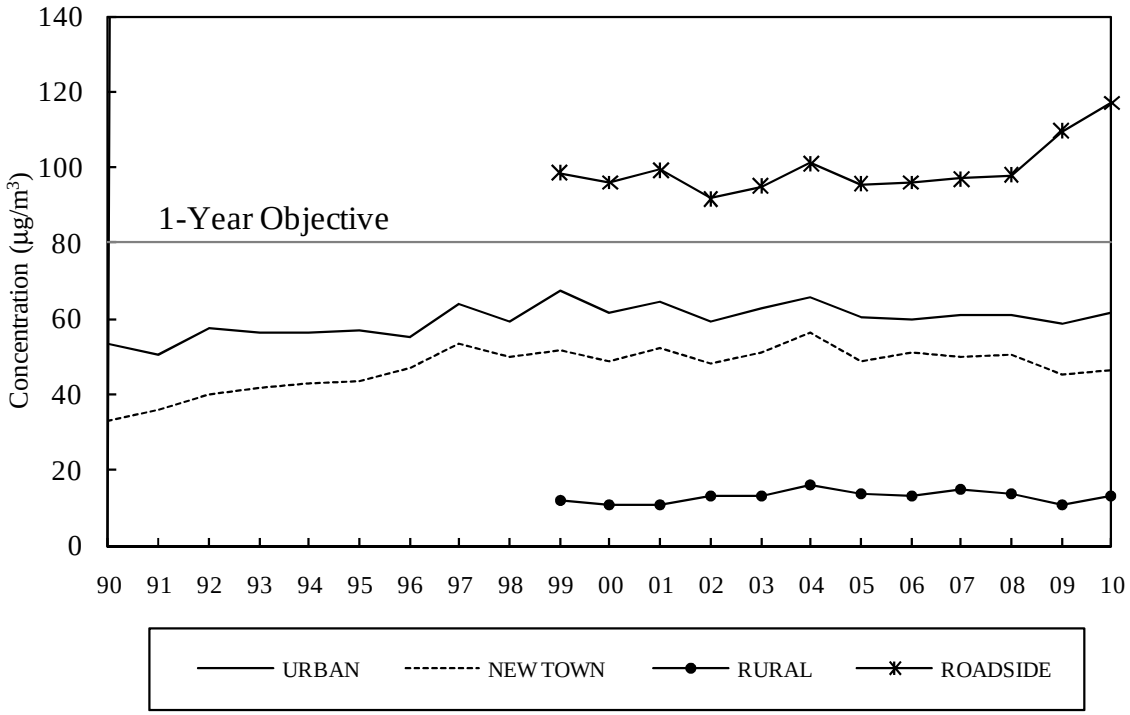
The annual average of NOx in urban areas has remained quite constant over the past decade. During the same period, the roadside NOx concentration has generally shown a decreasing trend, reflecting a reduction in vehicular NOx emission as a result of vehicle emission control measures implemented in the past decade. The roadside NOx concentration in 2010 was 30% 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 NOx. The oxidation can be promoted by the presence of more ozone and VOCs in the ambient air. The ambient NO_2 levels have exhibited slow rising trends since 1990 but the trends have levelled off in recent years. The roadside NO_2 concentrations have shown an overall increasing trend over the past years, which could be caused by a combination of the ageing of motor vehicles, increase in direct NO_2 emissions from motor vehicles and rise in regional background ozone concentration promoting the conversion of nitric oxide emitted from motor vehicles to NO_2. To address the problem of the rising roadside NO_2 concentration in recent years, the government is introducing initiatives to support the adoption of green technologies in transportation and install after-treatment devices to franchised buses to reduce their NOx emissions. We are also stepping up our efforts to control emissions from petrol and liquefied petroleum gas vehicles.

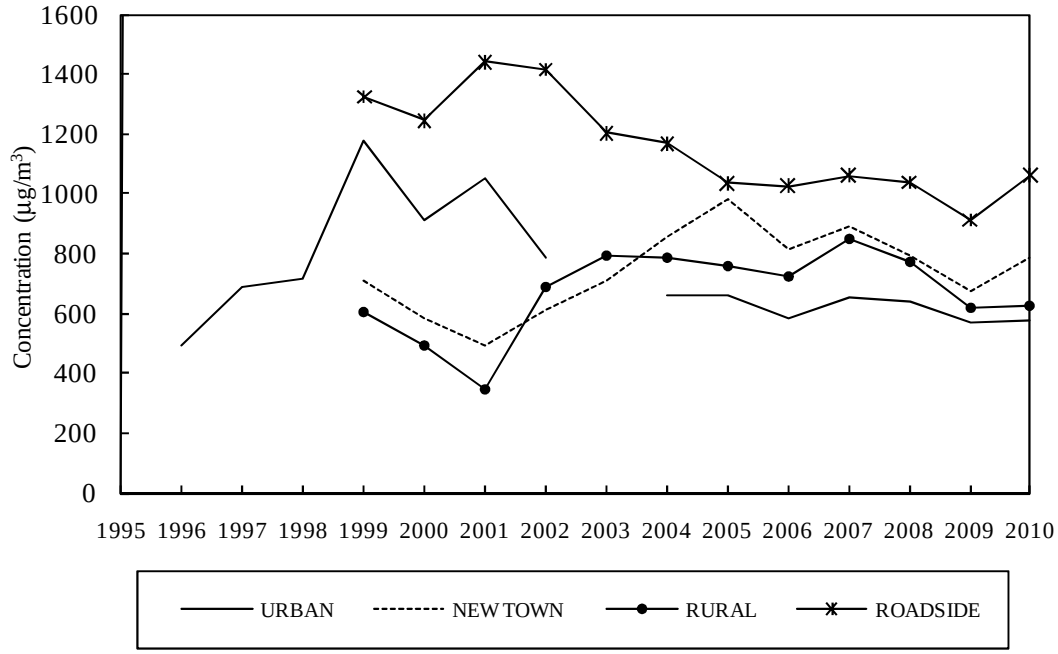
Figure 18: NO_2 long term trend



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.

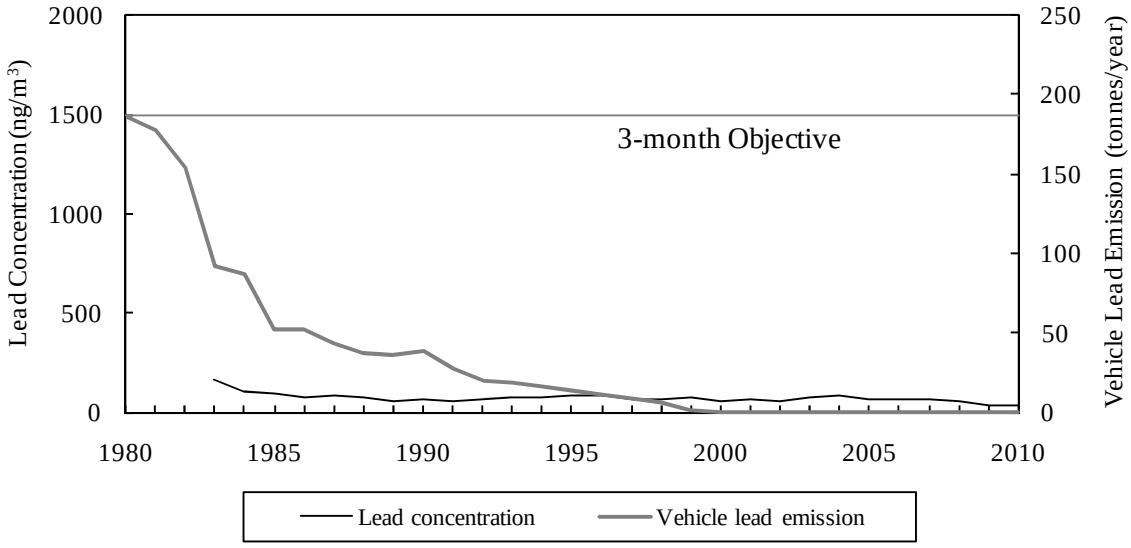
Figure 19: CO long term trend



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

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

Table A1: Hong Kong Air Quality Objectives (AQO)

