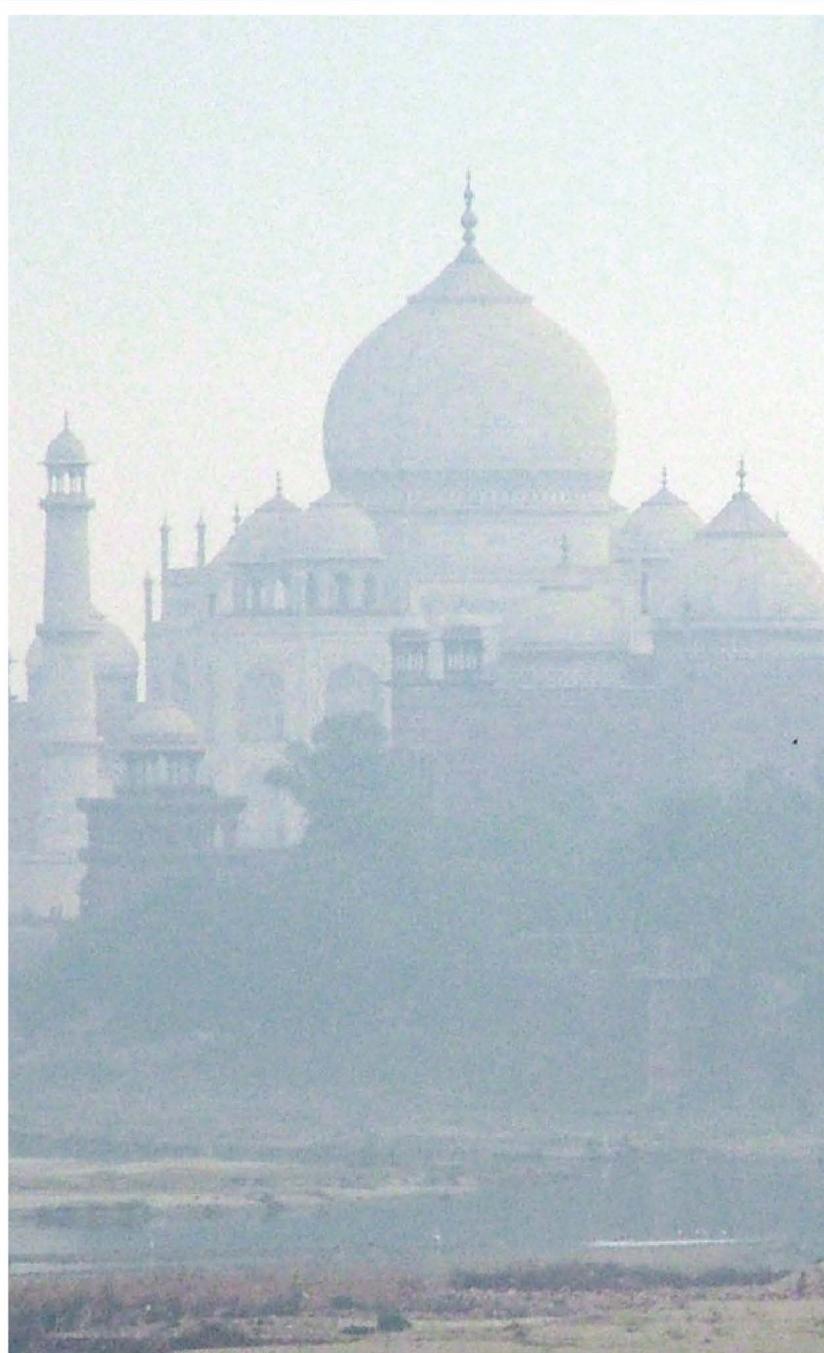


# Gaining a Rapid Win against Air Pollution: How India Can Make Use of China's Experience

Discussion Version



## 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.

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## EXECUTIVE SUMMARY

India released its National Clean Air Programme (NCAP) on January 10<sup>th</sup> 2019, setting targets of 20-30% reduction of PM<sub>2.5</sub> and PM<sub>10</sub> concentration by 2024 for 102 cities. Since then, issues such as the economic costs of the clean air campaign and feasibility of the NCAP targets have attracted significant attention.

