How China Fought the Air Pollution Battle from 2013 to 2017

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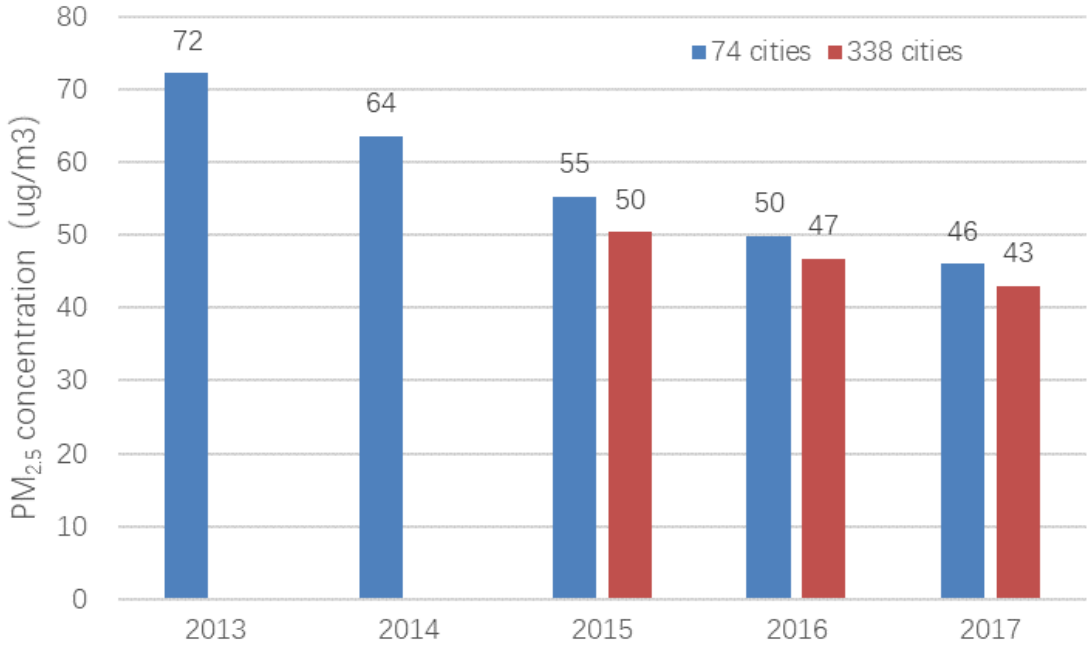
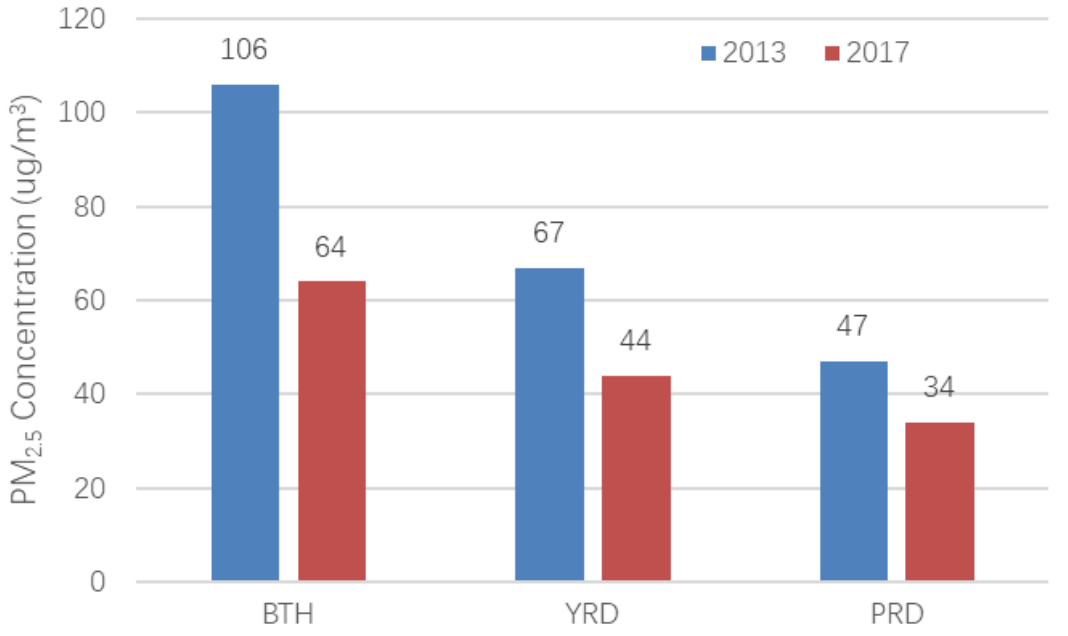
Air Quality Improvement in China from 2013-2017