Concentration in micrograms per cubic metre [1]

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

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

Table A2: Percentage Time in compliance with Short-Term Air Quality Objectives in 2010

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	99.92	100	100	98.36	99.18	100	100	--	--
	Eastern	99.99	100	100	--	99.18	100	100	--	--
	Kwai Chung	99.99	100	99.73	100	99.72	100	100	--	--
	Kwun Tong	100	100	100	100	99.18	100	100	--	--
	Sham Shui Po	99.98	100	100	98.39	99.18	100	100	--	--
	Tsuen Wan	100	100	100	100	99.45	100	100	100	100
	Sha Tin	99.96	100	100	98.36	99.45	100	100	--	--
	Tai Po	100	100	100	100	99.18	100	100	--	--
	Tung Chung	99.77	100	100	100	99.73	100	100	100	100
	Yuen Long	99.93	100	99.73	100	99.73	100	100	100	100
	Tap Mun	99.94	100	100	--	99.18	100	100	100	100
Roadside Station	Causeway Bay	--	99.40	84.15	--	99.18	100	100	100	100
	Central	--	99.29	78.90	--	99.18	100	100	100	100
	Mong Kok	--	99.76	88.77	98.36	99.18	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 2010. For NO_2, the compliance percentages of the 24-hour AQO were above 99% for general stations and between 78% to 88% 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. For TSP, the compliance rates were above 98% for all stations. For both RSP and TSP, all of the exceedances were caused by the dust plume episode in March. The compliance levels of 1-hour AQO for O_3 were over 99% at all monitoring stations. The compliance percentage of SO_2 reached 100% for all stations. For CO, all monitoring stations achieved full compliance with AQO in 2010.

Compliance with the long-term AQO

Table A3 shows the compliance status of the long-term (annual) AQO for all 14 monitoring stations in 2010. Similar to previous years, all monitoring stations achieved full compliance with the long-term AQO for SO_2 and lead in 2010. Compliance with the annual AQO for NO_2 was recorded at 11 out of 14 stations. 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 2010.

Table A3: Compliance Status of Long-Term (Annual) Air Quality Objectives in 2010

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"*
- 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)
- Ad hoc provision of air quality data to the public, academics and environmental consultants upon request for the purposes of research and air quality assessment

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

B.3 Quality Control and Assurance

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

The accuracy of the monitoring network is assessed by performance audits. Similar to overseas standards, control limits of ±15% and ±10% are adopted for the gaseous pollutants and particulates respectively. In 2010, 507 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 2010, 2276 precision checks were carried out on the analysers and samplers. As shown in Figure B2 and based on the 95% probability limits, the precision of the network varied between -6.0 % and 5.0 %, which was again within the control limits of ±20% and ±10% for the gaseous pollutants and particulates 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 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 (2010)

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

Figure B1: Accuracy of Air Quality Monitoring Network, 2010

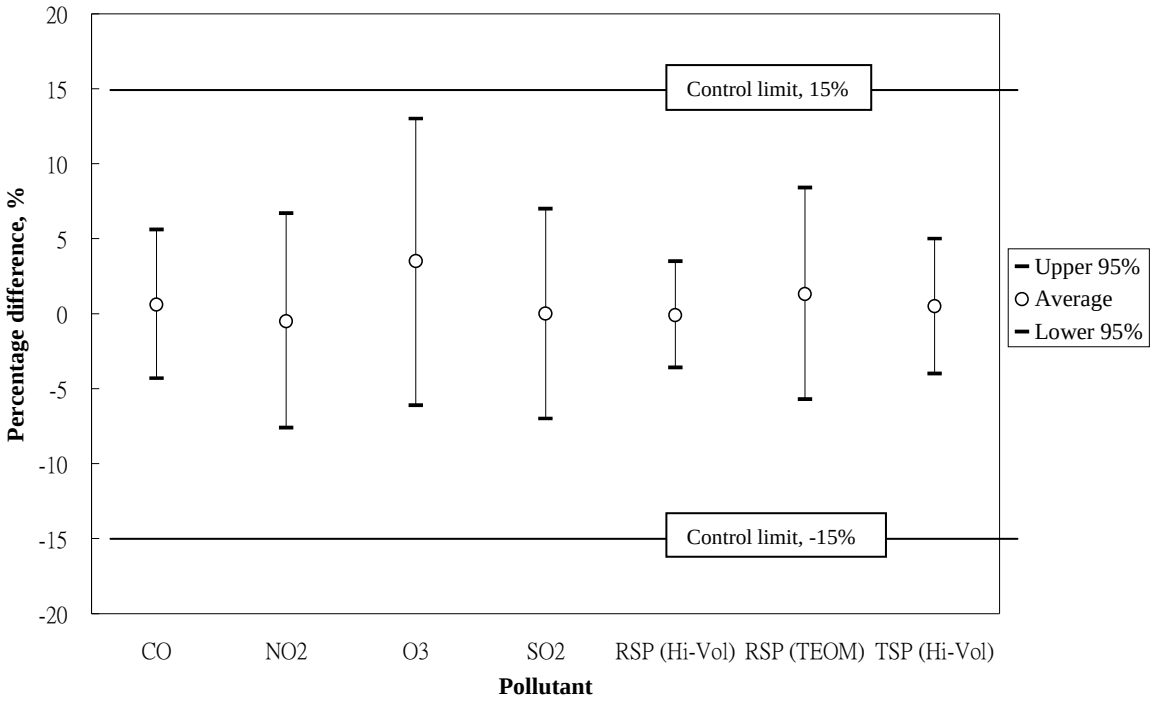
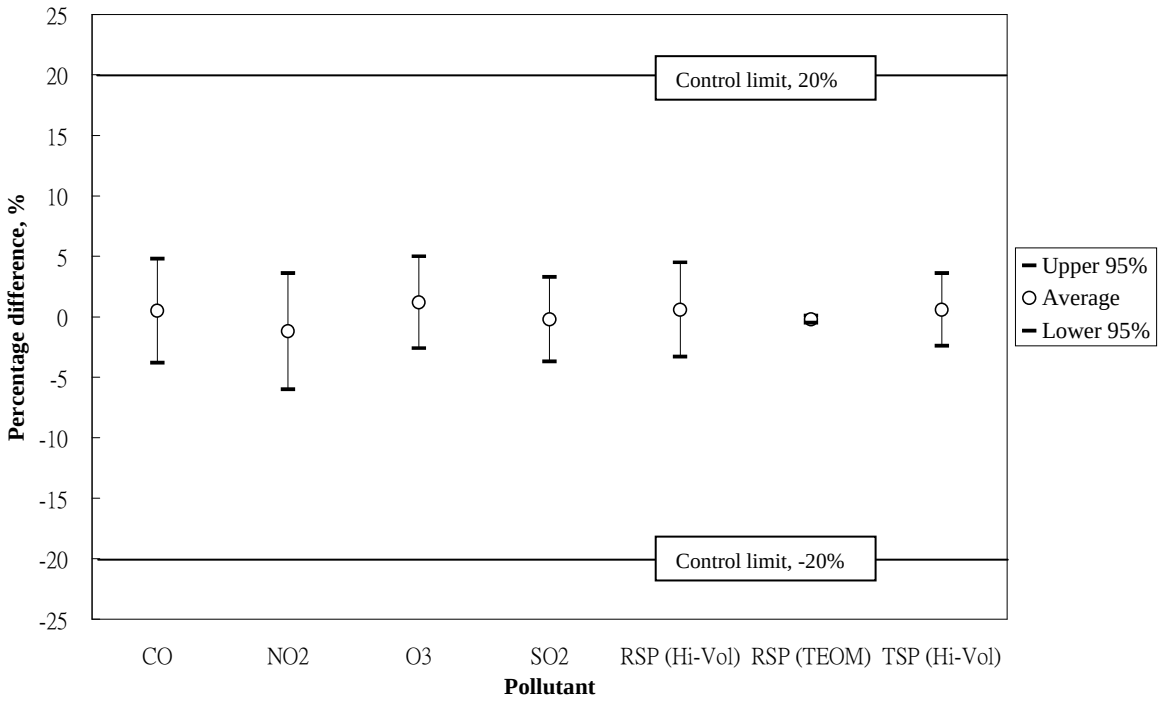