The situations were similar in China when its government issued its National Clean Air Action Plan (2013-2017)(hereafter, the National Action Plan) six years ago, with ambitious PM<sub>2.5</sub> and PM<sub>10</sub> reduction targets. The targets required China to improve its air quality in 5 years, comparable to the reduction in air pollution achieved in Europe and US over a number of decades. At first, many thought the national plan would be "Mission Impossible", and it would have enormous costs that could throttle the country's economic growth.

However, the reality proved such skeptics wrong: In only five years, PM pollution in China was reduced by 22.7% on average, and air quality in Beijing and its surrounding region (viz., Beijing-Tianjin-Hebei region - hereafter the BTH region) improved by nearly 40%. Furthermore, stringent air quality targets have stimulated innovation in China's environmental management and governance system and contributed to fast development of the markets for clean air technology and new energy solutions.

Being the world's two largest emerging economies and the most populous countries, India's and China's battles against air pollution are attracted to the world's attention. China started its national clean air program from scratch because there were simply no previous cases of bad air affecting such a huge area and population. But for India, China's experience

is a good case study on which to structure its own implementation framework . This doesn't mean that all measures that have been effective in China will be successful in India, but there are a few key drivers which have proved essential in securing significant and rapid improvement in air quality:

### **Strong political commitment**

The National Action Plan was released and assessed by the State Council of China, not the Ministry of Environmental Protection. The state council oversees all ministries and is the highest administrative organization. The Chinese government started to show strong political commitment in tackling the issue from the highest levels, which is widely considered to be a key factor of success. In India, the political system is different and in such a democratic set up, the central government doesn't enjoy as strong an enforcement power as its Chinese counterpart. Yet, strong political signals and statements of intent from the highest levels are still key in driving the urgency of how air pollution must be dealt with. In addition, political commitments from the state governments are also required, which are evaluated by an effective enforcement structure, so that the commitments are transformed into solid action. With the NCAP in place, and a new government at the centre, India has an opportunity to signal decisive political commitment and drive a unified framework that can deliver results.

### **Science-based policy making**

The buildup of air pollution is a complex process that draws from numerous primary sources, and from processes such as the formation of secondary particles through physicochemical reactions between pollutants. Effective air quality

management thus requires scientific assessments, including various aspects like data monitoring, emissions inventory, air quality modeling, source apportionment analysis and transport planning. It's also necessary that policy decisions are made on, and reflect latest scientific findings. China's lessons showed that significant investments and efforts that have no foundation in science are made in vain, with no impact on air quality improvement.

#### **Regionally coordinated air quality management**

No city can win the battle against air pollution on its own, because pollutants travel and spread out through regional wind patterns. Air quality management must be coordinated across cities and regions. It is key to make sure that policies are designed in a coordinated fashion for cities and regions under the same airshed, which sometimes calls for action that goes beyond administrative boundaries. This is an important factor in the Indian context as well. The NCAP lists 102 non-attainment cities that are spread out across the country, so it will be key for policy makers to buy into the airshed approach - which addresses the regional nature of air pollution.

#### **Enhanced air quality policy enforcement**

Strong enforcement holds the key to effective air quality management. For China, two components are vital in its strong policy enforcement, namely comprehensive monitoring and environmental inspection system. Comprehensive and credible air quality monitoring data is the prerequisite for policy making, it is also key to evaluate enforcement an assess policies. By far, China has built a large air monitoring network with over 5,000 monitoring sites. Moreover, a system of environmental protection inspection established in 2015 is the vehicle for central government to guide and evaluate enforcement at provincial and municipal levels. By sending inspectors to provinces and cities and handle public complaints and reports, the inspection

system has successfully resolved the conflicts of interest between local governments and companies, and delivered strong and quick outcomes.