$PM_{2.5}$ concentration in China, 2013-2017

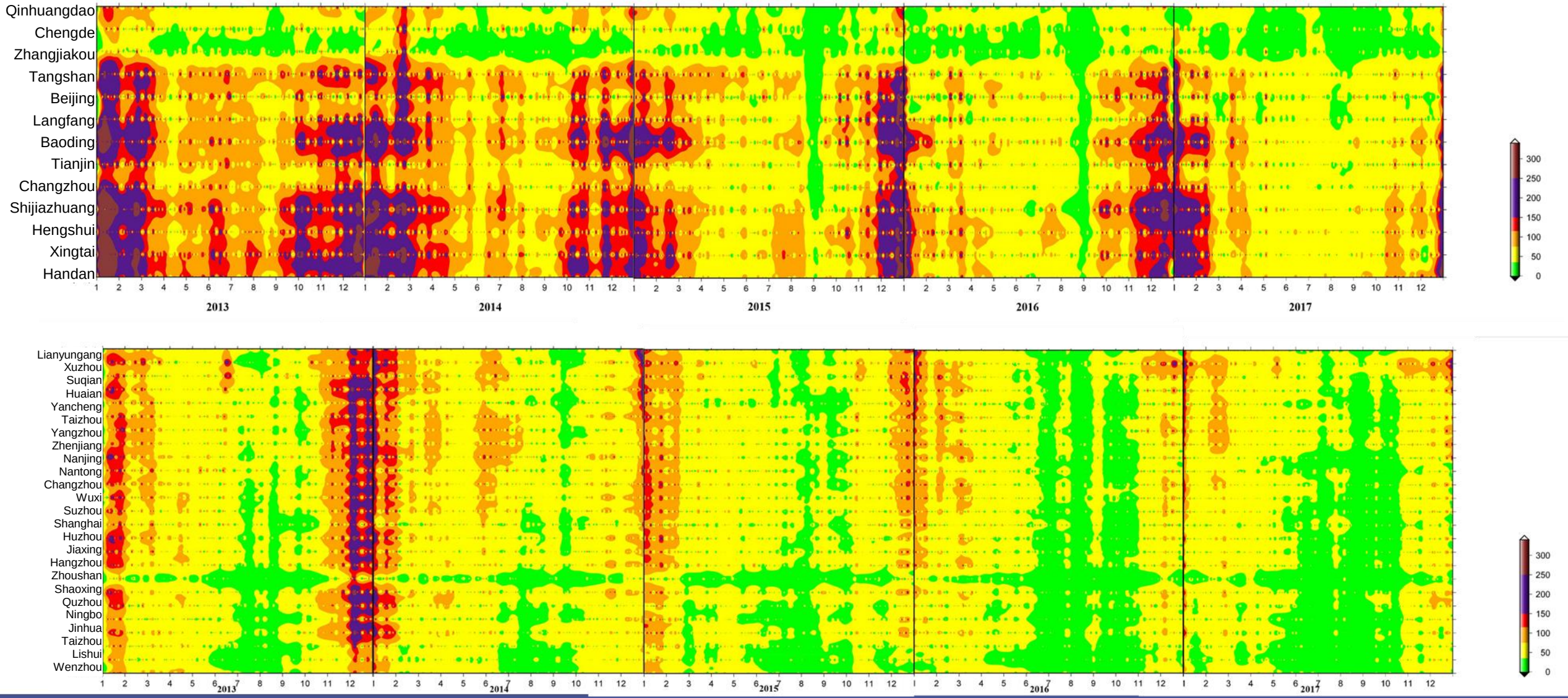


$PM_{2.5}$ concentration in the key regions, 2013 vs. 2017

Air quality: 2013-2017

- PM_{10} concentration dropped by 22.7% (target:10%)
- $PM_{2.5}$ concentration in BTH, YRD and PRD dropped by 39.6% , 34.3% and 27.7% (target: 25%, 20%, 15%)
