Guangdong-Hong Kong-Macao
Pearl River Delta
Regional Air Quality Monitoring Network

A Report of Monitoring Results in 2020

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Approved by	**:**	**Quality Management Committee of Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network**
Security Classification	**:**	**Unrestricted**

Purpose of the Report

This report provides the 2020 monitoring results from the Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network and their statistical analysis.

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1. Foreword

Since the Pearl River Delta (PRD) Regional Air Quality Monitoring Network came into operation on 30 November 2005, a half-yearly and an annual air quality monitoring reports were published every year since 2006.

With the growing concerns of air pollution control and economic development of the region, the environmental protection departments of Guangdong and Hong Kong had worked in collaboration with the environmental protection cum meteorological authorities of Macao to enhance the network by extending the coverage of monitoring area to Guangdong, Hong Kong and Macao in September 2014. The enhancements included the addition of monitoring stations from 16 to 23 to further improve the spatial distribution and the inclusion of two new monitoring parameters, i.e. carbon monoxide (CO) and fine suspended particulates ($PM_{2.5}$), to enrich the air quality monitoring information. At the same time, the network was renamed to "Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network" (the "Network").

With the enhancement of the network, the update of the national ambient air quality standards as well as the need for improving the reporting frequency of monitoring results, starting from 2014, the real-time hourly monitoring data was reported on a new internet platform to replace the daily Regional Air Quality Index (RAQI), the half-yearly report was also replaced by a quarterly report while the annual air quality monitoring report was maintained. The quarterly report is a brief statistical summary of the regional air quality monitoring results in a quarter. The annual report, in addition to the reporting of the monitoring data, provides a more detailed analysis and comparison of the air quality in the year.

2. Introduction to Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network

The PRD Regional Air Quality Monitoring Network was jointly established by the Guangdong Provincial Environmental Monitoring Centre [1] and the Environmental Protection Department of the Hong Kong Special Administrative Region (HKEPD) from 2003 to 2005. The network came into operation on 30 November 2005 and its data had been used for reporting Regional Air Quality Index (RAQI) to the public. At that time, the network comprised 16 automatic air quality monitoring stations (see Figure 1) across the PRD region. Ten of these stations were operated by the Ecological and Environmental Monitoring Centres of the individual cities in Guangdong while the three stations located in Hong Kong were managed by the HKEPD. The remaining three regional stations were operated by the Ecological and Environmental Monitoring Centre of Guangdong (GDEEMC). All stations were installed with equipment to measure the ambient concentrations of respirable suspended particulates (PM_{10} or RSP), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and ozone (O_3).

The network was enhanced in September 2014 and renamed "Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network". The number of monitoring stations was increased from 16 to 23. Guangdong, on its original 13 stations, added five stations, including Modiesha and Zhudong in Guangzhou, Duanfen and Huaguoshan in Jiangmen, and Xijiao in Huizhou. Hong Kong added Yuen Long monitoring station on the basis of its original three stations and Macao joined in with the monitoring

[1] Guangdong Provincial Environmental Monitoring Centre was renamed as Ecological and Environmental Monitoring Centre of Guangdong in December 2020.

station at Taipa Grande. As regards the monitoring parameters, the Network continued to monitor the original four air pollutants with the addition of two new monitoring parameters, i.e. carbon monoxide (CO) and fine suspended particulates ($PM_{2.5}$ or FSP). Figure 2 shows the spatial distribution of the monitoring stations after the enhancement of the network. Eight city monitoring stations of Guangdong have been operated by the operation-cum-maintenance agencies commissioned by the State since November 2016.

Based on the previous "Standard Operating Procedures on Quality Assurance and Quality Control of the PRD Air Quality Monitoring System for Guangdong and Hong Kong", the Network employs a revised "Standard Operating Procedures on Quality Assurance and Quality Control of the PRD Air Quality Monitoring System for Guangdong, Hong Kong and Macau" (QA/QC Operating Procedures) jointly developed by Guangdong, Hong Kong and Macau to ensure that the air quality monitoring results attain a high degree of accuracy and reliability, and meet the respective quality management policies of the three places. The design and operation of the Network comply with the requirements set out in the QA/QC Operating Procedures. In light of the development of the Network, the QA/QC Operating Procedures will be revised as and when necessary.

Figure 1：Spatial distribution of monitoring stations (Nov 2005 to Aug 2014)

Figure 2：Spatial distribution of monitoring stations in the Network (from Sept 2014)

Remark: For the boundary of the administrative division of the Macao Special Administrative Region, according the Decree n.º665 of the State Council of the People's Republic of China, "the map of the administrative division of the Macao Special Administrative Region" was approved at the 116th Executive Meeting of the State Council on 16 December 2015.

To cope with the enhancement of the Network and the update of national ambient air quality standards, the internet platform has increased the data reporting frequency by replacing the previous RAQI that was published once a day to hourly dissemination of real time air quality monitoring information of each monitoring station.

The objectives of the Network are to:

- provide accurate air quality data to assist the governments of Guangdong, Hong Kong and Macao in understanding the air quality situation and pollution problems in the PRD region for formulating appropriate control measures;
- evaluate the effectiveness of the air pollution control measures through long-term monitoring;
- provide the public with information on the air quality of different areas in the region.

This is an annual report on the monitoring results for 2020. From 2015 onwards, the annual report covers the monitoring results of six monitoring parameters recorded at 23 monitoring stations of the Network.

Annexes A and B set out the site information of the monitoring stations and the methods used for measuring air pollutant concentrations respectively.

3. Operation of the Network

The operation of Modiesha monitoring station in Guangzhou was suspended from 31 March 2020. In addition, owing to the in-site relocation of the Zhudong monitoring station in Guangzhou and Duanfen monitoring station in Jiangmen, the operations were suspended from 2 July to 3 August 2020 and in early September 2020 discontinuously, respectively.

The overall operation of the Network was smooth in 2020. The average hourly data capture rate for the six air pollutants measured at all monitoring stations was 96.9% (Modiesha monitoring station from April to December and Zhudong monitoring station in July were excluded).

3.1 Quality Control (QC) and Quality Assurance (QA) Activities

The governments of Guangdong, Hong Kong, and Macao have fully implemented the agreed QC works, which include zero/span checks, precision checks, dynamic calibration, etc. The QA/QC works are carried out in accordance with the QA/QC Operating Procedures so as to ensure that the air quality data from the monitoring stations are highly accurate and reliable. To ensure the operation of the Network is in compliance with the QA/QC requirements, the GDEEMC, HKEPD, Environmental Protection Bureau of Macau SARG and Meteorological and Geophysical Bureau of Macao SARG jointly established the "Quality Management Committee of Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network" (Quality Management Committee, “QMC”) to review and evaluate, on a quarterly basis, the performance of equipment, QA/QC works, data transmission system and operation of the Network. The QMC also conducts a system audit every year to evaluate the effectiveness of the quality management system. Based on the audit results, a report will be prepared to summarize any corrective measures and recommendations and the QMC will take appropriate follow-up actions.

3.2 Accuracy and Precision

The accuracy of the Network is evaluated by means of performance audits. The performance goals set for the gaseous pollutants and particulates (PM_{10} and $PM_{2.5}$) are ±20% and ±15% respectively. In 2020, we had carried out 442 audit checks on the analyzers and samplers at the monitoring stations of the Network. The results showed that, based on the 95% probability limits, the accuracy of the Network ranged from -9.6% to 8.7%, which were within the required performance goals (see Figure 3).

Precision is a measure of repeatability and is calculated in accordance with the QA/QC Operating Procedures. The performance goals adopted for the gaseous pollutants and particulates (PM_{10} and $PM_{2.5}$) are ±15%. In 2020, we had carried out 3566 precision checks on the analyzers and samplers at the monitoring stations of the Network. The results showed that, based on the 95% probability limits, the precision of the Network ranged from -10.6% and 13.9%, which were within the required performance goals (see Figure 4). In 2020, the overall QA/QC performance of the Network was satisfactory and met all the requirements specified in the QA/QC Operating Procedures.

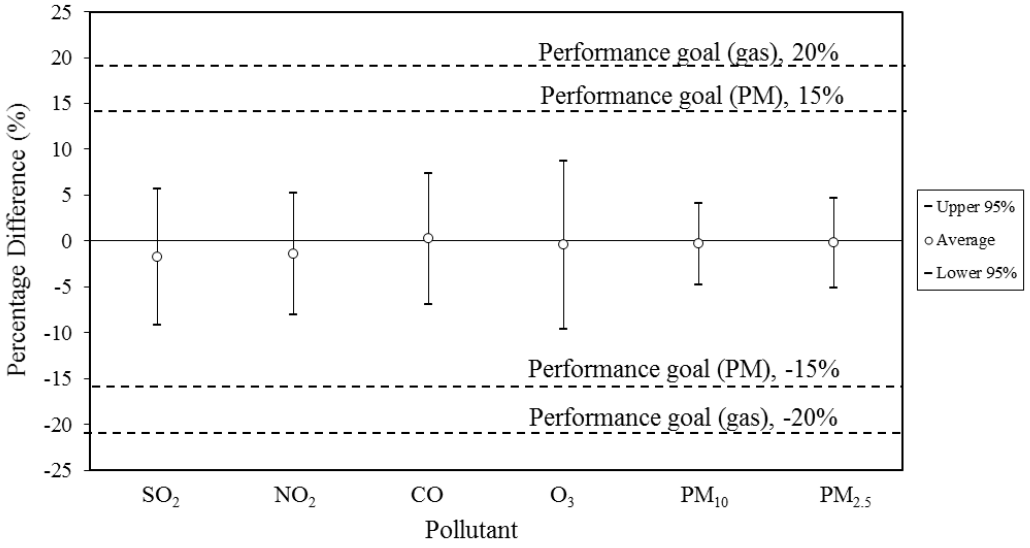

Figure 3：Accuracy of the monitoring network in 2020

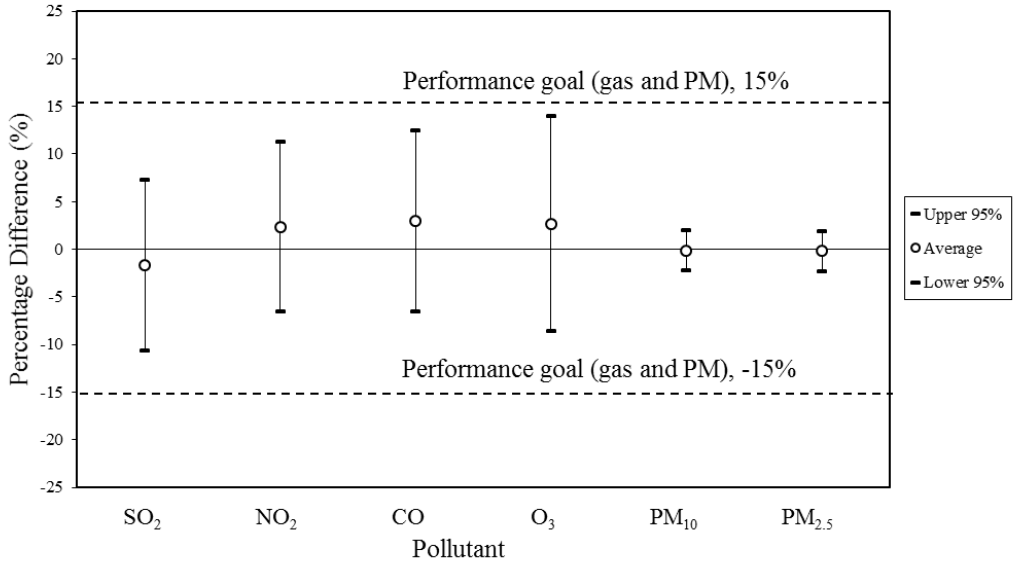

Figure 4：Precision of the monitoring network in 2020

4. Statistical Analysis of Pollutant Concentrations

Starting from 2014 annual report, the air quality assessment is conducted based on the class II limits of the national "Ambient Air Quality Standards" (NAAQS) (GB3095-2012). Per the amended version of the Standards, starting from 2019, the concentrations of gaseous pollutants are calculated at a reference temperature of 298.15K and a pressure of 101.325 kPa, while the concentrations of PM_{10} and $PM_{2.5}$ are measured at real-time temperature and atmospheric pressure during monitoring.

