



How to Achieve the Air Quality Attainment in the Yangtze River Delta Region?

Scenario Analysis for Reaching PM_{2.5} Standard in Shanghai, Jiangsu and Zhejiang.

Executive Summary



CAAC Policy Report

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Authors:

Tsinghua University

Wang Shuxiao

Shanghai Environmental Monitoring Center

Fu Qingyan

Shanghai Academy of Environmental Sciences

Li Li

Innovation Center for Clean-Air Solutions (CAAC Secretariat)

Xie Hongxing, Wang Lisha

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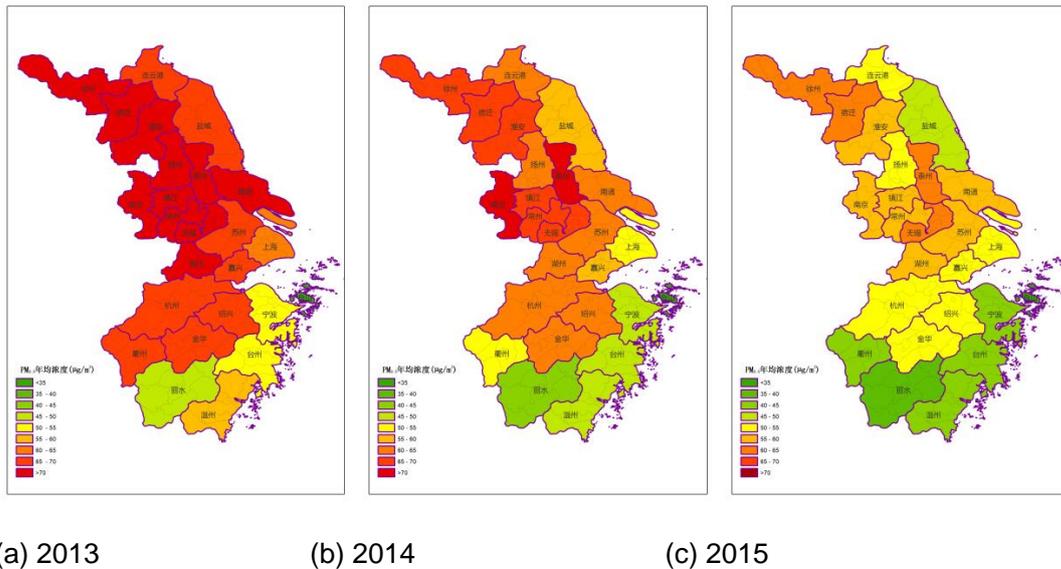
Yangtze River Delta Zone (hereafter referred to as “the Delta Zone”), covering Shanghai, Jiangsu and Zhejiang¹, is the top economic zone in China. However, the Delta Zone has been facing a severer environmental situation due frequently occurred air quality incidents in recent years. In September 2013, the State Council released “*Action Plan on Air Pollution Prevention and Control (2013-2017)*” and proposed to reduce the concentration of fine particulate matter (PM_{2.5}) in the Delta Zone by about 20% by 2017. According to the air quality attainment schedule² for cities across the country made by the Ministry of Environmental Protection (MEP) in 2013, the Delta Zone should make medium and long term air quality attainment plans, and all the cities should strive to reach the national standard (annual average PM_{2.5} concentration equals 35 µg/m³)³ by 2030.

The trend of annual average PM_{2.5} concentration in the Delta zone in last three years shows an obvious year-by-year decline (Figure 1). Yet, the annual average PM_{2.5} concentrations in all cities in the Delta Zone except for Zhoushan in 2015 remained higher than the national limits. The situation in Jiangsu was the worst.

¹ According to *the Development Planning of Yangtze River Delta Agglomerations* approved by the State Council Executive Meeting in May 11, 2016, Hefei Metropolitan Area was incorporated into the Delta Agglomerations. The coverage of the Delta has been extended from “two provinces and one municipality” (Jiangsu, Zhejiang and Shanghai) to current “three provinces and one municipality” (Jiangsu, Zhejiang, Anhui and Shanghai.)”. But this Paper was prepared prior to the issuance of the Planning and therefore does not involve correlative analysis on Anhui province.