Figure B2: Precision of Air Quality Monitoring Network, 2010



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 2010

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

Station	1st High	2nd High	3rd High	4th High
Central / Western	260	219	133	124
Eastern	133	107	99	83
Kwai Chung	211	208	204	202
Kwun Tong	99	89	89	87
Sham Shui Po	258	234	214	208
Tsuen Wan	170	156	143	131
Sha Tin	121	112	110	110
Tai Po	68	67	63	60
Tung Chung	113	108	108	104
Yuen Long	154	129	118	107
Tap Mun	64	58	57	57
Causeway Bay	233	166	116	102
Central	303	168	155	134
Mong Kok	229	217	177	164

Pollutant: Nitrogen Oxides

Station	1st High	2nd High	3rd High	4th High
Central / Western	859	804	789	783
Kwai Chung	1040	983	926	915
Kwun Tong	1008	984	937	897
Sham Shui Po	1356	1253	1122	1104
Tsuen Wan	728	685	680	669
Sha Tin	730	707	674	663
Tung Chung	584	480	479	475
Yuen Long	717	648	633	620
Tap Mun	231	137	131	113
Causeway Bay	1696	1358	1297	1293
Central	1673	1654	1610	1505
Mong Kok	1415	1406	1343	1305

Pollutant: Nitric Oxide

Station	1st High	2nd High	3rd High	4th High
Central / Western	424	422	411	411
Kwai Chung	543	485	473	469
Kwun Tong	532	531	522	506
Sham Shui Po	726	684	621	608
Tsuen Wan	353	345	342	337
Sha Tin	395	372	355	331
Tung Chung	284	225	217	216
Yuen Long	366	327	319	299
Tap Mun	83	54	42	36
Causeway Bay	850	665	663	635
Central	946	922	895	830
Mong Kok	756	718	697	690

Notes:

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

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

Station	1st High	2nd High	3rd High	4th High
Central / Western	255	215	208	208
Eastern	236	231	209	205
Kwai Chung	280	280	275	275
Kwun Tong	242	241	239	236
Sham Shui Po	300	296	286	280
Tsuen Wan	276	255	247	243
Sha Tin	248	242	209	201
Tai Po	174	173	165	164
Tung Chung	255	253	230	228
Yuen Long	228	228	226	226
Tap Mun	104	83	81	75
Causeway Bay	398	386	386	383
Central	423	381	377	372
Mong Kok	405	405	399	356

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

Station	1st High	2nd High	3rd High	4th High
Tsuen Wan	2320	2320	2290	2290
Tung Chung	2910	2710	2560	2520
Yuen Long	2730	2530	2520	2520
Tap Mun	2310	2250	2230	2180
Causeway Bay	4710	4710	4600	4600
Central	4370	4030	4030	3790
Mong Kok	4030	3790	3790	3560

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

Station	1st High	2nd High	3rd High	4th High
Central / Western	286	278	270	264
Eastern	252	240	234	224
Kwai Chung	245	235	225	213
Kwun Tong	143	142	140	138
Sham Shui Po	252	249	236	235
Tsuen Wan	240	219	211	208
Sha Tin	277	268	267	239
Tai Po	238	222	221	220
Tung Chung	341	321	309	303
Yuen Long	280	271	255	253
Tap Mun	259	252	248	246

Pollutant: Respirable Suspended Particulates

Station	1st High	2nd High	3rd High	4th High
Central / Western	732	718	712	706
Eastern	775	775	769	768
Kwai Chung	628	615	610	609
Kwun Tong	785	777	777	772
Sham Shui Po	630	615	609	609
Tsuen Wan	731	702	692	687
Sha Tin	783	778	768	758
Tai Po	732	723	721	707
Tung Chung	640	629	627	624
Yuen Long	602	590	564	564
Tap Mun	715	707	706	705
Causeway Bay	707	703	695	693
Central	716	709	708	706
Mong Kok	775	763	751	744

All the highest 4 hourly RSP readings above were recorded when Hong Kong was affected by a dust plume originated from northern part of China in March 2010.

TABLE C2: THE HIGHEST 2 DAILY POLLUTANT CONCENTRATIONS MEASURED IN 2010

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

Station	1st High	2nd High
Central / Western	49	49
Eastern	35	33
Kwai Chung	94	82
Kwun Tong	34	34
Sham Shui Po	78	73
Tsuen Wan	52	52
Sha Tin	40	40
Tai Po	33	29
Tung Chung	59	53
Yuen Long	54	53
Tap Mun	38	31
Causeway Bay	45	41
Central	49	46
Mong Kok	68	52

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

Station	1st High	2nd High
Central / Western	134	121
Eastern	128	124
Kwai Chung	159	149
Kwun Tong	123	121
Sham Shui Po	147	144
Tsuen Wan	142	133
Sha Tin	127	118
Tai Po	101	99
Tung Chung	149	139
Yuen Long	160	141
Tap Mun	42	39
Causeway Bay	234	216
Central	241	225
Mong Kok	205	196

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

Station	1st High	2nd High
Central / Western	636 ^	237 ^
Eastern	691 ^	294 ^
Kwai Chung	505 ^	175 ^
Kwun Tong	681 ^	237 ^
Sham Shui Po	569 ^	197 ^
Tsuen Wan	533 ^	195 ^
Sha Tin	651 ^	216 ^
Tai Po	627 ^	220 ^
Tung Chung	475 ^	159
Yuen Long	361 ^	161
Tap Mun	609 ^	258 ^
Causeway Bay	613 ^	223 ^
Central	628 ^	251 ^
Mong Kok	656 ^	236 ^

Pollutant: Nitrogen Oxides

Station	1st High	2nd High
Central / Western	371	299
Kwai Chung	495	410
Kwun Tong	417	416
Sham Shui Po	458	420
Tsuen Wan	384	281
Sha Tin	337	306
Tung Chung	278	255
Yuen Long	337	311
Tap Mun	54	50
Causeway Bay	749	699
Central	755	733
Mong Kok	667	620

Pollutant: Nitric Oxide

Station	1st High	2nd High
Central / Western	164	146
Kwai Chung	226	165
Kwun Tong	208	193
Sham Shui Po	206	189
Tsuen Wan	158	138
Sha Tin	137	133
Tung Chung	91	78
Yuen Long	128	99
Tap Mun	11	10
Causeway Bay	337	317
Central	382	373
Mong Kok	308	297

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

Station	1st High	2nd High
Central / Western	277 ^	187
Kwai Chung	234	176
Kwun Tong	142	134
Sham Shui Po	299 ^	170
Tsuen Wan	139	121
Sha Tin	705 ^	135
Tai Po	216 ^	138
Tung Chung	231	196
Yuen Long	249	205
Mong Kok	743 ^	187

The RSP and TSP readings marked with ^ in the tables above were recorded when Hong Kong was affected by a dust plume originated from northern part of China in March 2010.