Owing to the low daily data capture rate in 2020 for all pollutants data at Modiesha station and Zhudong station in Guangzhou, Xijiao station in Huizhou and Nanchengyuanling station in Dongguan, and sulphur dioxide, nitrogen dioxide, ozone and PM_{10} data at Duanfen station in Jiangmen, these data were not used for statistical analysis but for reference only.

4.1 Sulphur Dioxide (SO_2)

Sulphur dioxide (SO_2) comes mainly from the combustion of sulphur-containing fossil fuel. Its major sources of emissions include power plants, fuel combustion plants, vehicles and vessels. Apart from its impact on the human respiratory system, SO_2 can also be oxidized in the air to form sulphate, which has significant impact on the levels of particulate matters, acid rain and visibility in the region.

In 2020, the annual average of SO_2 recorded at each monitoring station in the Network ranged from 2 to 11 μg/m^3, and all stations were in compliance with the national annual average concentration limit (60 μg/m^3). As shown in Figure 5, the annual average concentrations of SO_2 recorded at all the monitoring stations were generally at a low level. During the year, all monitoring stations in the Network could comply with the national 24-hour average concentration limit (150 μg/m^3) and 1-hour average concentration limit (500 μg/m^3) of SO_2.

Tables 4.1a to 4.6c list the monthly maxima of hourly averages, the monthly maxima of daily averages with the 98th percentile of the year, the monthly and annual averages of SO_2 at each station respectively.

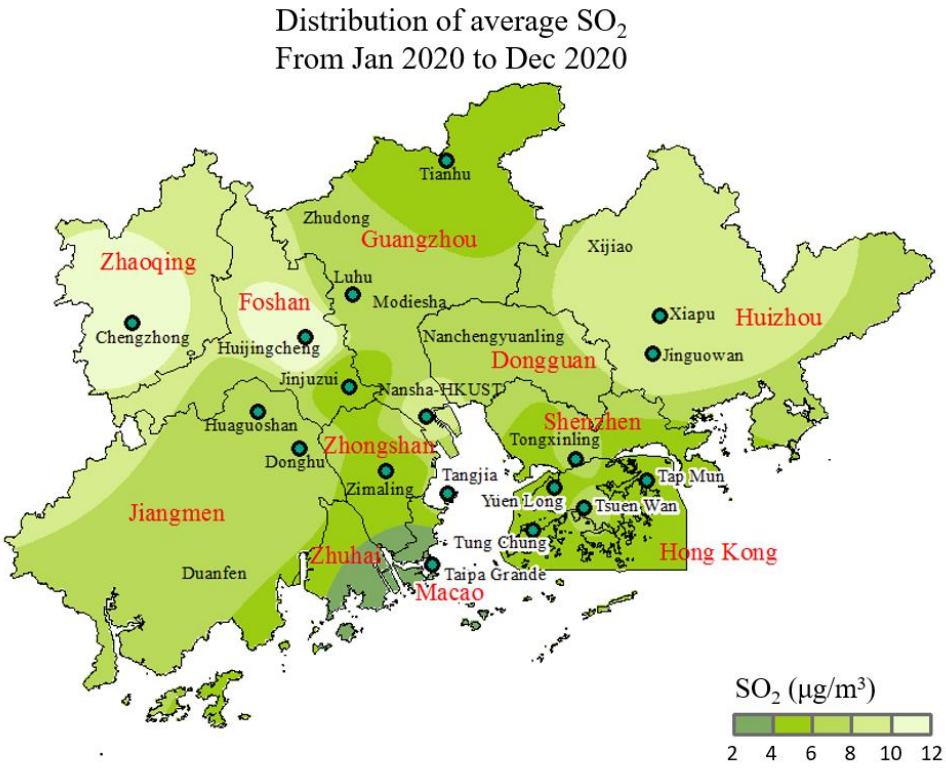

Figure 5：Spatial distribution of annual average concentrations of Sulphur Dioxide (SO_2)

Remark: Modiesha, Zhudong, Duanfen, Xijiao and Nanchengyuanling's data are excluded in the spatial distribution map owing to its low daily data capture rate in 2020.

Table 4.1a：Hourly averages of Sulphur Dioxide (the monthly maxima)

[Class II limit: 500 μg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Luhu (Guangzhou)	19	15	13	18	13	12	15	17	16	18	17	17
Modiesha (Guangzhou) #	25	23	24	-	-	-	-	-	-	-	-	-
Nansha-HKUST (Guangzhou)	19	17	21	29	19	16	17	18	22	23	28	32
Tianhu (Guangzhou)	24	7	15	15	11	12	14	16	15	17	17	25
Zhudong (Guangzhou) #	20	15	19	29	27	21	-	22	28	31	26	31
Tongxinling (Shenzhen)	8	7	8	11	8	12	8	8	10	8	11	8
Jinjuzui (Foshan)	16	23	18	36	23	16	13	22	16	17	20	17
Huijingcheng (Foshan)	22	18	20	55	30	19	21	44	46	22	25	34
Tangjia (Zhuhai)	20	15	12	19	12	12	12	19	20	15	18	17
Donghu (Jiangmen)	27	25	21	30	27	12	14	20	34	26	29	23
Duanfen (Jiangmen) #	16	11	15	17	18	9	12	19	14	22	19	22
Huaguoshan (Jiangmen)	49	12	36	64	43	63	69	94	58	63	58	47
Chengzhong (Zhaoqing)	44	13	28	84	94	48	120	93	138	58	52	28
Xiapu (Huizhou)	15	15	16	36	23	22	24	22	33	26	30	33
Xijiao (Huizhou) ^	44	21	25	12	14	26	33	8	25	19	13	15
Jinguowan (Huizhou)	20	16	14	16	14	35	14	26	15	11	14	16
Zimaling (Zhongshan)	15	11	12	17	13	14	8	10	18	16	22	17
Nanchengyuanling (Dongguan) ^	24	17	18	20	22	15	12	24	25	18	21	22
Tap Mun (Hong Kong)	9	9	10	5	4	7	8	8	8	9	13	12
Tsuen Wan (Hong Kong)	12	12	13	14	13	13	12	15	20	11	14	16
Yuen Long (Hong Kong)	9	9	20	9	8	7	14	10	10	11	13	14
Tung Chung (Hong Kong)	14	14	10	16	12	5	6	12	15	10	14	22
Taipa Grande (Macao)	9	10	6	12	14	7	11	6	6	6	9	16

Remarks : All concentration units are in micrograms per cubic metre (μg/m^3).

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.1b：Daily averages of Sulphur Dioxide (the monthly maxima and the 98th percentile of the year)

[Class II limit: 150 μg/m³]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Compliance	98th percentile
Luhu (Guangzhou)	10	8	8	14	9	7	8	9	10	11	13	12	100.0%	12
Modiesha (Guangzhou) #	14	12	13	-	-	-	-	-	-	-	-	-	-	-
Nansha-HKUST (Guangzhou)	13	9	8	15	11	8	8	9	11	12	15	18	100.0%	15
Tianhu (Guangzhou)	7	4	4	9	7	6	10	10	9	15	11	13	100.0%	11
Zhudong (Guangzhou) #	12	9	13	14	14	13	-	10	13	17	17	16	-	-
Tongxinling (Shenzhen)	6	6	6	8	6	7	6	7	8	8	9	7	100.0%	8
Jinjuzui (Foshan)	9	6	7	15	8	6	7	8	7	13	9	10	100.0%	9
Huijingcheng (Foshan)	14	12	13	27	14	12	15	17	18	15	18	22	100.0%	19
Tangjia (Zhuhai)	10	8	8	10	8	5	6	10	7	11	12	11	100.0%	10
Donghu (Jiangmen)	10	8	10	15	12	7	8	10	11	16	15	14	100.0%	13
Duanfen (Jiangmen) #	9	7	9	9	9	6	7	8	8	10	12	16	-	-
Huaguoshan (Jiangmen)	17	5	11	15	11	10	15	15	17	16	18	19	100.0%	16
Chengzhong (Zhaoqing)	18	9	15	24	22	17	25	19	21	14	28	19	100.0%	21
Xiapu (Huizhou)	10	9	9	15	12	9	11	13	14	17	16	15	100.0%	15
Xijiao (Huizhou) ^	24	7	6	5	5	4	5	3	9	6	7	8	-	-
Jinguowan (Huizhou)	10	11	10	11	10	13	9	11	13	8	11	9	100.0%	11
Zimaling (Zhongshan)	9	6	8	9	6	7	6	6	8	12	16	11	100.0%	12
Nanchengyuanling (Dongguan) ^	16	9	11	13	13	11	10	11	12	13	13	15	-	-
Tap Mun (Hong Kong)	9	8	8	2	2	3	5	4	5	8	9	10	100.0%	9
Tsuen Wan (Hong Kong)	6	7	7	9	7	7	7	7	8	9	11	10	100.0%	9
Yuen Long (Hong Kong)	6	6	8	7	6	5	6	4	6	8	10	10	100.0%	9
Tung Chung (Hong Kong)	8	8	7	10	7	2	3	5	7	5	8	8	100.0%	8
Taipa Grande (Macao)	4	4	4	7	2	1	1	2	3	4	6	8	100.0%	7

Remarks : All concentration units are in micrograms per cubic metre (μg/m³).

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.1c：The monthly and annual averages of Sulphur Dioxide

[Class II limit for annual average: 60 μg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Luhu (Guangzhou)	7	6	7	9	7	6	5	7	8	9	9	9	7
Modiesha (Guangzhou) #	11	10	10	-	-	-	-	-	-	-	-	-	10*
Nansha-HKUST (Guangzhou)	8	7	7	8	7	6	6	7	8	9	10	12	8
Tianhu (Guangzhou)	3	2	3	4	4	4	6	7	7	7	7	8	5
Zhudong (Guangzhou) #	8	7	8	10	9	9	-	8	8	11	11	11	9*
Tongxinling (Shenzhen)	5	5	6	6	6	6	6	7	7	5	6	5	6
Jinjuzui (Foshan)	6	4	5	7	5	3	4	4	4	5	6	6	5
Huijingcheng (Foshan)	9	9	11	12	8	9	10	11	9	12	13	16	11
Tangjia (Zhuhai)	6	5	6	7	5	4	5	4	4	7	7	7	6
Donghu (Jiangmen)	7	6	6	8	6	5	6	6	8	9	10	9	7
Duanfen (Jiangmen) #	6	6	6	5	5	5	5	5	5*	6	8	11	6*
Huaguoshan (Jiangmen)	6	3	5	8	5	5	5	6	9	10	11	10	7
Chengzhong (Zhaoqing)	7	4	10	13	12	11	12	11	11	7	11	7	10
Xiapu (Huizhou)	8	7	7	9	7	6	7	9	10	12	11	11	9
Xijiao (Huizhou) ^	5	3*	3*	3	2*	2	3	2	2	4	3	4	3*
Jinguowan (Huizhou)	8	8	9	9	8	8	8	9	7	4	6	6	8
Zimaling (Zhongshan)	6	5	5	6	4	5	4	5	3	8	8	6	5
Nanchengyuanling (Dongguan) ^	9	7	8	11*	10	7	7	6	7	8	9	10	8*
Tap Mun (Hong Kong)	7	6	5	2	2	2	3	3	4	5	5	7	4
Tsuen Wan (Hong Kong)	4	5	5	6	5	5	6	5	6	6	7	7	6
Yuen Long (Hong Kong)	5	4	4	5	5	4	4	3	4	5	7	8	5
Tung Chung (Hong Kong)	5	5	6	7	3	1	1	2	3	3	4	4	4
Taipa Grande (Macao)	3	2	2	3	1	1	1	1	2*	2	3	5	2

Remarks : All concentration units are in micrograms per cubic metre (μg/m^3).

* The capture rate of validated daily data per month is below 85%.

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

4.2 Nitrogen Dioxide (NO_2)

Nitrogen Dioxide (NO_2) is mainly formed from oxidization of nitric oxide (NO) emitted in the process of combustion. Its major emission sources include power plants, fuel combustion plants, vehicles and vessels. Apart from its impact on human respiratory system, NO_2 can also be oxidized in the air to form nitrate, which has significant impact on the levels of particulate matters, acid rain and visibility in the region.