#### **Development and application of clean air technologies**

It is reported that RMB 1.8 trillion was invested to meet China's 2017 air quality target, and it generated RMB 2 trillion of GDP growth in return<sup>1</sup>. China's experience shows that air quality improvement is aligned with technology development and economic growth. After massive deployment in the Chinese market, the costs of clean technologies have kept falling. Overall, it's Chinese suppliers of clean technologies who have benefitted from the country's crackdown on air pollution, and their products can now be deployed in the global market- including in India.

In fact, worsening air pollution and high pace of economic growth may indicate that, according to the Environmental Kuznets Curve theory, India is rapidly nearing a "turning point". Tackling air pollution could also create opportunities for India to update its energy and industry structure, and contribute to innovation in technology. In this context, if the right policies and technologies are implemented and deployed, India could embrace the unique opportunity to achieve both clean air and continued economic growth, just as China did.

Cases in various countries show that quality management efforts could trigger a deep reform of the domestic environmental management system which enables environmental protection to become a higher priority in policy making and bring in a more effective enforcement mechanism, this can happen in India too.happen in India too.

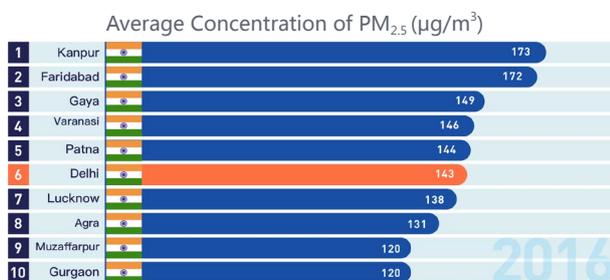
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<sup>1</sup>*Investment Requirements and Potential Effects of Implementing China's Air Pollution Prevention and Control Action Plan (2013-2017)*. Bluetech Clean Air Alliance.

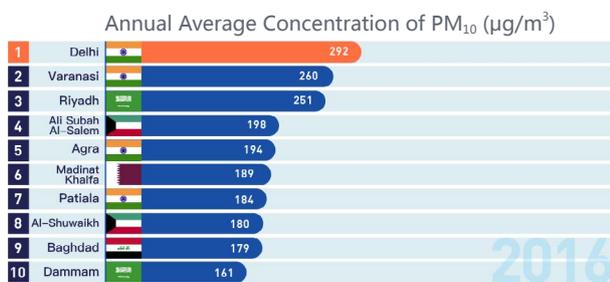
## CHAPTER SUMMARIES

### 1. Opportunity for India: Toward Cleaner Sky

Despite India's rapid economic development, its problem of poor air quality stands out, and has grown to become an issue of high public concern. According to the database released by the World Health Organization (April 2018), in 2016, the world's top ten cities with the worst PM<sub>2.5</sub> pollution were all located in India. Delhi, meanwhile, remained in the list of the top ten most polluted cities (PM<sub>10</sub>) from 2010 to 2016, and topped the list in 2016.



Top Ten of World's Most PM<sub>2.5</sub> Polluted Cities (2016)

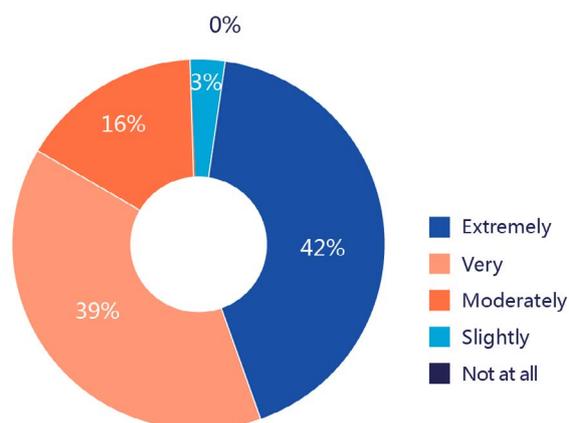


Delhi Topped the World's Most PM<sub>10</sub> Polluted Cities (2016)

Air pollution is believed to be one of key causes of death in India. The Global Burden of Disease study in 2017 concluded that premature deaths related to exposure to PM<sub>2.5</sub> in India were the second highest in the world. In 2017, 1.24 million deaths in India were attributable to air pollution which accounts for 12.5% of the total number of deaths in the year.