Pollutant: Ozone

Station	1st High	2nd High
Central / Western	108	106
Eastern	109	109
Kwai Chung	102	82
Kwun Tong	110	90
Sham Shui Po	89	87
Tsuen Wan	93	85
Sha Tin	132	115
Tai Po	96	95
Tung Chung	115	113
Yuen Long	100	98
Tap Mun	155	147

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

Station	1st High	2nd High
Tsuen Wan	2186	2156
Tung Chung	2469	2438
Yuen Long	2318	2309
Tap Mun	2144	2124
Causeway Bay	3378	3363
Central	2961	2919
Mong Kok	3219	3205

Notes:

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

TABLE C3: 2010 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	15	8	11	8	8	8	7	12	11	9	11	17	10
Eastern	11	4	9	5	5	5	5	10	13	10	11	11	8
Kwai Chung	13	21	22	19	23	39	35	25	23	9	14	14	21
Kwun Tong	11	7	10	10	8	7	7	10	12	9	11	12	10
Sham Shui Po	13	9	17	13	16	13	10	19	20	9	12	17	14
Tsuen Wan	13	14	19	13	14	17	13	16	20	12	14	19	15
Sha Tin	9	7	11	8	8	13	13	12	14	13	14	16	12
Tai Po	10	6	9	6	5	5	8 *	6	9	10	9	10	8
Tung Chung	13	7	13	12	11	9	8	11	13	15	15	19	12
Yuen Long	9	6	15	11	8	8	9	13	13	11	10	17	11
Tap Mun	11	6	10	9	9	9	9	7	9	13	12	15	10
Causeway Bay	10	7	9	5	5	7	5	7	8	7	9	12	8
Central	16	10	15	12	10	8	5	11	13	9	11	15	11
Mong Kok	13	10	15	9	8	8	7	12	15	9	12	17	11

Pollutant: Nitrogen Oxides

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	132	115	112	105	78	65	51	74	70	60	89	118	89
Kwai Chung	148	160	150	137	132	163	131	138	140	102	141	174	143
Kwun Tong	115	122	133	115	105	124	109	101	126	86	112	150	116
Sham Shui Po	147	132	144	139	127	113	96	121	127	94	121	163	127
Tsuen Wan	122	127	129	120	113	119	95	106	119	81	118	139	115
Sha Tin	80	61	77	61	55	64	52	78	72	47	97	122	72
Tung Chung	95	63	81	63	53	54	36	61	63	55	94	107	69
Yuen Long	113	82	105	86	81	89	78	94	99	66	117	147	97
Tap Mun	19	14	18	15	14	13	13	13	19	13	16	20	16
Causeway Bay	323	334	315	300	268	297	293	327	348	222	316	408	312
Central	323	337	376	319	314	323	285	337	324	336	355	408	336
Mong Kok	314	303	320	309	322	325	296	306	312	217	291	343	305

Pollutant: Nitric Oxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	42	39	32	30	16	19	17	21	15	7	14	27	23
Kwai Chung	52	65	53	49	47	69	58	54	48	26	37	56	51
Kwun Tong	36	44	45	36	30	46	44	33	44	19	26	47	38
Sham Shui Po	46	46	47	43	36	36	35	40	37	17	23	47	38
Tsuen Wan	37	46	42	37	34	42	36	34	32	14	23	35	34
Sha Tin	23	16	21	15	12	19	18	28	18	5	25	39	20
Tung Chung	26	19	22	15	11	14	12	17	16	6	14	22	16
Yuen Long	34	24	32	22	21	29	29	32	29	11	29	44	28
Tap Mun	3	1	3	2	2	2	2	2	2	1	2	3	2
Causeway Bay	131	144	129	123	105	129	135	144	147	77	113	165	128
Central	133	149	162	130	129	145	134	151	136	125	127	159	140
Mong Kok	129	134	134	127	132	145	140	133	130	73	99	131	125

Pollutant: Nitrogen Dioxide (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	68	55	63	60	53	37	25	41	46	50	69	77	54
Eastern	63	58	68	65	56	41	34	51	60	58	74	80	59
Kwai Chung	69	61	69	61	60	58	43	55	67	62	84	88	65
Kwun Tong	60	55	64	59	58	54	42	50	59	56	72	78	59
Sham Shui Po	76	62	73	74	72	58	43	60	71	67	86	92	69
Tsuen Wan	66	56	66	63	61	55	40	54	70	59	82	85	63
Sha Tin	46	36	46	39	36	34	25	36	45	39	60	62	42
Tai Po	52	45	48	45	39	32	33 *	31	44	46	65	61	46
Tung Chung	56	33	47	41	37	33	18	34	39	46	72	73	44
Yuen Long	61	45	56	52	50	46	33	46	54	49	73	79	54
Tap Mun	15	12	14	12	12	11	10	10	15	11	14	16	13
Causeway Bay	122	114	118	113	107	100	87	108	123	104	143	156	116
Central	119	109	128	120	117	101	79	106	115	145	161	164	122
Mong Kok	116	99	115	115	120	104	82	103	113	106	140	142	113

Pollutant: Carbon Monoxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tsuen Wan	887	679	660	685	493	387	247	392	446	600	733	753	579
Tung Chung	1063	645	909	751	666	601	546	697	740	582	737	902	737
Yuen Long	985	694	949	930	815	689	581	720	729	890	1025	948	833
Tap Mun	961	692	282	561	670	493	544	690	473	658	763	705	622
Causeway Bay	1283	1125	1381	1553	1055	1062	825	1209	1427	1324	1258	1181	1220
Central	895	689	1091	1206	1283	957	908	865	998	1037	1162	1133	1021
Mong Kok	1301	1006	1084	879	894	743	436	780	932	880	1088	1279	942

Pollutant: Ozone

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	31	21	32	37	41	30	21	29	39	57	59	43	37
Eastern	34	28	38	42	41	28	13	32	48	67	72	53	42
Kwai Chung	30	18	28	36	32	18	12	20	24	47	44	30	28
Kwun Tong	35	22	35	41	42	23	12	23	21	45	53	45	33
Sham Shui Po	26	16	24	26	28	20	13	22	27	49	48	36	28
Tsuen Wan	28	17	25	32	31	22	14	25	27	52	46	36	30
Sha Tin	41	34	45	56	55	32	20	30	38	69	62	53	45
Tai Po	41	29	32	37	38	32	8 *	19	34	56	56	53	38
Tung Chung	35	36	43	50	47	38	29	38	44	61	60	46	44
Yuen Long	25	22	36	34	38	27	16	27	35	57	51	37	34
Tap Mun	63	52	65	74	79	51	34	49	60	92	103	82	67

