

Pearl River Delta Regional Air Quality Monitoring Network

A Report of Monitoring Results in 2013

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Purpose of the Report

This report provides the 2013 monitoring results from the Pearl River Delta Regional Air Quality Monitoring Network and their statistical analysis.

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1. Introduction to the Pearl River Delta Regional Air Quality Monitoring Network

The Pearl River Delta (PRD) Regional Air Quality Monitoring Network (the Network) was jointly established by the Guangdong Provincial Environmental Monitoring Centre (GDEMC) 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 have been used for reporting Regional Air Quality Index (RAQI) to the public since then.

The Network comprises 16 automatic air quality monitoring stations (see Figure 1) across the PRD region. Ten of these stations are operated by the Environmental Monitoring Centres of the individual cities in Guangdong while the three stations located in Hong Kong are managed by the HKEPD. The remaining three regional stations in the Network are operated by the GDEMC. The objectives of the Network are to :

- provide accurate air quality data that can help the Guangdong Provincial and HKSAR governments to appraise 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 various places in the region.

In order to ensure that the air quality monitoring results attain a high degree of accuracy and reliability, the two governments had jointly developed a set of “Standard Operating Procedures on Quality Assurance and Quality Control of the PRD Air Quality Monitoring System for Hong Kong and Guangdong” (QA/QC Operating Procedures). The design and operation of the Network comply with the requirements set out in the QA/QC Operating Procedures.

All stations are installed with equipment to measure the ambient concentrations of respirable suspended particulates (PM₁₀ or RSP), sulphur dioxide (SO₂), nitrogen dioxide (NO₂) and ozone (O₃).

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



Figure 1 : Spatial distribution of the PRD Regional Air Quality Monitoring Stations

2. Operation of the Network

Owing to the extensive renovation work at the Wanqingsha monitoring station in Guangzhou Nansha, the station was temporarily suspended from operation in 2013.

The operation of the Network was generally smooth in 2013. Excluding the suspended Wanqingsha station, the average data capture rates of all other monitoring stations in the Network was 95%.

In order to provide the public in both Guangdong and HKSAR with information on the daily air quality of different parts of the PRD region, the GDEMC and HKEPD established a daily reporting system of the Regional Air Quality Index (RAQI). The two Governments have been issuing the RAQI to the public at 4pm every day through the Internet since 30 November 2005.

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

The two governments have fully implemented the agreed QA/QC programme, which include zero/span checks, precision checks, dynamic calibration, etc., 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 in compliance with the QA/QC requirements, the GDEMC and HKEPD have jointly set up the Guangdong-Hong Kong Quality Management Committee for the PRD Regional Air Quality Monitoring Network (the Quality Management Committee, QMC) to review, on a quarterly basis, the set-up of the network, its performance in QA/QC and the operation of its data transmission system. The QMC also conducts system audit once a year to evaluate the effectiveness of the quality management system. The QMC prepares a report summarizing the findings of the system audit including the deficiencies found, and take appropriate corrective measures.

2.2 Accuracy and Precision

The accuracy of the Network is assessed by means of performance audits. The control limits set for the gaseous pollutants and respirable suspended particulates (PM₁₀) are $\pm 15\%$ and $\pm 10\%$ respectively, these limits are similar to those of the United States Environmental Protection Agency and other international standards. In 2013, the GDEMC and HKEPD jointly carried out 374 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 varied between -8.9% and 9.5% and was within the specified control limits (see Figure 2).

Precision is a measure of repeatability and is calculated in accordance with the QA/QC Operating Procedures. The control limits adopted for the gaseous pollutants and respirable suspended particulates (PM₁₀) are $\pm 20\%$ and $\pm 10\%$ respectively. In 2013, the GDEMC and HKEPD jointly carried out 2136 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 varied between -12.3% and 12.4% and was within the specified control limits (see Figure 3). Overall, the QA/QC performance of the monitoring network was good in 2013, and met all the requirements specified in the QA/QC Operating Procedures.

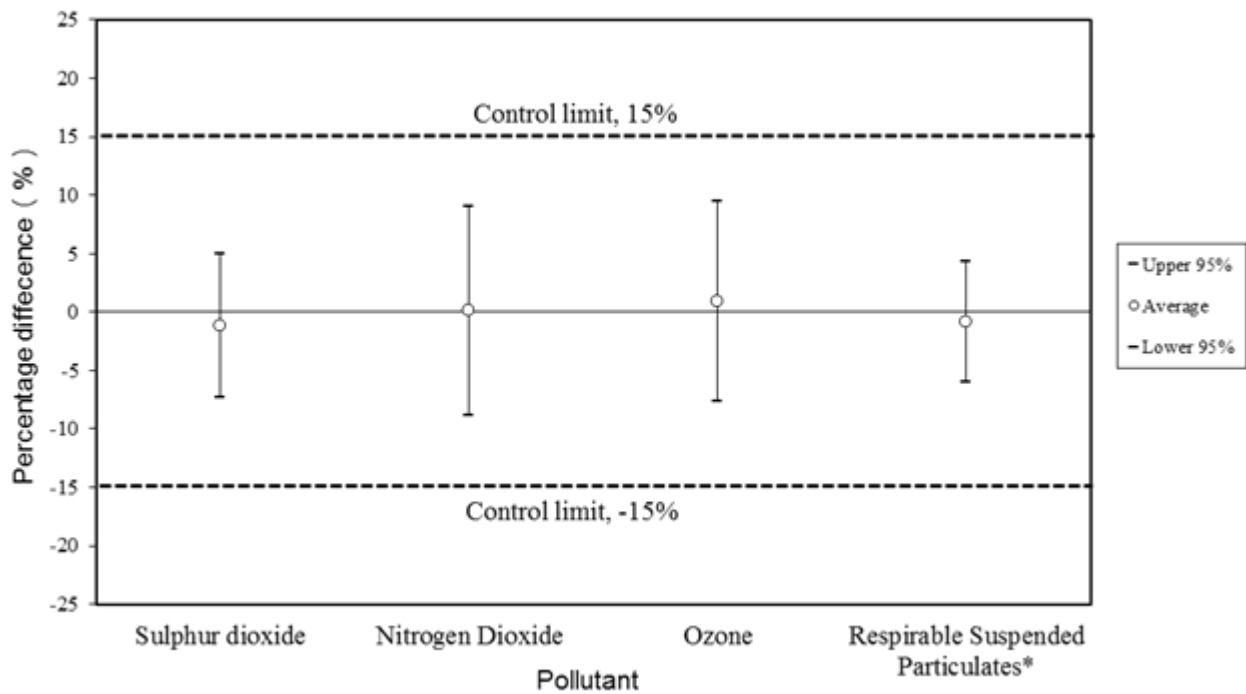


Figure 2 : Accuracy of the PRD Regional Air Quality Monitoring Network in 2013

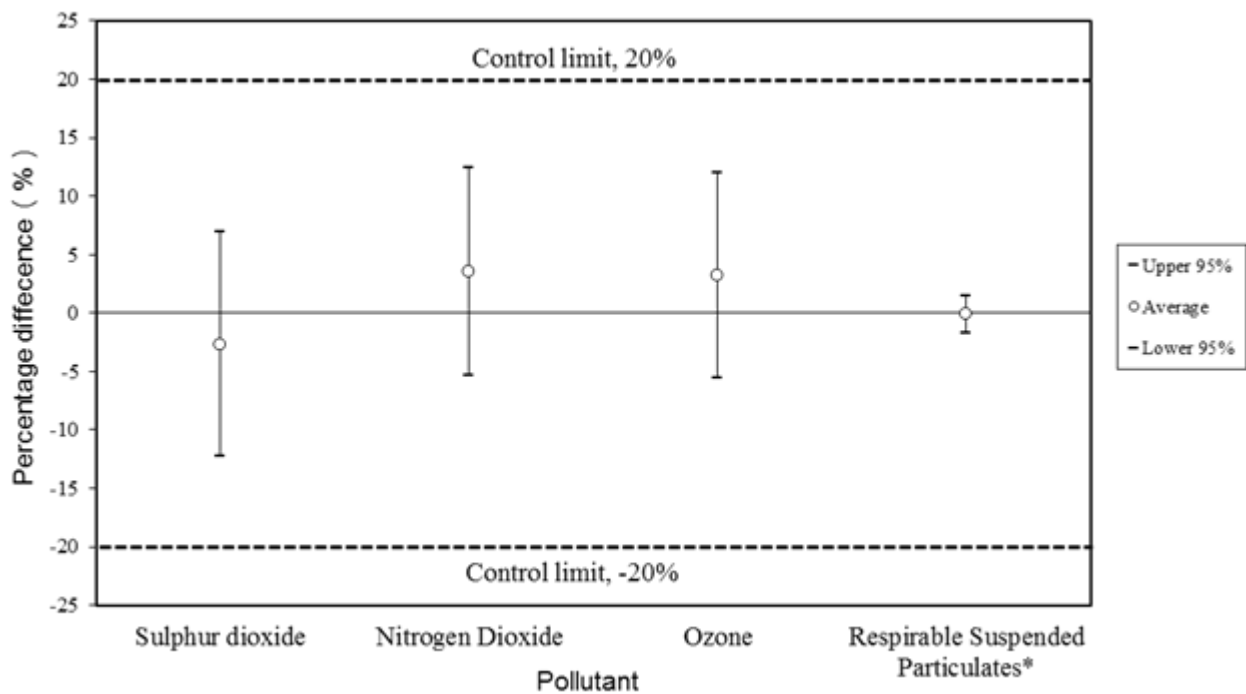


Figure 3 : Precision of the PRD Regional Air Quality Monitoring Network in 2013

* Both the accuracy and precision of the respirable suspended particulates (PM_{10}) adopt a control limit of $\pm 10\%$.

3. Statistical Analysis of Pollutant Concentrations

3.1 Sulphur Dioxide (SO₂)

Sulphur dioxide (SO₂) 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, SO₂ can also be oxidized in the air to form sulphate, which has significant impact on the levels of respirable suspended particulates (PM₁₀), acid rain and visibility in the region.

The annual averages of SO₂ at various monitoring stations in the Network ranged from 0.009 mg/m³ to 0.033 mg/m³ in 2013; all were in compliance with the national annual air quality standard¹ (0.06 mg/m³). As shown in Figure 4, the average levels of SO₂ along the coastal areas of PRD were in general lower than those of other areas. Summary of the monthly and annual averages of SO₂ at various stations are in Table 3.1c.

During the year, all monitoring stations in the Network were in compliance with the national hourly standard (0.50 mg/m³) and daily air quality standard (0.15 mg/m³) of SO₂. Details are shown in Table 3.1a and Table 3.1b.

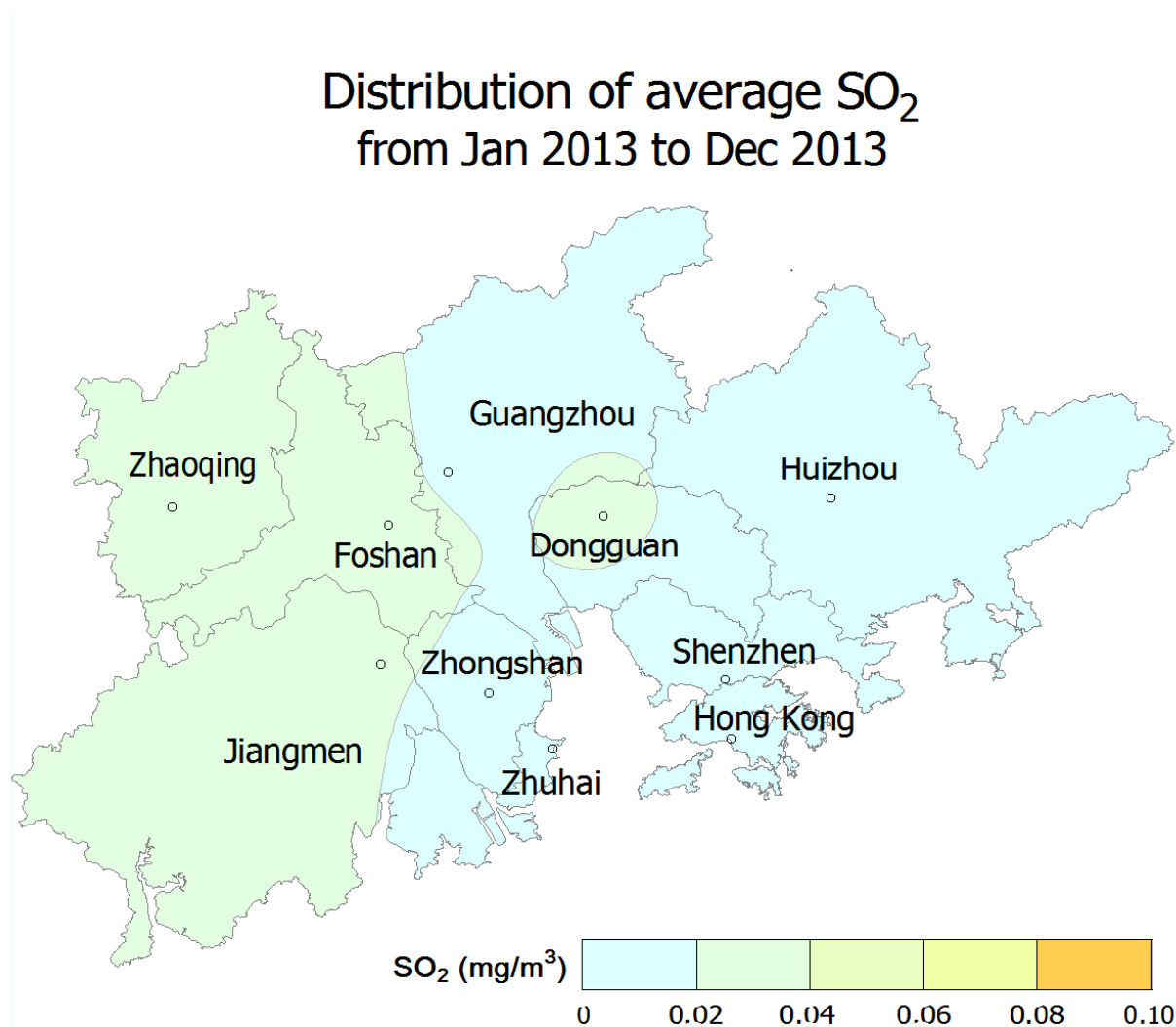


Figure 4 : Spatial distribution of average concentrations of Sulphur Dioxide (SO₂) in the Network

¹ The current National Standards refer to Class 2 of the “National Ambient Air Quality Standards (GB 3095 – 1996 – revised version)” [NAAQS], which are applicable to residential, mixed commercial/residential, cultural, industrial and village areas. The Standards have been updated (GB 3095 – 2012) in 2012 and the new Standards will come into operation from 2016.