In Delhi, poor quality air irreversibly damages the lungs of 2.2 million residents or 50% of its children. The health costs of air pollution have caused massive losses to the Indian economy. A study by the World Bank and the Institute for Health Metrics and Evaluation found that India's labor losses due to air pollution stood at about \$55.39 billion, or about 0.84% of its GDP in 2013. The World Bank report also revealed that air pollution cost Delhi and Mumbai as much as \$10.66 billion in 2015, which is equivalent to 0.71% of the India's GDP of that year.

Indian citizens' awareness and public scrutiny of air pollution are also rising. A survey showed that 81% of people in India claimed to be extremely or very concerned about air pollution (see below). Public protests demanding that air pollution be considered a key issue that needs to be addressed have also started, and the discourse is at a point where there is significant awareness amongst the urban class on the existence of the problem, even though the solutions are yet being discussed.



Public Awareness about Air Pollution in India<sup>2</sup>

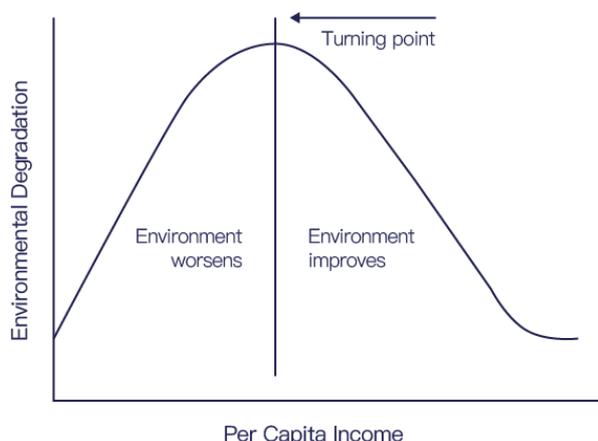
<sup>2</sup>A survey study of public awareness, perceptions and attitudes on air quality in urban India. Shakti Sustainable Energy Foundation and Edelman India (SHAKTI).

Despite insufficient data support from the under-developed air quality monitoring network, India has put efforts into scientific air pollution source apportionment analyses in recent years. According to these studies for Delhi, Agra, Bengaluru, and Chennai - besides external sources - transport, dust and domestic sources were major contributors to the cities' PM<sub>2.5</sub> pollution in 2015.

An important step was taken in January 2019, when India released its National Clean Air Programme (NCAP) and announced the target of 20-30% reduction of PM<sub>2.5</sub> and PM<sub>10</sub> concentration by 2024 for 102 non-attainment, or poor air quality, cities. It is considered as a key milestone for Indian air quality management, as before this, there was no clearly defined framework of actions to tackle India's air pollution.

While there is some skepticism about the feasibility of the national plan and its economic costs, its air pollution crisis presents India with a significant opportunity to drive technical innovation and add to its economic output. These are elaborated as under:

- **Opportunity for dual benefits:** According to the study on Environmental Kuznets Curve (EKC), India is most likely to be reaching the environmental "turning point". Taking cue from other countries that have already experienced severe pollution problems, and looking at India's economic growth and severity of air pollution, it is plausible that under the correct mix of policies and technologies, India could significantly improve its air quality and add to its economy.

