



## Methods and Achievements of Atmospheric Controlling in Shenyang

▶ Shenyang Environmental Protection Bureau of China



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## I Basic Information of Shenyang

### City Size

Located in south of northeast China, Shenyang is the center of Northeast Asia Economic Circle and Circum-Bohai Sea Economic Circle and the multifunctional hub city connecting Yangtze River Delta, Pearl River Delta and Beijing-Tianjin-Hebei Region to Kanto Region. With 10 districts, 2 counties and 1 county-level city under its jurisdiction, the city has a total area of over 12,984 square kilometers and an urban area of 3,495 square kilometers. With a permanent population of 8,291,000 people and a registered population of 7,304,000 people in 2015, the city realized a total output value of 728.05 billion yuan.

### Climatic Conditions

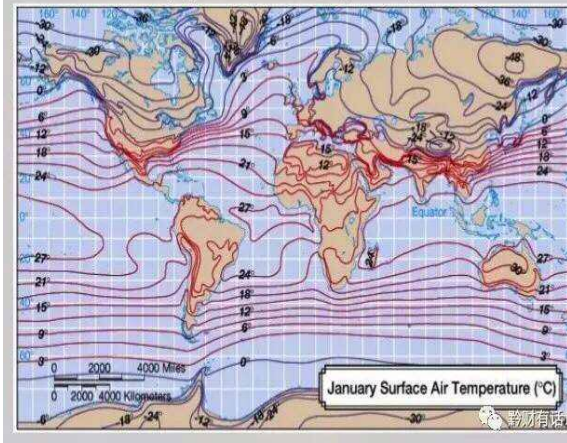


### Comparison and Analysis

Having a temperate semi-humid continental climate, Shenyang has an annual average temperature of 6.2 to 9.7°C. From the complete record since 1951, Shenyang has the extreme highest temperature of 38.3°C and the extreme lowest temperature of -32.9°C in central urban area, with a temperature difference exceeding 70°C. Shenyang has a yearly precipitation of 600 to 800 mm, with a yearly average precipitation of 716.2 mm in urban area in the period of 1951 to 2010, and has a yearly frost-free period of 155 to 180 days. Due to the monsoon, the precipitation occurs mainly in summer, with big temperature difference and four distinctive seasons. The winter period lasts for a long time, nearly 6 months.

#### Horizontal distribution of temperature

• Isotherms – maps, connect lines of equal temperature



City	Latitude	Temp. of Jan.
London	51.5°	4.5°C
Paris	49°	5°C
Sapporo	43°	-5°C
Helsinki	60°	-3.9°C
Shenyang	41°	-11°C

## ● II Main Conditions of Atmospheric Pollution-Main Source of Pollution



Shenyang currently has approximately 2 million motor vehicles, and the growth rate is high, with the motor vehicle population that equals five times of that in 2007.

The dust pollution mainly comes from blowing sands outside China, dust of local constructions and dust of local roads. Totally 7 sand and dust weathers occurred in 2016.



Shenyang has a total coal burning amount of **24.2717 million tons**. Its energy structure needs to be adjusted urgently. The burned coal is mainly paid by power industry, heating industry and industrial production.

Organic exhaust gas mainly consists of restaurant oily fume and disorganized VOC from industries of rubber, printing, chemical medicine, etc.

## ● Coal Usage



Shenyang had a total coal consumption of **24.2717 million tons** in 2016, including a coal consumption of **21.3153 million tons** from industrial pollution sources that makes **87.82%** of the total coal consumption of Shenyang City.



**Thermal Power Generation**

Till now, Shenyang totally has 9 thermal power stations, which has a gross generation of 12 billion KWH. In 2016, Shenyang upgraded and reconstructed all power stations for pollution abatement, and the main pollutants are discharged as per: TSP: 20mg/m<sup>3</sup>; Sulfur dioxide: 50mg/m<sup>3</sup>; NOx: 100mg/m<sup>3</sup>.



**Coal Heating**

As mentioned above, due to the special climatic conditions in Shenyang, the yearly heating period is 6 months to meet the heating demand of 8 million people for half a year, more than 7 million tons of coals need to be burned, and thus, just the heating occupies nearly one fourth of the standard coal burning amount of Shenyang. Currently, Shenyang has performed *National Comprehensive Emission Standards for Atmospheric Pollutants*: TSP: 30mg/m<sup>3</sup>; Sulfur dioxide: 200mg/m<sup>3</sup>; NOx: 200mg/m<sup>3</sup>.



**Industrial Production**

Shenyang has adjusted the industrial structure vigorously. Currently, Shenyang has equipment manufacturing industry as the main industry, and has only 1 large-scale chemical enterprise and has no heavy pollution industries of plate glass, cement, steel, etc.

## ● Solutions for Coal Burning Pollution



### Reduce Coal Use

Compared with 2015, Shenyang reduced coal use by 1 million tons in 2016, increased use of natural gas by 1623%, and increased the solar power generation of 500000 KWH.