Table 3.1a : The monthly maxima and minima of hourly averages of Sulphur Dioxide**[Class 2 NAAQS (Hourly) : 0.50 mg/m³]**

| Monitoring Stations | Mth | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Exceed- ance Hours | Exceed- ance Rate |
|--|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------|-------------------------|
| Luhu Park (Guangzhou) | Max | 0.075 | 0.044 | 0.090 | 0.086 | 0.049 | 0.046 | 0.067 | 0.068 | 0.070 | 0.051 | 0.049 | 0.067 | 0 | 0.00% |
| | Min | 0.002 | 0.003 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | | |
| Wanqingsha ² (Guangzhou) | Max | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Min | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| Tianhu (Guangzhou) | Max | 0.065 | 0.048 | 0.078 | 0.074 | 0.059 | 0.042 | 0.067 | 0.056 | 0.040 | 0.051 | 0.032 | 0.089 | 0 | 0.00% |
| | Min | 0.006 | 0.006 | 0.006 | 0.005 | 0.005 | 0.001 | 0.000 | 0.001 | 0.000 | 0.006 | 0.003 | 0.006 | | |
| Liyuan (Shenzhen) | Max | 0.044 | 0.056 | 0.055 | 0.063 | 0.076 | 0.027 | 0.055 | 0.046 | 0.035 | 0.030 | 0.039 | 0.065 | 0 | 0.00% |
| | Min | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 | 0.001 | 0.003 | 0.003 | 0.001 | 0.002 | | |
| Tangjia (Zhuhai) | Max | 0.064 | 0.039 | 0.067 | 0.105 | 0.058 | 0.053 | 0.025 | 0.065 | 0.051 | 0.064 | 0.050 | 0.080 | 0 | 0.00% |
| | Min | 0.004 | 0.002 | 0.000 | 0.000 | 0.000 | 0.003 | 0.004 | 0.004 | 0.000 | 0.005 | 0.006 | 0.005 | | |
| Jinjuzui (Foshan) | Max | 0.096 | 0.093 | 0.134 | 0.147 | 0.081 | 0.101 | 0.051 | 0.121 | 0.170 | 0.101 | 0.113 | 0.109 | 0 | 0.00% |
| | Min | 0.006 | 0.002 | 0.003 | 0.002 | 0.002 | 0.001 | 0.002 | 0.001 | 0.000 | 0.006 | 0.004 | 0.004 | | |
| Huijingcheng (Foshan) | Max | 0.128 | 0.132 | 0.163 | 0.245 | 0.112 | 0.102 | 0.071 | 0.128 | 0.147 | 0.127 | 0.135 | 0.224 | 0 | 0.00% |
| | Min | 0.007 | 0.006 | 0.013 | 0.007 | 0.007 | 0.006 | 0.000 | 0.000 | 0.000 | 0.008 | 0.003 | 0.008 | | |
| Donghu (Jiangmen) | Max | 0.119 | 0.180 | 0.115 | 0.123 | 0.075 | 0.040 | 0.065 | 0.095 | 0.117 | 0.105 | 0.101 | 0.120 | 0 | 0.00% |
| | Min | 0.012 | 0.005 | 0.008 | 0.008 | 0.007 | 0.003 | 0.003 | 0.003 | 0.005 | 0.004 | 0.001 | 0.001 | | |
| Chengzhong (Zhaoqing) | Max | 0.266 | 0.130 | 0.290 | 0.221 | 0.239 | 0.075 | 0.063 | 0.067 | 0.135 | 0.137 | 0.132 | 0.099 | 0 | 0.00% |
| | Min | 0.007 | 0.006 | 0.010 | 0.011 | 0.007 | 0.007 | 0.006 | 0.003 | 0.004 | 0.001 | 0.001 | 0.002 | | |
| Xiapu (Huizhou) | Max | 0.085 | 0.036 | 0.050 | 0.080 | 0.033 | 0.032 | 0.050 | 0.051 | 0.048 | 0.048 | 0.050 | 0.074 | 0 | 0.00% |
| | Min | 0.009 | 0.006 | 0.006 | 0.006 | 0.006 | 0.000 | 0.006 | 0.006 | 0.006 | 0.008 | 0.007 | 0.007 | | |
| Jinguowan (Huizhou) | Max | 0.040 | 0.042 | 0.047 | 0.095 | 0.045 | 0.029 | 0.069 | 0.054 | 0.046 | 0.041 | 0.062 | 0.055 | 0 | 0.00% |
| | Min | 0.006 | 0.005 | 0.006 | 0.008 | 0.009 | 0.010 | 0.010 | 0.003 | 0.005 | 0.007 | 0.008 | 0.007 | | |
| Nanchengyuanling (Dongguan) | Max | 0.106 | 0.130 | 0.104 | 0.140 | 0.115 | 0.094 | 0.132 | 0.124 | 0.101 | 0.112 | 0.087 | 0.102 | 0 | 0.00% |
| | Min | 0.008 | 0.006 | 0.000 | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 | 0.007 | 0.009 | 0.009 | 0.010 | | |
| Zimaling Park (Zhongshan) | Max | 0.079 | 0.064 | 0.117 | 0.092 | 0.081 | 0.065 | 0.035 | 0.068 | 0.098 | 0.065 | 0.071 | 0.069 | 0 | 0.00% |
| | Min | 0.007 | 0.005 | 0.002 | 0.002 | 0.003 | 0.008 | 0.006 | 0.006 | 0.001 | 0.002 | 0.011 | 0.008 | | |
| Tsuen Wan (HKSAR) | Max | 0.091 | 0.131 | 0.131 | 0.130 | 0.108 | 0.086 | 0.061 | 0.074 | 0.063 | 0.042 | 0.052 | 0.080 | 0 | 0.00% |
| | Min | 0.003 | 0.004 | 0.005 | 0.005 | 0.006 | 0.007 | 0.000 | 0.000 | 0.006 | 0.006 | 0.007 | 0.008 | | |
| Tap Mun (HKSAR) | Max | 0.046 | 0.035 | 0.038 | 0.050 | 0.032 | 0.027 | 0.028 | 0.040 | 0.035 | 0.043 | 0.032 | 0.064 | 0 | 0.00% |
| | Min | 0.008 | 0.007 | 0.008 | 0.007 | 0.003 | 0.007 | 0.000 | 0.006 | 0.006 | 0.007 | 0.004 | 0.002 | | |
| Tung Chung (HKSAR) | Max | 0.062 | 0.043 | 0.051 | 0.105 | 0.068 | 0.019 | 0.030 | 0.042 | 0.052 | 0.055 | 0.063 | 0.074 | 0 | 0.00% |
| | Min | 0.006 | 0.006 | 0.007 | 0.006 | 0.005 | 0.004 | 0.006 | 0.000 | 0.008 | 0.011 | 0.005 | 0.011 | | |

Table 3.1b : The monthly maxima and minima of daily averages of Sulphur Dioxide**[Class 2 NAAQS (Daily) : 0.15 mg/m³]**

| Monitoring Stations | Mth | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Exceed- ance Days | Exceed- ance Rate |
|--------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------------|-------------------------|
| Luhu Park (Guangzhou) | Max | 0.041 | 0.023 | 0.035 | 0.031 | 0.021 | 0.020 | 0.029 | 0.032 | 0.027 | 0.029 | 0.020 | 0.054 | 0 | 0.00% |
| | Min | 0.011 | 0.005 | 0.004 | 0.003 | 0.001 | 0.005 | 0.004 | 0.004 | 0.004 | 0.005 | 0.005 | 0.004 | | |
| Wanqingsha (Guangzhou) | Max | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Min | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| Tianhu (Guangzhou) | Max | 0.048 | 0.020 | 0.052 | 0.031 | 0.021 | 0.022 | 0.026 | 0.022 | 0.017 | 0.027 | 0.023 | 0.071 | 0 | 0.00% |
| | Min | 0.011 | 0.007 | 0.007 | 0.007 | 0.007 | 0.002 | 0.002 | 0.003 | 0.000 | 0.009 | 0.006 | 0.007 | | |
| Liyuan (Shenzhen) | Max | 0.021 | 0.011 | 0.019 | 0.034 | 0.013 | 0.010 | 0.015 | 0.019 | 0.011 | 0.022 | 0.016 | 0.056 | 0 | 0.00% |
| | Min | 0.007 | 0.001 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 | 0.003 | 0.004 | 0.007 | 0.004 | 0.003 | | |
| Tangjia (Zhuhai) | Max | 0.039 | 0.022 | 0.033 | 0.034 | 0.014 | 0.019 | 0.014 | 0.022 | 0.028 | 0.035 | 0.027 | 0.046 | 0 | 0.00% |
| | Min | 0.010 | 0.005 | 0.002 | 0.001 | 0.004 | 0.007 | 0.007 | 0.006 | 0.006 | 0.014 | 0.010 | 0.010 | | |
| Jinjuzui (Foshan) | Max | 0.041 | 0.031 | 0.048 | 0.071 | 0.033 | 0.031 | 0.021 | 0.043 | 0.028 | 0.057 | 0.063 | 0.061 | 0 | 0.00% |
| | Min | 0.013 | 0.004 | 0.008 | 0.008 | 0.007 | 0.003 | 0.006 | 0.005 | 0.007 | 0.014 | 0.008 | 0.006 | | |
| Huijingcheng (Foshan) | Max | 0.068 | 0.065 | 0.075 | 0.103 | 0.052 | 0.036 | 0.035 | 0.056 | 0.056 | 0.061 | 0.069 | 0.123 | 0 | 0.00% |
| | Min | 0.025 | 0.008 | 0.023 | 0.018 | 0.009 | 0.008 | 0.006 | 0.009 | 0.012 | 0.012 | 0.012 | 0.013 | | |
| Donghu (Jiangmen) | Max | 0.055 | 0.045 | 0.046 | 0.061 | 0.037 | 0.032 | 0.023 | 0.028 | 0.037 | 0.054 | 0.056 | 0.075 | 0 | 0.00% |
| | Min | 0.016 | 0.006 | 0.012 | 0.010 | 0.012 | 0.005 | 0.007 | 0.005 | 0.008 | 0.015 | 0.005 | 0.004 | | |
| Chengzhong (Zhaoqing) | Max | 0.084 | 0.054 | 0.098 | 0.091 | 0.084 | 0.042 | 0.026 | 0.023 | 0.053 | 0.057 | 0.067 | 0.057 | 0 | 0.00% |
| | Min | 0.009 | 0.008 | 0.012 | 0.016 | 0.014 | 0.014 | 0.012 | 0.004 | 0.008 | 0.008 | 0.006 | 0.004 | | |
| Xiapu (Huizhou) | Max | 0.045 | 0.019 | 0.024 | 0.030 | 0.015 | 0.019 | 0.025 | 0.030 | 0.019 | 0.031 | 0.027 | 0.064 | 0 | 0.00% |
| | Min | 0.013 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.006 | 0.007 | 0.007 | 0.012 | 0.009 | 0.008 | | |
| Jinguowan (Huizhou) | Max | 0.026 | 0.013 | 0.027 | 0.038 | 0.021 | 0.015 | 0.035 | 0.020 | 0.025 | 0.030 | 0.022 | 0.045 | 0 | 0.00% |
| | Min | 0.009 | 0.005 | 0.007 | 0.008 | 0.010 | 0.011 | 0.012 | 0.003 | 0.006 | 0.008 | 0.010 | 0.007 | | |
| Nanchengyuanling (Dongguan) | Max | 0.055 | 0.039 | 0.049 | 0.075 | 0.049 | 0.040 | 0.051 | 0.059 | 0.042 | 0.052 | 0.049 | 0.060 | 0 | 0.00% |
| | Min | 0.022 | 0.008 | 0.011 | 0.009 | 0.008 | 0.009 | 0.010 | 0.008 | 0.011 | 0.019 | 0.014 | 0.015 | | |
| Zimaling Park (Zhongshan) | Max | 0.049 | 0.027 | 0.034 | 0.032 | 0.025 | 0.024 | 0.018 | 0.032 | 0.042 | 0.028 | 0.038 | 0.044 | 0 | 0.00% |
| | Min | 0.011 | 0.006 | 0.004 | 0.004 | 0.005 | 0.009 | 0.007 | 0.008 | 0.002 | 0.011 | 0.016 | 0.015 | | |
| Tsuen Wan (HKSAR) | Max | 0.028 | 0.055 | 0.050 | 0.050 | 0.043 | 0.031 | 0.025 | 0.032 | 0.023 | 0.025 | 0.019 | 0.050 | 0 | 0.00% |
| | Min | 0.005 | 0.004 | 0.005 | 0.006 | 0.007 | 0.007 | 0.004 | 0.003 | 0.008 | 0.009 | 0.007 | 0.009 | | |
| Tap Mun (HKSAR) | Max | 0.027 | 0.015 | 0.020 | 0.028 | 0.015 | 0.013 | 0.019 | 0.023 | 0.020 | 0.031 | 0.025 | 0.056 | 0 | 0.00% |
| | Min | 0.013 | 0.008 | 0.009 | 0.009 | 0.005 | 0.008 | 0.010 | 0.010 | 0.009 | 0.012 | 0.009 | 0.004 | | |
| Tung Chung (HKSAR) | Max | 0.032 | 0.023 | 0.026 | 0.046 | 0.026 | 0.011 | 0.015 | 0.025 | 0.028 | 0.035 | 0.027 | 0.058 | 0 | 0.00% |
| | Min | 0.011 | 0.008 | 0.008 | 0.007 | 0.006 | 0.007 | 0.007 | 0.008 | 0.010 | 0.014 | 0.008 | 0.014 | | |

² Owing to the extensive renovation work at the Guangzhou Nansha Wanqingsha monitoring station, the station was temporarily suspended from operation in 2013.

Table 3.1c : The monthly and annual averages of Sulphur Dioxide**[Class 2 NAAQS (Annual) : 0.06 mg/m³]**

| Monitoring Stations | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Annual Average |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------------|
| Luhu Park (Guangzhou) | 0.023 | 0.013 | 0.018 | 0.013 | 0.010 | 0.011 | 0.013 | 0.015 | 0.013 | 0.016 | 0.012 | 0.023 | 0.015 |
| Wanqingsha (Guangzhou) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tianhu (Guangzhou) | 0.020 | 0.012 | 0.021 | 0.013 | 0.013 | 0.010 | 0.010 | 0.010 | 0.006 | 0.020 | 0.013 | 0.030 | 0.015 |
| Liyuan (Shenzhen) | 0.012 | 0.005 | 0.009 | 0.007 | 0.005 | 0.004 | 0.005 | 0.007 | 0.007 | 0.012 | 0.010 | 0.020 | 0.009 |
| Tangjia (Zhuhai) | 0.019 | 0.010 | 0.012 | 0.007 | 0.008 | 0.010 | 0.010 | 0.010 | 0.013 | 0.020 | 0.017 | 0.028 | 0.014 |
| Jinjuzui (Foshan) | 0.027 | 0.015 | 0.024 | 0.023 | 0.018 | 0.012 | 0.012 | 0.017 | 0.019 | 0.025 | 0.024 | 0.035 | 0.021 |
| Huijingcheng (Foshan) | 0.045 | 0.024 | 0.042 | 0.039 | 0.024 | 0.018 | 0.017 | 0.026 | 0.030 | 0.035 | 0.034 | 0.058 | 0.033 |
| Donghu (Jiangmen) | 0.036 | 0.018 | 0.026 | 0.022 | 0.019 | 0.011 | 0.011 | 0.012 | 0.021 | 0.031 | 0.026 | 0.028 | 0.022 |
| Chengzhong (Zhaoqing) | 0.035 | 0.025 | 0.056 | 0.045 | 0.037 | 0.025 | 0.018 | 0.011 | 0.028 | 0.024 | 0.031 | 0.033 | 0.031 |
| Xiapu (Huizhou) | 0.019 | 0.010 | 0.012 | 0.011 | 0.009 | 0.010 | 0.009 | 0.011 | 0.012 | 0.020 | 0.018 | 0.030 | 0.014 |
| Jinguowan (Huizhou) | 0.014 | 0.009 | 0.012 | 0.012 | 0.011 | 0.012 | 0.014 | 0.010 | 0.012 | 0.017 | 0.016 | 0.022 | 0.013 |
| Nanchengyuanling (Dongguan) | 0.036 | 0.018 | 0.023 | 0.020 | 0.017 | 0.016 | 0.015 | 0.024 | 0.022 | 0.031 | 0.027 | 0.042 | 0.024 |
| Zimaling Park (Zhongshan) | 0.026 | 0.012 | 0.014 | 0.012 | 0.010 | 0.012 | 0.010 | 0.013 | 0.013 | 0.019 | 0.026 | 0.028 | 0.016 |
| Tsuen Wan (HKSAR) | 0.016 | 0.016 | 0.020 | 0.017 | 0.021 | 0.016 | 0.015 | 0.017 | 0.012 | 0.015 | 0.014 | 0.024 | 0.017 |
| Tap Mun (HKSAR) | 0.017 | 0.011 | 0.013 | 0.013 | 0.011 | 0.010 | 0.012 | 0.013 | 0.013 | 0.019 | 0.017 | 0.022 | 0.014 |
| Tung Chung (HKSAR) | 0.020 | 0.015 | 0.014 | 0.014 | 0.010 | 0.008 | 0.010 | 0.012 | 0.016 | 0.022 | 0.016 | 0.030 | 0.016 |

Remark : All concentration units are in milligrams per cubic metre.