- PRD met the NAAQS
- $PM_{2.5}$ concentration in Beijing dropped from 90 to 58 ug/m^3 (target: 60 ug/m^3)

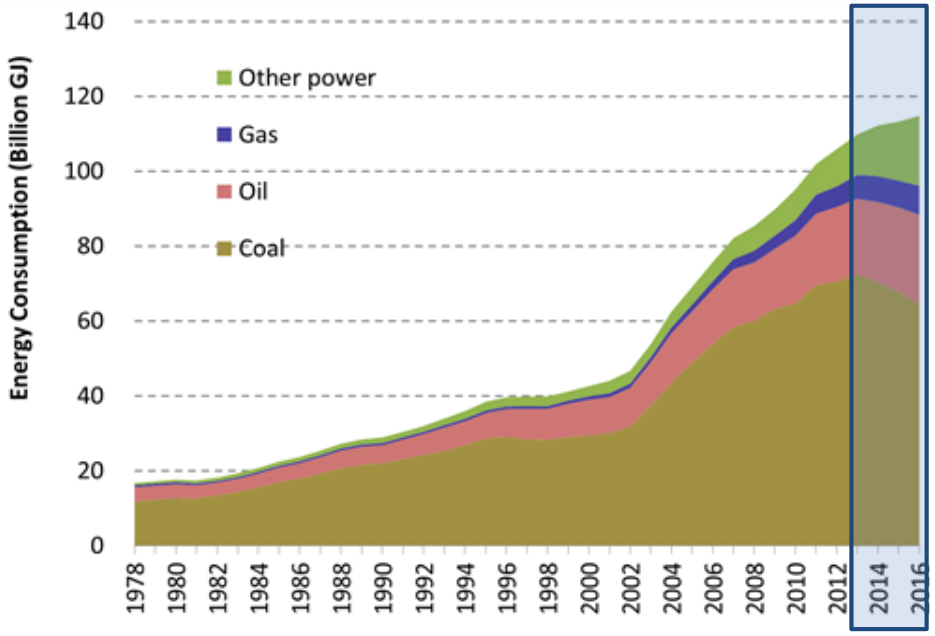
Significant AQ improvement in BTH and YRD



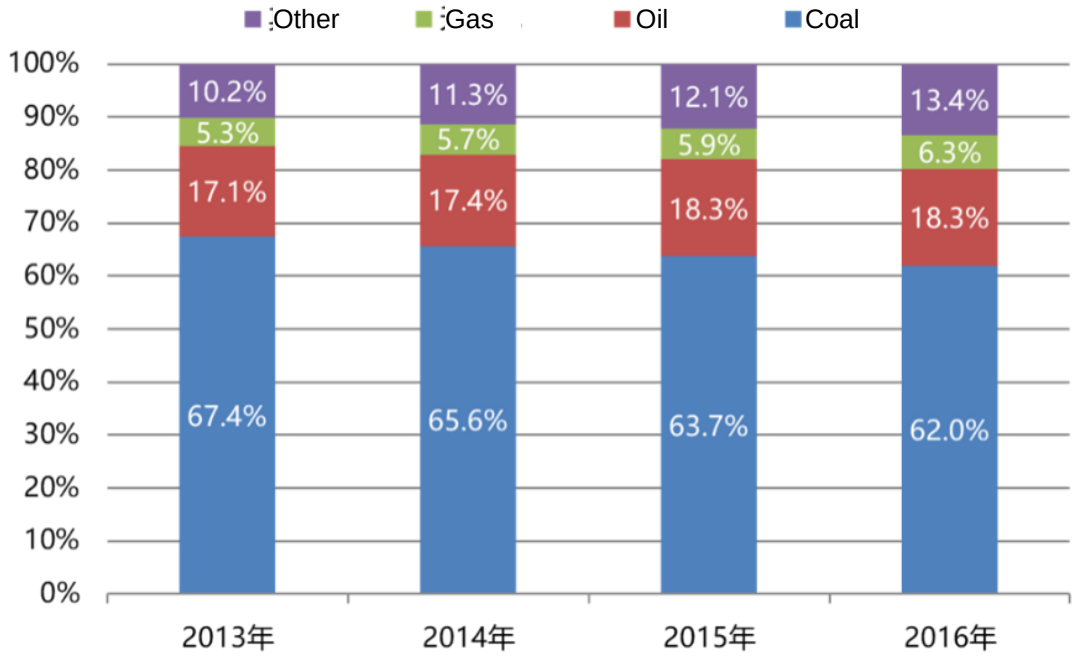
Air Pollution Prevention and Control Action Plan issued in 2013, declaring the war against air pollution

