

China Air Quality Management Assessment Report (2018)

Executive Summary



Bluetech Think-tank Report

Bluetech Think-tank Report series are a set of publications that focus on clean air and low-carbon development areas including clean-tech, clean energy, green transportation, and pollution prevention, etc. Through policy and market outlook, investment analysis and technology trend research,, it provides effective guidance for government, enterprises and investment institutions. While helping to win the battle of the blue sky, the Report aims to promote the rapid development of clean air industry.

Authors

**Innovation Center for Clean-air Solutions (Secretariat
for Bluetech Clean Air Alliance)**

Tonny Xie, Men Gaoshan, He Xin

Bluetech Clean Air Alliance

Ling Xuan, Li Lianfei, Bian Yue, Zhang Fan(intern)

Acknowledgment

World Bank

Chinese Academy For Environmental Planning

Energy Research Institute National Development And

Reform Commission

Disclaimer:

The views expressed in this report are based on the authors' personal opinions and do not necessarily reflect the views and policies of the authors' organizations, support organizations, BCAA and its members. BCAA does not guaran-tee the accuracy of the data included in this publication and accepts no responsibility for any consequence of their use. BCAA encourages printing or copying in-formation exclusively for personal and noncommercial use with proper acknowledgment of BCAA. Users are restricted from reselling, redistributing, or creating de-rivative works for commercial purpose without the ex-press, written consent of BCAA Secretariat.

Contents

Executive Summary / 1

1 Introduction / 8

2 Current Air Quality Situation / 9

2.1 Analysis of PM_{2.5} Pollution / 9

2.2 Analysis of PM₁₀ Pollution / 14

2.3 Analysis of O₃ Pollution / 16

2.4 Analysis of SO₂ Pollution / 19

2.5 Analysis of NO₂ Pollution / 29

2.6 Analysis of CO Pollution / 20

2.7 Days with Excellent and Fairly Good Air Quality / 21

3 Progress in Controlling Pollutant Emissions / 23

3.1 Control of SO₂ Emission / 23

3.2 Control of NO_x Emissions / 24

3.3 Control of VOCs / 24

3.4 Co-control of GHG Emissions / 25

4 Progress in Environmental Air Quality
Management / 35

4.1 Analysis of Air Quality Management Policies / 35

4.2 Progress of Air Quality Management Mode / 37

4.3 Cooperation Mechanism of Air Pollution Prevention and
Control in Beijing-Tianjin-Hebei and Surrounding Region / 40

5 Future Prospects / 43

Executive Summary

The Air Pollution Prevention and Control Action Plan (2013-2017) (hereafter referred as the Ten Air Measures) reached its final year in 2017. From 2013 to 2017, the overall air quality in China has improved substantially, and achieved the goals of the Ten Air Measures. In 2017, the average PM_{10} annual concentration of all cities at and above prefectural level have reduced by 22.7 % from that of 2013. The annual average concentrations of $PM_{2.5}$ in the key areas like Beijing-Tianjin-Hebei (BTH) region, Yangtze River delta region and Pearl River Delta region have dropped by 39.6 %, 34.3 %, 27.7 % compare to those of 2013 respectively.

The $PM_{2.5}$ in Pearl River Delta region has complied with national standard for three consecutive years. In addition, the annual average concentration of $PM_{2.5}$ in Beijing has dropped from $89.5 \mu g/m^3$ in 2013 to $58 \mu g/m^3$ in 2017 which has attracted the world's great attention. From 2013 to 2017, the number of compliance cities also increased year by year. Among the monitoring network available 74 cities in 2013, only Haikou, Zhoushan and Lhasa complied with the air quality standard, accounting for 4.1 %. By now, among the 338 prefecture-level cities in China, 99 cities have complied with the standard, accounting for 29.3 %.