3.2 Nitrogen Dioxide (NO₂)

Nitrogen Dioxide (NO₂) is mainly formed from oxidization of nitric oxide (NO) emitted in the process of combustion. Its major emission sources include power plants, industrial combustion plants, vehicles, vessels, etc. Apart from its impact on human respiratory system, NO₂ can also be oxidized in the air to form nitrate, which has significant impact on the levels of particulates, acid rain and visibility in the region.

The annual averages of NO₂ at various monitoring stations in the Network ranged from 0.011 mg/m³ to 0.068 mg/m³ in 2013, all were in compliance with the national annual air quality standard (0.08 mg/m³). During the year, 3 monitoring stations in the Network had recorded exceedance of the national hourly standard (0.24 mg/m³) and also 7 monitoring stations had recorded exceedance of the national daily air quality standard (0.12 mg/m³) of NO₂. Details are shown on Figures 5 and Tables 3.2a to 3.2c.

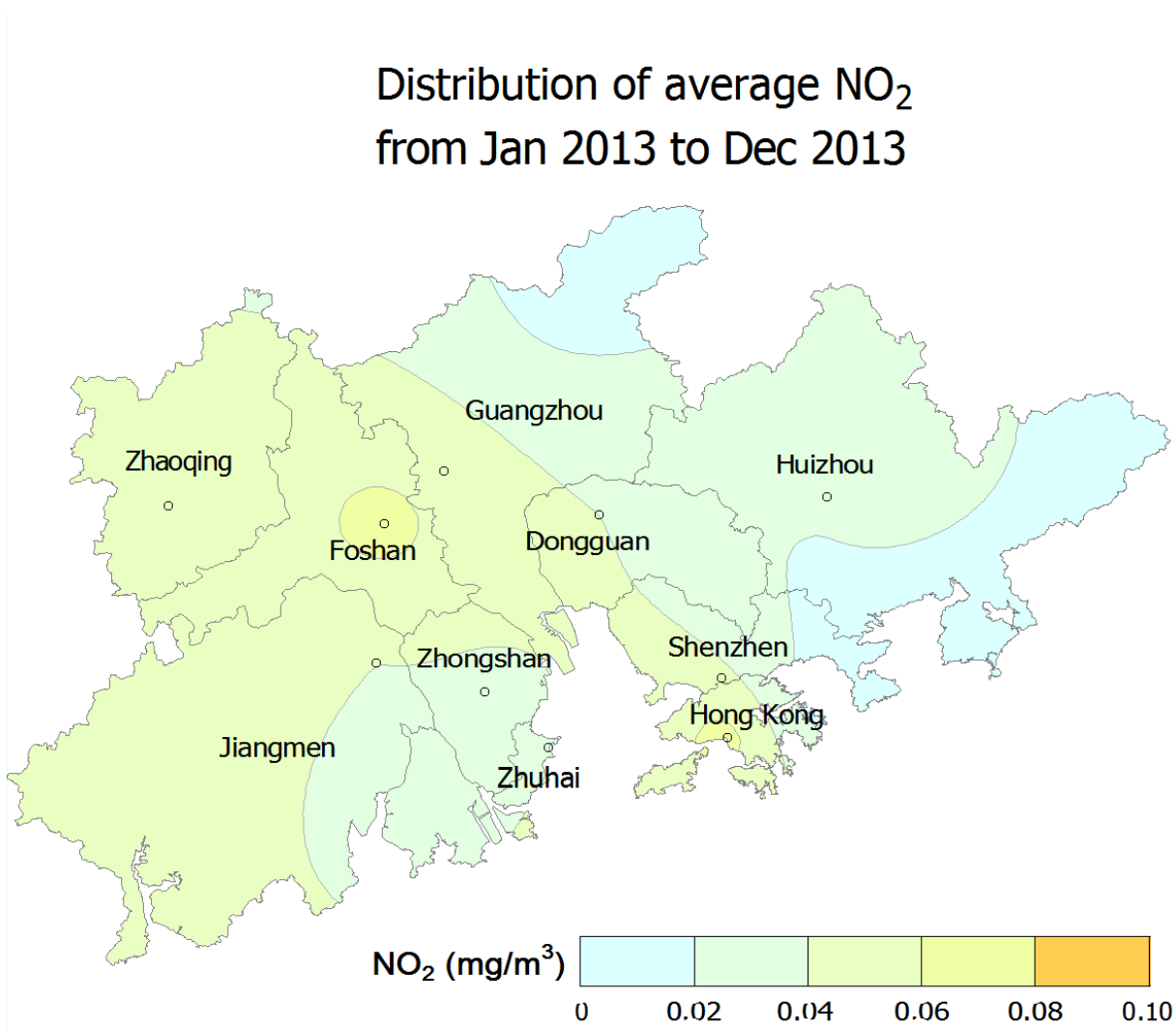


Figure 5 : Spatial distribution of average concentrations of Nitrogen Dioxide (NO₂) in the Network

Table 3.2a : The monthly maxima and minima of hourly averages of Nitrogen Dioxide**[Class 2 NAAQS (Hourly) : 0.24 mg/m³]**

| Monitoring Stations | Mth | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Exceed- ance Hours | Exceed- ance Rate |
|--------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------|-------------------------|
| Luhu Park (Guangzhou) | Max | 0.199 | 0.147 | 0.224 | 0.216 | 0.142 | 0.093 | 0.162 | 0.157 | 0.149 | 0.171 | 0.149 | 0.194 | 0 | 0.00% |
| | Min | 0.022 | 0.007 | 0.018 | 0.013 | 0.010 | 0.005 | 0.000 | 0.002 | 0.010 | 0.014 | 0.016 | 0.010 | | |
| Wanqingsha (Guangzhou) | Max | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Min | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| Tianhu (Guangzhou) | Max | 0.055 | 0.089 | 0.101 | 0.060 | 0.058 | 0.063 | 0.057 | 0.062 | 0.072 | 0.045 | 0.047 | 0.044 | 0 | 0.00% |
| | Min | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.004 | | |
| Liyuan (Shenzhen) | Max | 0.212 | 0.165 | 0.194 | 0.194 | 0.108 | 0.084 | 0.084 | 0.191 | 0.110 | 0.190 | 0.182 | 0.254 | 4 | 0.05% |
| | Min | 0.006 | 0.004 | 0.002 | 0.001 | 0.004 | 0.004 | 0.005 | 0.001 | 0.004 | 0.004 | 0.001 | 0.017 | | |
| Tangjia (Zhuhai) | Max | 0.142 | 0.101 | 0.129 | 0.145 | 0.127 | 0.096 | 0.063 | 0.158 | 0.118 | 0.116 | 0.121 | 0.172 | 0 | 0.00% |
| | Min | 0.004 | 0.000 | 0.001 | 0.016 | 0.009 | 0.002 | 0.000 | 0.001 | 0.000 | 0.007 | 0.013 | 0.013 | | |
| Jinjuzui (Foshan) | Max | 0.196 | 0.214 | 0.142 | 0.199 | 0.137 | 0.081 | 0.088 | 0.134 | 0.098 | 0.149 | 0.162 | 0.215 | 0 | 0.00% |
| | Min | 0.019 | 0.007 | 0.016 | 0.016 | 0.011 | 0.006 | 0.000 | 0.003 | 0.000 | 0.016 | 0.011 | 0.014 | | |
| Huijingcheng (Foshan) | Max | 0.228 | 0.219 | 0.207 | 0.187 | 0.137 | 0.088 | 0.175 | 0.177 | 0.195 | 0.291 | 0.278 | 0.333 | 21 | 0.25% |
| | Min | 0.017 | 0.004 | 0.009 | 0.019 | 0.013 | 0.008 | 0.010 | 0.010 | 0.011 | 0.023 | 0.022 | 0.017 | | |
| Donghu (Jiangmen) | Max | 0.178 | 0.112 | 0.111 | 0.144 | 0.131 | 0.080 | 0.094 | 0.126 | 0.102 | 0.166 | 0.118 | 0.168 | 0 | 0.00% |
| | Min | 0.012 | 0.008 | 0.008 | 0.004 | 0.007 | 0.007 | 0.006 | 0.006 | 0.009 | 0.018 | 0.011 | 0.014 | | |
| Chengzhong (Zhaoqing) | Max | 0.184 | 0.164 | 0.197 | 0.137 | 0.131 | 0.085 | 0.083 | 0.097 | 0.137 | 0.176 | 0.177 | 0.209 | 0 | 0.00% |
| | Min | 0.000 | 0.008 | 0.013 | 0.009 | 0.000 | 0.008 | 0.004 | 0.001 | 0.012 | 0.011 | 0.009 | 0.009 | | |
| Xiapu (Huizhou) | Max | 0.170 | 0.146 | 0.213 | 0.175 | 0.106 | 0.069 | 0.076 | 0.111 | 0.068 | 0.151 | 0.130 | 0.178 | 0 | 0.00% |
| | Min | 0.009 | 0.013 | 0.010 | 0.000 | 0.004 | 0.006 | 0.001 | 0.008 | 0.002 | 0.005 | 0.007 | 0.010 | | |
| Jinguowan (Huizhou) | Max | 0.095 | 0.067 | 0.074 | 0.095 | 0.059 | 0.049 | 0.058 | 0.122 | 0.053 | 0.043 | 0.044 | 0.037 | 0 | 0.00% |
| | Min | 0.007 | 0.002 | 0.007 | 0.003 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.005 | 0.004 | | |
| Nanchengyuanling (Dongguan) | Max | 0.164 | 0.175 | 0.182 | 0.152 | 0.119 | 0.077 | 0.108 | 0.135 | 0.121 | 0.171 | 0.169 | 0.206 | 0 | 0.00% |
| | Min | 0.008 | 0.000 | 0.004 | 0.007 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.002 | 0.007 | 0.007 | | |
| Zimaling Park (Zhongshan) | Max | 0.168 | 0.113 | 0.106 | 0.102 | 0.107 | 0.048 | 0.040 | 0.093 | 0.076 | 0.089 | 0.116 | 0.178 | 0 | 0.00% |
| | Min | 0.018 | 0.009 | 0.004 | 0.004 | 0.000 | 0.000 | 0.002 | 0.001 | 0.002 | 0.006 | 0.009 | 0.019 | | |
| Tsuen Wan (HKSAR) | Max | 0.224 | 0.173 | 0.211 | 0.261 | 0.169 | 0.120 | 0.152 | 0.294 | 0.137 | 0.252 | 0.176 | 0.300 | 10 | 0.12% |
| | Min | 0.026 | 0.020 | 0.017 | 0.017 | 0.017 | 0.012 | 0.000 | 0.000 | 0.009 | 0.016 | 0.009 | 0.015 | | |
| Tap Mun (HKSAR) | Max | 0.120 | 0.049 | 0.081 | 0.105 | 0.068 | 0.046 | 0.073 | 0.087 | 0.076 | 0.034 | 0.033 | 0.063 | 0 | 0.00% |
| | Min | 0.006 | 0.004 | 0.005 | 0.004 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.004 | | |
| Tung Chung (HKSAR) | Max | 0.217 | 0.161 | 0.198 | 0.194 | 0.122 | 0.087 | 0.089 | 0.135 | 0.132 | 0.198 | 0.214 | 0.229 | 0 | 0.00% |
| | Min | 0.010 | 0.010 | 0.006 | 0.008 | 0.006 | 0.003 | 0.000 | 0.000 | 0.002 | 0.010 | 0.009 | 0.018 | | |

Table 3.2b : The monthly maxima and minima of daily averages of Nitrogen Dioxide**[Class 2 NAAQS (Daily) : 0.12 mg/m³]**