In 2020, the annual average of NO_2 recorded at each monitoring station in the Network ranged from 9 to 35 μg/m^3 and all monitoring stations met the national annual average concentration limit (40 μg/m^3). During the year, 7 monitoring stations in the Network recorded no exceedance of the national 24-hour average concentration limit (80 μg/m^3) while the corresponding compliance rates in the Network ranged from 97.2% to 100.0%; 15 monitoring stations recorded no exceedance of national 1-hour average concentration limit of NO_2 (200 μg/m^3).

Tables 4.2a to 4.2c list the monthly maxima of hourly averages, the monthly maxima of daily averages with the 98th percentile of the year, the monthly and annual averages of NO_2 at each station respectively.

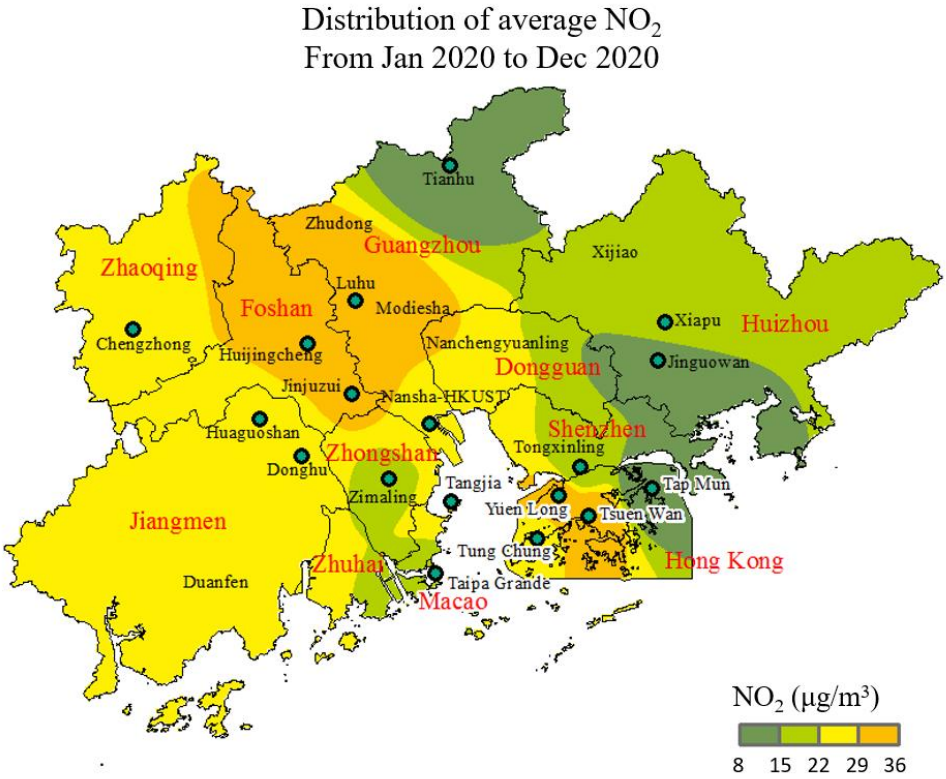

Figure 6：Spatial distribution of annual average concentrations of Nitrogen Dioxide (NO_2)

Remark: Modiesha, Zhudong, Duanfen, Xijiao and Nanchengyuanling's data are excluded in the spatial distribution map owing to its low daily data capture rate in 2020.

Table 4.2a：Hourly averages of Nitrogen Dioxide (the monthly maxima)

[Class II limit: 200 μg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Luhu (Guangzhou)	204	111	101	134	90	73	64	100	105	104	166	196
Modiesha (Guangzhou) #	173	109	103	-	-	-	-	-	-	-	-	-
Nansha-HKUST (Guangzhou)	106	98	101	168	67	52	66	66	90	107	117	207
Tianhu (Guangzhou)	79	46	43	52	49	39	38	36	28	17	74	39
Zhudong (Guangzhou) #	111	66	88	117	83	54	-	64	69	77	85	97
Tongxinling (Shenzhen)	77	49	58	68	59	43	39	69	57	60	144	124
Jinjuzui (Foshan)	140	94	87	153	93	58	64	59	86	143	137	174
Huijingcheng (Foshan)	180	105	89	149	93	85	55	72	102	139	183	235
Tangjia (Zhuhai)	183	78	110	104	74	54	46	64	82	88	141	126
Donghu (Jiangmen)	110	52	70	99	56	45	33	60	84	90	136	177
Duanfen (Jiangmen) #	52	26	41	56	32	19	19	32	45	49	57	52
Huaguoshan (Jiangmen)	107	43	84	89	44	40	35	56	80	100	140	111
Chengzhong (Zhaoqing)	198	70	100	109	80	52	68	87	100	109	128	150
Xiapu (Huizhou)	110	72	58	88	51	43	41	47	52	74	107	146
Xijiao (Huizhou) ^	24	18	25	41	28	34	24	22	20	17	23	26
Jinguowan (Huizhou)	58	25	37	63	38	34	41	26	41	29	39	87
Zimaling (Zhongshan)	83	67	63	107	69	47	35	59	67	93	135	139
Nanchengyuanling (Dongguan) ^	139	68	86	107	74	63	50	68	85	114	118	122
Tap Mun (Hong Kong)	42	23	48	39	51	24	37	34	38	23	41	52
Tsuen Wan (Hong Kong)	156	128	111	137	92	58	62	102	141	105	143	180
Yuen Long (Hong Kong)	136	104	96	106	70	43	44	62	74	77	167	166
Tung Chung (Hong Kong)	125	153	89	131	97	48	42	76	99	83	111	119
Taipa Grande (Macao)	93	57	67	97	57	35	25	46	46	52	81	133

Remarks : All concentration units are in micrograms per cubic metre (μg/m^3).

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.2b：Daily averages of Nitrogen Dioxide (the monthly maxima and the 98th percentile of the year) **[Class II limit: 80 μg/m³]**

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Compliance	98th percentile
Luhu (Guangzhou)	122	56	64	96	48	43	32	55	53	60	65	92	99.2%	71
Modiesha (Guangzhou) #	87	52	67	-	-	-	-	-	-	-	-	-	-	-
Nansha-HKUST (Guangzhou)	61	48	59	87	31	29	31	35	42	54	60	104	98.9%	64
Tianhu (Guangzhou)	43	18	18	34	20	18	20	19	15	11	34	25	100.0%	28
Zhudong (Guangzhou) #	64	32	54	61	33	35	-	33	35	33	56	48	-	-
Tongxinling (Shenzhen)	48	23	31	45	33	20	18	28	35	27	45	56	100.0%	39
Jinjuzui (Foshan)	92	44	66	86	53	34	29	29	45	61	75	85	98.6%	72
Huijingcheng (Foshan)	113	63	67	96	56	45	32	42	58	64	83	103	97.2%	83
Tangjia (Zhuhai)	51	36	60	48	48	27	23	27	39	32	61	81	99.7%	59
Donghu (Jiangmen)	73	31	52	57	41	23	22	29	47	49	67	83	99.7%	63
Duanfen (Jiangmen) #	30	16	25	29	16	11	10	13	25	25	32	30	-	-
Huaguoshan (Jiangmen)	75	27	52	46	34	24	19	23	40	59	67	73	100.0%	63
Chengzhong (Zhaoqing)	92	37	67	65	33	34	32	44	46	59	67	91	99.2%	69
Xiapu (Huizhou)	46	22	27	46	26	26	24	26	26	27	39	65	100.0%	40
Xijiao (Huizhou) ^	14	11	15	20	15	13	13	10	9	9	11	16	-	-
Jinguowan (Huizhou)	27	11	22	25	17	13	20	12	16	18	24	32	100.0%	23
Zimaling (Zhongshan)	52	23	39	53	32	17	22	23	44	46	59	85	99.2%	62
Nanchengyuanling (Dongguan) ^	73	35	47	51	40	41	32	46	44	42	48	79	-	-
Tap Mun (Hong Kong)	15	10	19	20	17	10	19	15	16	13	24	28	100.0%	19
Tsuen Wan (Hong Kong)	78	65	77	64	48	37	36	47	60	44	65	83	99.7%	73
Yuen Long (Hong Kong)	74	52	53	60	41	26	27	36	48	39	77	83	99.7%	66
Tung Chung (Hong Kong)	71	68	54	72	67	19	18	42	58	42	59	82	99.7%	64
Taipa Grande (Macao)	53	32	52	44	37	20	15	26	25	33	47	75	100.0%	53

Remarks : All concentration units are in micrograms per cubic metre (μg/m³).

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.2c：The monthly and annual averages of Nitrogen Dioxide

[Class II limit for annual average: 40 μg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Luhu (Guangzhou)	42	29	37	45	31	25	18	28	38	30	42	46	34
Modiesha (Guangzhou) #	42	29	41	-	-	-	-	-	-	-	-	-	37*
Nansha-HKUST (Guangzhou)	34	24	35	33	17	11	16	23	30	26	36	47	28
Tianhu (Guangzhou)	15	9	12	16	11	12	14	10	7	8	13	14	12
Zhudong (Guangzhou) #	30	19	32	36	21	18	-	21	25	22	30	30	26*
Tongxinling (Shenzhen)	19	11	15	20	14	11	10	14	17	17	22	31	17
Jinjuzui (Foshan)	41	23	33	42	22	16	16	17	29	30	42	47	30
Huijingcheng (Foshan)	44	28	38	47	33	24	15	26	37	28	43	47	34
Tangjia (Zhuhai)	29	22	32	32	18	13	13	15	22	20	33	45	25
Donghu (Jiangmen)	32	18	25	31	17	12	10	15	24	30	39	45	25
Duanfen (Jiangmen) #	14	8	12	14	7	4	4	6	11*	17	16	19	11*
Huaguoshan (Jiangmen)	32	19	26	27	15	9	9	14	24	35	45	44	25
Chengzhong (Zhaoqing)	36	20	31	29	22	19	18	26	30	26	37	38	28
Xiapu (Huizhou)	23	13	18	22	18	17	17	16	16	15	22	27	19
Xijiao (Huizhou) ^	8	6*	10*	10	9*	8	9	5	6	6	9	11	8*
Jinguowan (Huizhou)	13	6	12	13	10	8	10	8	10	14	15	19	11
Zimaling (Zhongshan)	24	13	18	27	11	5	9	14	17	27	37	50	21
Nanchengyuanling (Dongguan) ^	32	18	28	30*	24	21	19	27	26	21	32	35	26*
Tap Mun (Hong Kong)	9	6	10	9	7	6	9	6	6	8	12	16	9
Tsuen Wan (Hong Kong)	46	37	38	40	31	26	26	28	33	31	42	46	35
Yuen Long (Hong Kong)	46	36	33	35	25	18	18	22	29	28	40	45	31
Tung Chung (Hong Kong)	37	30	29	37	24	9	10	20	29	28	33	44	28
Taipa Grande (Macao)	34	22	25	28	12	6	6	11	14	22	32	45	21

Remarks : All concentration units are in micrograms per cubic metre (μg/m^3).

* The capture rate of validated daily data per month is below 85%.

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

4.3 Ozone (O_3)

Ozone (O_3) is not directly emitted from emission sources. It is formed by the photochemical reaction of oxygen, nitrogen oxides (NOx) and volatile organic compounds (VOCs) in the air under sunlight, and is one of the main components of photochemical smog. Ozone can cause irritation to the eyes, nose and throat. At elevated levels, it can increase a person's susceptibility to respiratory diseases and aggravate pre-existing respiratory diseases such as asthma.

The precursors of O_3 (NOx and VOCs) mainly originate from pollution sources in urban areas. However, as it usually takes several hours for O_3 to be formed and rise to its peak level, O_3 and its precursors can be transported to other areas downwind of their sources during this period. The concentrations of O_3 in downwind rural areas are therefore often higher than those in the urban areas.