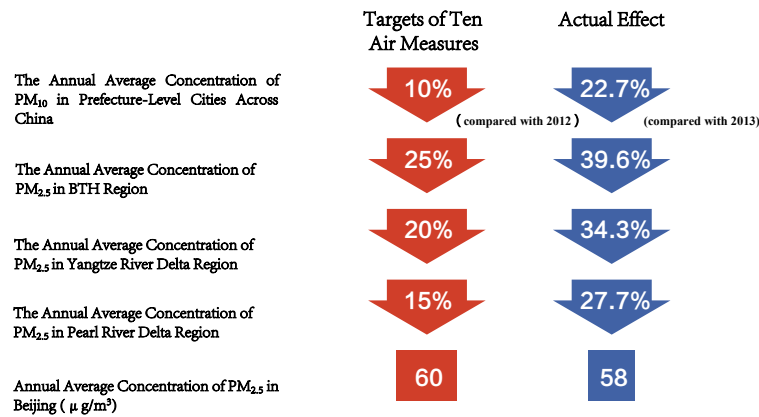


Figure1 Implementation of the "Ten Air Measures"

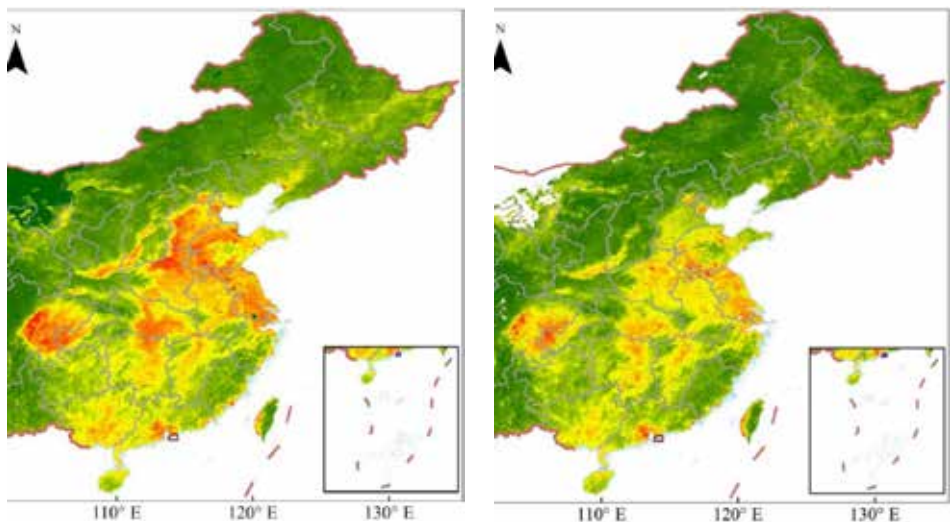


Figure 2 Satellite Inversion Graph of $PM_{2.5}$ Concentration Near the Ground Nationwide in Key Area from 2013-2017

In the meantime, due to the homologous sources of air pollution and greenhouse gases, the implementation of the "Ten Air Measures" has also brought significant co-benefits on carbon reduction. Since the implementation of the "Ten Air Measures" in 2013, coal share in China's total energy consumption has continuously declined for five years, the growth rate of total carbon emissions is basically zero, and the commitment to reduce the emission intensity per unit GDP by 40 % - 45 % before 2020 has been fulfilled ahead of schedule. Preliminary estimation shows that implementation of some key measures in BTH region could benefit more than 350 million tons of greenhouse gas reduction each year.

Continuous improvement of air quality requires strong support from effective scientific tools and systematic management. This report analyzes air quality improvement, emission control efforts and environmental management progress to date, as well as various challenges in pollution control from 2013 to 2017 across 30 provinces/cities in mainland China (with the exception of Tibet due to data availability). The report serves to provide information and references to support local governments to improve air quality management strategies.

Major findings of this report include:

▲ Air Quality: China air quality has significantly

improved in 2017, all the 11 provinces/cities located in the key areas¹ of PM_{2.5} pollution control have already fulfilled the goals set by the "Ten Air Measures". The SO₂ annual average concentrations in all the provinces/cities have, for the first time, all complied with National Standard. The atmospheric NO₂ in 15 provinces and cities and O₃ in 19 provinces and cities have bounced back.