| Monitoring Stations | Mth | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Exceed- ance Days | Exceed- ance Rate |
|--------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------------|-------------------------|
| Luhu Park (Guangzhou) | Max | 0.125 | 0.091 | 0.127 | 0.110 | 0.082 | 0.043 | 0.052 | 0.073 | 0.075 | 0.095 | 0.089 | 0.126 | 4 | 1.11% |
| | Min | 0.036 | 0.017 | 0.033 | 0.030 | 0.025 | 0.013 | 0.019 | 0.010 | 0.028 | 0.040 | 0.026 | 0.026 | | |
| Wanqingsha (Guangzhou) | Max | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Min | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| Tianhu (Guangzhou) | Max | 0.023 | 0.037 | 0.042 | 0.032 | 0.024 | 0.021 | 0.021 | 0.027 | 0.027 | 0.024 | 0.029 | 0.027 | 0 | 0.00% |
| | Min | 0.005 | 0.003 | 0.002 | 0.001 | 0.000 | 0.003 | 0.000 | 0.000 | 0.001 | 0.003 | 0.003 | 0.009 | | |
| Liyuan (Shenzhen) | Max | 0.103 | 0.080 | 0.134 | 0.099 | 0.069 | 0.047 | 0.051 | 0.083 | 0.053 | 0.070 | 0.091 | 0.148 | 5 | 1.40% |
| | Min | 0.034 | 0.016 | 0.023 | 0.018 | 0.021 | 0.017 | 0.017 | 0.014 | 0.015 | 0.023 | 0.025 | 0.032 | | |
| Tangjia (Zhuhai) | Max | 0.101 | 0.061 | 0.075 | 0.086 | 0.080 | 0.050 | 0.032 | 0.068 | 0.065 | 0.051 | 0.062 | 0.106 | 0 | 0.00% |
| | Min | 0.023 | 0.011 | 0.018 | 0.034 | 0.019 | 0.014 | 0.003 | 0.004 | 0.009 | 0.017 | 0.026 | 0.034 | | |
| Jinjuzui (Foshan) | Max | 0.149 | 0.106 | 0.095 | 0.121 | 0.083 | 0.049 | 0.041 | 0.082 | 0.066 | 0.085 | 0.097 | 0.134 | 6 | 1.70% |
| | Min | 0.034 | 0.025 | 0.040 | 0.030 | 0.022 | 0.015 | 0.019 | 0.015 | 0.025 | 0.036 | 0.028 | 0.030 | | |
| Huijingcheng (Foshan) | Max | 0.167 | 0.122 | 0.128 | 0.151 | 0.096 | 0.054 | 0.063 | 0.096 | 0.084 | 0.131 | 0.173 | 0.234 | 23 | 6.63% |
| | Min | 0.037 | 0.019 | 0.035 | 0.032 | 0.030 | 0.019 | 0.025 | 0.023 | 0.042 | 0.044 | 0.045 | 0.037 | | |
| Donghu (Jiangmen) | Max | 0.126 | 0.069 | 0.068 | 0.105 | 0.071 | 0.051 | 0.043 | 0.056 | 0.069 | 0.096 | 0.074 | 0.102 | 1 | 0.28% |
| | Min | 0.017 | 0.016 | 0.018 | 0.012 | 0.015 | 0.015 | 0.010 | 0.009 | 0.013 | 0.037 | 0.024 | 0.023 | | |
| Chengzhong (Zhaoqing) | Max | 0.116 | 0.094 | 0.106 | 0.087 | 0.077 | 0.051 | 0.050 | 0.057 | 0.071 | 0.094 | 0.115 | 0.106 | 0 | 0.00% |
| | Min | 0.003 | 0.016 | 0.024 | 0.021 | 0.025 | 0.018 | 0.012 | 0.008 | 0.022 | 0.024 | 0.022 | 0.022 | | |
| Xiapu (Huizhou) | Max | 0.079 | 0.065 | 0.086 | 0.072 | 0.040 | 0.038 | 0.043 | 0.062 | 0.049 | 0.050 | 0.050 | 0.083 | 0 | 0.00% |
| | Min | 0.031 | 0.020 | 0.026 | 0.018 | 0.016 | 0.019 | 0.017 | 0.014 | 0.019 | 0.018 | 0.016 | 0.020 | | |
| Jinguowan (Huizhou) | Max | 0.042 | 0.027 | 0.046 | 0.039 | 0.030 | 0.019 | 0.031 | 0.036 | 0.028 | 0.017 | 0.021 | 0.022 | 0 | 0.00% |
| | Min | 0.015 | 0.008 | 0.012 | 0.007 | 0.006 | 0.002 | 0.002 | 0.003 | 0.001 | 0.009 | 0.010 | 0.009 | | |
| Nanchengyuanling (Dongguan) | Max | 0.081 | 0.077 | 0.105 | 0.108 | 0.076 | 0.041 | 0.046 | 0.082 | 0.060 | 0.066 | 0.085 | 0.115 | 0 | 0.00% |
| | Min | 0.023 | 0.005 | 0.020 | 0.021 | 0.010 | 0.010 | 0.013 | 0.015 | 0.018 | 0.022 | 0.016 | 0.028 | | |
| Zimaling Park (Zhongshan) | Max | 0.102 | 0.053 | 0.068 | 0.064 | 0.056 | 0.022 | 0.022 | 0.048 | 0.053 | 0.048 | 0.070 | 0.095 | 0 | 0.00% |
| | Min | 0.034 | 0.017 | 0.012 | 0.012 | 0.010 | 0.004 | 0.004 | 0.003 | 0.009 | 0.022 | 0.022 | 0.034 | | |
| Tsuen Wan (HKSAR) | Max | 0.126 | 0.114 | 0.139 | 0.141 | 0.092 | 0.069 | 0.077 | 0.123 | 0.069 | 0.099 | 0.091 | 0.155 | 10 | 2.84% |
| | Min | 0.052 | 0.043 | 0.048 | 0.056 | 0.042 | 0.037 | 0.018 | 0.012 | 0.036 | 0.057 | 0.033 | 0.034 | | |
| Tap Mun (HKSAR) | Max | 0.048 | 0.018 | 0.051 | 0.058 | 0.027 | 0.024 | 0.032 | 0.041 | 0.021 | 0.016 | 0.014 | 0.028 | 0 | 0.00% |
| | Min | 0.011 | 0.007 | 0.008 | 0.008 | 0.006 | 0.002 | 0.002 | 0.002 | 0.003 | 0.004 | 0.003 | 0.007 | | |
| Tung Chung (HKSAR) | Max | 0.120 | 0.098 | 0.144 | 0.126 | 0.085 | 0.060 | 0.043 | 0.083 | 0.088 | 0.097 | 0.108 | 0.153 | 6 | 1.67% |
| | Min | 0.034 | 0.030 | 0.019 | 0.024 | 0.010 | 0.009 | 0.005 | 0.003 | 0.006 | 0.035 | 0.022 | 0.038 | | |

Table 3.2c : The monthly and annual averages of Nitrogen Dioxide**[Class 2 NAAQS (Annual) : 0.08 mg/m³]**

| Monitoring Stations | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Annual Average |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------------|
| Luhu Park (Guangzhou) | 0.073 | 0.049 | 0.066 | 0.061 | 0.044 | 0.029 | 0.037 | 0.045 | 0.049 | 0.056 | 0.053 | 0.063 | 0.052 |
| Wanqingsha (Guangzhou) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tianhu (Guangzhou) | 0.012 | 0.013 | 0.019 | 0.011 | 0.010 | 0.01* | 0.006 | 0.009 | 0.007 | 0.010 | 0.010 | 0.017 | 0.011 |
| Liyuan (Shenzhen) | 0.063 | 0.037 | 0.052 | 0.042 | 0.039 | 0.029 | 0.029 | 0.038 | 0.031 | 0.038 | 0.046 | 0.078 | 0.044 |
| Tangjia (Zhuhai) | 0.061 | 0.026 | 0.040 | 0.057 | 0.044 | 0.029 | 0.015 | 0.029 | 0.042 | 0.027 | 0.042 | 0.060 | 0.039 |
| Jinjuzui (Foshan) | 0.078 | 0.050 | 0.061 | 0.064 | 0.047 | 0.030 | 0.028 | 0.036 | 0.041 | 0.057 | 0.062 | 0.081 | 0.053 |
| Huijingcheng (Foshan) | 0.083 | 0.056 | 0.066 | 0.077 | 0.056 | 0.035 | 0.040 | 0.051 | 0.062 | 0.073 | 0.088 | 0.106 | 0.066 |
| Donghu (Jiangmen) | 0.054 | 0.034 | 0.034 | 0.049 | 0.030 | 0.028 | 0.019 | 0.027 | 0.037 | 0.057 | 0.044 | 0.060 | 0.040 |
| Chengzhong (Zhaoqing) | 0.055 | 0.042 | 0.056 | 0.055 | 0.044 | 0.034 | 0.031 | 0.031 | 0.045 | 0.047 | 0.057 | 0.063 | 0.047 |
| Xiapu (Huizhou) | 0.049 | 0.035 | 0.043 | 0.036 | 0.029 | 0.027 | 0.024 | 0.031 | 0.027 | 0.026 | 0.031 | 0.046 | 0.034 |
| Jinguowan (Huizhou) | 0.024 | 0.013 | 0.021 | 0.017 | 0.014 | 0.009 | 0.008 | 0.014 | 0.011 | 0.013 | 0.015 | 0.015 | 0.015 |
| Nanchengyuanling (Dongguan) | 0.051 | 0.036 | 0.052 | 0.046 | 0.037 | 0.025 | 0.026 | 0.036 | 0.031 | 0.034 | 0.048 | 0.062 | 0.040 |
| Zimaling Park (Zhongshan) | 0.063 | 0.032 | 0.033 | 0.031 | 0.025 | 0.012 | 0.012 | 0.017 | 0.026 | 0.034 | 0.048 | 0.065 | 0.033 |
| Tsuen Wan (HKSAR) | 0.088 | 0.073 | 0.079 | 0.078 | 0.065 | 0.051 | 0.045 | 0.056 | 0.053 | 0.074 | 0.062 | 0.091 | 0.068 |
| Tap Mun (HKSAR) | 0.020 | 0.011 | 0.017 | 0.015 | 0.014 | 0.009 | 0.006 | 0.011 | 0.008 | 0.010 | 0.009 | 0.016 | 0.012 |
| Tung Chung (HKSAR) | 0.078 | 0.059 | 0.061 | 0.054 | 0.041 | 0.027 | 0.020 | 0.030 | 0.039 | 0.066 | 0.064 | 0.093 | 0.053 |

Remarks :

1. All concentration units are in milligrams per cubic metre.
2. “*” denotes that the data capture rate does not meet the minimum requirements for determining a representative value.

3.3 Ozone (O₃)

Ozone (O₃) is not directly emitted from emission sources. It is formed by the photochemical reaction of oxygen, nitrogen oxides (NO_x) 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 O₃ (NO_x and VOCs) mainly originate from pollution sources in urban areas. However, as it usually takes several hours for O₃ to be formed and rise to its peak level, O₃ and its precursors can be transported to other areas downwind of their sources during this period. The concentrations of O₃ in rural areas are therefore often higher than those in the urban areas. In 2013, the annual averages of O₃ recorded by the Network ranged from 0.036 mg/m³ to 0.082 mg/m³ with higher average values being recorded in rural areas such as Tianhu of Guangzhou, Tap Mun of Hong Kong and Jinguowan of Huizhou, similar to the situation in previous years. During the year, all monitoring stations in the Network had recorded exceedance of the national hourly standard (0.2 mg/m³) of O₃. Details are shown on Figures 6 and Tables 3.3a to 3.3c.

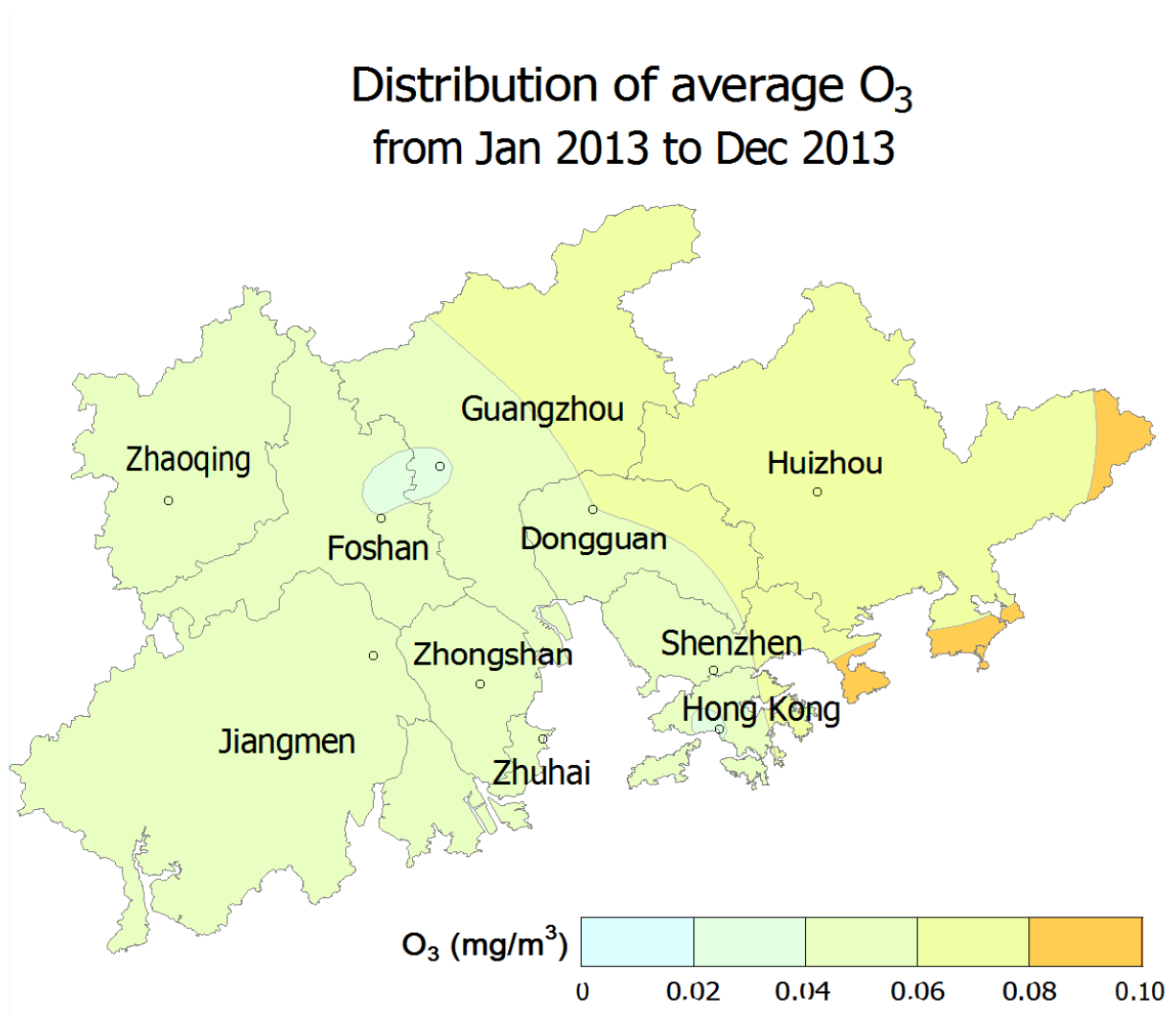


Figure 6 : Spatial distribution of average concentrations of Ozone (O₃) in the Network

Table 3.3a : The monthly maxima and minima of hourly averages of Ozone**[Class 2 NAAQS (Hourly) : 0.20mg/m³]**