1. Comprehensive Control and Reduce Emission of Multi-Pollutants
2. Optimize the Industrial Structure and Promote Industrial Restructure
3. Accelerate the Technology Transformation and Improve the Innovation Capability
4. Adjust the Energy Structure and Increase the Clean Energy Supply
5. Strengthen Environmental Thresholds and Optimize Industrial Layout
6. Better Play the Role of Market Mechanism and Improve Environmental Economic Policies
7. Improve Law and Regulation System. Carry on Supervision and Management Based on Law
8. Establish the Regional Coordination Mechanism and the Integrated Regional Management
9. Establish Monitoring and Warning System. Cope with Heavy Pollution
10. Clarify Responsibilities of the Government, Enterprise and Society. Mobilize Public Participation

Coal Consumption Cap and Energy Restructure



Energy consumption since 1978

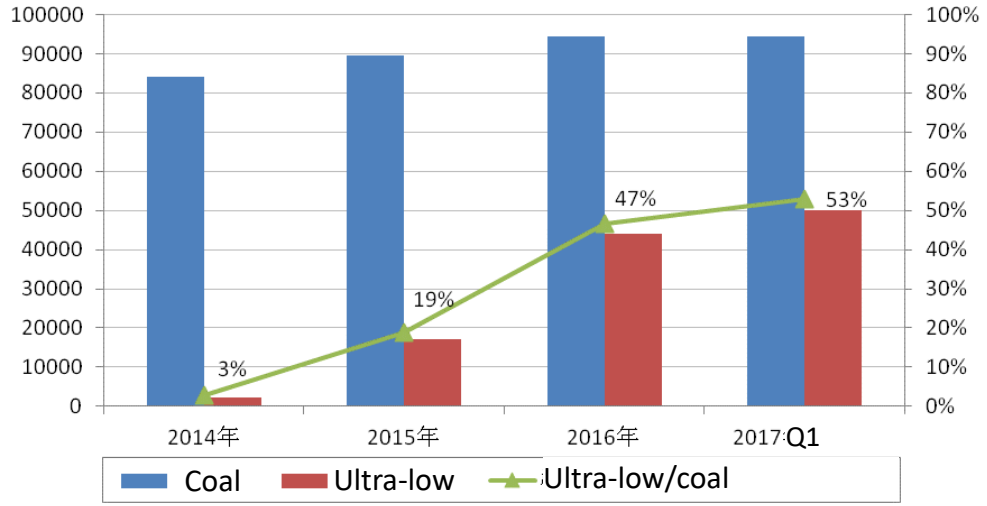


Energy structure, 2013-2016

- **Trend of coal consumption changed**
  - ✓ Before 2013: doubled in one decade
  - ✓ After 2013: from 4.2 billion tons to 3.9 billion tons in 2017
  - ✓ Ratio of coal on total energy drop from 67.4% to 60.4%.