Since implementation of the "Ten Air Measures", the concentration of particulate matter in China has decreased significantly, 11 provinces/cities (Beijing, Tianjin, Hebei, Shandong, Shanxi, Shanghai, Jiangsu, Zhejiang, Pearl River Delta, Chongqing and Inner Mongolia) located in the key control areas have already achieved the PM_{2.5} reduction goals set by the "Ten Air Measures". The annual average concentration of PM_{2.5} in Pearl River Delta and Zhejiang Province have complied with National Stage II standards. For the 9 cities' the annual average concentrations of PM_{2.5} in Pearl River Delta, 7 of them slightly increased from 2016, however, the whole region was still in compliance. The annual average concentrations of PM₁₀ in 12 provinces/cities including Hainan were complied with the standards, the annual average concentrations of PM₁₀ in Anhui, Heilongjiang, Guangxi, Guangdong, Jiangxi, Ningxia, Gansu, Yunnan slightly increased compared to 2016.

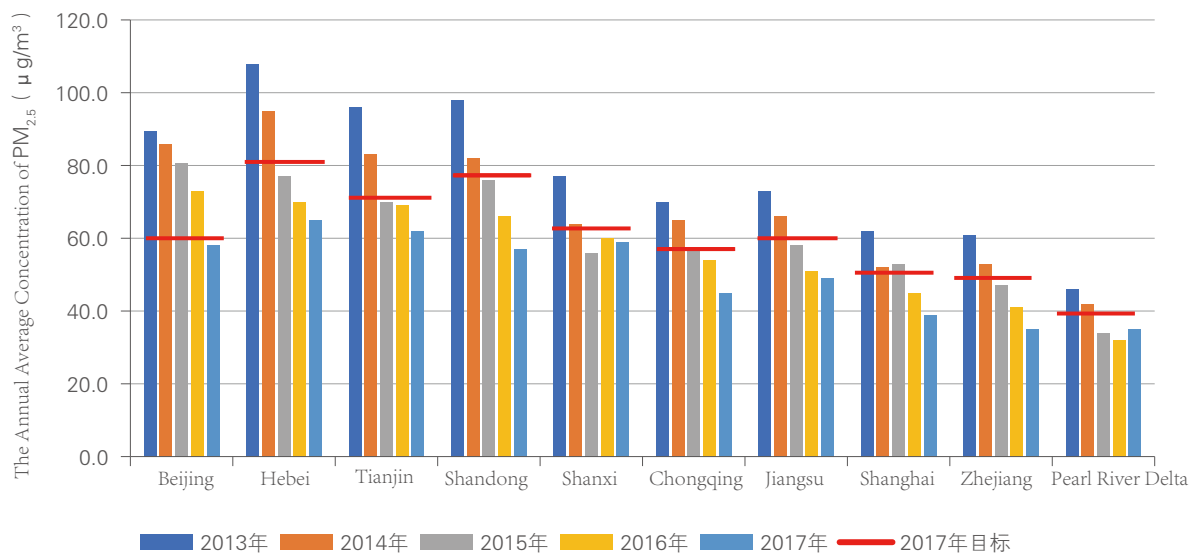


Figure 3 Achievements to date of PM_{2.5} annual average concentrations in key provinces/cities during the "Ten Air Measures" period.²

1. The key areas for PM_{2.5} pollution control refer to the regions with PM_{2.5} as the assessment indicator according to the Goal Responsibility of Air Pollution Control signed by Ministry of Environmental Protection and the national provinces/cities.
2. The fine particulate concentration in Beijing would declined to 60 μg/m³ by 2017 compared to 2012 the according to the "Ten Air Measures". According to the Implementation Details of The Assessment Method for The Implementation of Air Pollution Prevention and Control Action Plan (trial), the assessment base of the decline target is the annual PM_{2.5} average concentration in 2013. According to the Responsibility Agreement on the Prevention and Control of Atmospheric Pollution signed by Ministry of Environmental Protection and the 31 national provinces/cities, the annual PM_{2.5} average concentration in Beijing, Tianjin and Hebei declined by 25 %, and Shanxi, Shandong, Shanghai, Jiangsu and Zhejiang with the task of 20 % decline, 15% in Pearl River Delta, Chongqing, and 10 % in Inner Mongolia.