In 2020, the annual average of O_3 recorded at each monitoring station in the Network ranged from 42 to 77 $\mu g/m^3$ with higher average values being recorded in rural areas such as Tianhu in Guangzhou and Tap Mun in Hong Kong, the situation was similar to the one in previous years. During the year, the compliance rates of the daily maximum 8-hour averages of O_3 in the Network ranged from 85.4% to 99.2%. All monitoring stations recorded exceedance of the national 1-hour average concentration limit (200 $\mu g/m^3$) and the daily maximum 8-hour average concentration limit (160 $\mu g/m^3$) of O_3.

Tables 4.3a to 4.3c list the monthly maxima of hourly averages, the monthly maxima of daily maximum 8-hour averages with the 90th percentile of the year, the monthly and annual averages of O_3 at each station respectively.

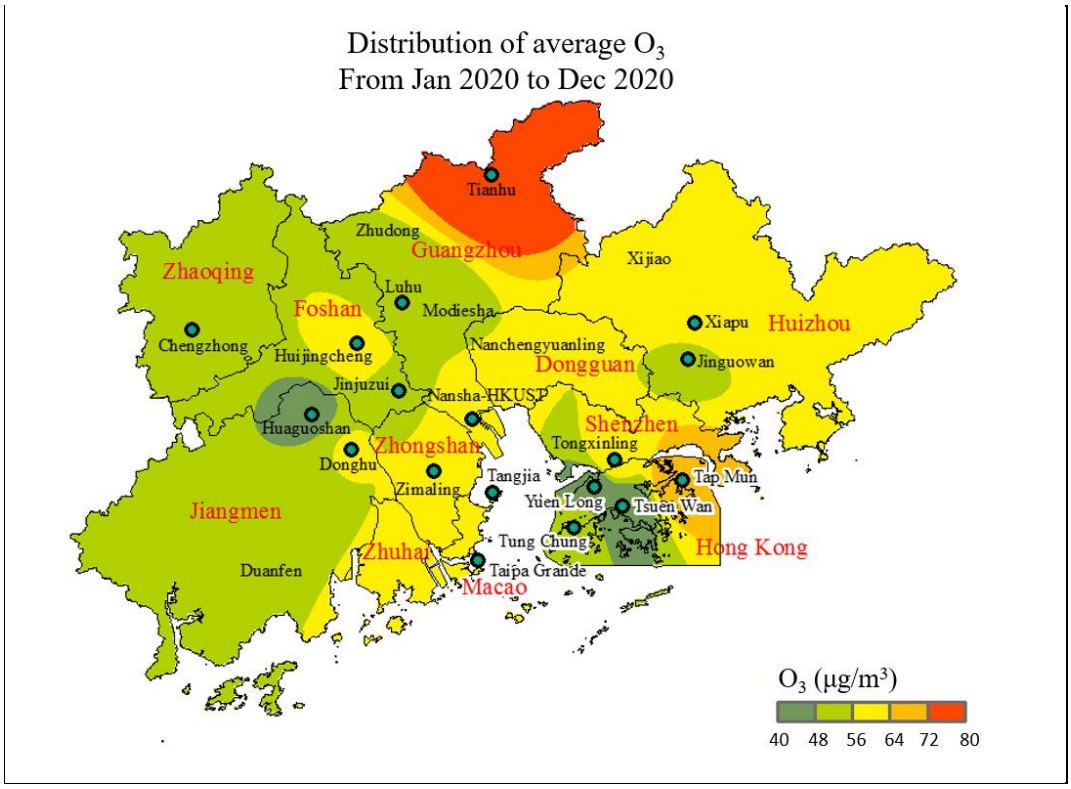

Figure 7：Spatial distribution of annual average concentrations of Ozone (O_3)

Remark: Modiesha, Zhudong, Duanfen, Xijiao and Nanchengyuanling's data are excluded in the spatial distribution map owing to its low daily data capture rate in 2020.

Table 4.3a：Hourly averages of Ozone (the monthly maxima)

[Class II limit: 200 μg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Luhu (Guangzhou)	219	178	156	297	259	180	232	255	240	239	200	241
Modiesha (Guangzhou) #	225	186	151	–	–	–	–	–	–	–	–	–
Nansha-HKUST (Guangzhou)	397	217	160	298	256	152	197	313	335	263	316	272
Tianhu (Guangzhou)	183	171	171	297	204	217	257	228	190	189	179	169
Zhudong (Guangzhou) #	253	177	165	299	305	198	–	245	303	234	223	280
Tongxinling (Shenzhen)	132	146	129	266	181	92	153	245	312	217	222	233
Jinjuzui (Foshan)	221	160	156	288	254	172	204	299	269	252	283	235
Huijingcheng (Foshan)	243	184	162	331	348	167	248	315	272	243	238	194
Tangjia (Zhuhai)	170	195	166	222	213	131	128	282	265	250	323	294
Donghu (Jiangmen)	229	196	171	295	293	168	160	242	304	305	278	284
Duanfen (Jiangmen) #	167	170	170	251	174	161	145	204	231	256	251	162
Huaguoshan (Jiangmen)	191	156	144	292	223	189	177	202	201	213	228	191
Chengzhong (Zhaoqing)	252	155	121	246	194	143	171	227	211	181	182	243
Xiapu (Huizhou)	182	127	195	262	259	141	211	224	170	168	183	250
Xijiao (Huizhou) ^	137	147	167	265	195	177	235	193	188	157	192	171
Jinguowan (Huizhou)	241	133	215	337	290	112	262	225	170	179	182	285
Zimaling (Zhongshan)	198	236	166	314	318	156	156	249	324	304	274	300
Nanchengyuanling (Dongguan) ^	248	217	207	301	273	138	296	293	247	245	202	231
Tap Mun (Hong Kong)	139	146	160	229	170	78	150	255	297	185	219	180
Tsuen Wan (Hong Kong)	105	108	128	279	161	53	66	176	213	174	236	135
Yuen Long (Hong Kong)	120	138	130	226	159	58	129	185	324	221	309	280
Tung Chung (Hong Kong)	109	200	165	332	283	64	116	234	353	236	299	210
Taipa Grande (Macao)	143	219	164	243	220	129	87	194	192	242	282	214

Remarks : All concentration units are in micrograms per cubic metre (μg/m^3).

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.3b：Daily maximum 8-hour averages of Ozone (the monthly maxima and the 90th percentile of the year) **[Class II limit: 160 μg/m³]**

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Compliance	90th percentile
Luhu (Guangzhou)	168	141	123	242	171	146	214	204	207	191	162	164	92.8%	152
Modiesha (Guangzhou) #	163	161	127	–	–	–	–	–	–	–	–	–	–	–
Nansha-HKUST (Guangzhou)	267	189	121	239	181	99	149	268	261	221	267	213	85.4%	175
Tianhu (Guangzhou)	166	148	150	274	172	180	236	204	164	163	161	149	92.0%	152
Zhudong (Guangzhou) #	203	150	128	266	196	164	–	208	250	197	163	183	–	–
Tongxinling (Shenzhen)	117	124	124	233	152	76	111	210	205	181	177	180	96.2%	134
Jinjuzui (Foshan)	172	139	137	225	211	135	169	241	238	206	216	186	88.5%	164
Huijingcheng (Foshan)	187	155	129	283	239	149	211	259	232	200	195	151	87.2%	164
Tangjia (Zhuhai)	126	165	140	206	165	75	99	224	213	226	257	229	89.7%	154
Donghu (Jiangmen)	186	169	137	241	232	131	138	215	267	261	237	227	86.5%	177
Duanfen (Jiangmen) #	125	158	140	209	160	123	99	183	191	218	207	137	–	–
Huaguoshan (Jiangmen)	155	137	116	225	196	152	129	149	165	188	187	142	95.7%	131
Chengzhong (Zhaoqing)	204	130	100	209	177	112	150	192	169	164	154	196	97.6%	128
Xiapu (Huizhou)	122	111	130	228	173	112	190	191	153	162	157	185	96.8%	140
Xijiao (Huizhou) ^	111	107	143	218	156	140	184	169	141	142	145	141	–	–
Jinguowan (Huizhou)	153	116	131	271	189	90	223	182	152	165	153	234	97.8%	133
Zimaling (Zhongshan)	147	196	140	240	277	110	120	209	255	240	207	222	89.5%	160
Nanchengyuanling (Dongguan) ^	221	173	149	243	203	113	226	232	205	219	180	184	–	–
Tap Mun (Hong Kong)	131	130	153	196	168	67	119	205	212	174	181	147	95.0%	142
Tsuen Wan (Hong Kong)	89	98	113	223	125	41	52	137	171	134	184	90	99.2%	99
Yuen Long (Hong Kong)	89	114	117	195	134	45	94	165	230	168	208	180	97.8%	112
Tung Chung (Hong Kong)	101	136	126	252	193	62	75	198	246	173	229	142	97.0%	127
Taipa Grande (Macao)	116	162	142	230	191	87	65	163	159	205	224	180	95.6%	135

Remarks : All concentration units are in micrograms per cubic metre (μg/m³).

The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.3c：The monthly and annual averages of Ozone

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Luhu (Guangzhou)	41	45	39	51	55	37	51	54	44	71	64	42	49
Modiesha (Guangzhou) #	44	52	41	-	-	-	-	-	-	-	-	-	46*
Nansha-HKUST (Guangzhou)	66	64	45	51	54	36	48	63	74	88	81	50	60
Tianhu (Guangzhou)	72	72	66	91	78	65	77	69	68	93	94	73	77
Zhudong (Guangzhou) #	44	49	40	57	62	51	-	69	53	72	63	48	55*
Tongxinling (Shenzhen)	67	65	64	70	57	36	37	48	65	87	77	50	60
Jinjuzui (Foshan)	52	57	50	54	58	39	46	59	57	78	66	41	55
Huijingcheng (Foshan)	47	53	44	63	64	44	58	68	61	80	71	43	58
Tangjia (Zhuhai)	62	62	63	68	56	38	45	58	61	91	81	50	61
Donghu (Jiangmen)	53	54	50	61	62	37	42	56	60	80	75	49	56
Duanfen (Jiangmen) #	60	57	57	57	53	48	40	55	52*	86	80	58	59*
Huaguoshan (Jiangmen)	46	48	40	53	53	38	41	46	42	62	58	34	47
Chengzhong (Zhaoqing)	46	51	40	53	51	37	46	51	54	69	64	48	51
Xiapu (Huizhou)	60	60	60	68	59	40	49	53	64	81	75	55	60
Xijiao (Huizhou) ^	36	39*	49*	56	51	43	48	45	46	65	61	57	50*
Jinguowan (Huizhou)	62	58	62	66	48	28	43	45	50	73	71	57	55
Zimaling (Zhongshan)	55	58	57	58	59	43	43	49	56	79	72	42	56
Nanchengyuanling (Dongguan) ^	60	64	61	72*	66	43	52	63	65	75	73	54	62*
Tap Mun (Hong Kong)	80	75	76	84	63	37	37	52	83	97	94	68	70
Tsuen Wan (Hong Kong)	45	46	46	57	33	18	19	29	43	70	63	41	42
Yuen Long (Hong Kong)	44	42	47	52	35	23	22	29	43	70	65	42	43
Tung Chung (Hong Kong)	43	48	55	61	46	35	33	41	57	80	70	39	51
Taipa Grande (Macao)	62	66	62	73	59	42	36	44	58	88	82	50	60

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

* The capture rate of validated daily data per month is below 85%.

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

4.4 Carbon Monoxide (CO)

Carbon Monoxide (CO) is formed when the fuel is not completely burned. Except for methane conversion, plant emissions, forest fires and other natural sources, deforestation, grassland and waste incineration, and the use of fossil fuels and civilian fuel are the main anthropogenic sources of CO. In most urban areas, the major emission source of CO is automobiles.

In 2020, the annual average of CO recorded at each monitoring station in the Network ranged from 0.4 to 0.8 mg/m^3. During the year, all monitoring stations in the Network were in compliance with the national 1-hour and 24-hour average concentration limits (10 mg/m^3 and 4 mg/m^3).

Tables 4.6a to 4.6c list the monthly maxima of hourly and daily averages, the maxima of daily averages with the 95th percentile of the year, the monthly and annual averages of CO at each station respectively.