### Combined Heat and Power Generation

Shenyang dismantled totally 1917 coal-fired boilers of less than 10 tons, with three situations: heating boilers-combine big boilers and dismantle small boilers; production boiler-change coal to gas, change coal to electricity; close down outdated production facilities.

### Add Efficient Desulfurization De-dusting Equipment

De-duster upgrading and reconstruction has completed the total capacity of 5204 T/H, and the desulfurization facility reconstruction has completed the total capacity of 8299 T/H.

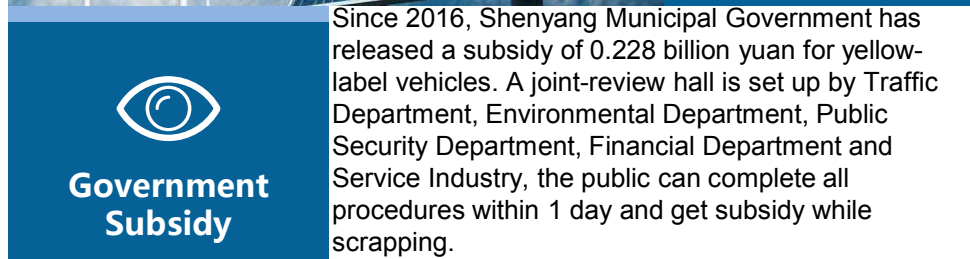
### Recommend Use of Cleaned Coal

In 2016, the quality of coal burned in Shenyang improved largely, including that coal ash and sulphur content decreased by almost 10% and that the cleaned coal occupied more than 80% of the total coal consumption.