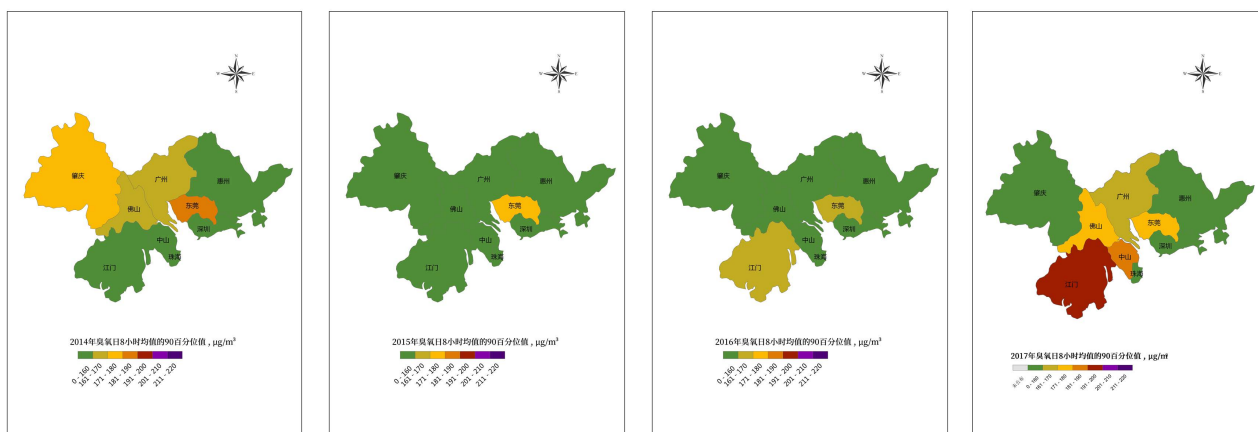


Figure 4 Variations in the O₃ Concentrations in Pearl River Delta Region from 2014 to 2017

The SO₂ reduction was the most during the “Ten Air Measures” period. In 2017, for the first time, the annual average concentrations of SO₂ of all 30 provinces/cities across the country have complied with National Stage II standards. The SO₂ pollution in all provinces/cities was basically decreasing year by year. Compare with SO₂, the reduction of NO₂ was slower, amongst 30 provinces/cities, Beijing, Tianjin, Hebei, Shanxi, Shanghai, Chongqing and Shaanxi were still exceeded the national standard, 15 provinces/cities the average concentrations increased from those of 2016.

In addition, the O₃ pollution has gradually stood out, it has become the major pollutants after particulate matter in BTH region and the Yangtze River Delta region, and become the primary pollutant in the Pearl River Delta region. The O₃ 8-hr running average concentrations in 8 provinces/cities including Beijing, Tianjin, Hebei, Shanxi, Shanghai, Jiangsu, Chongqing and Shaanxi were exceeding the national standards while there was only 5 provinces/cities in exceedance in 2016. Furthermore, the O₃ concentrations in 19 provinces/cities increased compared to 2016.