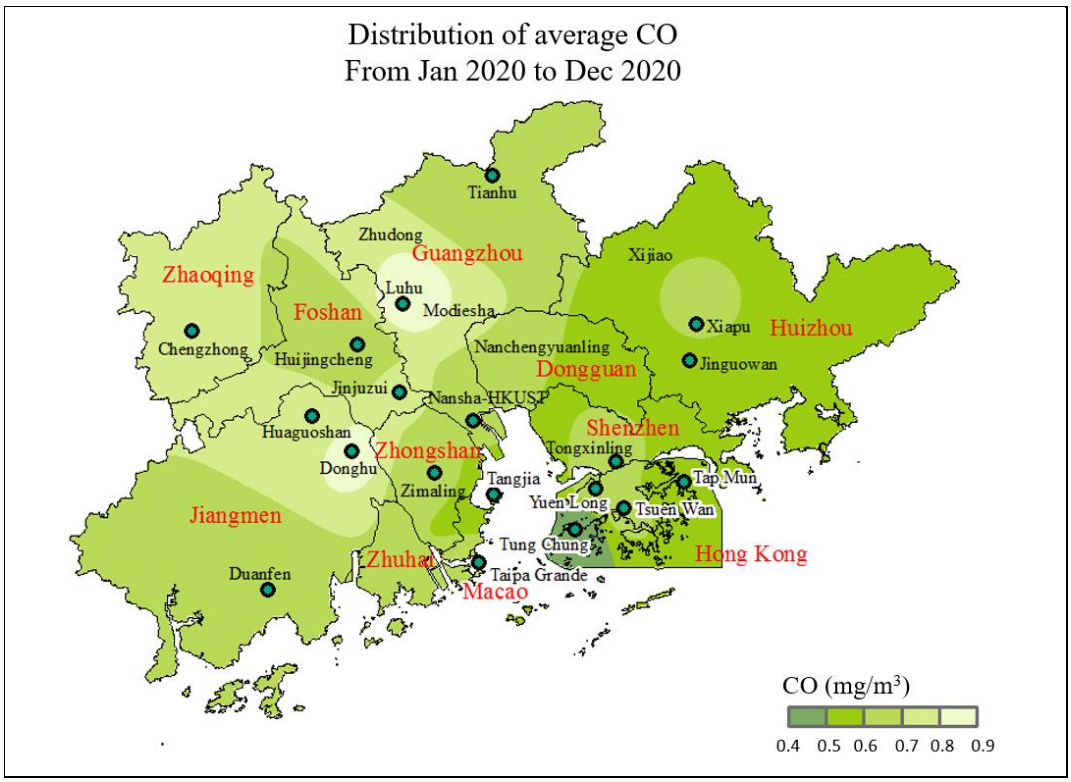

Figure 8：Spatial distribution of annual average concentrations of Carbon Monoxide (CO)

Remark: Modiesha, Zhudong, Xijiao and Nanchengyuanling's data are excluded in the spatial distribution map owing to its low daily data capture rate in 2020.

Table 4.4a：Hourly averages of Carbon Monoxide (the monthly maxima)

[Class II limit: 10 mg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Luhu (Guangzhou)	1.8	1.5	1.5	1.4	1.3	1.3	1.0	1.2	1.5	1.2	1.5	1.6
Modiesha (Guangzhou) #	1.7	1.0	1.3	-	-	-	-	-	-	-	-	-
Nansha-HKUST (Guangzhou)	1.8	1.0	1.2	1.2	1.2	1.0	0.8	1.1	1.3	1.4	1.2	1.8
Tianhu (Guangzhou)	1.3	1.5	1.4	1.1	0.7	0.6	0.7	0.8	0.8	1.0	1.0	1.3
Zhudong (Guangzhou) #	2.0	1.5	1.1	1.2	1.8	0.8	-	0.8	0.9	1.1	1.3	1.4
Tongxinling (Shenzhen)	1.3	0.9	1.1	1.1	0.9	0.9	0.9	1.1	1.2	0.9	1.5	1.5
Jinjuzui (Foshan)	1.5	1.1	1.1	1.6	1.5	1.1	0.9	1.1	1.4	1.5	1.4	2.0
Huijingcheng (Foshan)	2.3	1.2	1.1	1.3	1.4	1.0	0.7	0.9	1.2	1.2	2.1	2.6
Tangjia (Zhuhai)	1.3	0.9	1.1	1.2	1.0	0.6	0.8	0.7	1.1	1.3	1.1	1.5
Donghu (Jiangmen)	3.0	1.7	1.5	1.5	1.4	1.4	1.1	1.5	1.7	2.5	2.8	3.4
Duanfen (Jiangmen)	1.8	1.1	1.2	1.1	0.9	1.4	0.9	1.0	0.8	0.9	1.2	1.5
Huaguoshan (Jiangmen)	2.0	1.3	1.1	1.2	1.2	0.7	1.0	1.0	1.7	1.5	1.4	1.6
Chengzhong (Zhaoqing)	1.8	0.9	1.9	1.4	1.3	1.2	1.1	1.0	1.1	1.2	1.6	1.6
Xiapu (Huizhou)	1.4	1.1	1.0	0.9	1.2	1.0	0.7	0.8	1.0	0.9	1.2	2.1
Xijiao (Huizhou) ^	1.1	0.8	0.8	1.1	0.9	1.9	0.6	0.8	1.2	0.9	1.1	1.4
Jinguowan (Huizhou)	1.2	0.7	1.1	0.8	0.8	0.7	0.9	1.3	1.0	1.2	1.0	1.6
Zimaling (Zhongshan)	1.6	1.0	0.9	1.4	1.5	1.1	0.8	0.9	1.2	1.0	1.2	1.3
Nanchengyuanling (Dongguan) ^	1.4	1.0	1.1	1.1	1.1	1.0	0.7	0.9	1.2	1.4	1.2	1.4
Tap Mun (Hong Kong)	1.2	1.1	0.9	0.9	0.8	0.3	0.3	0.6	1.0	0.8	1.0	1.5
Tsuen Wan (Hong Kong)	1.4	1.1	1.2	1.0	1.0	0.7	0.6	1.0	1.4	1.0	1.1	1.4
Yuen Long (Hong Kong)	1.5	1.1	1.0	1.0	0.9	0.7	0.5	0.7	1.0	0.8	1.5	1.4
Tung Chung (Hong Kong)	1.3	0.9	1.0	0.9	0.8	0.4	0.5	0.6	0.9	0.7	0.9	1.5
Taipa Grande (Macao)	1.3	0.9	1.2	1.0	0.8	0.6	0.8	1.1	1.3	1.4	1.3	1.5

Remarks : All concentration units are in milligrams per cubic metre (mg/m^3).

\# The operations of the Modiesha monitoring station and Zhudong monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.4b：Daily averages of Carbon Monoxide (the monthly maxima and the 95th percentile of the year) **[Class II limit: 4 mg/m³]**

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Compliance	95th percentile
Luhu (Guangzhou)	1.3	0.9	1.0	1.1	1.0	1.0	0.8	0.9	1.0	1.0	1.0	1.2	100.0%	1.0
Modiesha (Guangzhou) #	1.3	0.8	0.9	-	-	-	-	-	-	-	-	-	-	-
Nansha-HKUST (Guangzhou)	0.9	0.4	0.7	0.7	0.7	0.5	0.6	0.8	1.0	1.0	1.0	1.3	100.0%	1.0
Tianhu (Guangzhou)	1.3	1.1	1.0	1.0	0.6	0.3	0.6	0.7	0.8	0.9	0.9	0.9	100.0%	0.9
Zhudong (Guangzhou) #	1.2	0.9	1.0	1.0	0.9	0.6	-	0.6	0.7	1.0	1.0	1.3	-	-
Tongxinling (Shenzhen)	1.1	0.9	0.8	0.9	0.8	0.7	0.7	0.8	1.1	0.8	0.9	1.0	100.0%	0.9
Jinjuzui (Foshan)	1.2	0.8	0.8	1.1	1.1	0.7	0.7	0.9	1.1	1.0	1.0	1.2	100.0%	1.0
Huijingcheng (Foshan)	1.1	0.9	0.8	0.9	1.0	0.7	0.5	0.7	0.8	0.8	1.1	1.1	100.0%	0.9
Tangjia (Zhuhai)	1.1	0.7	0.8	0.9	0.8	0.4	0.6	0.6	0.9	1.0	0.9	1.1	100.0%	0.9
Donghu (Jiangmen)	1.2	0.9	1.0	1.1	1.1	0.8	0.7	0.9	1.1	1.0	1.2	1.4	100.0%	1.1
Duanfen (Jiangmen)	1.2	0.7	0.9	0.9	0.8	1.0	0.5	0.7	0.7	0.8	1.1	1.3	100.0%	1.0
Huaguoshan (Jiangmen)	1.3	1.1	0.9	0.9	0.9	0.5	0.7	0.9	1.3	1.1	1.2	1.2	100.0%	1.1
Chengzhong (Zhaoqing)	1.2	0.8	1.3	1.0	1.0	0.8	0.9	0.8	0.9	0.9	1.0	1.1	100.0%	1.0
Xiapu (Huizhou)	1.0	0.7	0.8	0.7	0.9	0.6	0.6	0.7	0.8	0.8	0.8	1.0	100.0%	0.9
Xijiao (Huizhou) ^	1.0	0.7	0.5	0.7	0.6	0.7	0.5	0.8	0.9	0.8	1.0	1.1	-	-
Jinguowan (Huizhou)	1.1	0.6	1.0	0.6	0.4	0.4	0.8	0.9	0.9	1.1	1.0	1.0	100.0%	0.9
Zimaling (Zhongshan)	1.3	0.8	0.7	0.9	1.0	0.8	0.7	0.6	0.9	0.8	1.0	0.9	100.0%	0.9
Nanchengyuanling (Dongguan) ^	1.1	0.8	0.7	0.8	0.9	0.7	0.6	0.7	0.8	0.8	1.0	1.0	-	-
Tap Mun (Hong Kong)	1.2	0.9	0.6	0.8	0.6	0.3	0.2	0.5	0.8	0.7	0.9	1.0	100.0%	0.9
Tsuen Wan (Hong Kong)	1.2	0.8	0.9	0.8	0.6	0.4	0.5	0.8	1.1	0.9	0.9	1.2	100.0%	0.9
Yuen Long (Hong Kong)	1.2	0.9	0.9	0.9	0.8	0.5	0.4	0.6	0.9	0.7	0.8	0.8	100.0%	0.8
Tung Chung (Hong Kong)	1.1	0.8	0.7	0.7	0.6	0.3	0.3	0.5	0.7	0.6	0.7	1.0	100.0%	0.8
Taipa Grande (Macao)	1.2	0.8	0.9	0.9	0.6	0.5	0.7	1.0	1.1	1.0	1.0	1.1	100.0%	1.0

Remarks : All concentration units are in milligrams per cubic metre (mg/m³).