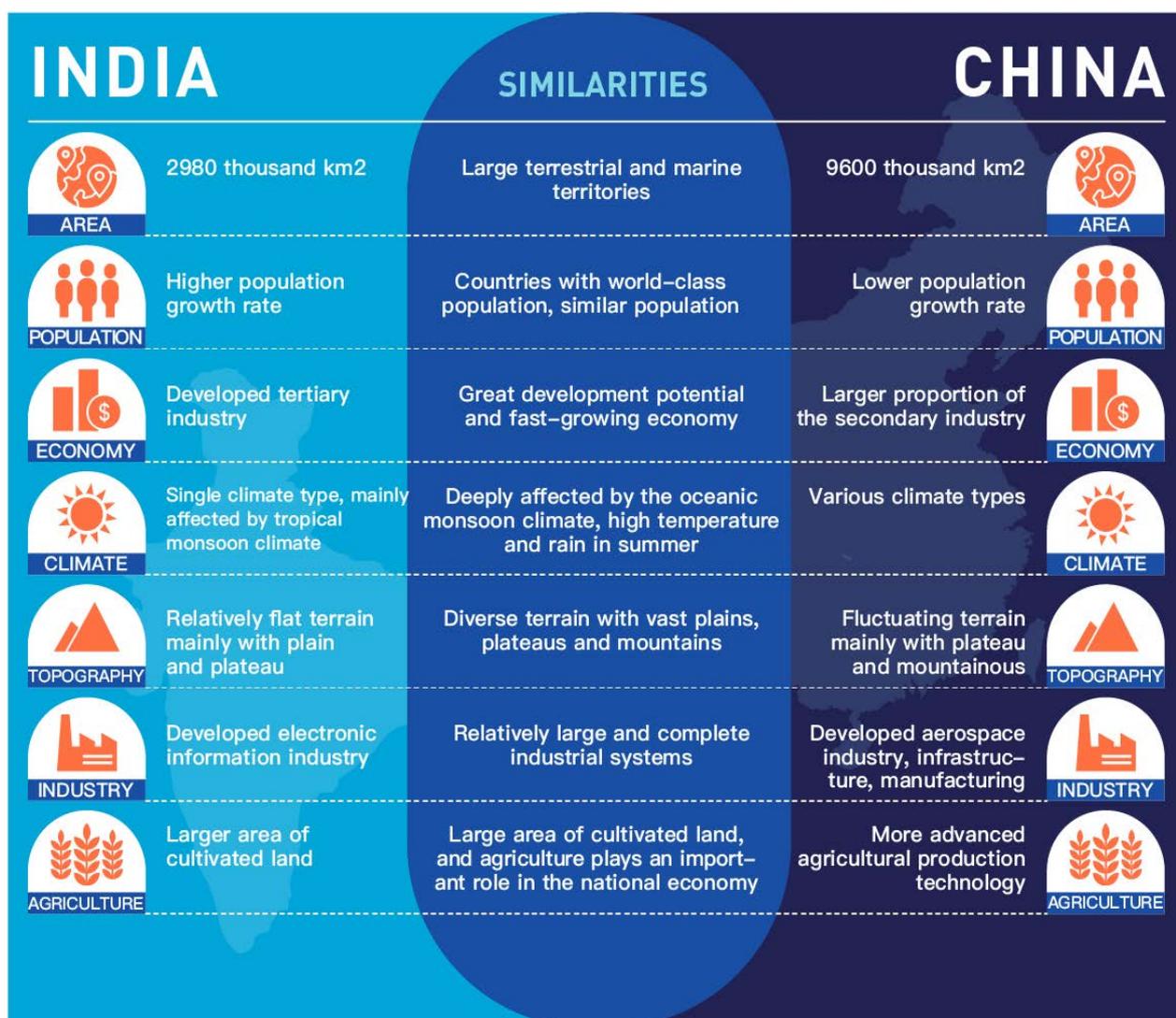


*Environmental Kuznets Curve*

- **Opportunity for establishing and strengthening environmental management system:** Experience from the UK, US and China shows that an effective air quality control system usually precedes the improvement of a nation's environment management system. India has just released its NCAP, and must use it to build a better environmental management system under its the blue skies campaign.
- **Opportunity for co-control of air pollutants and Green House Gases (GHGs):** Since air pollutants and GHGs often emanate from the same sources, such as vehicular and industrial exhaust, India has the opportunity for a co-reduction in its air pollutants and GHG emissions.
- **Opportunity for industrial structure reform and technical innovation:** The stringent demands on emissions control under a strong air quality campaign stimulate industrial energy reform and technological innovation – as it did in China. These measures and innovations can even be shared outside domestic markets and add to India's economic growth.