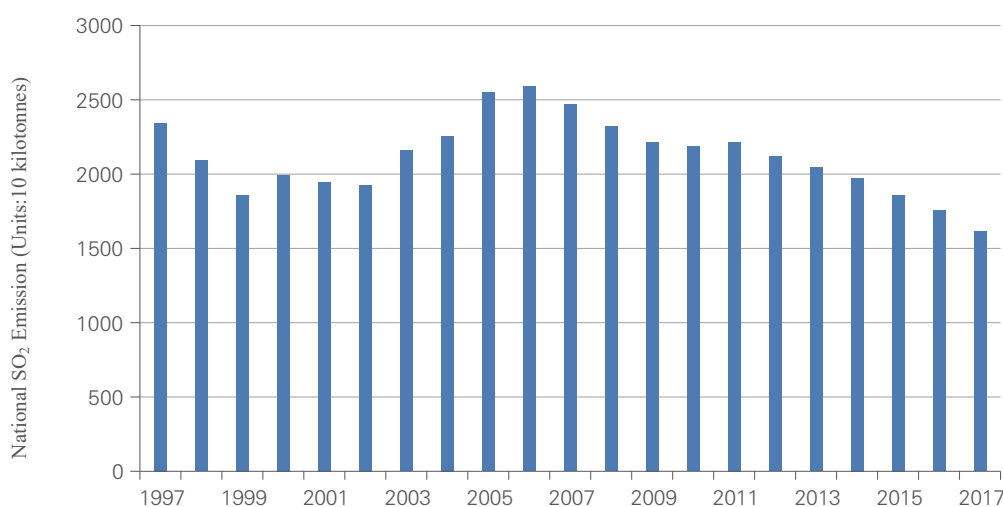


Figure 5 Annual SO₂ Emission in China from 1997 to 2017

▲ **Pollutant emission control: from 2013-2017, total emission of SO₂ and NO_x decreased significantly; the emission control of VOCs has been continuously strengthened and has gradually become an important index for air pollution prevention and control of in China.**

From 2013 to 2017, total SO₂ emission continued to decrease at an increasing rate year by year. In 2017, the total emission has reduced by 21 % from that of 2013. In addition, the total NO_x emission also went down significantly, in 2017 it has reduced by 24 % compared to 2013.

VOCs emission control faces many challenges, and the total emission still tends to rise. During the National Thirteenth Five-year Plan, both the central government and the local governments have started moving forward to VOCs pollution control, a series of relevant policies, measures and standards have been issued.

▲ **Since the implementation of "Ten Air Measures", the growth rate of the total carbon emission is basically zero, and the commitment to reduce the emission intensity per unit GDP by 40 % - 45 % before 2020 has been fulfilled ahead of the schedule. Coal share in total energy consumption has declined for five consecutive years. All seven provinces/cities have achieved their targets of negative growth in coal consumption set by the "Ten Air Measures". Preliminary estimation shows that implementation of some key measures in BTH region could benefit more than 350 million tons of greenhouse gas reduction each year.**

The "Ten Air Measures" clearly illustrates the goal to adjust and optimize the industrial structure, accelerate the adjustment of energy structure and increase clean energy supply. Since its implementation in 2013, it effectively contributed to co-control on climate change and the growth rate of total carbon emissions is basically zero. Since the "Ten Air Measures" has set the goal to reduce coal cap, coal used in direct energy consumption has declined for five years continuously. In 2014, the total coal consumption turned down for the first time in nearly 16 years. Majority of provinces/cities have set the goal to reduce coal cap and achieved negative growth. Seven provinces/cities have met their coal cap targets set by the "Ten Air Measures". During the "Ten Air Measures" period, industries like iron, steel, coke, cement etc. in BTH and surrounding region have eliminated excess production capacity by nearly 300 million tons. In addition, small-sized coal-burning boilers has been reduced by 320,000 steam ton, about 6 million households have replaced their winter heating energy from coal to electricity or gas, more than 8.4 million old and "yellow-label" (high emission) vehicles have been eliminated. According to preliminary estimation, the above measures in BTH and surrounding region can benefit about 350 million tons of carbon emission reduction every year. By the end of 2017, China's carbon emission intensity per unit GDP has dropped 46 %³ compared with 2005 and the commitment to reduce the emission intensity per unit GDP by 40 % - 45 % before 2020 has been fulfilled ahead of the schedule.