| Monitoring Stations | Mth | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Exceed- ance Hours | Exceed- ance Rate |
|--------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------|-------------------------|
| Luhu Park (Guangzhou) | Max | 0.192 | 0.188 | 0.248 | 0.235 | 0.186 | 0.228 | 0.283 | 0.276 | 0.274 | 0.207 | 0.199 | 0.190 | 51 | 0.59% |
| | Min | 0.001 | 0.000 | 0.000 | 0.000 | 0.004 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | |
| Wanqingsha (Guangzhou) | Max | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Min | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| Tianhu (Guangzhou) | Max | 0.208 | 0.152 | 0.260 | 0.251 | 0.340 | 0.244 | 0.240 | 0.287 | 0.198 | 0.205 | 0.154 | 0.198 | 106 | 1.31% |
| | Min | 0.020 | 0.003 | 0.003 | 0.006 | 0.007 | 0.004 | 0.000 | 0.006 | 0.000 | 0.008 | 0.010 | 0.034 | | |
| Liyuan (Shenzhen) | Max | 0.203 | 0.138 | 0.163 | 0.190 | 0.127 | 0.167 | 0.251 | 0.236 | 0.195 | 0.218 | 0.144 | 0.155 | 16 | 0.19% |
| | Min | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.008 | 0.001 | 0.005 | | |
| Tangjia (Zhuhai) | Max | 0.173 | 0.164 | 0.149 | 0.222 | 0.134 | 0.121 | 0.080 | 0.226 | 0.228 | 0.217 | 0.162 | 0.173 | 17 | 0.20% |
| | Min | 0.014 | 0.007 | 0.000 | 0.005 | 0.002 | 0.000 | 0.001 | 0.000 | 0.000 | 0.015 | 0.009 | 0.001 | | |
| Jinjuzui (Foshan) | Max | 0.221 | 0.213 | 0.252 | 0.303 | 0.264 | 0.266 | 0.354 | 0.332 | 0.309 | 0.323 | 0.269 | 0.230 | 286 | 3.45% |
| | Min | 0.004 | 0.002 | 0.004 | 0.004 | 0.005 | 0.005 | 0.000 | 0.000 | 0.000 | 0.006 | 0.004 | 0.002 | | |
| Huijingcheng (Foshan) | Max | 0.148 | 0.171 | 0.246 | 0.283 | 0.213 | 0.208 | 0.229 | 0.274 | 0.264 | 0.233 | 0.212 | 0.140 | 113 | 1.37% |
| | Min | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.002 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | | |
| Donghu (Jiangmen) | Max | 0.193 | 0.218 | 0.242 | 0.245 | 0.193 | 0.247 | 0.184 | 0.300 | 0.328 | 0.297 | 0.242 | 0.187 | 183 | 2.20% |
| | Min | 0.003 | 0.006 | 0.003 | 0.003 | 0.004 | 0.004 | 0.002 | 0.003 | 0.003 | 0.005 | 0.006 | 0.003 | | |
| Chengzhong (Zhaoqing) | Max | 0.178 | 0.223 | 0.186 | 0.300 | 0.252 | 0.262 | 0.218 | 0.242 | 0.289 | 0.239 | 0.201 | 0.153 | 74 | 0.89% |
| | Min | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | |
| Xiapu (Huizhou) | Max | 0.218 | 0.207 | 0.353 | 0.246 | 0.211 | 0.244 | 0.335 | 0.343 | 0.223 | 0.202 | 0.154 | 0.156 | 85 | 1.02% |
| | Min | 0.003 | 0.002 | 0.001 | 0.001 | 0.002 | 0.002 | 0.003 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | | |
| Jinguowan (Huizhou) | Max | 0.245 | 0.209 | 0.353 | 0.284 | 0.187 | 0.252 | 0.332 | 0.278 | 0.159 | 0.212 | 0.159 | 0.170 | 96 | 1.18% |
| | Min | 0.006 | 0.009 | 0.005 | 0.009 | 0.005 | 0.005 | 0.000 | 0.000 | 0.007 | 0.015 | 0.010 | 0.017 | | |
| Nanchengyuanling (Dongguan) | Max | 0.198 | 0.247 | 0.314 | 0.316 | 0.257 | 0.301 | 0.359 | 0.336 | 0.341 | 0.244 | 0.204 | 0.207 | 190 | 2.31% |
| | Min | 0.002 | 0.002 | 0.000 | 0.001 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.004 | 0.002 | 0.003 | | |
| Zimaling Park (Zhongshan) | Max | 0.171 | 0.189 | 0.187 | 0.239 | 0.254 | 0.204 | 0.249 | 0.267 | 0.260 | 0.243 | 0.209 | 0.160 | 58 | 0.69% |
| | Min | 0.002 | 0.018 | 0.004 | 0.007 | 0.000 | 0.004 | 0.000 | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | | |
| Tsuen Wan (HKSAR) | Max | 0.173 | 0.112 | 0.140 | 0.184 | 0.146 | 0.096 | 0.169 | 0.268 | 0.178 | 0.227 | 0.124 | 0.140 | 4 | 0.05% |
| | Min | 0.001 | 0.001 | 0.002 | 0.003 | 0.003 | 0.005 | 0.000 | 0.000 | 0.005 | 0.006 | 0.004 | 0.003 | | |
| Tap Mun (HKSAR) | Max | 0.177 | 0.166 | 0.194 | 0.288 | 0.175 | 0.123 | 0.250 | 0.213 | 0.244 | 0.235 | 0.216 | 0.200 | 80 | 0.95% |
| | Min | 0.005 | 0.010 | 0.004 | 0.002 | 0.002 | 0.006 | 0.000 | 0.003 | 0.007 | 0.027 | 0.019 | 0.008 | | |
| Tung Chung (HKSAR) | Max | 0.311 | 0.142 | 0.202 | 0.286 | 0.165 | 0.150 | 0.192 | 0.343 | 0.272 | 0.311 | 0.228 | 0.176 | 82 | 0.96% |
| | Min | 0.001 | 0.002 | 0.001 | 0.002 | 0.002 | 0.005 | 0.005 | 0.000 | 0.005 | 0.006 | 0.000 | 0.003 | | |

Table 3.3b : The monthly maxima and minima of daily averages of Ozone

| Monitoring Stations | Mth | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
|--------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Luhu Park (Guangzhou) | Max | 0.056 | 0.065 | 0.083 | 0.091 | 0.083 | 0.088 | 0.092 | 0.074 | 0.070 | 0.108 | 0.077 | 0.069 |
| | Min | 0.006 | 0.002 | 0.001 | 0.005 | 0.008 | 0.010 | 0.005 | 0.005 | 0.005 | 0.032 | 0.006 | 0.004 |
| Wanqingsha (Guangzhou) | Max | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Min | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tianhu (Guangzhou) | Max | 0.120 | 0.108 | 0.184 | 0.161 | 0.125 | 0.161 | 0.133 | 0.160 | 0.110 | 0.170 | 0.127 | 0.145 |
| | Min | 0.029 | 0.030 | 0.029 | 0.042 | 0.051 | 0.045 | 0.034 | 0.041 | 0.012 | 0.026 | 0.036 | 0.041 |
| Liyuan (Shenzhen) | Max | 0.100 | 0.085 | 0.097 | 0.088 | 0.087 | 0.068 | 0.076 | 0.084 | 0.083 | 0.140 | 0.075 | 0.079 |
| | Min | 0.009 | 0.018 | 0.004 | 0.002 | 0.003 | 0.011 | 0.009 | 0.016 | 0.020 | 0.062 | 0.014 | 0.011 |
| Tangjia (Zhuhai) | Max | 0.125 | 0.070 | 0.077 | 0.103 | 0.076 | 0.034 | 0.033 | 0.150 | 0.090 | 0.150 | 0.101 | 0.099 |
| | Min | 0.032 | 0.025 | 0.021 | 0.021 | 0.010 | 0.008 | 0.010 | 0.013 | 0.015 | 0.074 | 0.020 | 0.005 |
| Jinjuzui (Foshan) | Max | 0.074 | 0.076 | 0.115 | 0.137 | 0.097 | 0.091 | 0.108 | 0.110 | 0.119 | 0.145 | 0.096 | 0.095 |
| | Min | 0.010 | 0.019 | 0.006 | 0.008 | 0.016 | 0.017 | 0.017 | 0.026 | 0.012 | 0.055 | 0.008 | 0.009 |
| Huijingcheng (Foshan) | Max | 0.056 | 0.062 | 0.113 | 0.121 | 0.079 | 0.081 | 0.084 | 0.097 | 0.109 | 0.123 | 0.077 | 0.058 |
| | Min | 0.007 | 0.012 | 0.004 | 0.004 | 0.010 | 0.008 | 0.008 | 0.003 | 0.003 | 0.043 | 0.003 | 0.010 |
| Donghu (Jiangmen) | Max | 0.075 | 0.070 | 0.113 | 0.125 | 0.079 | 0.078 | 0.096 | 0.097 | 0.132 | 0.140 | 0.100 | 0.088 |
| | Min | 0.010 | 0.016 | 0.006 | 0.007 | 0.010 | 0.006 | 0.007 | 0.013 | 0.010 | 0.041 | 0.009 | 0.015 |
| Chengzhong (Zhaoqing) | Max | 0.080 | 0.062 | 0.060 | 0.105 | 0.099 | 0.095 | 0.084 | 0.103 | 0.115 | 0.133 | 0.091 | 0.092 |
| | Min | 0.004 | 0.006 | 0.002 | 0.005 | 0.010 | 0.016 | 0.014 | 0.009 | 0.015 | 0.047 | 0.006 | 0.022 |
| Xiapu (Huizhou) | Max | 0.087 | 0.072 | 0.125 | 0.170 | 0.092 | 0.109 | 0.135 | 0.132 | 0.110 | 0.150 | 0.095 | 0.105 |
| | Min | 0.015 | 0.025 | 0.015 | 0.016 | 0.027 | 0.020 | 0.017 | 0.044 | 0.046 | 0.063 | 0.020 | 0.019 |
| Jinguowan (Huizhou) | Max | 0.114 | 0.096 | 0.168 | 0.169 | 0.097 | 0.112 | 0.149 | 0.115 | 0.107 | 0.163 | 0.097 | 0.121 |
| | Min | 0.020 | 0.041 | 0.034 | 0.036 | 0.036 | 0.029 | 0.026 | 0.024 | 0.039 | 0.068 | 0.026 | 0.029 |
| Nanchengyuanling (Dongguan) | Max | 0.086 | 0.084 | 0.130 | 0.125 | 0.088 | 0.102 | 0.124 | 0.103 | 0.120 | 0.138 | 0.082 | 0.110 |
| | Min | 0.011 | 0.016 | 0.015 | 0.010 | 0.021 | 0.015 | 0.018 | 0.022 | 0.022 | 0.057 | 0.021 | 0.019 |
| Zimaling Park (Zhongshan) | Max | 0.081 | 0.078 | 0.109 | 0.121 | 0.097 | 0.068 | 0.093 | 0.092 | 0.086 | 0.114 | 0.070 | 0.066 |
| | Min | 0.005 | 0.033 | 0.010 | 0.014 | 0.020 | 0.009 | 0.002 | 0.019 | 0.005 | 0.053 | 0.003 | 0.004 |
| Tsuen Wan (HKSAR) | Max | 0.078 | 0.061 | 0.079 | 0.105 | 0.058 | 0.047 | 0.045 | 0.078 | 0.078 | 0.105 | 0.075 | 0.073 |
| | Min | 0.006 | 0.007 | 0.005 | 0.008 | 0.005 | 0.010 | 0.004 | 0.006 | 0.010 | 0.040 | 0.015 | 0.011 |
| Tap Mun (HKSAR) | Max | 0.144 | 0.120 | 0.140 | 0.171 | 0.128 | 0.094 | 0.100 | 0.105 | 0.127 | 0.188 | 0.153 | 0.138 |
| | Min | 0.021 | 0.045 | 0.008 | 0.017 | 0.019 | 0.031 | 0.031 | 0.032 | 0.036 | 0.089 | 0.035 | 0.031 |
| Tung Chung (HKSAR) | Max | 0.105 | 0.090 | 0.094 | 0.136 | 0.105 | 0.065 | 0.083 | 0.129 | 0.109 | 0.141 | 0.092 | 0.089 |
| | Min | 0.005 | 0.008 | 0.007 | 0.007 | 0.009 | 0.018 | 0.011 | 0.015 | 0.012 | 0.036 | 0.008 | 0.006 |

Table 3.3c : The monthly and annual averages of Ozone

| Monitoring Stations | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Annual Average |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------------|
| Luhu Park (Guangzhou) | 0.027 | 0.029 | 0.029 | 0.027 | 0.034 | 0.042 | 0.033 | 0.037 | 0.041 | 0.067 | 0.035 | 0.038 | 0.037 |
| Wanqingsha (Guangzhou) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tianhu (Guangzhou) | 0.077 | 0.064 | 0.089 | 0.087 | 0.085 | 0.075 | 0.063 | 0.071 | 0.067 | 0.095 | 0.087 | 0.100 | 0.080 |
| Liyuan (Shenzhen) | 0.051 | 0.049 | 0.041 | 0.042 | 0.031 | 0.028 | 0.022 | 0.034 | 0.056 | 0.097 | 0.051 | 0.043 | 0.045 |
| Tangjia (Zhuhai) | 0.066 | 0.040 | 0.045 | 0.043 | 0.036 | 0.016 | 0.016 | 0.054 | 0.050 | 0.106 | 0.063 | 0.044 | 0.048 |
| Jinjuzui (Foshan) | 0.039 | 0.040 | 0.043 | 0.044 | 0.048 | 0.046 | 0.044 | 0.055 | 0.073 | 0.107 | 0.054 | 0.046 | 0.053 |
| Huijingcheng (Foshan) | 0.029 | 0.032 | 0.037 | 0.032 | 0.037 | 0.036 | 0.034 | 0.036 | 0.054 | 0.084 | 0.038 | 0.038 | 0.040 |
| Donghu (Jiangmen) | 0.040 | 0.042 | 0.044 | 0.034 | 0.041 | 0.034 | 0.029 | 0.045 | 0.064 | 0.096 | 0.050 | 0.046 | 0.047 |
| Chengzhong (Zhaoqing) | 0.033 | 0.033 | 0.032 | 0.037 | 0.041 | 0.043 | 0.034 | 0.045 | 0.064 | 0.093 | 0.043 | 0.046 | 0.045 |
| Xiapu (Huizhou) | 0.051 | 0.053 | 0.065 | 0.061 | 0.052 | 0.049 | 0.062 | 0.077 | 0.074 | 0.104 | 0.065 | 0.063 | 0.065 |
| Jinguowan (Huizhou) | 0.067 | 0.068 | 0.081 | 0.082 | 0.062 | 0.053 | 0.044 | 0.058 | 0.070 | 0.111 | 0.075 | 0.083 | 0.072 |
| Nanchengyuanling (Dongguan) | 0.043 | 0.053 | 0.058 | 0.054 | 0.051 | 0.054 | 0.049 | 0.053 | 0.076 | 0.106 | 0.058 | 0.060 | 0.060 |
| Zimaling Park (Zhongshan) | 0.050 | 0.054 | 0.044 | 0.048 | 0.050 | 0.034 | 0.029 | 0.047 | 0.052 | 0.083 | 0.037 | 0.031 | 0.046 |
| Tsuen Wan (HKSAR) | 0.031 | 0.029 | 0.033 | 0.044 | 0.022 | 0.022 | 0.017 | 0.022 | 0.047 | 0.076 | 0.044 | 0.043 | 0.036 |
| Tap Mun (HKSAR) | 0.085 | 0.079 | 0.080 | 0.094 | 0.060 | 0.057 | 0.052 | 0.058 | 0.086 | 0.137 | 0.096 | 0.100 | 0.082 |
| Tung Chung (HKSAR) | 0.037 | 0.037 | 0.044 | 0.060 | 0.039 | 0.039 | 0.034 | 0.043 | 0.059 | 0.095 | 0.048 | 0.042 | 0.048 |

Remark : All concentration units are in milligrams per cubic metre.

3.4 Respirable Suspended Particulates (PM₁₀)

Respirable suspended particulates (PM₁₀ 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 SO₂) or formed from photochemical reactions. PM₁₀ can penetrate deeply into human lungs and cause impact on human respiratory system. Furthermore, finer particles in PM₁₀ have significant effect on visibility.

In 2013, the annual averages of PM₁₀ at various monitoring stations in the Network ranged from 0.046 mg/m³ to 0.079 mg/m³. As shown in Figure 7, the average levels of PM₁₀ in the central to north-western part of PRD were relatively higher than those in the coastal areas in the south. During the year, all monitoring stations in the Network were in compliance with the national annual air quality standard (0.10 mg/m³) of PM₁₀ while 14 monitoring stations had recorded exceedance of the national daily standard (0.15mg/m³) of PM₁₀. Details are shown on Tables 3.4a to 3.4c.