## 2. Case of China: Significant Improvement over 5 Years (2013-2017)

India and China are both populous agricultural countries that control land and marine territories. Both nations have diverse climatic conditions and geographies, and have emerged as the world's two largest growing economies.

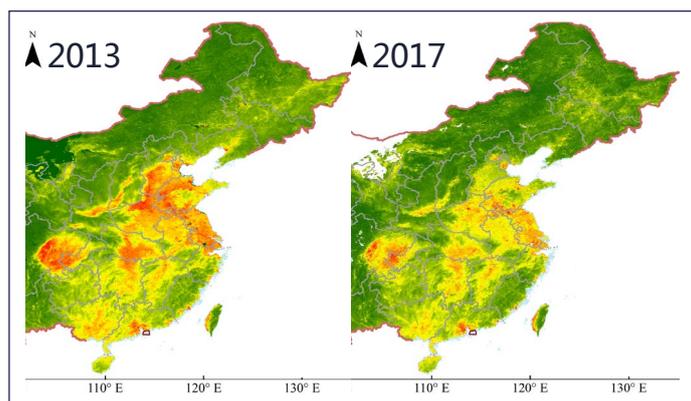


Similarities and Differences between India and China

Rapid economic development in China over the last 40 years resulted in severe air pollution, that eventually drew the attention of both its people and its central government. In March 2013, Chinese Premier Li Keqiang declared a war against air pollution, signaling the highest political commitment to fight the issue. Six months later, China's State Council released the National Clean Air Action Plan (hereafter, the National Action Plan), which is widely considered to be the start of a new era of environmental management and governance in China. Following that, environmental protection policies and regulations - especially policies that addressed air pollution - were issued more frequently. At least 280 policies, appearing in different forms under regulations, sectoral standards

and plans, had been rolled out at the ministry-level or above by the end of 2017.

The results were obvious, as between 2013 and 2017, China's air quality improvement was rapid and significant. China has managed to reduce PM concentration by over 20% for all 338 of its target cities on average, while key regions achieved even better results. One example is of the Beijing-Tianjin-Hebei (BTH) region, which slashed its PM<sub>2.5</sub> concentration by almost 40%. China's case has therefore demonstrated that air quality improvement within a short period is achievable, with a strong implementation, monitoring and evaluation framework as a pre-requisite.



Satellite Inversion Map of Near-surface  $PM_{2.5}$  Concentrations in Key Areas of China in 2013 and 2017<sup>3</sup>

China's efforts also lead to the growth of its green economy, thanks to technology development in response to market demands. It was estimated that a total of RMB 1.8 trillion was invested on air pollution control and resulted in RMB 2 trillion worth of national GDP growth by 2017. As air

pollutants and greenhouse gases are mainly discharged by the same source-burning of fossil fuels-measures to reduce air pollution can also contribute to positive action against climate change. By 2017, China's emission intensity per unit GDP had dropped by 46% over 2005 levels.

Table 1: Outputs and CO<sub>2</sub>e Emission Reduction Effects of Key Measures in BTH and Surrounding Regions

Measures	Measure output	CO <sub>2</sub> e emission reduction per year
Clean Heating	By the end of 2017, nearly 6 million households had switched to clean energy heating.	Nearly 40 million tons
Elimination of Small-sized Coal-burning Boilers	As of 2017, 219,000 of small-sized coal-burning boilers (320,000 tons vapor) have been eliminated.	More than 200 million tons
Elimination of Overcapacity	From 2013 to 2017, industries including iron, steel, coke and cement cut overcapacity by nearly 300 million tons.	About 100 million tons
Elimination of Yellow-label Vehicles and Outdated Vehicles	By 2017, over 20 million outdated vehicles and yellow-label vehicles had been eliminated in China, and more than 8.4 million vehicles were eliminated in BTH and its surrounding area.	973,000 tons

<sup>3</sup>China Air Quality Management Assessment Report (2018). Blutech Clean Air Alliance.