Notes: *1. All units are in microgram 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: 2010 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	96	46	126	89	80	42	26	50	35	102	112	121	76
Kwai Chung	82	61	96	64	49	50	35	38	71	77	99	121	71
Kwun Tong	90	59	80	71	62	48	31	42	31	79	106	92	67
Sham Shui Po	92	51	131	85	79	48	32	46	40	76	117	122	76
Tsuen Wan	87	50	79	65	50	49	31	44	45	62	88	102	63
Sha Tin	55	45	208	42	41	24	26	43	41	73	93	106	67
Tai Po	72	52	110	61	43	28	23	33	64	73	92	112	64
Tung Chung	75	57	92	47	31	35	20	22	35	68	104	114	59
Yuen Long	120	50	87	57	57	50	29	55	41	101	118	167	78
Mong Kok	116	78	251	88	81	53	52	68	52	99	131	146	102

Pollutant: Respirable Suspended Particulates (Annual AQO = 55)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	58	35	85	45	40	25	17	26	32	56	72	74	47
Eastern	53	30	87	42	37	19	15	24	29	49	67	64	43
Kwai Chung	55	34	71	35	35	34	24	27	33	53	68	70	45
Kwun Tong	54	34	88	44	40	26	20	28	38	57	71	66	47
Sham Shui Po	55	33	82	45	42	28	22	31	36	55	71	70	48
Tsuen Wan	54	33	76	40	36	28	21	28	34	54	68	67	45
Sha Tin	52	30	80	39	35	25	18	30	33	54	71	66	45
Tai Po	53	32	81	41	35	25	18	28	35	55	71	66	45
Tung Chung	58	30	70	35	31	25	15	26	33	57	76	75	45
Yuen Long	65	36	74	41	35	26	18	30	37	62	80	84	49
Tap Mun	50	26	79	35	31	18	15	22	30	54	70	64	41
Causeway Bay	74	50	100	64	59	42	37	54	61	75	87	86	66
Central	63	45	96	58	53	37	29	40	44	69	88	85	59
Mong Kok	62	41	95	54	51	35	28	38	43	62	79	75	55

Notes:

1. *All units are in microgram 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: 2010 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	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8618	98.4	2	4	7	12	22	33	48	63	10	260	49
Eastern	8564	97.8	2	3	7	10	15	22	34	45	8	133	35
Kwai Chung	8610	98.3	4	6	9	25	61	77	96	117	21	211	94
Kwun Tong	8543	97.5	4	5	8	11	16	21	35	42	10	99	34
Sham Shui Po	8635	98.6	3	6	8	14	28	48	80	104	14	258	78
Tsuen Wan	8511	97.2	4	6	10	18	34	47	62	72	15	170	52
Sha Tin	8594	98.1	4	6	9	14	21	29	40	50	12	121	40
Tai Po	8056	92.0	3	4	6	9	14	18	24	31	8	68	33
Tung Chung	8566	97.8	5	6	9	14	23	30	47	61	12	113	59
Yuen Long	8464	96.6	3	5	8	14	21	28	42	54	11	154	54
Tap Mun	8477	96.8	5	6	8	12	16	20	26	30	10	64	38
Causeway Bay	8596	98.1	2	3	5	9	15	21	31	42	8	233	45
Central	8586	98.0	2	4	8	14	23	32	46	58	11	303	49
Mong Kok	8620	98.4	3	4	7	12	21	36	60	80	11	229	68

Pollutant: Nitrogen Oxides

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8595	98.1	25	42	69	110	173	225	308	397	89	859	371
Kwai Chung	8606	98.2	49	83	125	179	249	308	397	481	143	1040	495
Kwun Tong	8539	97.5	43	67	100	143	197	242	310	426	116	1008	417
Sham Shui Po	8631	98.5	45	77	114	152	201	255	370	505	127	1356	458
Tsuen Wan	8535	97.4	41	74	103	140	194	242	315	389	115	728	384
Sha Tin	8594	98.1	20	30	49	83	153	225	306	352	72	730	337
Tung Chung	8499	97.0	17	30	52	91	144	181	230	270	69	584	278
Yuen Long	8464	96.6	40	56	80	115	171	222	299	355	97	717	337
Tap Mun	8289	94.6	7	9	13	19	27	35	48	59	16	231	54
Causeway Bay	8534	97.4	125	188	274	399	543	650	787	896	312	1696	749
Central	8618	98.4	116	191	312	439	588	685	826	946	336	1673	755
Mong Kok	8616	98.4	129	205	305	381	459	525	626	746	305	1415	667

Pollutant: Nitric Oxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8591	98.1	1	4	10	26	59	88	135	188	23	424	164
Kwai Chung	8606	98.2	8	18	38	69	107	137	188	232	51	543	226
Kwun Tong	8539	97.5	5	13	26	49	79	103	142	211	38	532	208
Sham Shui Po	8631	98.5	4	14	27	45	73	108	171	236	38	726	206
Tsuen Wan	8535	97.4	5	12	24	44	71	98	140	186	34	353	158
Sha Tin	8594	98.1	2	3	7	20	54	91	134	161	20	395	137
Tung Chung	8499	97.0	3	4	8	18	42	61	87	104	16	284	91
Yuen Long	8463	96.6	5	9	18	34	62	90	129	157	28	366	128
Tap Mun	8447	96.4	1	1	1	2	3	5	8	11	2	83	11
Causeway Bay	8534	97.4	38	63	105	172	247	305	376	433	128	850	337
Central	8618	98.4	33	64	121	191	269	320	399	478	140	946	382
Mong Kok	8616	98.4	39	75	121	162	205	244	306	365	125	756	308

Pollutant: Nitrogen Dioxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8595	98.1	19	30	49	72	95	111	130	146	54	255	134
Eastern	8564	97.8	27	39	57	74	92	105	126	141	59	236	128
Kwai Chung	8606	98.2	32	44	59	78	105	127	157	179	65	280	159
Kwun Tong	8539	97.5	29	41	55	72	92	108	131	148	59	242	123
Sham Shui Po	8631	98.5	33	45	65	88	110	124	146	166	69	300	147
Tsuen Wan	8535	97.4	30	42	58	77	101	122	143	159	63	276	142
Sha Tin	8594	98.1	15	23	35	52	78	100	129	147	42	248	127
Tai Po	8056	92.0	19	29	41	58	79	94	111	123	46	174	101
Tung Chung	8499	97.0	10	21	36	59	88	108	134	156	44	255	149
Yuen Long	8463	96.6	27	35	48	66	89	109	135	151	54	228	160
Tap Mun	8289	94.6	5	7	11	15	22	28	39	46	13	104	42
Causeway Bay	8534	97.4	55	80	110	144	183	210	248	281	116	398	234
Central	8618	98.4	57	80	114	154	199	228	262	290	122	423	241
Mong Kok	8616	98.4	55	80	108	141	174	196	226	253	113	405	205

Pollutant: Carbon Monoxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Arithmetic mean	Highest 1 hour	Highest 8 hour
Tsuen Wan	8537	97.5	250	370	560	750	930	1050	1186	1330	579	2320	2186
Tung Chung	8513	97.2	470	560	670	850	1100	1300	1450	1640	737	2910	2469
Yuen Long	8458	96.6	510	610	780	1000	1240	1400	1610	1780	833	2730	2318
Tap Mun	8477	96.8	360	470	600	770	920	1020	1205	1290	622	2310	2144
Causeway Bay	8317	94.9	580	800	1150	1490	1840	2180	2530	2880	1220	4710	3378
Central	8595	98.1	580	690	1030	1270	1490	1730	2070	2300	1021	4370	2961
Mong Kok	8619	98.4	460	690	920	1150	1380	1490	1730	1960	942	4030	3219