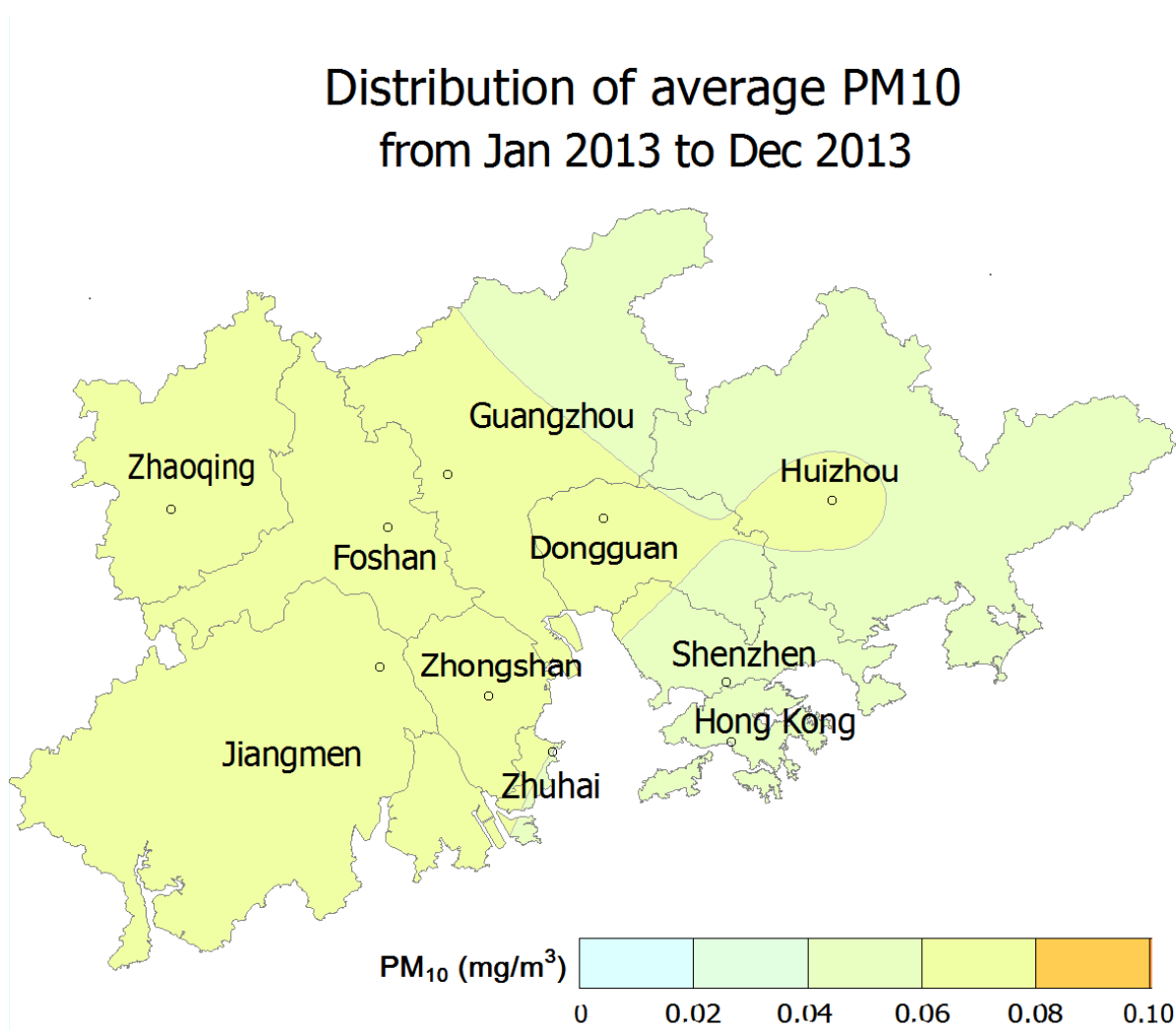


Figure 7 : Spatial distribution of average concentrations of Respirable Suspended Particulates (PM₁₀) in the Network

Table 3.4a : The monthly maxima and minima of hourly averages of Respirable Suspended Particulates

| Monitoring Stations | Mth | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
|-----------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Luhu Park (Guangzhou) | Max | 0.251 | 0.180 | 0.216 | 0.267 | 0.167 | 0.136 | 0.158 | 0.219 | 0.158 | 0.193 | 0.184 | 0.315 |
| | Min | 0.010 | 0.006 | 0.002 | 0.006 | 0.003 | 0.005 | 0.009 | 0.007 | 0.013 | 0.034 | 0.005 | 0.005 |
| Wanqingsha (Guangzhou) | Max | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Min | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tianhu (Guangzhou) | Max | 0.190 | 0.162 | 0.230 | 0.182 | 0.129 | 0.105 | 0.142 | 0.145 | 0.104 | 0.181 | 0.160 | 0.219 |
| | Min | 0.009 | 0.000 | 0.001 | 0.003 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.013 | 0.000 | 0.000 |
| Liyuan (Shenzhen) | Max | 0.281 | 0.169 | 0.148 | 0.206 | 0.110 | 0.086 | 0.115 | 0.233 | 0.184 | 0.256 | 0.231 | 0.336 |
| | Min | 0.012 | 0.002 | 0.007 | 0.009 | 0.003 | 0.003 | 0.003 | 0.003 | 0.010 | 0.026 | 0.015 | 0.007 |
| Tangjia (Zhuhai) | Max | 0.270 | 0.166 | 0.244 | 0.301 | 0.156 | 0.136 | 0.103 | 0.193 | 0.138 | 0.199 | 0.210 | 0.321 |
| | Min | 0.012 | 0.010 | 0.014 | 0.005 | 0.003 | 0.000 | 0.002 | 0.003 | 0.001 | 0.020 | 0.011 | 0.009 |
| Jinjuzui (Foshan) | Max | 0.371 | 0.274 | 0.252 | 0.255 | 0.143 | 0.110 | 0.129 | 0.189 | 0.131 | 0.219 | 0.270 | 0.396 |
| | Min | 0.014 | 0.005 | 0.008 | 0.006 | 0.001 | 0.001 | 0.000 | 0.000 | 0.008 | 0.019 | 0.002 | 0.002 |
| Huijingcheng (Foshan) | Max | 0.399 | 0.274 | 0.304 | 0.294 | 0.233 | 0.127 | 0.197 | 0.221 | 0.182 | 0.313 | 0.313 | 0.391 |
| | Min | 0.015 | 0.000 | 0.004 | 0.006 | 0.005 | 0.010 | 0.005 | 0.003 | 0.006 | 0.042 | 0.013 | 0.010 |
| Donghu (Jiangmen) | Max | 0.258 | 0.231 | 0.230 | 0.364 | 0.263 | 0.094 | 0.126 | 0.233 | 0.155 | 0.314 | 0.306 | 0.325 |
| | Min | 0.023 | 0.008 | 0.010 | 0.011 | 0.009 | 0.006 | 0.003 | 0.005 | 0.007 | 0.043 | 0.008 | 0.002 |
| Chengzhong (Zhaoqing) | Max | 0.269 | 0.287 | 0.279 | 0.438 | 0.256 | 0.172 | 0.152 | 0.162 | 0.175 | 0.283 | 0.334 | 0.311 |
| | Min | 0.014 | 0.007 | 0.003 | 0.006 | 0.008 | 0.005 | 0.003 | 0.005 | 0.008 | 0.018 | 0.010 | 0.003 |
| Xiapu (Huizhou) | Max | 0.293 | 0.179 | 0.269 | 0.328 | 0.125 | 0.185 | 0.161 | 0.169 | 0.096 | 0.195 | 0.219 | 0.282 |
| | Min | 0.023 | 0.003 | 0.002 | 0.004 | 0.003 | 0.004 | 0.002 | 0.003 | 0.007 | 0.020 | 0.010 | 0.022 |
| Jinguowan (Huizhou) | Max | 0.188 | 0.253 | 0.214 | 0.284 | 0.138 | 0.321 | 0.150 | 0.190 | 0.147 | 0.200 | 0.193 | 0.231 |
| | Min | 0.017 | 0.007 | 0.005 | 0.004 | 0.005 | 0.002 | 0.000 | 0.000 | 0.000 | 0.012 | 0.002 | 0.000 |
| Nanchengyuanling (Dongguan) | Max | 0.248 | 0.166 | 0.250 | 0.237 | 0.148 | 0.374 | 0.148 | 0.181 | 0.119 | 0.172 | 0.190 | 0.247 |
| | Min | 0.020 | 0.004 | 0.007 | 0.009 | 0.005 | 0.006 | 0.006 | 0.004 | 0.006 | 0.029 | 0.005 | 0.006 |
| Zimaling Park (Zhongshan) | Max | 0.307 | 0.158 | 0.149 | 0.236 | 0.152 | 0.093 | 0.114 | 0.226 | 0.224 | 0.250 | 0.231 | 0.326 |
| | Min | 0.032 | 0.002 | 0.009 | 0.008 | 0.000 | 0.001 | 0.003 | 0.002 | 0.006 | 0.001 | 0.007 | 0.003 |
| Tsuen Wan (HKSAR) | Max | 0.163 | 0.087 | 0.115 | 0.210 | 0.072 | 0.106 | 0.113 | 0.172 | 0.125 | 0.183 | 0.167 | 0.218 |
| | Min | 0.020 | 0.007 | 0.005 | 0.008 | 0.004 | 0.009 | 0.000 | 0.000 | 0.004 | 0.030 | 0.007 | 0.002 |
| Tap Mun (HKSAR) | Max | 0.138 | 0.093 | 0.139 | 0.159 | 0.073 | 0.075 | 0.084 | 0.156 | 0.108 | 0.210 | 0.170 | 0.279 |
| | Min | 0.016 | 0.007 | 0.005 | 0.009 | 0.006 | 0.004 | 0.000 | 0.000 | 0.007 | 0.026 | 0.011 | 0.004 |
| Tung Chung (HKSAR) | Max | 0.213 | 0.116 | 0.108 | 0.255 | 0.090 | 0.058 | 0.066 | 0.144 | 0.103 | 0.165 | 0.144 | 0.197 |
| | Min | 0.019 | 0.014 | 0.003 | 0.004 | 0.001 | 0.002 | 0.000 | 0.000 | 0.001 | 0.031 | 0.013 | 0.006 |

Table 3.4b : The monthly maxima and minima of daily averages of Respirable Suspended Particulates**[Class 2 NAAQS (Daily) : 0.15 mg/m³]**

| Monitoring Stations | Mth | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Exceed- ance Days | Exceed- ance Rate |
|-----------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------------|-------------------------|
| Luhu Park (Guangzhou) | Max | 0.162 | 0.119 | 0.155 | 0.168 | 0.090 | 0.069 | 0.112 | 0.108 | 0.093 | 0.145 | 0.133 | 0.205 | 12 | 4.10% |
| | Min | 0.035 | 0.026 | 0.044 | 0.036 | 0.027 | 0.029 | 0.025 | 0.032 | 0.031 | 0.059 | 0.019 | 0.014 | | |
| Wanqingsha (Guangzhou) | Max | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Min | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| Tianhu (Guangzhou) | Max | 0.110 | 0.090 | 0.148 | 0.096 | 0.065 | 0.078 | 0.092 | 0.086 | 0.062 | 0.110 | 0.128 | 0.167 | 2 | 0.58% |
| | Min | 0.019 | 0.010 | 0.013 | 0.018 | 0.010 | 0.007 | 0.008 | 0.007 | 0.012 | 0.024 | 0.010 | 0.002 | | |
| Liyuan (Shenzhen) | Max | 0.115 | 0.090 | 0.114 | 0.087 | 0.053 | 0.045 | 0.056 | 0.113 | 0.091 | 0.131 | 0.123 | 0.197 | 10 | 3.17% |
| | Min | 0.048 | 0.012 | 0.027 | 0.033 | 0.015 | 0.011 | 0.014 | 0.021 | 0.019 | 0.054 | 0.033 | 0.020 | | |
| Tangjia (Zhuhai) | Max | 0.133 | 0.085 | 0.115 | 0.168 | 0.073 | 0.054 | 0.050 | 0.120 | 0.086 | 0.135 | 0.134 | 0.186 | 6 | 1.82% |
| | Min | 0.061 | 0.034 | 0.034 | 0.033 | 0.010 | 0.014 | 0.008 | 0.015 | 0.012 | 0.050 | 0.027 | 0.021 | | |
| Jinjuzui (Foshan) | Max | 0.245 | 0.141 | 0.135 | 0.165 | 0.082 | 0.058 | 0.073 | 0.114 | 0.084 | 0.149 | 0.177 | 0.228 | 18 | 5.17% |
| | Min | 0.055 | 0.020 | 0.036 | 0.029 | 0.023 | 0.025 | 0.022 | 0.019 | 0.022 | 0.051 | 0.028 | 0.018 | | |
| Huijingcheng (Foshan) | Max | 0.240 | 0.136 | 0.179 | 0.178 | 0.111 | 0.062 | 0.094 | 0.104 | 0.094 | 0.165 | 0.200 | 0.255 | 24 | 6.80% |
| | Min | 0.053 | 0.015 | 0.045 | 0.028 | 0.031 | 0.026 | 0.021 | 0.018 | 0.029 | 0.067 | 0.025 | 0.020 | | |
| Donghu (Jiangmen) | Max | 0.193 | 0.123 | 0.132 | 0.167 | 0.121 | 0.052 | 0.059 | 0.095 | 0.093 | 0.168 | 0.197 | 0.225 | 28 | 8.38% |
| | Min | 0.045 | 0.019 | 0.038 | 0.034 | 0.027 | 0.023 | 0.015 | 0.021 | 0.028 | 0.079 | 0.031 | 0.015 | | |
| Chengzhong (Zhaoqing) | Max | 0.183 | 0.191 | 0.152 | 0.243 | 0.127 | 0.084 | 0.074 | 0.096 | 0.122 | 0.186 | 0.214 | 0.187 | 21 | 6.25% |
| | Min | 0.027 | 0.015 | 0.026 | 0.032 | 0.036 | 0.035 | 0.023 | 0.019 | 0.024 | 0.040 | 0.020 | 0.016 | | |
| Xiapu (Huizhou) | Max | 0.143 | 0.094 | 0.162 | 0.165 | 0.059 | 0.058 | 0.104 | 0.101 | 0.069 | 0.128 | 0.154 | 0.174 | 7 | 1.95% |
| | Min | 0.035 | 0.016 | 0.021 | 0.022 | 0.018 | 0.014 | 0.013 | 0.012 | 0.030 | 0.040 | 0.024 | 0.040 | | |
| Jinguowan (Huizhou) | Max | 0.135 | 0.097 | 0.128 | 0.114 | 0.058 | 0.060 | 0.111 | 0.093 | 0.078 | 0.148 | 0.131 | 0.174 | 4 | 1.25% |
| | Min | 0.041 | 0.023 | 0.024 | 0.030 | 0.031 | 0.016 | 0.013 | 0.016 | 0.027 | 0.045 | 0.019 | 0.008 | | |
| Nanchengyuanling (Dongguan) | Max | 0.139 | 0.093 | 0.131 | 0.134 | 0.073 | 0.054 | 0.097 | 0.106 | 0.088 | 0.126 | 0.161 | 0.178 | 5 | 1.52% |
| | Min | 0.040 | 0.011 | 0.032 | 0.027 | 0.020 | 0.016 | 0.017 | 0.016 | 0.028 | 0.046 | 0.023 | 0.027 | | |
| Zimaling Park (Zhongshan) | Max | 0.200 | 0.089 | 0.097 | 0.129 | 0.079 | 0.054 | 0.058 | 0.152 | 0.096 | 0.201 | 0.143 | 0.193 | 22 | 6.59% |
| | Min | 0.064 | 0.023 | 0.026 | 0.023 | 0.013 | 0.015 | 0.008 | 0.018 | 0.013 | 0.080 | 0.028 | 0.013 | | |
| Tsuen Wan (HKSAR) | Max | 0.107 | 0.067 | 0.094 | 0.118 | 0.044 | 0.069 | 0.055 | 0.101 | 0.079 | 0.123 | 0.114 | 0.154 | 1 | 0.28% |
| | Min | 0.035 | 0.022 | 0.021 | 0.029 | 0.015 | 0.017 | 0.008 | 0.010 | 0.018 | 0.049 | 0.026 | 0.009 | | |
| Tap Mun (HKSAR) | Max | 0.103 | 0.079 | 0.103 | 0.116 | 0.043 | 0.048 | 0.053 | 0.076 | 0.084 | 0.143 | 0.132 | 0.191 | 5 | 1.39% |
| | Min | 0.038 | 0.017 | 0.022 | 0.019 | 0.013 | 0.014 | 0.009 | 0.015 | 0.017 | 0.042 | 0.032 | 0.013 | | |
| Tung Chung (HKSAR) | Max | 0.140 | 0.080 | 0.087 | 0.145 | 0.048 | 0.037 | 0.039 | 0.099 | 0.066 | 0.118 | 0.091 | 0.144 | 0 | 0.00% |
| | Min | 0.038 | 0.024 | 0.019 | 0.015 | 0.010 | 0.007 | 0.005 | 0.010 | 0.009 | 0.039 | 0.023 | 0.017 | | |