- Over 200, 000 coal-fired boiler eliminated
- 4.7 million households switch heating sources from coal to NG or electricity in “2+26” cities

Industrial Pollution Control



Capacity of power units reaching the ultra-low emissions standard

- **By 2015**
  - ✓ **99% coal-fired power units with FGD**
  - ✓ **92% thermal power units with SCR**
- **Till 2017**
  - ✓ **700 GW coal-fired power units meet the ultra-low emissions requirements, equivalent to NG power emission standard**

- Adjust industrial structure
  - Eliminated outdated production facilities
  - Reduce excess production capacity
  - Shut down dispersed and heavy polluted industrial plants
- Emission control
  - More than 20 new emission standards issued/revised (cement, brick, boilers, petrochemical, etc)
- Supervision
  - CEMs on over 10,000 industrial plants

Mobile Source Emission Control

Lower sulfur content (ppm) by upgrading oil standards

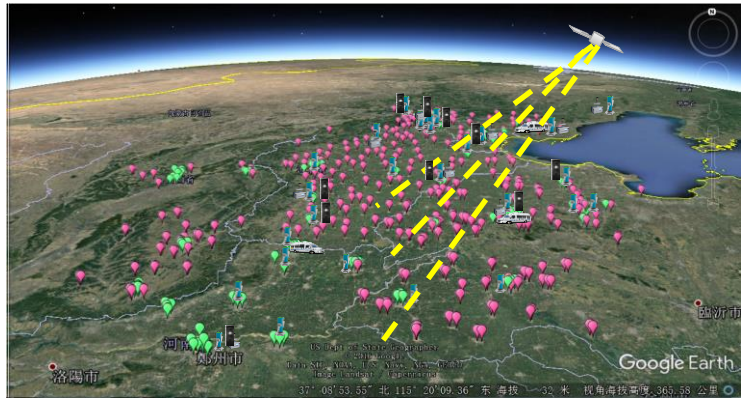
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Gasoline	1500	1000				800 (Stage Ⅰ)			500 (Stage Ⅱ)				150 (Stage Ⅲ)				50 (Stage Ⅳ)		10 (Stage Ⅴ)	
Diesel (Vehicle)	2000/5000/10000			2000							(Stage Ⅰ)			350 (Stage Ⅲ)			50 (Stage Ⅳ)		10 (Stage Ⅴ)	
Diesel (others)	2000/5000/10000			2000									(Stage Ⅰ)			350 (Stage Ⅲ)			50 Ⅳ	10 (Ⅴ)

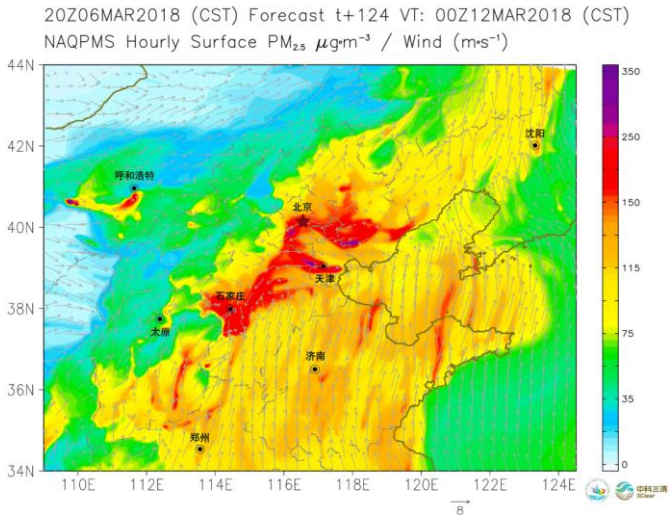
Vehicles Year		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Light	Diesel				Stage Ⅰ				Stage Ⅱ			Stage Ⅲ				Stage Ⅳ				Stage Ⅴ		
	Gasoline				Stage Ⅰ				Stage Ⅱ			Stage Ⅲ			Stage Ⅳ				Stage Ⅴ			
Heavy	Diesel				Stage Ⅰ				Stage Ⅱ			Stage Ⅲ				Stage Ⅳ				Stage Ⅴ		
	Gasoline					Stage Ⅰ			Stage Ⅱ				Stage Ⅲ			Stage Ⅳ						