### 3. Takeaways from China's Experience

China's experience in the past years offers the following lessons that are of value to India:

- **Rapid and significant air quality improvement is achievable.**

From 2013 to 2017, PM pollution in China was reduced by 22.7% on average, and air quality in BTH region improved by nearly 40%. China's experience has demonstrated that it is possible to achieve significant air quality improvement within a short period in nowadays.

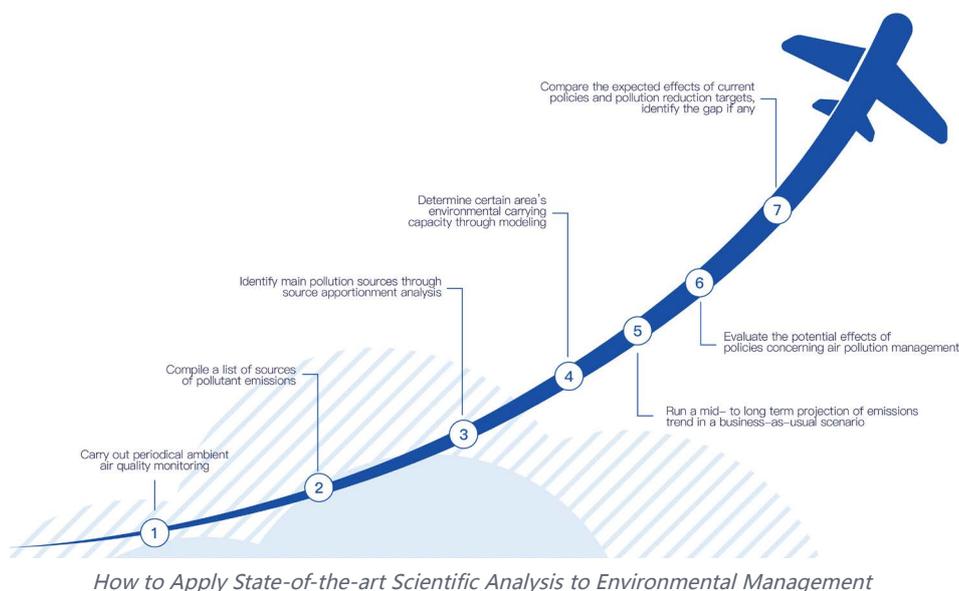
- **Strong political commitment is essential.**

Air pollution control is a multi-sectional task, and needs to integrate the efforts from many governmental departments, and introduce consistent policies and regulations. The China case demonstrated that strong political commitment is the very important first step in winning the air pollution combat. For example, the National Action Plan was released and assessed by the State Council of China, not the Ministry of Environmental Protection. The

state council oversees all ministries and is the highest administrative organization. In India, the governance structure is very different from China. Political commitment from the central government and state government are both required. An effective enforcement structure is also necessary to ensure the political commitment can be transformed into solid actions.

- **Policies must be based on scientific studies.**

Air quality management is a complicated task that requires experts on data monitoring, emissions inventory, air quality modeling, source apportionment and transport planning to work together. Air quality management decisions should also be based on well-designed scientific studies that adequately assess local conditions. Otherwise, the investment of resources and money may be in vain, with little or no appreciable improvement in air quality. All implementation measures must also be screened through cost-benefit analyses, so that only the most optimal action plans are selected.



- Air quality management must be regionally coordinated.

Air pollutants are transported away from their point of origin due to regional air patterns. Therefore it is important to ensure that all implementation targets, policies and measures are designed with adequate consideration to regional airsheds. Integrated regional air quality management and coordination is also essential. On the one hand, it is necessary to break out of administrative boundaries and utilise regional environmental management resources as a whole; on the other, it is important to minimize pollution relocation within the same airshed. The BTH regional air quality management in China offers a good model for India.