Pollutant: Ozone

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8515	97.2	6	13	28	53	78	96	114	131	37	286	108
Eastern	8564	97.8	10	20	35	59	80	94	110	125	42	252	109
Kwai Chung	8596	98.1	4	6	19	44	65	79	97	110	28	245	102
Kwun Tong	8510	97.1	5	10	26	52	73	85	98	106	33	143	110
Sham Shui Po	8583	98.0	4	8	20	41	64	79	98	114	28	252	89
Tsuen Wan	8507	97.1	5	9	21	43	66	82	100	113	30	240	93
Sha Tin	8513	97.2	4	11	33	71	101	118	138	151	45	277	132
Tai Po	8056	92.0	2	10	29	58	85	101	118	130	38	238	96
Tung Chung	8544	97.5	7	17	37	61	87	106	135	163	44	341	115
Yuen Long	8422	96.1	4	9	24	48	79	101	130	151	34	280	100
Tap Mun	8461	96.6	22	36	61	92	122	135	152	166	67	259	155

Pollutant: Respirable Suspended Particulates (Continuous monitoring)

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8699	99.3	13	22	38	64	87	104	127	146	47	732 ^	636 ^
Eastern	8688	99.2	11	18	34	59	80	93	117	134	43	775 ^	691 ^
Kwai Chung	8600	98.2	16	25	37	58	80	95	113	132	45	628 ^	505 ^
Kwun Tong	8656	98.8	15	24	38	62	84	98	121	141	47	785 ^	681 ^
Sham Shui Po	8496	97.0	16	24	39	62	85	100	123	143	48	630 ^	569 ^
Tsuen Wan	8616	98.4	15	23	36	59	82	97	116	135	45	731 ^	533 ^
Sha Tin	8372	95.6	14	22	34	59	84	97	116	135	45	783 ^	651 ^
Tai Po	8638	98.6	14	22	35	60	83	97	119	135	45	732 ^	627 ^
Tung Chung	8498	97.0	12	18	33	61	89	108	136	167	45	640 ^	475 ^
Yuen Long	8378	95.6	15	22	39	67	95	115	143	165	49	602 ^	361 ^
Tap Mun	8560	97.7	11	17	31	55	81	93	110	125	41	715 ^	609 ^
Causeway Bay	8512	97.2	27	41	59	82	106	124	150	173	66	707 ^	613 ^
Central	8448	96.4	23	33	50	76	102	117	144	163	59	716 ^	628 ^
Mong Kok	8588	98.0	21	31	47	71	95	111	135	156	55	775 ^	656 ^

Notes:

1. *All concentration units are in microgram per cubic metre.*
2. *Annual averages calculated from less than 8 representative months are not published.*
3. *The RSP readings marked with ^ in the table were recorded when Hong Kong was affected by a dust plume originated from northern part of China in March 2010.*

TABLE C6: 2010 TOTAL WET AND DRY DEPOSITION

(a) WET DEPOSITION

	Monitoring Station	Central / Western	Kwun Tong	Yuen Long
	WET DEPOSITION (TON/HA)	25289	24796	16297
	WEIGHTED MEAN pH (based on volume-weighted mean hydrogen ion concentrations ($[H^+]$)	4.50	4.53	4.53
	WEIGHTED MEAN pH (based on volume-weighted mean pH)	4.72	4.82	4.66
	NO. OF SAMPLES	100	115	72
Filtrate (Kg/Ha)	**NH_4^+**	8.45	8.69	5.15
	NO_3^-	30.49	27.15	17.33
	$SO_4^=$	37.79	34.63	21.01
	Cl^-	17.20	21.59	5.27
	F-	0.72	0.66	0.43
	Na^+	9.68	12.33	3.46
	K^+	6.28	6.25	4.05
	Formate	5.08	5.19	3.88
	Acetate	4.83	4.44	3.33
	Ca^{++}	3.89	3.16	2.23
	Mg^{++}	1.24	1.50	0.45

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

(b) DRY DEPOSITION

	Monitoring Station	Central / Western	Kwun Tong	Yuen Long
	NO. OF SAMPLES	26	26	18
Filtrate (Kg/Ha)	**NH_4^+**	0.46	0.84	0.08
	NO_3^-	11.30	12.44	5.88
	$SO_4^=$	9.71	8.20	4.12
	Cl^-	12.42	9.74	2.47
	F-	0.108	0.106	0.080
	Na^+	7.44	6.07	1.55
	K^+	0.78	0.53	0.33
	Formate	0.20	0.22	0.12
	Acetate	0.17	0.17	0.12
	Ca^{++}	7.43	5.96	4.35
	Mg^{++}	1.06	0.86	0.32

TABLE C7: 2010 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	9	9	9	10	10	10	10	12	14	13	12	11	10	10	11	11	10	10	10	11	11	10	9	9
Eastern	8	8	8	8	8	8	8	10	9	9	9	8	8	8	8	8	8	8	8	9	10	9	8	8
Kwai Chung	21	20	19	20	18	18	18	18	19	20	22	22	23	23	23	24	25	24	25	24	23	22	21	20
Kwun Tong	9	10	9	11	10	9	10	10	10	10	10	10	9	9	10	10	9	10	9	9	9	9	9	9
Sham Shui Po	14	15	14	17	15	15	14	14	14	14	14	13	12	12	13	13	13	13	13	14	14	14	14	14
Tsuen Wan	13	13	12	14	12	12	12	13	16	17	17	18	18	18	18	18	18	18	16	15	16	16	15	14
Sha Tin	11	11	11	12	11	10	11	11	12	12	12	12	11	11	11	12	12	13	13	13	13	12	12	11
Tai Po	7	7	7	7	7	7	7	7	8	9	9	9	9	8	8	8	8	8	8	8	8	8	7	7
Tung Chung	10	10	10	12	11	10	11	12	14	15	15	15	15	16	15	15	14	13	12	11	11	10	10	10
Yuen Long	10	9	8	13	10	9	9	10	11	12	12	11	11	11	11	11	12	12	12	12	11	11	11	10
Tap Mun	9	9	9	10	9	9	9	10	11	12	12	12	11	11	10	10	10	9	9	9	9	8	8	8
Causeway Bay	7	7	7	7	7	7	7	9	10	10	9	9	8	8	8	8	7	7	7	7	7	7	7	7
Central	10	9	9	11	9	9	10	13	15	15	14	12	11	11	12	11	11	12	12	12	12	10	10	10
Mong Kok	11	12	11	11	11	10	11	12	12	12	11	11	11	11	11	12	11	11	11	11	11	11	11	11