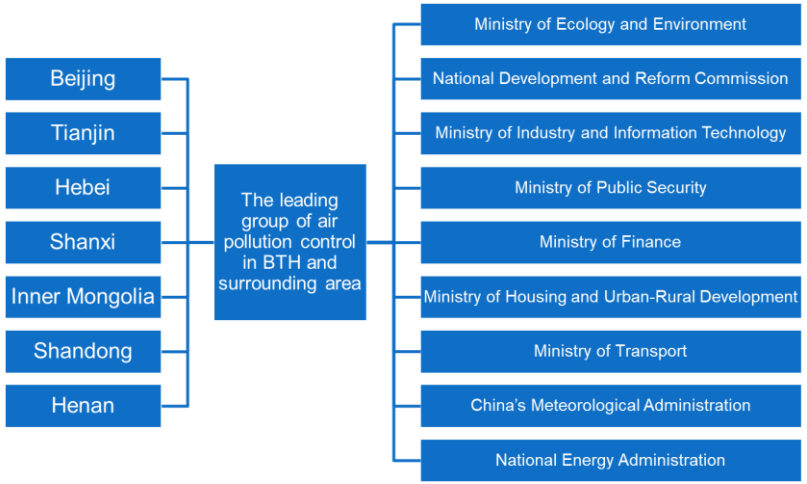
Vehicle emission standards

- **2013-2017**
  - ✓ **20 million** yellow-label and old vehicles eliminated
  - ✓ Oil standards upgraded **by two stages**
  - ✓ **Stage V** emission standards implemented for vehicles
- **Coal transportation from inland to harbors in Bohai Ocean switched from road to railway**

Enhancing capacity and regional coordination







Monitoring

- **Ambient air quality monitoring network;**
- **1436 state monitoring sites**
- **Satellite and remote sensing**

Forecasting

- **Region-province-city forecasting and alarming;**
- **100% accuracy in pollution episode forecasting**
- **75% accuracy in pollution level forecasting**

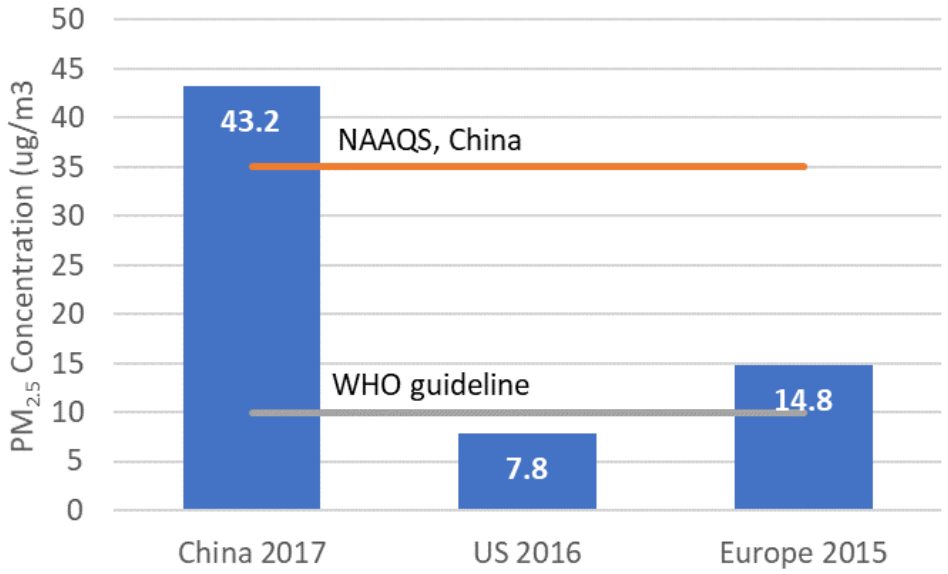
Regional coordination

- **A leading group led by the vice premier;**
- **9 ministries involved;**
- **7 provinces covered**