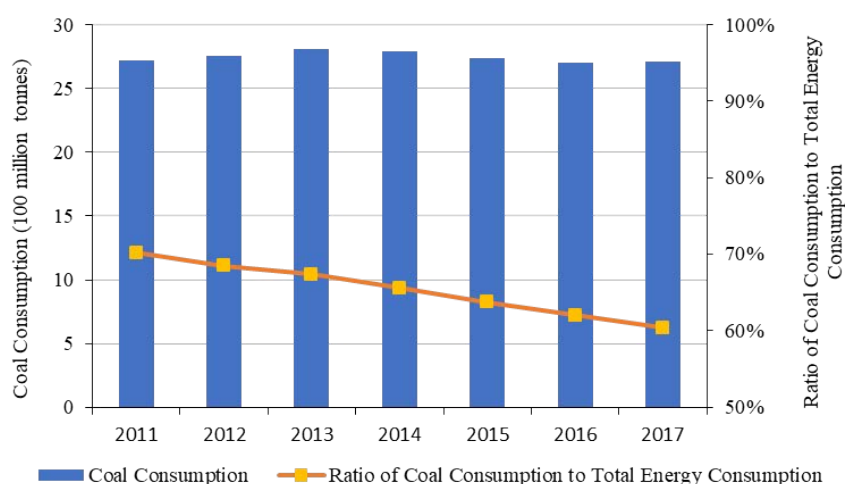


Figure 6 Ratio of nationwide coal consumption to total energy consumption from 2011 to 2017

▲ **Environmental air quality management: from 2012 to 2017, over 280 air quality related standards, policies and regulations were issued by the central government. A Chinese version of air quality management system has been established, several innovative management mechanisms and modes were invented. Particularly, the establishment of regional air pollution prevention cooperative mechanism has substantially accelerated the regional air quality improvement pace.**

Since action of the amended atmospheric air quality standards in 2012, a boost of environmental policies has been produced, especially for air pollution control. According to incomplete statistics, approx 280 policies, standards, regulations and plans have been issued. They have formed a new pattern with the central government as the core and the joint participation of ministries and local governments in the implementation. China has developed a Chinese version of air quality management system and has given a strong impetus to the process of air pollution prevention and control.

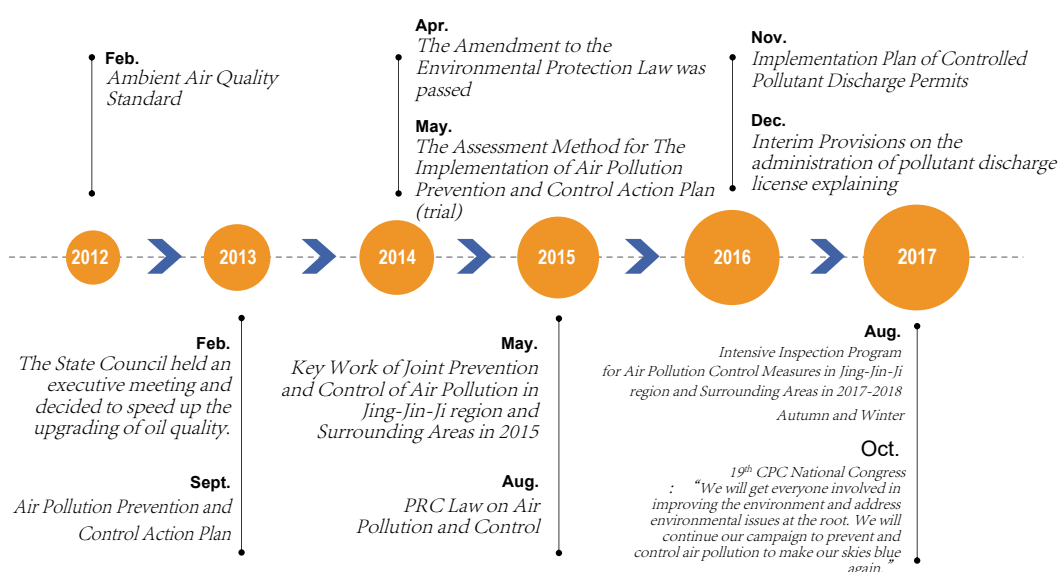


Figure 7 2012-2017 Core policy roadmap of China's air pollution prevention and control

Over the past five years, China's air quality management objectives have gradually changed from total emission control to air quality control, the supervision and assessment system involves central and local governments has been formed and continuously strengthened. In addition, a unique management mode in China including National Environmental Protection Inspection, the municipal air quality ranking system, annual assessment, questioning mechanism, etc. Meanwhile, the reform of environmental monitoring management, reform of pollutant discharge permitting and reform of economic incentive scheme have been carried out. Moreover, city air quality attainment mechanism, an innovative regional cooperation mechanism have been formed. Information disclosure has been continuously strengthened and public participation has gradually increased.