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	82	64	55	49	47	43	54	98	135	135	117	101	82	90	96	99	103	107	109	104	98	93	92	88
Kwai Chung	128	99	84	73	71	79	121	172	205	191	163	148	144	141	145	152	159	170	195	185	162	151	146	144
Kwun Tong	114	87	73	62	59	66	108	151	162	151	132	119	111	111	117	121	131	147	148	143	124	117	121	125
Sham Shui Po	124	95	82	74	69	72	111	152	171	159	137	126	117	119	127	133	143	151	161	158	147	142	140	137
Tsuen Wan	105	72	61	53	51	55	90	129	160	158	140	127	121	122	125	127	136	148	152	142	131	125	124	121
Sha Tin	87	73	64	55	53	55	75	98	97	76	63	52	45	45	47	51	60	72	85	94	96	96	98	96
Tung Chung	73	59	48	42	41	48	68	86	84	76	73	70	71	70	67	67	66	74	82	81	80	74	74	76
Yuen Long	107	91	81	66	65	66	97	130	122	99	88	77	74	77	80	85	96	107	119	121	118	116	117	116
Tap Mun	15	15	15	15	15	15	16	16	18	19	20	18	16	15	14	15	15	15	16	16	15	15	14	15
Causeway Bay	286	223	196	174	167	165	239	392	431	413	376	351	329	331	335	335	326	344	362	365	347	341	350	329
Central	289	212	182	153	153	146	209	351	503	496	433	390	356	358	365	372	388	427	456	428	385	358	343	333
Mong Kok	298	205	186	160	146	144	227	313	360	356	325	312	318	340	354	369	380	401	404	362	330	336	353	348

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	21	15	12	11	11	9	12	30	48	47	38	29	20	23	25	24	24	24	24	22	21	21	23	22
Kwai Chung	46	34	28	23	23	26	45	71	88	79	62	53	49	45	46	48	50	55	70	67	57	54	53	53
Kwun Tong	38	28	23	18	17	19	37	58	63	57	47	39	35	33	34	35	38	44	44	43	37	35	38	41
Sham Shui Po	38	28	23	21	19	20	34	53	63	57	45	38	33	32	34	35	38	40	44	45	41	41	41	42
Tsuen Wan	31	18	14	13	11	13	26	45	61	60	49	41	35	34	34	33	36	40	42	40	37	36	36	37
Sha Tin	28	22	18	15	14	15	23	34	33	23	17	13	10	9	10	10	11	13	19	24	26	27	30	30
Tung Chung	19	14	10	8	8	11	19	28	27	22	19	17	16	15	13	13	12	13	16	17	17	17	18	19
Yuen Long	35	28	25	19	18	19	34	50	44	31	25	20	18	18	18	19	21	24	29	32	33	34	37	38
Tap Mun	1	2	2	2	2	2	2	2	3	3	4	3	2	2	2	2	2	2	1	1	1	1	1	1
Causeway Bay	123	96	83	73	70	69	99	171	191	179	160	146	132	131	130	129	121	132	140	144	141	140	144	139
Central	123	84	69	58	57	55	83	155	234	225	189	164	143	143	144	146	153	173	188	178	164	152	146	143
Mong Kok	128	87	78	65	57	55	94	137	161	156	137	127	125	134	140	145	149	161	164	147	133	138	148	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	50	41	36	31	30	30	35	52	61	62	59	56	51	55	59	62	66	71	73	70	66	61	58	54
Eastern	56	47	39	35	33	37	50	63	66	65	61	59	58	59	63	67	73	76	75	73	71	66	62	61
Kwai Chung	57	47	42	38	37	39	52	63	70	70	69	67	69	71	75	79	82	86	88	83	76	69	66	63
Kwun Tong	55	44	38	34	33	36	51	63	66	64	60	59	58	60	64	67	73	80	81	77	68	63	63	62
Sham Shui Po	66	51	46	42	40	42	59	71	75	73	69	67	67	70	75	79	85	91	93	90	84	80	77	73
Tsuen Wan	58	44	39	34	33	36	50	60	67	67	65	65	67	70	73	76	81	87	87	81	75	70	68	64
Sha Tin	45	39	35	32	31	32	39	45	46	42	37	33	30	31	32	36	43	52	56	58	56	54	52	49
Tai Po	47	41	35	31	30	33	42	52	52	45	39	35	34	35	37	42	49	59	66	66	60	57	55	52
Tung Chung	44	37	32	29	28	31	39	43	44	43	44	44	46	48	47	48	48	55	58	56	53	49	47	47
Yuen Long	54	48	43	38	37	38	45	54	55	51	49	47	47	50	52	56	64	70	74	72	67	63	61	58
Tap Mun	12	12	12	13	12	12	13	13	14	14	15	13	12	12	11	12	12	13	14	14	13	13	12	12
Causeway Bay	98	76	69	62	61	60	88	130	139	140	132	128	126	131	136	139	141	142	148	144	131	127	129	117
Central	100	83	76	64	66	63	82	115	146	153	144	140	138	140	144	149	155	162	168	156	134	125	120	114
Mong Kok	102	72	67	61	59	59	83	104	114	118	116	119	127	136	141	147	152	155	153	137	126	125	127	120

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	549	496	469	449	462	476	540	612	655	637	611	569	558	561	565	562	589	622	667	686	672	651	632	599
Tung Chung	719	713	706	712	704	717	722	745	753	747	748	742	753	755	752	749	746	746	752	754	751	741	736	730
Yuen Long	881	824	792	756	746	740	800	880	883	830	797	766	761	782	783	788	817	851	900	934	931	912	912	903
Tap Mun	592	588	588	589	588	598	613	625	628	633	633	640	638	639	641	639	638	645	647	647	642	635	616	594
Causeway Bay	1472	1555	1520	1443	1322	1286	1078	1029	1099	1111	1171	1182	1169	1175	1139	1142	1065	1062	1124	1195	1256	1250	1202	1278
Central	1100	1019	899	793	745	728	738	889	1023	1119	1168	1067	1013	1098	1056	1044	995	1035	1110	1132	1206	1236	1148	1152
Mong Kok	1003	1112	1052	935	887	855	781	793	846	910	896	866	852	901	947	959	957	975	1050	1070	1056	1014	958	938

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	33	39	42	45	45	44	37	24	20	24	30	39	50	52	51	50	45	37	31	29	29	29	30	31
Eastern	37	41	44	46	47	44	35	28	27	31	38	46	53	55	55	54	48	42	40	39	37	37	37	36
Kwai Chung	26	33	34	36	36	33	25	18	16	19	25	32	36	38	38	37	33	28	22	21	22	24	25	24
Kwun Tong	29	36	38	39	39	36	26	20	20	24	31	38	43	45	44	43	38	32	28	28	31	31	29	28
Sham Shui Po	24	32	34	36	36	34	22	16	16	20	27	34	40	42	41	39	33	26	20	19	20	20	20	21
Tsuen Wan	25	33	35	39	38	34	24	19	19	22	29	35	39	41	42	41	37	29	23	22	23	23	23	23
Sha Tin	34	37	38	39	39	36	31	28	31	39	49	59	68	72	72	70	64	53	44	38	36	35	34	34
Tai Po	28	29	31	32	31	29	22	19	24	34	44	53	61	64	64	60	53	43	34	29	30	29	28	27
Tung Chung	36	39	41	42	41	37	31	28	30	35	41	49	58	65	70	68	66	54	43	39	37	37	36	35
Yuen Long	23	25	27	29	28	26	21	18	21	29	39	51	61	64	64	60	51	39	29	25	24	23	22	22
Tap Mun	58	55	54	52	51	49	49	50	54	60	67	75	83	88	91	91	89	84	78	72	69	65	62	60