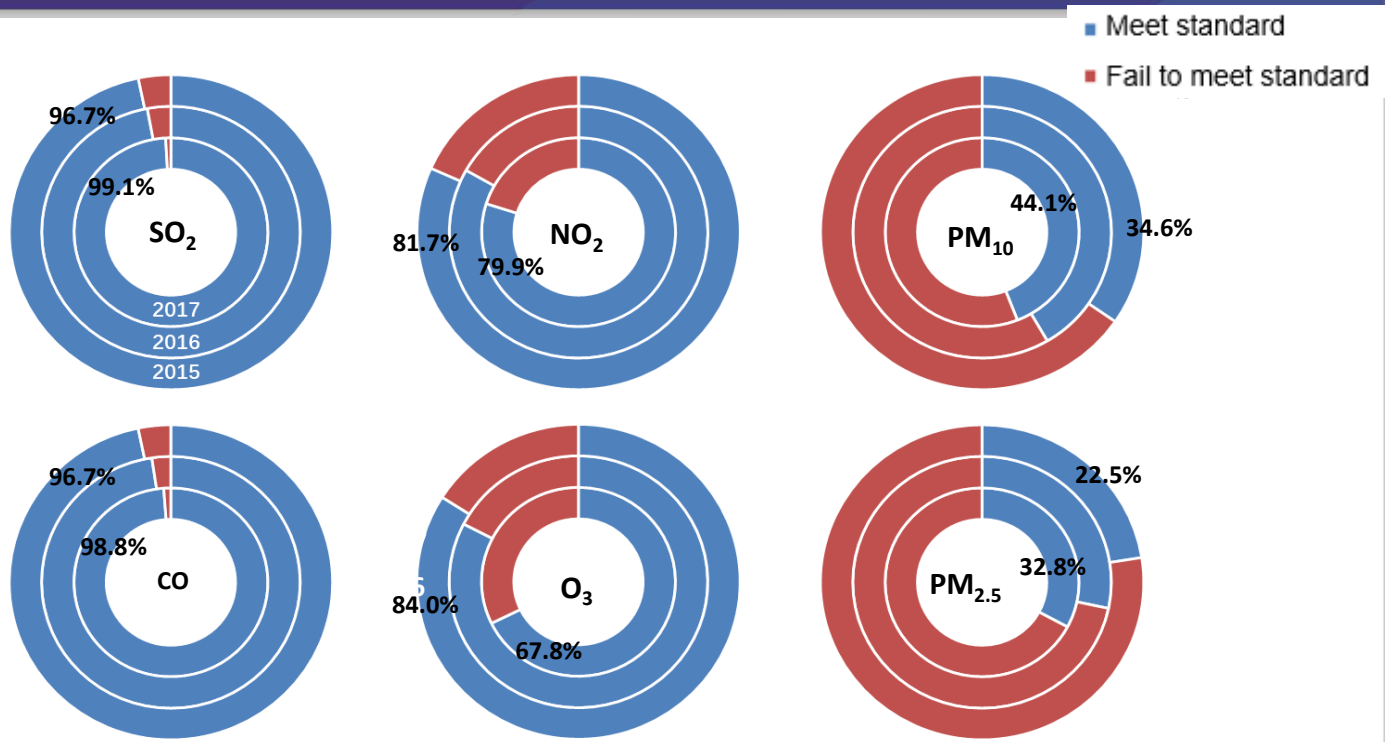
Summary of experience: Systematic planning, targeted measures, and emphasizing implementation

- **Divide responsibilities and all parties working together**
  - All departments concerned, each level of governments, private sectors, regional collaboration
  - Legal and policy support
  - Strict supervision and accountability
- **Focus on priority areas and combine the source and endof-pipe emission reduction**
  - Focus on key areas and approaches
  - Promote major projects for emission control
- **Strengthen information disclosure and engage public for actions**
  - Advocate the whole society to “Fight for the better air together”