\# The operations of the Modiesha monitoring station and Zhudong monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.4c：The monthly and annual averages of Carbon Monoxide

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Luhu (Guangzhou)	0.9	0.7	0.8	0.8	0.7	0.7	0.6	0.6	0.8	0.8	0.8	0.9	0.8
Modiesha (Guangzhou) #	0.9	0.6	0.7	-	-	-	-	-	-	-	-	-	0.7*
Nansha-HKUST (Guangzhou)	0.5	0.3	0.5	0.5	0.4	0.4	0.5	0.6	0.7	0.8	0.7	0.9	0.6
Tianhu (Guangzhou)	0.9	0.7	0.9	0.7	0.4	0.2	0.5	0.5	0.6	0.6	0.7	0.7	0.6
Zhudong (Guangzhou) #	1.0	0.7	0.7	0.8	0.6	0.4	-	0.3	0.5	0.7	0.8	0.8	0.7*
Tongxinling (Shenzhen)	0.8	0.7	0.7	0.6	0.6	0.4	0.5	0.6	0.6	0.6	0.6	0.7	0.6
Jinjuzui (Foshan)	0.8	0.5	0.6	0.8	0.7	0.6	0.6	0.7	0.9	0.8	0.8	0.9	0.7
Huijingcheng (Foshan)	0.7	0.5	0.6	0.6	0.6	0.5	0.4	0.5	0.6	0.6	0.7	0.7	0.6
Tangjia (Zhuhai)	0.7	0.5	0.6	0.6	0.5	0.4	0.4	0.4	0.6	0.5	0.6	0.7	0.5
Donghu (Jiangmen)	0.9	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.8	0.8	0.9	1.0	0.8
Duanfen (Jiangmen)	0.8	0.6	0.6	0.5	0.5	0.3	0.3	0.5	0.4*	0.5	0.8	1.0	0.6
Huaguoshan (Jiangmen)	0.8	0.6*	0.6	0.7	0.6	0.4	0.5	0.5	0.9	0.9	0.9	1.0	0.7
Chengzhong (Zhaoqing)	0.9	0.6	0.8	0.7	0.7	0.6	0.5	0.6	0.7	0.6	0.7	0.7	0.7
Xiapu (Huizhou)	0.8	0.6	0.6	0.6	0.6	0.4	0.4	0.5	0.6	0.5	0.6	0.7	0.6
Xijiao (Huizhou) ^	0.7	0.5*	0.4*	0.5	0.5	0.5	0.4	0.6	0.8	0.5	0.7	0.7	0.6*
Jinguowan (Huizhou)	0.8	0.4	0.5	0.4	0.2	0.3	0.5	0.6	0.7	0.6	0.7	0.8	0.5
Zimaling (Zhongshan)	0.8	0.6	0.5	0.6	0.5	0.6	0.5	0.5	0.6	0.6	0.6	0.7	0.6
Nanchengyuanling (Dongguan) ^	0.8	0.6	0.5	0.6*	0.7	0.5	0.4	0.5	0.5	0.6	0.7	0.8	0.6*
Tap Mun (Hong Kong)	0.9	0.7	0.5	0.6	0.4	0.2	0.1	0.3	0.4	0.5	0.5	0.7	0.5
Tsuen Wan (Hong Kong)	0.8	0.7	0.7	0.6	0.4	0.4	0.4	0.5	0.6	0.7	0.5	0.8	0.6
Yuen Long (Hong Kong)	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6
Tung Chung (Hong Kong)	0.7	0.5	0.5	0.5	0.3	0.2	0.2	0.2	0.3	0.4	0.5	0.7	0.4
Taipa Grande (Macao)	0.7	0.6	0.6	0.6	0.5	0.5	0.4	0.8	0.8	0.7	0.7	0.8	0.6

Remarks : All concentration units are in milligrams per cubic metre (mg/m^3).

* The capture rate of validated daily data per month is below 85%.

\# The operations of the Modiesha monitoring station and Zhudong monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

4.5 Respirable Suspended Particulates (PM_{10})

Respirable suspended particulates (PM_{10} or RSP) in the atmosphere come from a great variety of emission sources, such as power plants, vehicles, vessels, cement and pottery manufacturing, fugitive dust, etc. while some are products of oxidization of gaseous pollutants in the air (e.g. sulphate formed from oxidation of SO_2) or formed from photochemical reactions. PM_{10} can penetrate deeply into human lungs and cause impact on human respiratory system. Furthermore, finer particles in PM_{10} have significant effect on visibility.

In 2020, the annual average of PM_{10} recorded at each monitoring station in the Network ranged from 24 to 49 $\mu g/m^3$, and all monitoring stations met the national annual average concentration limit (70 $\mu g/m^3$). During the year, 16 monitoring stations in the Network recorded no exceedance of the national 24-hour average concentration limit (150 $\mu g/m^3$) while the corresponding compliance rates in the Network ranged from 99.7% to 100.0%.

Table 4.5a and Table 4.5b list the monthly maxima of daily averages with the 95th percentile of the year, the monthly and annual averages of PM_{10} at each station respectively.

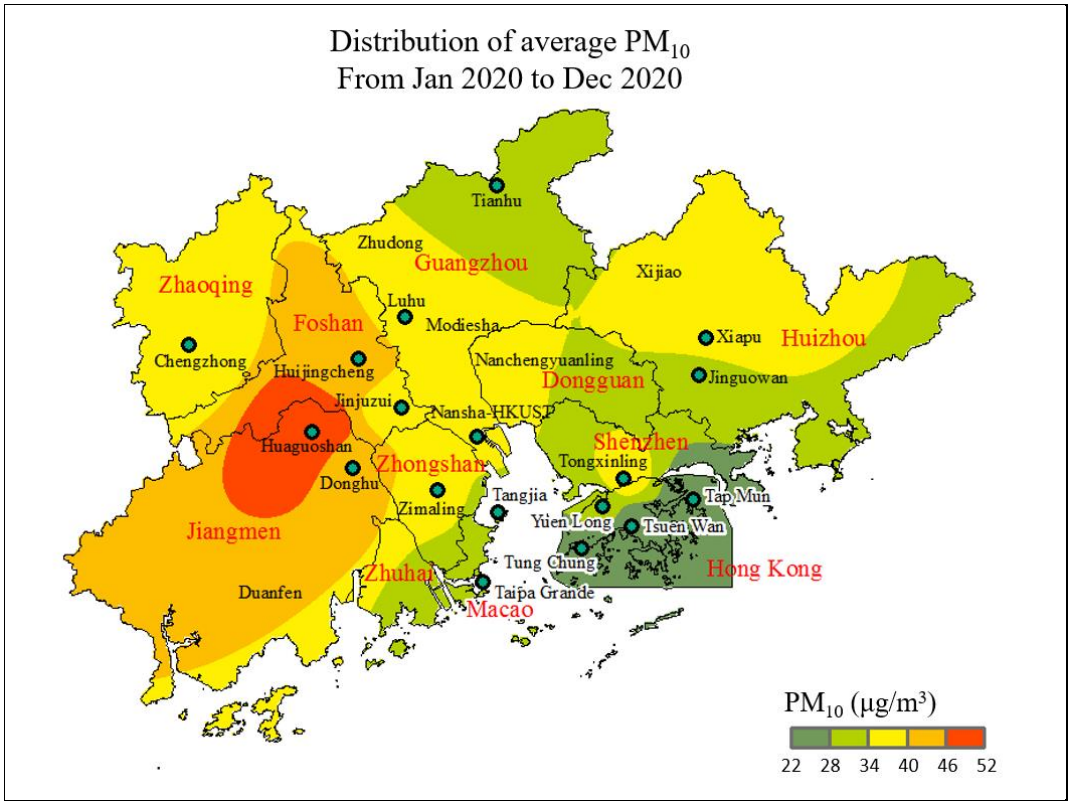

Figure 9：Spatial distribution of annual average concentrations of Respirable Suspended Particulates (PM_{10})

Remark: Modiesha, Zhudong, Duanfen, Xijiao and Nanchengyuanling's data are excluded in the spatial distribution map owing to its low daily data capture rate in 2020.

Table 4.5a：Daily averages of PM_{10} (the monthly maxima and the 95th percentile of the year)

[Class II limit: 150 μg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Compliance	95th percentile
Luhu (Guangzhou)	123	53	67	95	61	31	39	68	79	80	82	115	100.0%	75
Modiesha (Guangzhou) #	106	53	76	-	-	-	-	-	-	-	-	-	-	-
Nansha-HKUST (Guangzhou)	82	48	54	98	66	29	29	51	76	84	80	97	100.0%	73
Tianhu (Guangzhou)	63	51	61	63	39	33	46	49	51	68	71	64	100.0%	56
Zhudong (Guangzhou) #	139	67	79	98	69	43	-	76	71	85	92	105	-	-
Tongxinling (Shenzhen)	73	54	60	82	42	22	26	48	72	73	88	108	100.0%	73
Jinjuzui (Foshan)	72	51	51	74	62	29	28	59	78	84	84	120	100.0%	78
Huijingcheng (Foshan)	109	59	57	92	78	38	41	75	97	97	104	170	99.7%	85
Tangjia (Zhuhai)	62	50	54	86	57	23	26	39	64	69	83	107	100.0%	72
Donghu (Jiangmen)	117	100	89	91	95	40	33	72	81	98	92	137	100.0%	88
Duanfen (Jiangmen) #	75	61	53	49	42	23	29	42	52	90	102	97	-	-
Huaguoshan (Jiangmen)	159	91	94	99	107	41	39	77	87	116	106	136	99.7%	99
Chengzhong (Zhaoqing)	120	55	98	83	56	35	35	86	75	81	89	140	100.0%	75
Xiapu (Huizhou)	79	54	61	90	60	32	48	65	78	81	80	102	100.0%	72
Xijiao (Huizhou) ^	55	40	51	62	42	36	42	51	61	59	65	65	-	-
Jinguowan (Huizhou)	47	43	49	60	48	32	35	46	59	66	77	68	100.0%	59
Zimaling (Zhongshan)	62	56	54	92	69	23	24	50	81	85	89	114	100.0%	78
Nanchengyuanling (Dongguan) ^	106	54	66	70	53	26	34	62	75	83	81	113	-	-
Tap Mun (Hong Kong)	45	58	56	56	36	12	15	33	60	64	76	62	100.0%	53
Tsuen Wan (Hong Kong)	45	54	43	72	40	14	16	37	56	54	64	61	100.0%	48
Yuen Long (Hong Kong)	55	52	57	80	43	18	20	43	55	80	97	78	100.0%	65
Tung Chung (Hong Kong)	46	59	35	90	40	14	15	36	56	53	70	81	100.0%	56
Taipa Grande (Macao)	58	47	47	84	51	28	17	39	50	77	88	89	100.0%	69

Remarks : All concentration units are in micrograms per cubic metre (μg/m^3).

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.5b：The monthly and annual averages of PM_{10}

[Class II limit for annual average: 70 μg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Luhu (Guangzhou)	47	31	36	46	35	24	23	30	36	44	55	58	39
Modiesha (Guangzhou) #	48	33	45	-	-	-	-	-	-	-	-	-	42*
Nansha-HKUST (Guangzhou)	39	27	32	41	27	16	17	24	32	47	55	59	35
Tianhu (Guangzhou)	30	26	27	30	27	21	27	24	24	36	42	37	29
Zhudong (Guangzhou) #	52	36	43	48	41	33	-	42	41	51	62	59	46*
Tongxinling (Shenzhen)	45	30	37	37	24	15	14	22	26	46	54	65	35
Jinjuzui (Foshan)	38	26	31	37	32	21	21	27	33	48	58	68	37
Huijingcheng (Foshan)	43	32	36	46	37	25	26	34	41	53	64	66	42
Tangjia (Zhuhai)	39	29	31	36	21	13	12	17	22	42	51	66	32
Donghu (Jiangmen)	53	38	44	49	39	26	22	31	44	57	65	69	45
Duanfen (Jiangmen) #	49	35	29	28	19	14*	17	20	26*	52	58	58	34*
Huaguoshan (Jiangmen)	66	44	45	55	42	24	27	34	43	63	70	71	49
Chengzhong (Zhaoqing)	49	30	39	36	32	23	25	31	37	43	54	51	38
Xiapu (Huizhou)	44	28	35	44	33	23	27	30	35	47	53	56	38
Xijiao (Huizhou) ^	33	25*	28*	34*	30*	24	24	26	30*	36	39	38	31*
Jinguowan (Huizhou)	30	22	29	32	29	19	18	23	28	40	45	49	31
Zimaling (Zhongshan)	39	27	30	42	29	17	17	23	30	49	57	63	35
Nanchengyuanling (Dongguan) ^	44	31	36	45*	30	18	20	29	35	43	54	53	36*
Tap Mun (Hong Kong)	30	27	30	27	15	8	7	14	21	37	41	41	25
Tsuen Wan (Hong Kong)	28	25	25	25	17	10	10	16	19	34	36	40	24
Yuen Long (Hong Kong)	34	29	32	35	22	13	13	18	21	41	51	52	30
Tung Chung (Hong Kong)	29	23	21	30	17	9	9	15	21	36	41	50	25
Taipa Grande (Macao)	35	26	28	29	19	10	9	16	17	45	52	60	29

Remarks : All concentration units are in micrograms per cubic metre (μg/m^3).