## ● Pollutions of Motor Vehicle Exhaust

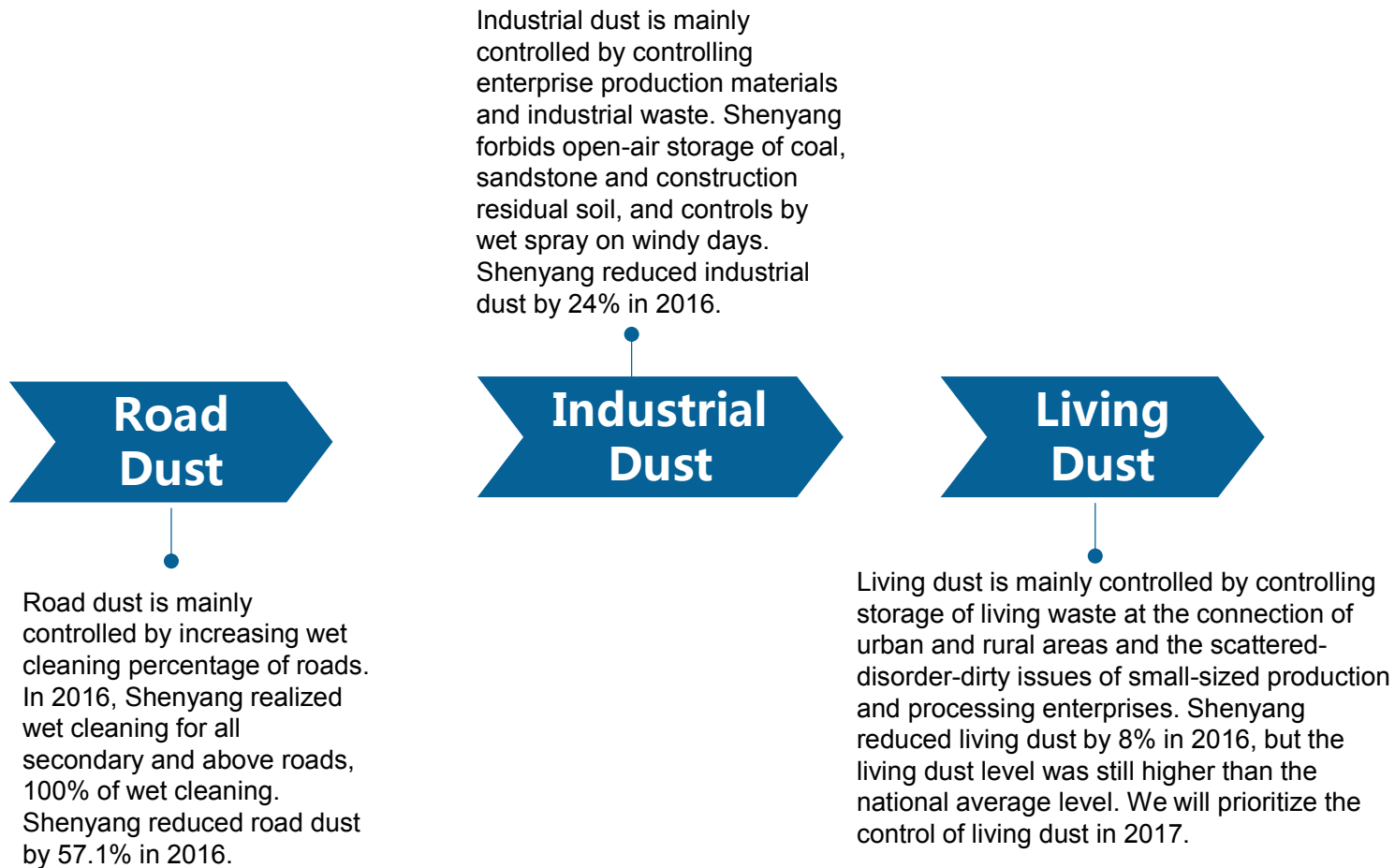


As organic exhaust gases discharged from motor vehicles cause many diseases and they are discharged at the height basically equal to breathing height, widely publicize the consequences of exhaust gas discharge, set up green-label roads, and forbid the pass of yellow-label vehicles on the green-label roads.



Shenyang has scrapped totally 56,645 yellow-label and old vehicles, and has upgraded 361 petrol stations, 7 oil storage tanks and recycled oil gases of 261 oil tank trucks.

## ● Dust Control





## ● Control on Organic Exhaust Pollution



### Special Control to Tertiary Industry

Shenyang Municipal Government released financial subsidy of 10 million yuan in 2016 to control oily fume pollution of small catering industries. Shenyang rectified totally 340 catering enterprises that have oily fume pollution. The catering enterprises with oily fume discharge in urban area are all equipped with electrostatic purification devices.



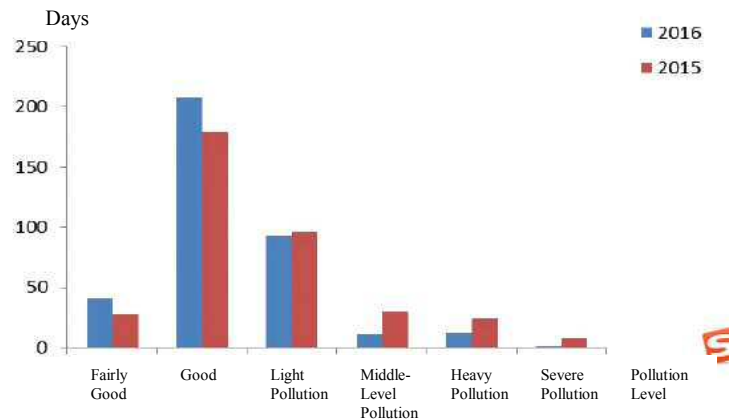
### Control on Industrial Organic Exhaust Gas

Aimed at the industry features of Shenyang, Shenyang focused efforts to rectify the organic exhaust gas pollutions of rubber & tire industry, printing industry, chemical and medicine industry and automotive industry in 2016, to standardize the exhaust gases discharged by enterprises by RTO, Light Oxygen Catalyzing, Active Carbon Adsorption, etc., and Shenyang prohibited disorganized discharge of organic exhaust gases.

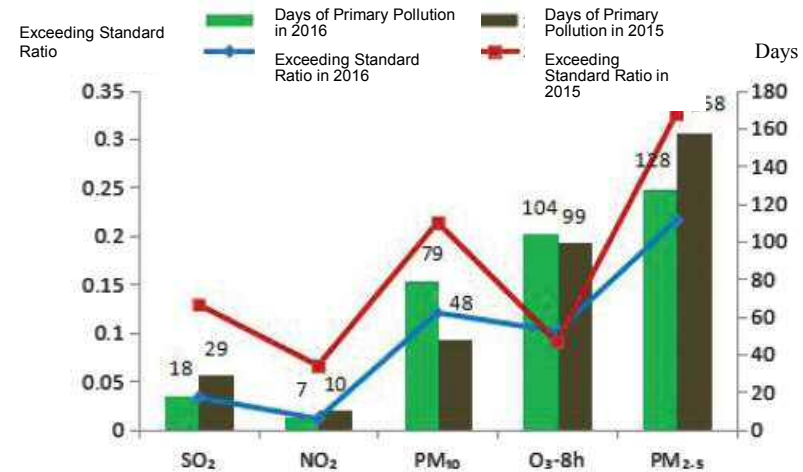
### III Achievements of Environmental Control



In 2016, Shenyang had 249 fairly good or good days in ambient air quality, which increased by 42 days compared with 2015, and reduced light pollution, middle-level pollution, heavy pollution and severe pollution by 3 days, 19 days, 12 days and 7 days respectively.



Compared with 2015, Shenyang increased by 5 days and 31 days for O<sub>3</sub> and PM<sub>10</sub> as primary pollutants respectively, and reduced by 3 days, 11 days and 30 days for NO<sub>2</sub>, SO<sub>2</sub> and PM<sub>2.5</sub> as primary pollutants respectively. Except that CO didn't exceed standard and exceeding standard ratio of O<sub>3</sub> rose on year-on-year basis, the remaining four exceeding standard ratios all reduced to certain extent on year-on-year basis.





# THANK YOU

▶ Welcome Comments and  
Guidance from All Participants ◀