- Policy enforcement needs to be emphasized and enhanced.

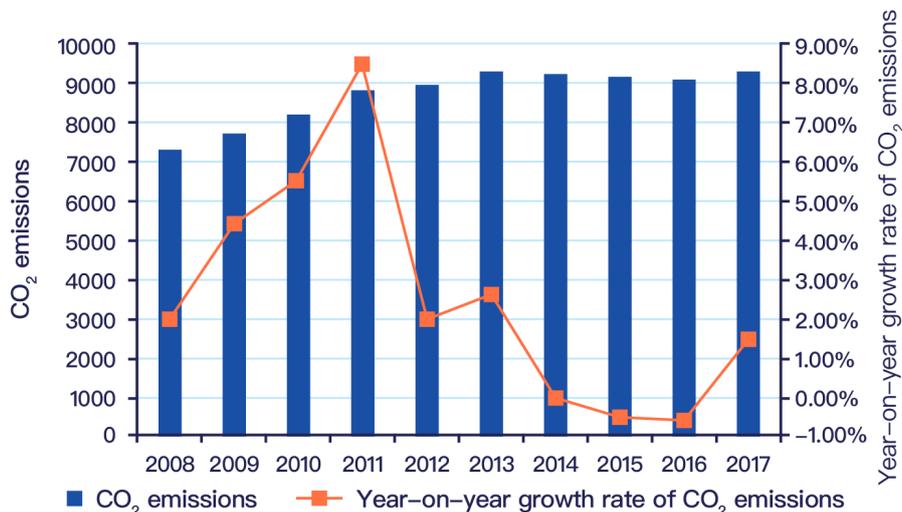
Strong enforcement holds the key to effective air quality control policies and measures. Two components have been essential in China's air quality control enforcement: monitoring and inspection, and supervision.

- Clean air campaign can boost technology development.

China's experience with air pollution control shows that air quality improvement can align with clean air technology development and the growth of the green economy. Clean air technologies in China have driven the development of many relevant industries, and their market demand also drove their prices down. India could also benefit from these low cost technologies by collaborating with Chinese technology providers.

- Improving air quality can contribute to tackling climate change.

Air pollutants and GHGs are often discharged by the same source, one of which is coal burning. Since China's National Action Plan was introduced in 2013, coal's share in China's total energy consumption has fallen for five consecutive years. China's total GHGs emissions have also not increased since 2013.



Variations of CO<sub>2</sub> Emissions and the Year-on-year Growth of CO<sub>2</sub> Emissions in China from 2008 to 2017<sup>4</sup>

<sup>4</sup>BP (2018) Statistical Review of World Energy.

## Structure of Full Report

### Executive Summary

#### **Chapter 1 Opportunity for India: Toward Cleaner Sky**

- 1.1 Overview: Air Pollution in India
- 1.2 Opportunity for India

#### **Chapter 2 Case of China: Significant Improvement over the Past 5 Years (2013-2017)**

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- 2.2 Rapid Air Quality Improvement
- 2.3 Energy & Industry Structure Reform and Technology Innovation
- 2.4 Co-benefits for Curbing Climate Change

#### **Chapter 3 Takeaways from the China Case**

- 3.1 Rapid and Significant Air Quality Improvement is Achievable
- 3.2 Strong Political Commitment is Essential
- 3.3 Science-Based Policy Making
- 3.4 Regional Air Quality Management is Important
- 3.5 Enhanced Air Quality Policy Enforcement
- 3.6 Development and Application on Clean Air Technologies
- 3.7 Significant Co-benefits of Reducing GHGs Emissions

## 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. BCAA is evolved from the Clean Air Alliance of China, an integrated platform launched in 2013 by 10 leading Chinese research institutions to tackle China's severe air pollution problem. Over five years' operation, the Alliance has conducted and participated in various clean air research projects, carried out pilot projects in 10 provinces and cities in China, published 51 policy and market research reports, assessed approx. 300 clean air technologies from 22 countries, and established collaborations with partners across 20 countries.





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