In spite of improvement we achieved, large gap remains



$PM_{2.5}$ concentration in China, US and Europe

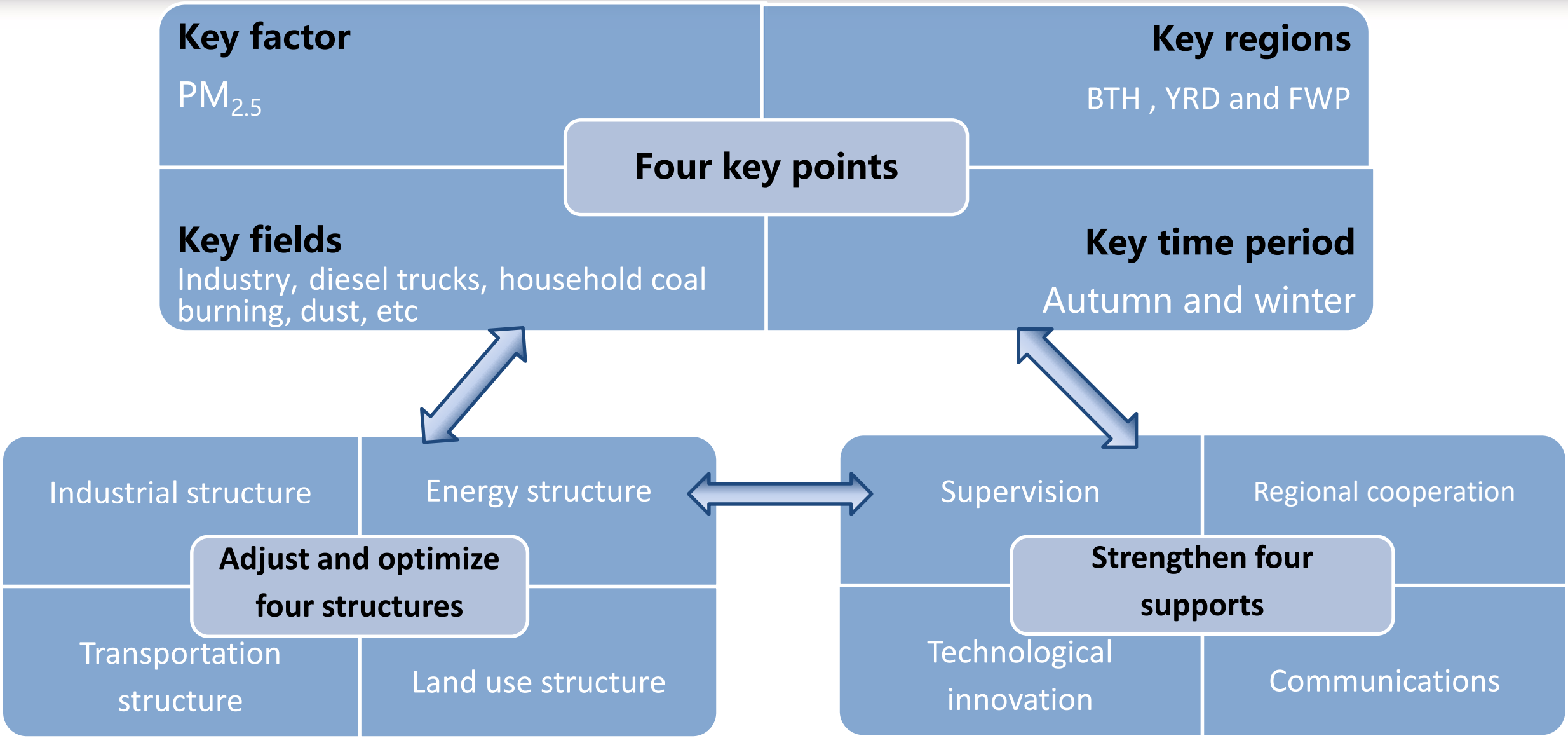


Percentage of cities which meet or failed to meet NAAQS

- **$PM_{2.5}$ concentration still lagged far behind the air quality standards in US, EU and the WHO guideline;**
- **Two thirds of cities failed to meet the air quality standards.**

- **O_3 concentration elevated in the last few years;**
- **More efforts to reduce emissions, especially VOCs**

Three-Year Action Plan for Winning the Blue Sky Defense Battle



Thanks for attention

Sharing the experience, Cleaning the air.

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