Cooperative mechanism in BTH and surrounding region is a great innovation for regional air quality management in China, which has broken the boundary of administrative division and solved the world class problem of long-distance transportation and regional interaction of air pollution. After about 5 years of cooperation, an effective cooperation mechanism has established. During these five years, the boundary of the regional cooperation has expanded from three province/cities including Beijing, Tianjin and Hebei to seven provinces/cities including Beijing, Tianjin, Inner Mongolia, Shanxi, Shandong, Hebei and Henan. More and more relevant ministries have gradually involved. Serial scientific studies on regional policy making have been conducted, policy and measure implementation mechanism has been established, regional cooperation scope has been widened and deepened.

Driven by this cooperation mechanism, BTH and its surrounding region has achieved tremendous pollutant reduction and the air quality has improved significantly. However, the current collaboration mechanism is yet completed. In the future, there are still a lot of works to be done including a constant management structure, a long-term scientific research cooperation platform, systematic regional law enforcement and a detailed regional evaluation system.

▲ Future Prospect: Goals set by 2020 on the annual average concentration of PM_{2.5}, the ratio of heavy pollution days, the emission control of SO₂ or NO_x are expected to be achieved in advance. Several greenhouse gas control tasked set by "13th Five-Year Plan" have already been fulfilled. Thanks to the continuous stringent air quality improvement progress requirements, China will continue to be the world's largest clean air technology market.

June 2018, the State Council issued the "Three-Year Action Plan on Defending the Blue Sky" and proposed the air quality improvement targets by 2020. Over the past few years, the annual average concentration of PM_{2.5} and the ratio of heavy pollution days have decreased significantly. The 2020 target are expected to be achieved ahead of schedule. However, progress on the ratio of compliance days are still slow, there is still a significant gap toward the 2020 target. The total emission control of SO₂ and NO_x has made great progress. Especially for SO₂ emission in 2017 which was already very close to the 2020 target. In the new action plan, the scope of BTH region and Yangtze River Delta region has been expanded, 12 cities in Fen-Wei plain have been added into BTH region. In the future, challenges on air quality improvement will still remain. Although China has made great progress on air quality improvement, more than 70 % of cities still yet complied with the air quality standard. In addition to particulate pollution, many provinces/cities also face new threats of ozone pollution, difficulties on policy making and implementation will continue to raise. More customized measures for different cities will continue to be designed and produced. During the 19th CPC National Congress, China has shown its determination to fight pollution vigorously by 2020 and fundamentally improve its ecological-environmental system, to achieve "beautiful China" by 2035.

To build a beautiful China and restore the blue sky by 2035, it is essential to achieve the national air quality standard nation-wide, many industries which are directly related to the prevention and control of air pollution will face great opportunities for development. According to the relevant research, by the end of 2030, there would be more than 20 trillion market opportunities for parts of the key areas of clean air and China will continue be the world's largest clean air market.

Bluetech Clean Air Alliance

Bluetech Clean Air Alliance (BCAA) is a non-profit professional organization focusing on the development of clean air technologies and industries in China and the world through technology transfer, technology assessment and demos, investment service, IP protection, and policy research. Succeeded from the Clean Air Alliance of China (CAAC), BCAA has accumulated over five years' experience in various clean air research projects, carried out pilot projects in 10 provinces and cities in China, published 46 policy and market research reports, assessed over 200 advanced clean air technologies from 16 countries, and established collaborations with partners across 20 countries.

BCAA was evolved from CAAC, which was launched in January 2013 with the aim to improve China's air quality via providing systematic technical support on policy making and implementation. CAAC was initiated by 10 leading research entities including Tsinghua University, Chinese Academy for Environmental Planning, Appraisal Center for Environment & Engineering of MEP, providing a platform for cities and provinces, domestic and international research institutions, relevant government departments, enterprises and NGOs to work together.



Suite 709, East Center, 24A Jiangguomenwai street,
Beijing 100004 Tel: +86-1 0-65155838
Email: cleanairchina@iccs.org.cn