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	41	40	40	40	40	41	45	47	52	51	51	46	50	54	54	55	55	52	51	50	48	46	44
Eastern	40	40	39	39	39	40	41	42	43	44	43	44	44	45	47	47	47	47	47	47	47	45	43	42
Kwai Chung	40	37	36	36	37	39	42	45	49	49	47	45	44	46	48	49	50	51	52	53	51	49	45	42
Kwun Tong	43	41	40	40	40	41	44	46	47	49	47	48	48	50	51	52	53	55	54	54	52	49	47	45
Sham Shui Po	44	42	41	40	40	41	43	45	46	48	48	48	46	49	52	52	54	54	55	57	55	51	48	45
Tsuen Wan	41	38	37	37	37	38	39	41	44	44	46	46	46	48	50	51	53	53	52	52	51	48	45	43
Sha Tin	44	42	41	41	41	41	42	44	43	44	42	41	42	43	45	47	49	50	50	50	50	48	47	46
Tai Po	44	42	41	41	40	41	43	46	46	45	45	45	45	44	44	46	47	48	49	50	50	48	47	45
Tung Chung	41	40	39	39	38	39	40	42	42	44	46	47	49	52	52	51	51	50	47	47	47	45	43	42
Yuen Long	45	44	43	43	42	42	44	48	51	50	52	51	51	52	52	53	54	55	56	55	54	52	49	47
Tap Mun	38	38	37	38	38	39	40	41	42	43	43	44	43	43	43	42	42	44	43	43	42	41	40	39
Causeway Bay	57	49	46	45	45	45	54	63	67	70	70	69	65	73	73	74	76	79	83	83	80	74	71	66
Central	52	48	47	47	47	49	53	59	67	67	62	61	58	61	63	64	65	66	67	66	65	62	59	56
Mong Kok	49	44	43	43	43	44	48	53	57	58	56	54	55	58	61	62	63	66	66	69	67	62	56	52

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

TABLE C8: 2010 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	40	39
Organic Substances			
Benzene	$\mu g/m^3$	1.85	1.64
Benzo[a]pyrene	ng/m^3	0.17	0.16
1,3-Butadiene	$\mu g/m^3$	0.20	0.19
Formaldehyde [4]	$\mu g/m^3$	-	4.39
Perchloroethylene	$\mu g/m^3$	0.55	0.46
Dioxins [3]	$pgI\text{-}TEQ/m^3$	0.070	0.045

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 2010 annual average concentrations in the elemental analysis of total suspended particulates.

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

[4] The measurement of formaldehyde was affected by influence from massive renovation works at buildings in the vicinity of Tuen Wan station. Hence, only formaldehyde concentration at the Central/Western station is reported.

Appendix D

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

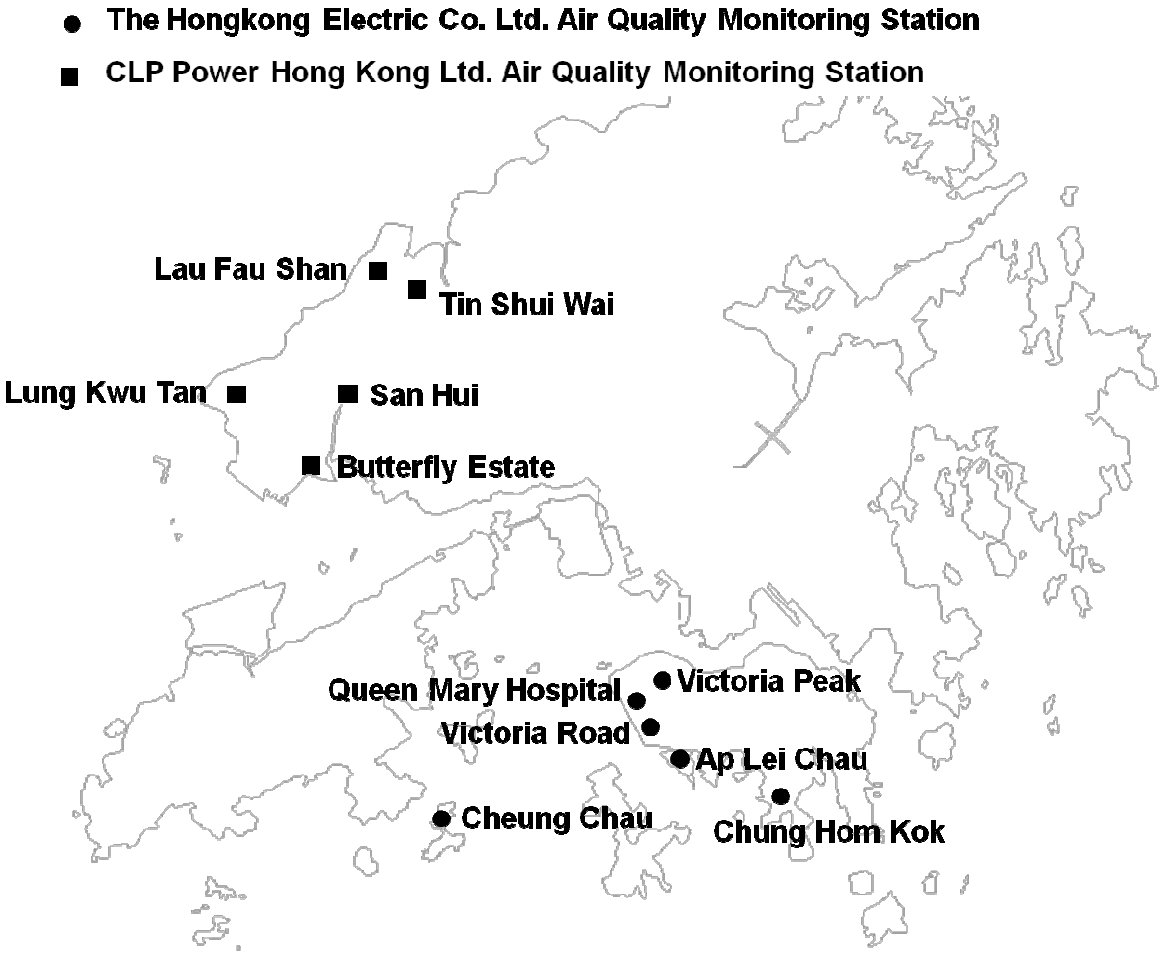


Figure D1 Location of HEC's & CLP's Air Quality Monitoring Stations for Sulphur Dioxide and Nitrogen Dioxide

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	9	2 - 19
Victoria Road	8	3 - 15
Queen Mary Hospital	9	5 - 15
Ap Lei Chau	11	7 - 19
Cheung Chau	-- [4]	4 - 13
Nitrogen Dioxide (NO_2) [2]		
Victoria Peak	28	9 - 47
Chung Hom Kok	18	11 - 23
Victoria Road	34	18 - 54
Queen Mary Hospital	26	7 - 45
Ap Lei Chau	17	6 - 41
Cheung Chau	-- [4]	4 - 31

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	14	1 - 26
Tin Shui Wai	7	3 - 13
Butterfly Estate	7	4 - 12
Lung Kwu Tan	18	11 - 27
Lau Fau Shan	7	1 - 13
Nitrogen Dioxide (NO_2)		
San Hui [3]	68	36 - 99
Tin Shui Wai	40	17 - 69
Butterfly Estate	38	22 - 55
Lung Kwu Tan	26	7 - 48
Lau Fau Shan	29	16 - 53

Notes:

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

[2] There was no exceedance of AQO limit for the pollutants in 2010.

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

[4] Data collected was not sufficient for a representative annual average due to suspension of monitoring in the year.