Table 3.4c : The monthly and annual averages of Respirable Suspended Particulates**[Class 2 NAAQS (Annual) : 0.10 mg/m³]**

| Monitoring Stations | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Annual Average |
|-----------------------------|-------|--------|--------|-------|--------|-------|-------|-------|-------|-------|--------|-------|----------------|
| Luhu Park (Guangzhou) | 0.095 | 0.064* | 0.091* | 0.08* | 0.052 | 0.043 | 0.045 | 0.057 | 0.061 | 0.097 | 0.080 | 0.114 | 0.074 |
| Wanqingsha (Guangzhou) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tianhu (Guangzhou) | 0.064 | 0.045 | 0.065 | 0.049 | 0.035 | 0.032 | 0.028 | 0.033 | 0.037 | 0.076 | 0.060 | 0.073 | 0.050 |
| Liyuan (Shenzhen) | 0.082 | 0.044 | 0.054 | 0.049 | 0.029 | 0.027 | 0.024 | 0.038 | 0.048 | 0.090 | 0.077* | 0.132 | 0.057 |
| Tangjia (Zhuhai) | 0.096 | 0.055* | 0.063 | 0.063 | 0.033 | 0.029 | 0.018 | 0.033 | 0.051 | 0.094 | 0.078 | 0.114 | 0.060 |
| Jinjuzui (Foshan) | 0.122 | 0.062 | 0.074 | 0.068 | 0.047 | 0.038 | 0.033 | 0.051 | 0.058 | 0.101 | 0.085 | 0.123 | 0.072 |
| Huijingcheng (Foshan) | 0.121 | 0.058 | 0.086 | 0.083 | 0.054 | 0.040 | 0.041 | 0.053 | 0.066 | 0.109 | 0.095 | 0.129 | 0.079 |
| Donghu (Jiangmen) | 0.114 | 0.059 | 0.073 | 0.084 | 0.054 | 0.033 | 0.033 | 0.043 | 0.062 | 0.118 | 0.100 | 0.127 | 0.075 |
| Chengzhong (Zhaoqing) | 0.088 | 0.066 | 0.083 | 0.109 | 0.067 | 0.048 | 0.044 | 0.051 | 0.068 | 0.090 | 0.095 | 0.113 | 0.076 |
| Xiapu (Huizhou) | 0.095 | 0.052 | 0.064 | 0.059 | 0.039 | 0.035 | 0.029 | 0.040 | 0.049 | 0.088 | 0.079 | 0.119 | 0.062 |
| Jinguowan (Huizhou) | 0.079 | 0.046 | 0.063 | 0.060 | 0.043* | 0.038 | 0.029 | 0.044 | 0.050 | 0.088 | 0.072 | 0.094 | 0.060 |
| Nanchengyuanling (Dongguan) | 0.092 | 0.049 | 0.073 | 0.060 | 0.039 | 0.034 | 0.032 | 0.042 | 0.053 | 0.088 | 0.080 | 0.112 | 0.062 |
| Zimaling Park (Zhongshan) | 0.114 | 0.054 | 0.056 | 0.058 | 0.035 | 0.029 | 0.019 | 0.046 | 0.061 | 0.132 | 0.088 | 0.117 | 0.067 |
| Tsuen Wan (HKSAR) | 0.070 | 0.042 | 0.048 | 0.050 | 0.032 | 0.032 | 0.026 | 0.037 | 0.042 | 0.084 | 0.061 | 0.084 | 0.051 |
| Tap Mun (HKSAR) | 0.067 | 0.042 | 0.051 | 0.049 | 0.027 | 0.024 | 0.020 | 0.032 | 0.049 | 0.093 | 0.078 | 0.102 | 0.053 |
| Tung Chung (HKSAR) | 0.085 | 0.045 | 0.044 | 0.047 | 0.023 | 0.017 | 0.013 | 0.023 | 0.036 | 0.079 | 0.056 | 0.081 | 0.046 |

Remarks :

1. All concentration units are in milligrams per cubic metre.
2. “*” denotes that the data capture rate does not meet the minimum requirements for determining a representative value.

3.5 Monthly Variations of Pollutant Concentrations

Figure 8 shows the monthly variations of the major pollutants (SO_2 , NO_2 , O_3 , and PM_{10}) recorded by the Network in 2013. The overall concentrations of SO_2 , NO_2 and PM_{10} were generally higher during the winter season (first and fourth quarters of the year) and relatively lower in the summer months. The lower pollutants levels in summer were mainly due to the relatively clean 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. As for ozone, higher monthly averages occurred in September and October because of more days with meteorological conditions that favoured photochemical reactions (such as strong solar radiation, less amount of clouds, low wind speed etc.) causing more ozone formation in the period.

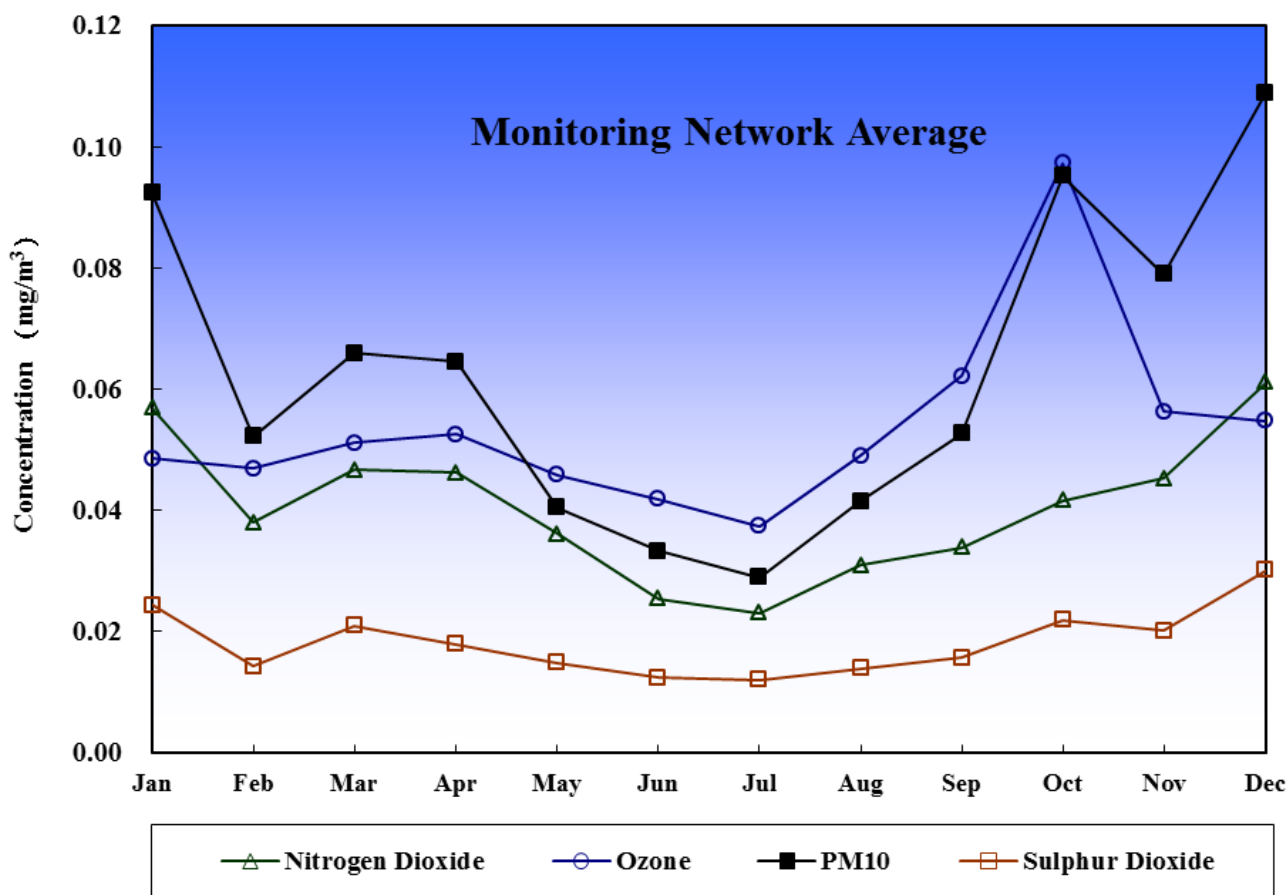


Figure 8 : Monthly variations of average pollutant concentrations measured by the Network

3.6 Annual Variations of Pollutant Concentrations (2006-2013)

Table 3.6 shows the annual mean concentrations of the major pollutants (SO₂, NO₂, O₃, and PM₁₀) recorded by the Network from 2006 to 2013.

From 2006 to 2013, the annual averages recorded by the Network for SO₂, NO₂, and PM₁₀ decreased by 62%, 13% and 15% respectively. These reductions indicated that the measures implemented in recent years by Guangdong and Hong Kong, including the retrofitting of power plants with flue-gas desulphurization facilities, tightening the vehicle emission standards and fuel specifications, phasing out the more polluting industrial facilities in the PRD, etc., had brought improvements in the overall air quality in the Pearl River Delta region. However, the Network had recorded an increase of 13% in the annual ozone average in the same period, reflecting that the situation of photochemical smog pollution in the region has to be improved. The Guangdong and Hong Kong governments will continue to implement emission reduction measures to further improve the air quality in the region and tackle the photochemical pollution problem.

Table 3.6 : Annual averages of the pollutants from the monitoring network

| | Sulphur Dioxide | Nitrogen Dioxide | Ozone | Respirable Suspended Particulates |
|------|-----------------|------------------|-------|---|
| 2006 | 0.047 | 0.046 | 0.048 | 0.074 |
| 2007 | 0.048 | 0.045 | 0.051 | 0.079 |
| 2008 | 0.039 | 0.045 | 0.051 | 0.070 |
| 2009 | 0.029 | 0.042 | 0.056 | 0.069 |
| 2010 | 0.025 | 0.043 | 0.053 | 0.064 |
| 2011 | 0.024 | 0.040 | 0.058 | 0.064 |
| 2012 | 0.018 | 0.038 | 0.054 | 0.056 |
| 2013 | 0.018 | 0.040 | 0.054 | 0.063 |

Remark : All concentration units are in milligrams per cubic metre.

4. Statistical Analysis of the Regional Air Quality Index (RAQI)

The two governments of Guangdong and HKSAR jointly started the daily reporting of the RAQI since 30 November 2005 to provide the public with information about the air quality in different parts of the PRD region.

The RAQI is a composite indicator of the aggregate level of the four major regional air pollutants, namely sulphur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃) and respirable suspended particulates (PM₁₀). The higher the index value, the higher the regional air pollution levels. The RAQI is divided into the following five grades:

| Grade | Regional Air Quality Index (RAQI) value [#] | Air Quality Condition in the Monitored Area |
|-------|--|--|
| I | 0 – 1 | Concentrations of all pollutants are well within Class 2 of the National Ambient Air Quality Standards (NAAQS) |
| II | 1 – 2 | Concentrations of all pollutants are generally within Class 2 NAAQS |
| III | 2 – 3 | Concentrations of individual pollutants may approach or exceed Class 2 NAAQS |
| IV | 3 – 4 | Class 2 NAAQS are generally exceeded |
| V | >4 | Class 2 NAAQS are significantly exceeded |

The formula for calculating the RAQI is as follows:

$$I_c = \sum_{i=1}^4 \frac{C_i}{R_i}$$

where I_c stands for the RAQI, an indicator of the aggregate pollution level of four pollutants, namely, SO₂, NO₂, O₃ and PM₁₀. For SO₂, NO₂ and PM₁₀, C_i is the daily average concentration while R_i represents the daily average concentration limits of the corresponding pollutants as specified in Class 2 NAAQS. For O₃, C_i is the highest hourly average of a day while R_i represents the hourly average concentration limit in Class 2 NAAQS (refer to Class 2 NAAQS (GB 3095 – 1996) revised version).

[#] The upper limits of the range of Grades I, II, III and IV of the RAQI are inclusive.

4.1 Statistics on RAQI Grades

Table 4.1 summarise the statistics on the RAQI grades and effective days of RAQI for all monitoring stations in the Network from January to December 2013. The percentages of days with valid RAQI at various monitoring stations averaged 95%.

Table 4.1 : Statistics on RAQI grades of individual monitoring stations

| Monitoring Stations | District | Days with valid RAQI | Ratio of valid RAQI | Distribution of RAQI grades in 2013 (%) | | | | |
|---------------------|-----------|----------------------|---------------------|---|----------|-----------|----------|---------|
| | | | | Grade I | Grade II | Grade III | Grade IV | Grade V |
| Luhu Park | Guangzhou | 359 | 98% | 18.11 | 62.12 | 18.11 | 1.67 | 0.00 |
| Wanqingsha | Guangzhou | -- | -- | -- | -- | -- | -- | -- |
| Tianhu | Guangzhou | 340 | 93% | 46.18 | 49.12 | 4.71 | 0.00 | 0.00 |
| Liyuan | Shenzhen | 349 | 96% | 47.85 | 40.40 | 11.46 | 0.29 | 0.00 |
| Tangjia | Zhuhai | 351 | 96% | 39.89 | 46.72 | 13.39 | 0.00 | 0.00 |
| Jinjuzui | Foshan | 343 | 94% | 18.95 | 45.19 | 30.32 | 5.54 | 0.00 |
| Huijingcheng | Foshan | 354 | 97% | 13.28 | 48.31 | 30.23 | 7.06 | 1.13 |
| Donghu | Jiangmen | 353 | 97% | 33.43 | 40.23 | 22.66 | 3.68 | 0.00 |
| Chengzhong | Zhaoqing | 319 | 87% | 18.81 | 56.11 | 22.26 | 2.82 | 0.00 |
| Xiapu | Huizhou | 361 | 99% | 28.81 | 57.06 | 13.57 | 0.55 | 0.00 |
| Jinguowan | Huizhou | 337 | 92% | 41.25 | 54.01 | 4.75 | 0.00 | 0.00 |
| Nanchengyuanling | Dongguan | 351 | 96% | 19.09 | 55.56 | 23.08 | 2.28 | 0.00 |
| Zimaling Park | Zhongshan | 351 | 96% | 35.90 | 46.44 | 17.38 | 0.28 | 0.00 |
| Tsuen Wan | HKSAR | 352 | 96% | 25.28 | 62.78 | 11.36 | 0.57 | 0.00 |
| Tap Mun | HKSAR | 352 | 96% | 40.63 | 54.26 | 5.11 | 0.00 | 0.00 |
| Tung Chung | HKSAR | 351 | 96% | 37.04 | 47.01 | 14.25 | 1.71 | 0.00 |