² http://www.chinadaily.com.cn/hqgj/jryw/2013-01-25/content_8124505.html. The MEP Strives for Air Quality Standard Level 2 in All Cities across China by 2030: Cities with excessive major atmospheric pollutants of no more than 15% should strive to achieve the air quality standard by 2015, those with excessive major atmospheric pollutants between 15% and 30% should strive to achieve the air quality standard by 2020, and those with excessive major atmospheric pollutants of more than 30% should make medium and long term plans so that all cities across the country can achieve air quality standard Level 2 by 2030.

³ According to *the Ambient Air Quality Standard (AAQS) (GB3095-2012)*, residential areas, commercial, transportation, and residential mixed areas, cultural areas, general industrial areas, and rural areas as defined in town planning should execute secondary standards, whose limit for annual average PM_{2.5} concentration is 35µg/m³. Since the major pollutant in the Yangtze River Delta Region is PM_{2.5}, the study takes the achievement of PM_{2.5} attainment as an indicator for the achievement of air quality standard during the analysis.



(a) 2013 (b) 2014 (c) 2015
 Figure 1. Annual average PM_{2.5} Concentrations in the Cities in Yangtze River Delta Zone, 2013-2015⁴

Based on the medium and long term targets for 2030, this Study conducts scenario analysis on how Shanghai, Jiangsu and Zhejiang to achieve PM_{2.5} targets. The analysis results suggest that to ensure full compliance with air quality standards across the Delta Zone, we have to, on one hand, implement emission reduction measures for maximum potential and, on the other hand, implement sustainable energy development strategies. The strategies and measures include:

1. Adjustment to energy structure and industrial structure, Change of life styles and Improvement of energy efficiency

- The share of coal in energy consumption should be cut down by using more clean energy. The share of coal in primary energy consumption should be cut down to 52%, the share of natural gas should be increased to 9%, and the share of biomass and other renewable energy sources should be increased to 20%.
- The share of coal-fired generation capacity shall be reduced and the efficiency of coal-fired power generation should be improved. The share of coal-fired power generation capacity in total power generation capacity should be reduced to 57%. The share of supercritical and ultra-supercritical power generation units and

⁴ Data of the annual concentrations of PM_{2.5} in key cities in China for the year of 2013, 2014 and 2015 were published by Greenpeace.

integrated gasification combined cycle generating units should be substantially increased.

➤ Best available technologies (BAT) should be widely used in all industries. Backward and high energy consuming technologies should be replaced by efficient energy technologies. China's energy efficiency should match or catch up the world's highest level.

➤ New energy vehicles should be promoted and fuel economy should be improved. The shares of hybrid electric cars, plug-in hybrid cars and electric cars among total new cars sold should arrive at 25%, 28% and 2% respectively. The fuel economy of new cars and heavy-duty vehicles should be increased by 33% and 57% respectively than those in 2010 through implementing new fuel economy standards.

2. Full implementation and use of pollutant control technologies.

➤ *Power Sector:* Emission of SO₂, NO_x and particulate matters should be controlled to ultra-low levels through renovation. The use of the state-of-the-art pollutant control technologies should be maximized.

➤ *Industrial Sector:* For industrial boilers, the state-of-the-art emission reduction technologies should be made full use of, such as flue gas desulfurization, low NO_x combustion plus selective catalytic reduction and efficient dust removal technologies. For industrial process sources, the latest emission standards for each industry should be executed, and the state-of-the-art end-of-pipe control measures should be implemented. For volatile organic compounds (VOCs) in industrial processes, the end-of-pipe control measures and recycling technologies for VOCs should be used.

➤ *Traffic Sector:* Strictest existing European standards should be applied to all automobiles. Elimination of high-polluting and high-emission vehicles should be accelerated. All gasoline/diesel fired light-duty vehicles and diesel heavy-duty vehicles should comply with Euro 6, and all gasoline-fired cars should basically meet with Euro 6 standards.

➤ *Use of Solvents:* Solvent content should be reduced. Technologies such as alternative water-based paints should be used to eliminate VOCs emission. For printing ink, coating, printing and

packaging industries, the method of "substitution + end-of-pipe measures" should be taken.