* The capture rate of validated daily data per month/year is below 85%.

\# The operations of the Modiesha monitoring station, Zhudong monitoring station and Duanfen monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

4.6 Fine Suspended Particulates ($PM_{2.5}$)

Fine suspended particulates ($PM_{2.5}$) in the atmosphere come from a great variety of combustion sources, such as the emissions from power plants and diesel vehicles exhaust while some are products of oxidization of gaseous pollutants in the air (e.g. sulphate formed from oxidation of SO_2) or formed from photochemical reactions. $PM_{2.5}$ have significant effect on visibility.

In 2020, the annual average of $PM_{2.5}$ recorded at each monitoring station in the Network ranged from 14 to 28 $\mu g/m^3$, and all monitoring stations met the national annual average concentration limit (35 $\mu g/m^3$). During the year, 17 monitoring stations in the Network recorded no exceedance of the national 24-hour average concentration limit (75$\mu g/m^3$) while the corresponding compliance rates in the Network ranged from 98.6% to 100.0%.

Tables 4.6a and 4.6b list the monthly maxima of daily averages with the 95th percentile of the year, the monthly and annual averages of $PM_{2.5}$ at each station respectively.

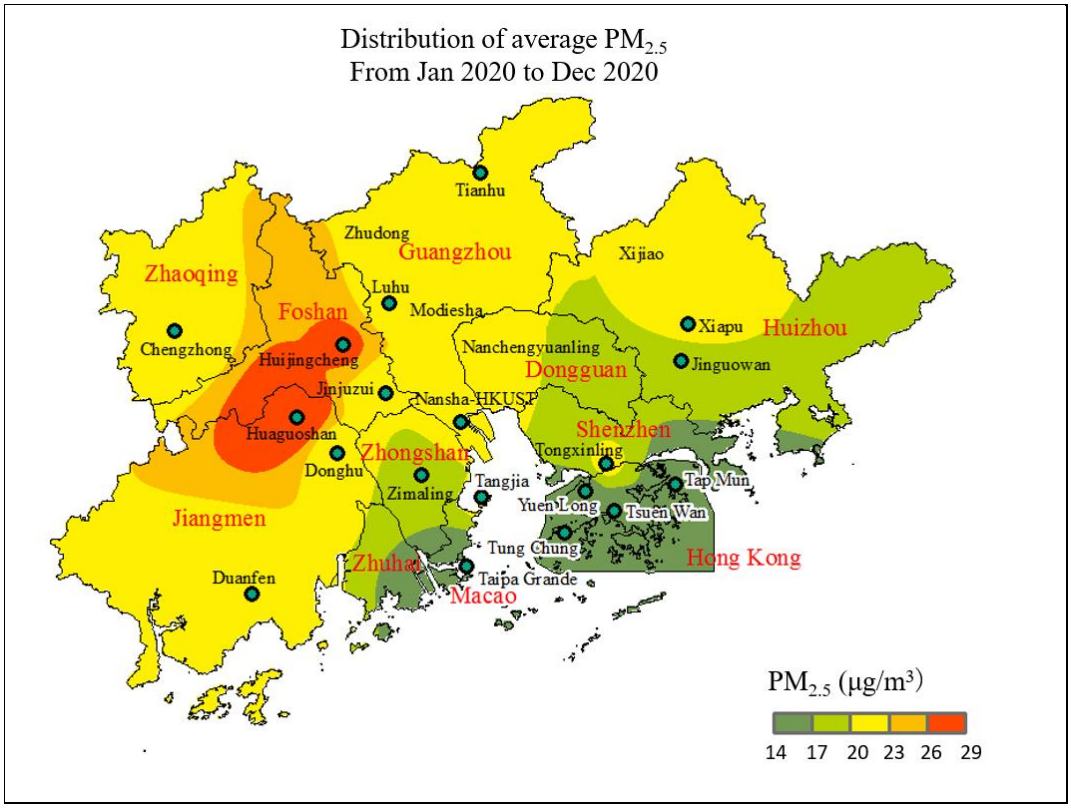

Figure 10：Spatial distribution of annual average concentrations of Fine Suspended Particulates ($PM_{2.5}$)

Remark: Modiesha, Zhudong, Xijiao and Nanchengyuanling's data are excluded in the spatial distribution map owing to its low daily data capture rate in 2020.

Table 4.6a：Daily averages of $PM_{2.5}$ (the monthly maxima and the 95th percentile of the year)

[Class II limit: 75 μg/m³]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Compliance	95th percentile
Luhu (Guangzhou)	64	45	34	57	44	17	19	45	53	46	46	62	100.0%	44
Modiesha (Guangzhou) #	45	36	33	-	-	-	-	-	-	-	-	-	-	-
Nansha-HKUST (Guangzhou)	68	39	39	55	41	20	21	37	41	48	55	57	100.0%	43
Tianhu (Guangzhou)	40	46	36	48	36	22	22	36	34	32	35	45	100.0%	38
Zhudong (Guangzhou) #	97	52	50	64	47	24	-	53	51	50	54	66	-	-
Tongxinling (Shenzhen)	47	35	35	56	28	13	17	34	53	44	46	61	100.0%	44
Jinjuzui (Foshan)	50	42	32	44	39	14	12	36	46	43	44	58	100.0%	43
Huijingcheng (Foshan)	74	46	38	61	62	23	22	57	61	55	68	94	99.7%	54
Tangjia (Zhuhai)	44	40	35	70	34	16	12	35	52	43	51	70	100.0%	47
Donghu (Jiangmen)	47	48	40	57	49	14	15	43	46	54	52	66	100.0%	48
Duanfen (Jiangmen)	42	55	42	48	29	13	14	29	29	50	55	72	100.0%	48
Huaguoshan (Jiangmen)	116	69	58	55	53	19	17	57	58	73	69	90	98.6%	62
Chengzhong (Zhaoqing)	68	45	53	57	35	18	19	54	47	43	55	73	100.0%	47
Xiapu (Huizhou)	58	40	36	60	29	13	20	33	42	45	42	56	100.0%	45
Xijiao (Huizhou) ^	39	33	33	45	26	19	29	34	40	35	44	43	-	-
Jinguowan (Huizhou)	36	30	32	38	29	14	22	36	42	39	44	47	100.0%	36
Zimaling (Zhongshan)	34	37	28	45	50	9	10	32	51	48	47	64	100.0%	44
Nanchengyuanling (Dongguan) ^	84	58	50	50	33	15	15	40	48	43	45	60	-	-
Tap Mun (Hong Kong)	28	24	26	42	22	5	7	25	50	32	37	42	100.0%	31
Tsuen Wan (Hong Kong)	33	37	31	59	29	8	7	28	43	31	38	45	100.0%	32
Yuen Long (Hong Kong)	34	26	28	39	29	12	10	31	41	39	36	44	100.0%	32
Tung Chung (Hong Kong)	33	39	24	69	27	5	5	24	42	28	37	47	100.0%	33
Taipa Grande (Macao)	29	22	29	55	30	9	6	28	32	36	41	49	100.0%	32

Remarks : All concentration units are in micrograms per cubic metre (μg/m³).

^ Data are for reference only owing to its low daily data capture rate in 2020.

The operations of the Modiesha monitoring station and Zhudong monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

Table 4.6b：The monthly and annual averages of $PM_{2.5}$

[Class II limit for annual average: 35 μg/m^3]

Monitoring Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Luhu (Guangzhou)	27	22	19	26	18	11	10	17	21	27	31	33	22
Modiesha (Guangzhou) #	22	19	20	-	-	-	-	-	-	-	-	-	20*
Nansha-HKUST (Guangzhou)	25	20	21	23*	17	11	10	16	21	27	31	35	22
Tianhu (Guangzhou)	23	22	19	27	22	16	14	12	13	19	23	28	20
Zhudong (Guangzhou) #	34	28	28	31	21	13	-	22	27	32	34	38	28*
Tongxinling (Shenzhen)	29	21	22	22	14	7	9	13	16	26	29	37	20
Jinjuzui (Foshan)	25	20	19	20	17	9	9	14	18	25	30	36	20
Huijingcheng (Foshan)	29	24	23	28	25	14	13	22	27	31	36	39	26
Tangjia (Zhuhai)	28	21	21	23	13	7	7	12	15	25	31	43	20
Donghu (Jiangmen)	26	23	20	24	17	9	9	15	20	29	33	38	22
Duanfen (Jiangmen)	25	21	15	23	14	11	11	9	14*	29	35	39	21
Huaguoshan (Jiangmen)	40	30	27	30	20	10	11	19	28	37	42	45	28
Chengzhong (Zhaoqing)	29	21	21	21	18	12	12	17	21	24	31	33	22
Xiapu (Huizhou)	30	21	21	25	16	9	10	14	17	25	28	35	21
Xijiao (Huizhou) ^	24	20*	20*	24*	18*	11*	13	14	17*	24	27	27	20*
Jinguowan (Huizhou)	22	17	18	20	15	6	10	15	17	24	24	31	18
Zimaling (Zhongshan)	22	18	16	21	14	7	7	9	16	26	28	34	18
Nanchengyuanling (Dongguan) ^	30	25	22	33*	15	8	9	15	19	24	27	31	21*
Tap Mun (Hong Kong)	18	15	17	16	8	3	4	8	12	19	21	26	14
Tsuen Wan (Hong Kong)	20	17	16	17	11	5	5	10	12	20	22	27	15
Yuen Long (Hong Kong)	20	16	16	17	13	8	8	12	13	20	21	26	16
Tung Chung (Hong Kong)	19	15	13	18	10	4	4	9	13	18	21	28	14
Taipa Grande (Macao)	18	12	14	16	9	4	3	9	10	20	23	29	14

Remarks : All concentration units are in micrograms per cubic metre (μg/m^3).

* The capture rate of validated daily data per month/year is below 85%.

\# The operations of the Modiesha monitoring station and Zhudong monitoring station were suspended owing to the relocation of the stations. Hence, its data are for reference only owing to its low daily data capture rate in 2020.

^ Data are for reference only owing to its low daily data capture rate in 2020.

4.7 Monthly Variations of Pollutant Concentrations

Figure 11 shows the monthly variations of the major pollutants (Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Ozone (O_3), Respirable Suspended Particulates (PM_{10}), Fine Suspended Particulates ($PM_{2.5}$), and Carbon Monoxide (CO)) recorded by the Network in 2020. In general, the monthly average concentrations of SO_2, NO_2, PM_{10}, $PM_{2.5}$, and CO were higher during the winter season (first and fourth quarters of the year) and relatively lower in the summer months. The lower pollutant levels in summer were mainly due to the cleaner maritime air stream prevailed in the PRD region under the influence of southern monsoon, together with heavier rainfall and higher mixing layer that favoured the dispersion of pollutants. The ozone concentration was higher in October, mainly due to the fact that there were more days with meteorological conditions that favoured photochemical reactions (such as strong solar radiation and less amount of clouds) and resulted in more ozone formation during the period.