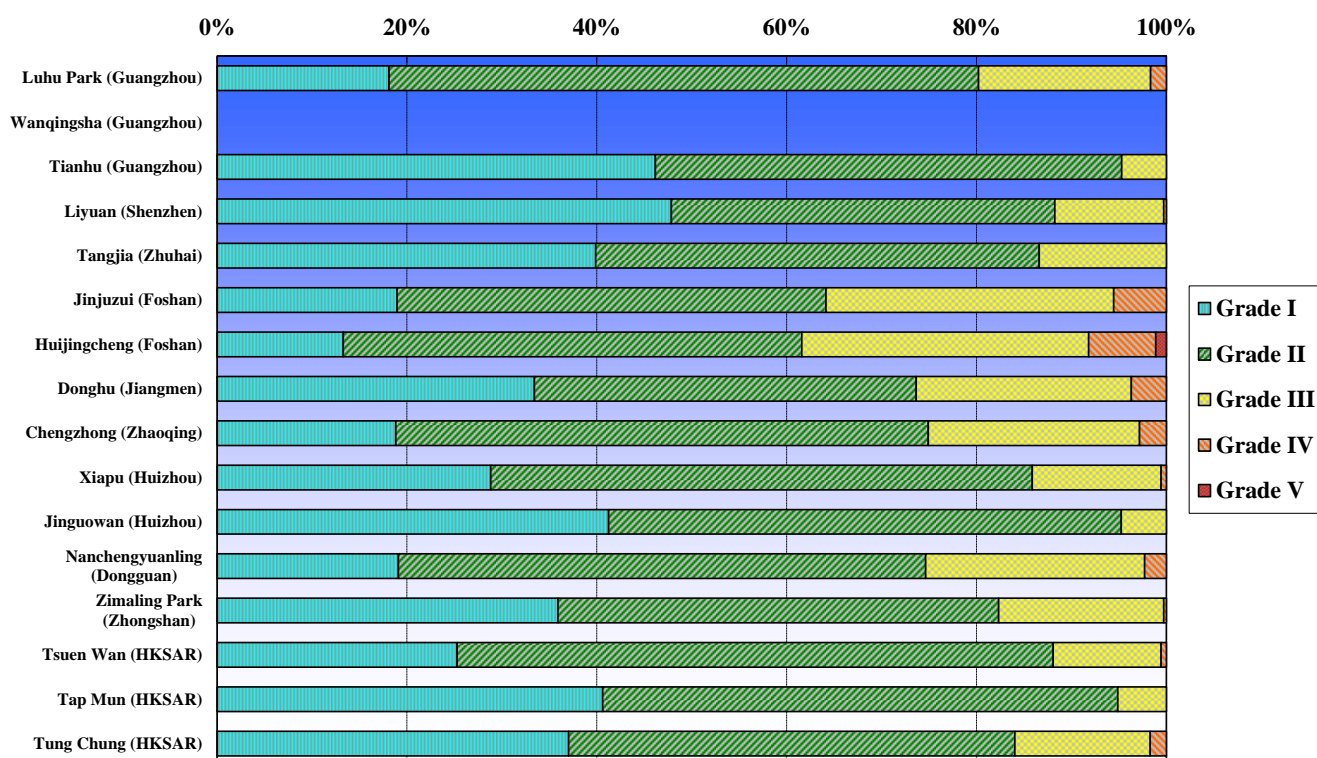


Figure 9 : Stacked column chart of RAQI grades of individual monitoring stations

Figure 10 shows the overall distribution of different RAQI grades recorded by the Network in 2013. As a whole, 81.98% of the RAQI values are at Grade I to II, meaning the pollutant concentrations are generally within Class 2 of the NAAQS, followed by 16.18% at Grade III, 1.76% at Grade IV and 0.08% at Grade V.

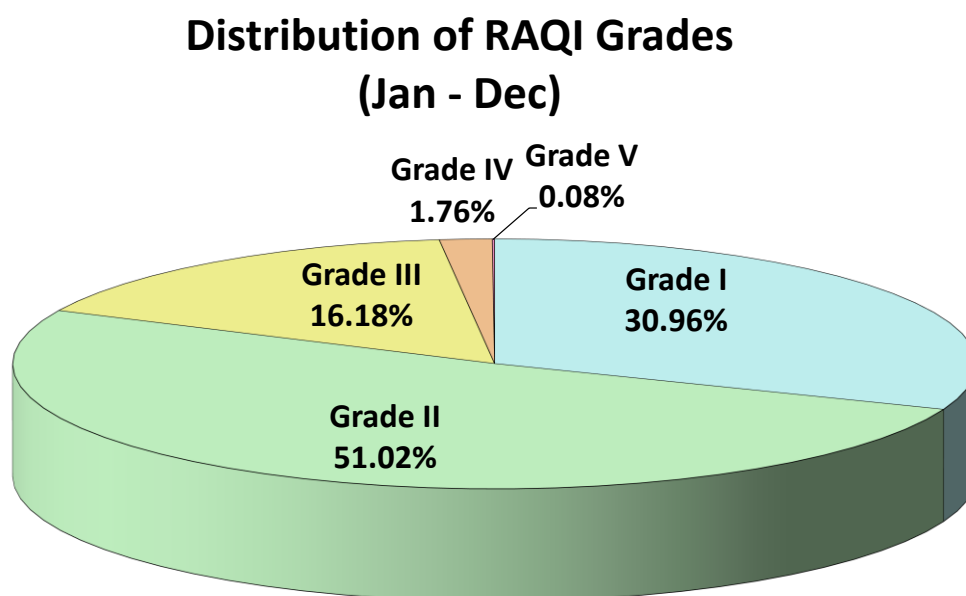


Figure 10 : Distribution of RAQI grades in the Network

4.2 Spatial Distribution of Average RAQI Grades

Figure 11 shows the spatial distribution of RAQI annual average in 2013 at monitoring stations in the network. The average values for all monitoring stations were among at Grade II.

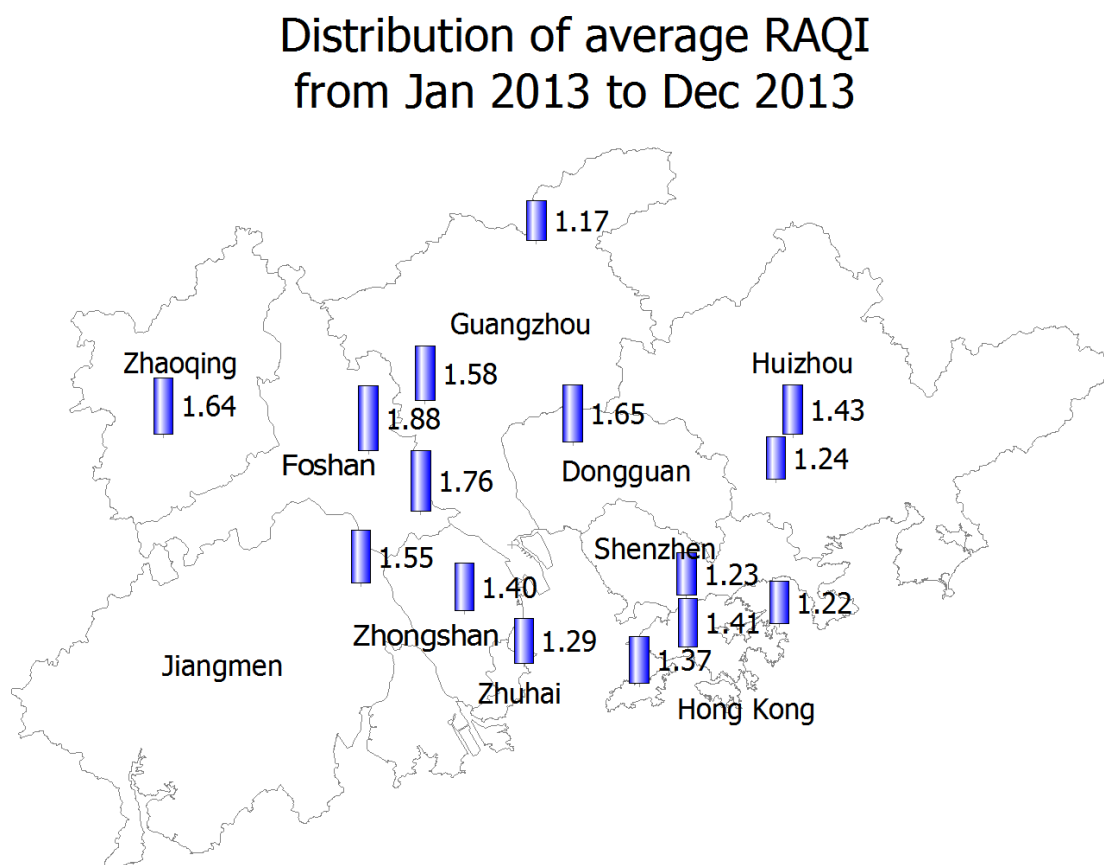


Figure 11 : Spatial distribution of average RAQI at Monitoring Stations in the Network

4.3 Monthly Variations of Average RAQI

Figure 12 shows the monthly variations in the average RAQI values of the Network from January to December 2013. During the year, all monthly average RAQI were within either Grade I or Grade II categories, except for October. The maximum and minimum RAQI values were recorded in October and July respectively.

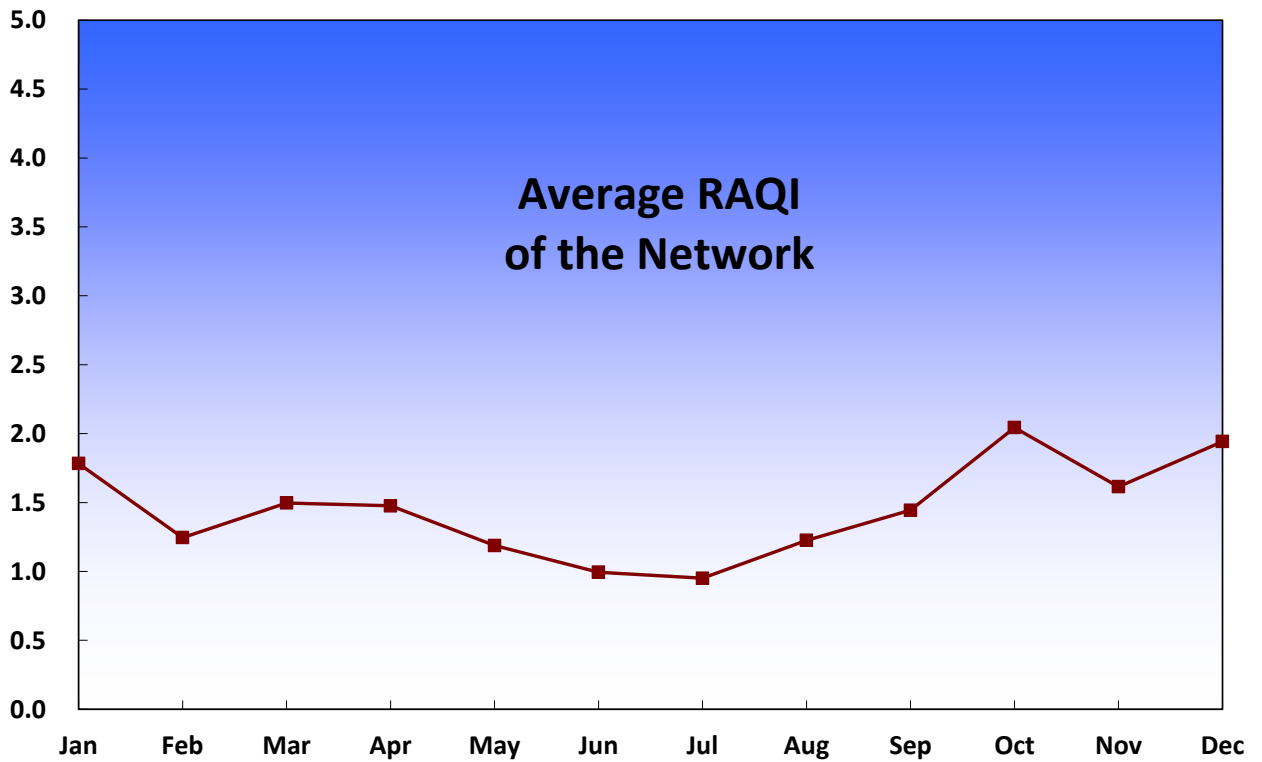


Figure 12 : Monthly variations in average RAQI

Annex A : Site Information of Monitoring Stations

| Monitoring Stations | Address | Area Type | Sampling Height (Above P.D.) | Above Ground | Date Commenced Operation |
|------------------------------|---|--|------------------------------|--------------|--------------------------|
| Luhu Park (Guangzhou) | Inside Jufong Garden of Luhu Park (Big yard, No. 11 Luhu Park) | City | 30m | 9m | 1993 |
| Wanqingsha (Guangzhou) | Wanqingsha Secondary School, Nansha | Mixed educational/ commercial and residential/industrial | 13m | 12m | Oct 2004 |
| Tianhu (Guangzhou) | Tianhu Park, Conghua City | Background : rural | 251m | 13m | Oct 2004 |
| Liyuan (Shenzhen) | Shennan Zhong Road, Shenzhen City | City | 38m | 12m | Sep 1997 |
| Tangjia (Zhuhai) | Qiao Island Mangrove Monitoring Station, Tangjia County | Mixed educational/ commercial and residential/industrial | 13m | 13m | Jan 2010 |
| Jinjuzui (Foshan) | Roof-top of Educational Building, Foshan City Communist Party Shunde Jinjuzui | Tourist and cultural /educational | 27m | 17m | Oct 1999 |
| Huijingcheng (Foshan) | No. 127, Fenjiang Nan Road, Chancheng Area | Urban: mixed residential/commercial/ industrial | 24m | 14m | Feb 2000 |
| Donghu (Jiangmen) | Inside Donghu Park, Jiangmen City | City | 17.5m | 5m | Nov 2001 |
| Chengzhong (Zhaoqing) | No. 17, Qintian Road, Zhaoqing City | Urban: mixed residential/commercial | 21m | 16m | Jun 2001 |
| Xiapu (Huizhou) | No. 4 Xiabuhengjiang Road No. 3, Huicheng Area | Urban: commercial | 49m | 20m | Dec 1999 |
| Jinguowan (Huizhou) | Jinguowan Ecological Farm, Huizhou City | Residential | 77m | 8m | Oct 2004 |
| Nancheng-yuanling (Dongguan) | Nanchengyuanling Community, Dongguan City | Mixed residential/ commercial/industrial | 33 m | 18m | Sep 2010 |
| Zimaling Park (Zhongshan) | Zimaling Park, Zhongshan City | Mixed residential/ commercial | 45 m | 7m | Aug 2002 |
| Tsuen Wan (HKSAR) | 60 Tai Ho Road, Tsuen Wan | Urban: mixed residential/commercial/ industrial | 21m | 17m | Aug 1988 |
| Tap Mun (HKSAR) | Tap Mun Police Station | Background: rural | 26m | 11m | Apr 1998 |
| Tung Chung (HKSAR) | 6 Fu Tung Street, Tung Chung | New Town: residential | 34.5m | 27.5m | Apr 1999 |

Annex B : Measurement Methods of Air Pollutant Concentration

| Pollutants | Measuring Principles |
|-----------------------------------|---|
| Sulphur Dioxide | UV fluorescence / Differential Optical Absorption Spectroscopy |
| Nitrogen Dioxide | Chemiluminescence / Differential Optical Absorption Spectroscopy |
| Ozone | UV absorption / Differential Optical Absorption Spectroscopy |
| Respirable Suspended Particulates | Oscillating microbalance (TEOM) Beta particulate monitor |