➤ *Residential/commercial purpose combustion and open burning of biomass:* Both residential and commercial sectors should reduce and even eliminate energy consuming and high polluting stoves. Desulphurization facilities should be installed to all residential and commercial boilers. Priority shall be given to use of low-sulfur coal. Efficient dust-removal measures should be used to reduce PM2.5 emission. Any open burning of biomass should be forbidden.

Other Findings and Suggestions:

Pressures and potential emission reduction in different regions.

Zhejiang has to make stricter reduction measures than Shanghai and Jiangsu to comply with the standards. Thus, it is suggested to, in future efforts on inter-regional joint emission prevention and control, the effects of complex economic and social factors in different regions should be scientifically and comprehensively considered. Instead of taking totally the same control strategies in all regions. It is necessary to find best portfolio measures for emission reduction which balances between the economy and environment as well as between different regions.

Control of agricultural ammonia emission. If the agricultural sector also takes measures to reduce ammonia emissions to a level substantially lower than 2010 in addition to above control measures, not only the Delta Zone will be compliant with the air quality standards but also the concentration of PM2.5 may be further reduced. But, there will be challenges in actual implementation and management of ammonia emission reduction measures.

The areas beyond the Delta Zone also need to vigorously promote emission reduction measures. Though the excessive PM2.5 emission is mainly caused by the polluting sources within the Delta Zone, the contribution of the emission from the sources beyond the Delta Zone should not be ignored. If the regions beyond the Delta Zone do not take effective reduction measures while maintaining rapid growth, it is difficult to guarantee complete compliance with PM2.5 concentration limit only relying on Delta Zone alone to implement sustainable energy development strategy and emission reduction measures to maximize the reduction potential. Therefore, the regions beyond the Delta Zone also need to enforce the implementation of emission reduction measures.

Enhancement of policy implementation. This Study assumes that all relevant policies have been fully implemented under all scenarios. However, actual implementation is likely to be affected by various factors. It is suggested to carry out researches related to the policy implementation to identify the needs for funds, technologies and other requirements, in order to ensure smooth implementation.

Pay attention to ozone pollution while promoting the achievement of PM2.5 attainment. PM2.5 as the primary air pollutant in the Delta Zone has decreased significantly in recent year following a series of prevention and control measures. But, ozone pollution has not been improved or even worse. Ozone accounts for 31% of the primary pollutants in the 107 polluted days in Shanghai in 2015.⁵ Since 2013, the ozone concentration has not dropped but risen for two consecutive years in Jiangsu Province.⁶ Therefore in order to achieve all targets of air quality, the Delta Zone needs to keep eyes on the ozone pollution while promoting the achievement of PM2.5 attainment. The co-control measures to reduce both PM2.5 and ozone may be taken as priority measures.

Air quality attainment planning should be carried out and completed as soon as possible. The modeling, research methods and suggested measures in this Study provides certain supports for the air quality management in the Delta Zone. It is suggested to, according to the requirements in the new Air Pollution Prevention Law, start working on the Delta Zone's air attainment planning as soon as possible and at the same time start working on municipals' planning in order to develop measures for air quality compliance and formulate management mechanisms based on scientifically developed plans.

⁵ Xinhua.cn (http://www.sh.xinhuanet.com/2016-01/22/c_135035243.htm)

⁶ Data from *Environmental Statement of Jiangsu Province, 2014* and *Environmental Statement of Jiangsu Province, 2015*.

Clean Air Alliance of China

Clean Air Alliance of China (CAAC), initiated by 10 key Chinese academic and technical institutions in clean air field, aims at providing an integrated clean air collaboration platform in China for academic and technical institutions, provinces and cities, Non-profit organizations and enterprises. The overarching goal is to improve air quality in China and mitigate the negative impacts on public health due to air pollution. The members of CAAC include academic institutions, provinces & cities, as well as other nonprofit organizations and enterprises that care about clean air.

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Energy Foundation



Innovation Center for Clean-air Solutions (CAAC Secretariat)

Suite 709, East Ocean Center, 24A Jianguomeiwai Street, Chaoyang District,
Beijing

Tel: +86-10-65155838

E-mail: cleanairchina@iccs.org.cn