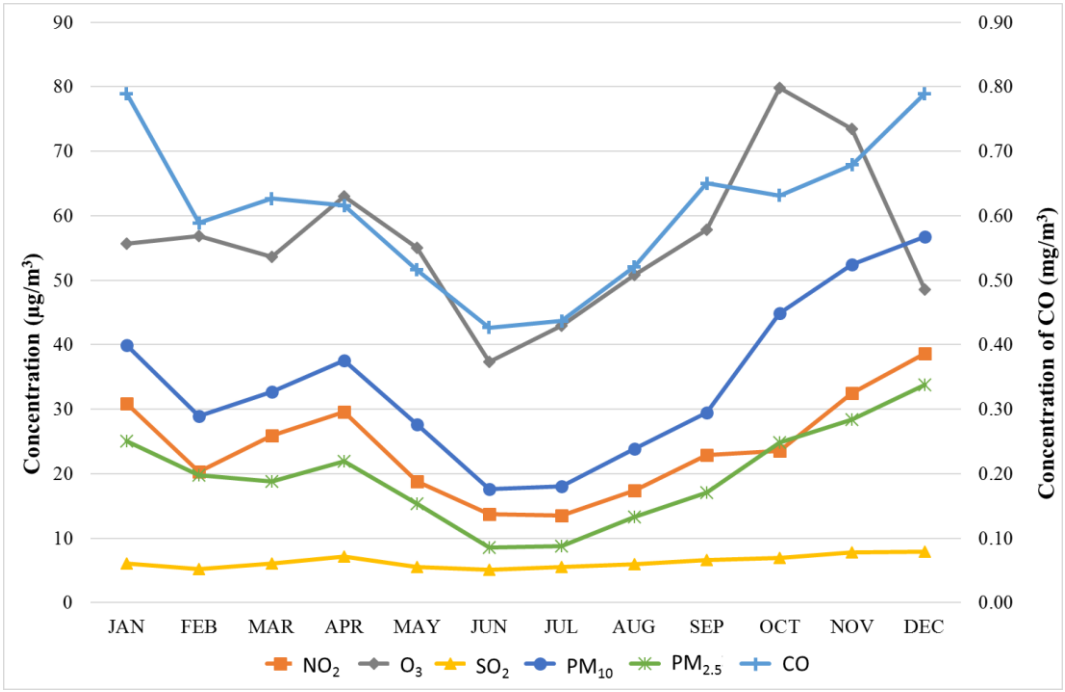

Figure 11：Monitoring network monthly variations of air pollutant concentrations

Remark: All Modiesha, Zhudong, Xijiao and Nanchengyuanling's pollutants data and Duanfen's SO_2, NO_2, O_3 and PM_{10} data are excluded from the calculation of the monthly variation of pollutant concentrations in 2020 owing to its low daily data capture rate during the year.

4.8 Annual Variations of Pollutant Concentrations (2006-2020)

Table 4.8 shows the annual average concentrations of air pollutants recorded by the Network from 2006 to 2020, while Figure 12 shows the trend of rate of changes in the annual pollutant concentrations.

From 2006 to 2020, the annual averages recorded by the Network for SO_2, NO_2, and PM_{10} decreased by 86%, 43% and 49% respectively, which exhibited a discernible downward trend with a descending rate of about 2.6, 1.3 and 2.4$\mu g/m^3$ per year respectively. As for CO and $PM_{2.5}$, these two parameters had been added to the Network in September 2014 and their annual averages decreased by 16% and 31% respectively between 2015 and 2020. These reductions indicate that the measures implemented in recent years by concerted or individual effort of Guangdong, Hong Kong and Macao, including retrofitting of power plants with flue-gas desulphurization facilities, tightening the vehicle emission standards, prohibiting import of heavy polluting vehicles, tightening the fuel specifications, and phasing out the more polluting industrial facilities in the PRD, etc., have improved the overall air quality in the PRD region. Compared with 2006, the annual average of O_3 in 2020 increased by 27%, reflecting the photochemical smog problem in the region has not yet been resolved. The Guangdong, Hong Kong and Macao governments will continue to implement emission reduction measures to further improve the air quality in the region and tackle the photochemical pollution problem.

Table 4.8：Annual averages of the pollutants in the monitoring network

Year	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	CO (mg/m^3)
2006	43	42	44	67	-	-
2007	44	41	46	72	-	-
2008	36	40	46	65	-	-
2009	26	38	51	64	-	-
2010	23	39	49	59	-	-
2011	21	37	53	59	-	-
2012	17	35	49	52	-	-
2013	17	37	49	59	-	-
2014	14	34	52	50	-	-
2015	12	30	47	44	29	0.730
2016	11	32	44	41	26	0.728
2017	10	31	52	45	28	0.665
2018	9	29	53	42	25	0.611
2019	7	30	60	42	25	0.700
2020	6	24	56	34	20	0.611

Remarks:

(1) All Tap Mun's pollutants data are excluded from the calculation of the annual averages of pollutants in 2016 owing to its low hourly data capture rate in 2016.

(2) Taipa Grande's PM_{10} and $PM_{2.5}$, Tap Mun's PM_{10} and Xijiao's $PM_{2.5}$ data are excluded from the calculation of the annual averages of pollutants in 2017 owing to its low daily data capture rate in 2017.

(3) All Tap Mun's pollutants and Jinguowan's O_3 data are excluded from the calculation of the annual averages of pollutants in 2018 owing to its low daily data capture rate in 2018.

(4) Zhudong's $PM_{2.5}$ data is excluded from the calculation of the annual averages of pollutants in 2019 owing to its low daily data capture rate in 2019.

(5) All Modiesha, Zhudong, Xijiao and Nanchengyuanling's pollutants data and Duanfen's SO_2, NO_2, O_3 and PM_{10} data are excluded from the calculation of the annual averages of pollutants in 2020 owing to its low daily data capture rate in 2020.

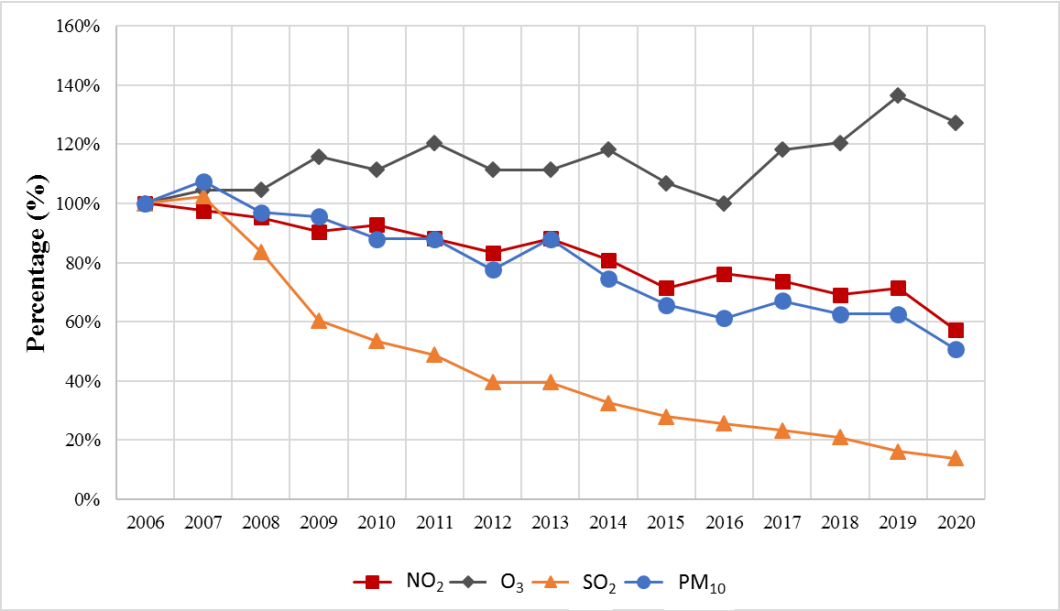

Figure 12：Trend of rates of changes in pollutant's annual averages in the monitoring network

Remarks:

(1) All Tap Mun's pollutants data are excluded from the calculation of the annual averages of pollutants in 2016 owing to its low hourly data capture rate in 2016.

(2) Taipa Grande's PM_{10} and Tap Mun's PM_{10} data are excluded from the calculation of the annual averages of pollutants in 2017 owing to its low daily data capture rate in 2017.

(3) All Tap Mun's pollutants and Jinguowan's O_3 data are excluded from the calculation of the annual averages of pollutants in 2018 owing to its low daily data capture rate in 2018.

(4) All Modiesha, Zhudong, Duanfenm Xijiao and Nanchengyuanling's pollutants data are excluded from the calculation of the annual averages of pollutants in 2020 owing to its low daily data capture rate in 2020.

Annex A：Site Information of Monitoring Stations

Monitoring Stations	Address	Area Type	Sampling Height (Above P.D.)	Above Ground	Date Commenced Operation
Luhu (Guangzhou)	Jufong Garden of Luhu Park (Big yard, No. 11 Luhu Park)	City	30m	9m	Jan 1993
Modiesha (Guangzhou)	Modiesha Street, Haizhu District	City	95m	45m	Dec 2011
Nansha-HKUST (1) (Guangzhou)	HKUST Fok Ying Tung Research Institute, Nansha	Mixed educational/ commercial and residential/industrial	54m	28m	Oct 2004
Tianhu (Guangzhou)	Tianhu Park, Conghua	Background : rural	251m	13m	Oct 2004
Zhudong (Guangzhou)	Zhudong Village Committee, Chini Town, Huadu District	Rural	19m	10m	Dec 2011
Tongxinling (2) (Shenzhen)	Shennan Zhong Road, Futian District	City	38m	12m	Sep 1997
Jinjuzui (Foshan)	Foshan City Communist Party School, Jinjuzui, Shunde District	Tourist and cultural /educational	27m	17m	Oct 1999
Huijingcheng (Foshan)	No. 127, Fenjiang Nan Road, Chancheng District	Urban: mixed residential/commercial/ industrial	24m	14m	Feb 2000
Tangjia (Zhuhai)	Qiao Island Mangrove Monitoring Station, Tangjia Town	Mixed educational/ commercial and residential/industrial	13m	13m	Jan 2010
Donghu (Jiangmen)	Donghu Park, Jiangmen	City	17.5m	5m	Nov 2001
Duanfen (Jiangmen)	Duanfen Middle School, Taishan	Rural	15m	12m	Dec 2011
Huaguoshan (Jiangmen)	Huaguoshan, Taoyuan, Heshan	Rural	25m	15m	Feb 2012
Chengzhong (Zhaoqing)	No. 63, Zhengdong Road, Duanzhou District	Urban: mixed residential/commercial	38m	16m	Jun 2001
Xiapu (Huizhou)	No. 4 Xiabuhengjiang Road No. 3, Huicheng District	Urban: commercial	49m	20m	Dec 1999
Xijiao (3) (Huizhou)	Zhangbei Yaowei She Nationality Primary School, Henghe Town	Rural	44m	10m	Dec 2011
Jinguowan (Huizhou)	Jinguowan Ecological Farm, Huizhou	Residential	77m	8m	Oct 2004

Monitoring Stations	Address	Area Type	Sampling Height (Above P.D.)	Above Ground	Date Commenced Operation
Zimaling (Zhongshan)	Zimaling Park, Zhongshan	Mixed residential/ commercial	45 m	7m	Aug 2002
Nancheng-yuanling (Dongguan)	Nanchengyuanling Community, Dongguan	Mixed residential/ commercial/industrial	33 m	18m	Sep 2010
Tap Mun (Hong Kong)	Tap Mun Police Station	Background: rural	26m	11m	Apr 1998
Tsuen Wan (Hong Kong)	60 Tai Ho Road, Tsuen Wan	Urban: mixed residential/commercial/ industrial	21m	17m	Aug 1988
Yuen Long (Hong Kong)	Yuen Long District Office, 269 Castle Peak Road, Yuen Long	New Town: residential	31m	25m	Jul 1995
Tung Chung (Hong Kong)	6 Fu Tung Street, Tung Chung	New Town: residential	34.5m	27.5m	Apr 1999
Taipa Grande (Macao)	Rampa do Observatorio, Taipa Grande	Rural	120m	10m	Mar 1999

Remarks:

(1) Wanqingsha station was renamed as Nansha-HKUST station in the 1st quarter of 2019.

(2) Liyuan station was renamed as Tongxinling station in the 1st quarter of 2019.

(3) Xijiao Station was relocated to Zhangbei Yaowei She Nationality Primary School, Henghe Town, Boluo County, in the 4th quarter of 2019. The distance between the old and new sites is about 200 metres.

Annex B: Measurement Methods of Air Pollutant Concentration

Pollutants	**Measuring Principles**
Sulphur dioxide (SO_2)	UV fluorescence / Differential Optical Absorption Spectroscopy
Nitrogen dioxide (NO_2)	Chemiluminescence / Differential Optical Absorption Spectroscopy
Ozone (O_3)	UV absorption / Differential Optical Absorption Spectroscopy
Respirable suspended particulates (PM_{10})	Oscillating microbalance (TEOM) / Beta particulate monitor
Fine suspended particulates ($PM_{2.5}$)	Oscillating microbalance (TEOM) / Beta particulate monitor / Hybrid nephelometric / radiometric particulate mass monitor
Carbon monoxide (CO)	Gas filter correlation infrared absorption method / Non-dispersive infrared absorption method