Pollutant Discharge

General Situation

The annual targets for reducing the total loads of main pollutants COD, ammonia nitrogen, SO_2 and NO_X in China were all met in 2013.

Main Pollutants in Wastewater A total of 23.527 mil. t COD was discharged within the year, down 2.9% from a year earlier; as well as 2.457 mil. t ammonia nitrogen, down 3.1% from a year earlier.

Main Pollutants in Waste Gas A total of 20.439 mil. t SO_2 was emitted within the year, down 3.5% from a year earlier; as well as 22.273 mil. t NO_X, down 4.7% from a year earlier.

Solid Wastes Up to 3,277.019 mil. t industrial solid wastes were generated nationwide in 2013, and 2,059.163 mil. t were comprehensively utilized (including wastes generated in previous years), accounting for 62.3% of the total.

A total of 173 mil. t municipal solid wastes were cleared away in 2013 from municipalities that administer one or more county-level cities in China. With environmentally sound processing capacity totaling 0.493 mil. t/d, up to 154 mil. t solid wastes were decontaminated and processed, which accounted for 89.0%.

Discharge of main pollutants in wastewater in China in 2013

COD (10,000 t)					Ammonia nitrogen (10,000 t)				
Total	Industry	Municipal	Agriculture	Centralized	Total	Industry	Municipal	Agriculture	Centralized
2352.7	319.5	889.8	1125.7	17.7	245.7	24.6	141.4	77.9	1.8

Emission of main pollutants in waste gas in China in 2013

SO_2 (10,000 t)				NO_X (10,000 t)				
Total	Industry	Municipal	Centralized	Total	Industry	Municipal	Motor vehicles	Centralized
2043.9	1835.2	208.5	0.2	2227.3	1545.7	40.7	640.5	0.4

Industrial solid wastes generated and utilized in China in 2013

Generated (10,000 t)	Comprehensively utilized (10,000 t)	Stored (10,000 t)	Disposed (10,000 t)
327701.9	205916.3	42634.2	82969.5

Measures and Actions

【Reduction of main pollutants】 Earnest efforts were made this year in implementation of the *Twelfth Five-Year Comprehensive Work Programme on Energy Conservation and Pollution Reduction*, the *Twelfth Five-Year Plan for National Environmental Protection*, and the *Twelfth Five-Year Plan for Energy Conservation and Pollution Reduction*, as well as in the improved verification and regulation on the reduction of total load of main pollutants. Wastewater advanced treatment and reclamation engineering was available for 842 key projects in paper making, printing and dyeing industries. The processing and resource use facilities of wastes were upgraded in 12,724 scaled livestock and poultry breeding farms, improving the COD and ammonia nitrogen removal efficiency by 7 and 27 percentage points respectively. A larger share of the de-SO_2 facilities attained emission standards among thermal power generating units, and de-SO_2 facilities were being expanded and upgraded for 34 mil. kW in-service units. The flue gas sulfur removal facilities of sintering machines increased by 23,600 m^2 in iron and steel industry. The gas availability was up 2.6 bn. m^3, owing to local coal-to-gas upgrading engineering, which had 4.9 mil. t raw coal replaced and 39,000 t SO_2 emission reduced. Notable progress was made in the catalytic cracking flue gas sulfur removal engineering in petroleum refining industry, and sulfur removal facility was made available to 18 sets of catalytic cracking devices with combined capacity at 31.5 mil. t. The flue gas bypasses were dismantled from the de-SO_2 facilities of 203 mil. kW in-service thermal power generating units, as a consequence, the overall de-SO_2 efficiency had been improved from 82% to over 90%. Falsification and deception was cracked down during operation of de-SO_2 facilities. Electricity tariffs equivalent to 440 mil. yuan were either fined or confiscated, and nearly 100 mil. yuan SO_2 emission fee was recovered. De-NO_X electricity price was enforced. The construction of de-NO_X facilities made a breakthrough, the total capacity of de-NO_X electricity generating units soared by 205 mil. kW all over the year, and de-NO_X facility was made available to cement clinker production facilities with combined capacity at 570 mil. t. All in all, the NO_X emission from electricity industry dropped by 11%. A total of 1.83 mil. outdated and used motor vehicles were taken out of street. Comprehensive check was carried out on NO_X pollution charge in cement industry. Enhanced inspection was targeted at the installation, operation, and maintenance of the field terminal of online pollution source monitoring equipment.

【Prevention and control of pollution by solid wastes】 Forty-one construction projects with regard to hazardous waste collection and disposal and 253 projects with regard to medical waste collection and disposal were concluded this year; the above projects were among those specified by *National Plan for Construction of Hazardous Waste and Medical Waste Disposal Facility*. Substantial progress was made in the implementation of the *Twelfth Five-Year Plan for Prevention and Control of Pollution by Hazardous Waste*, and thematic campaigns were initiated on treatment of hazardous wastes. The enforcement of *Measures on the Administration of Hazardous Waste Business License* proceeded, and the standardized evaluation of hazardous waste continued. Thematic campaigns were undertaken on management of imported solid wastes, collaborations with relevant countries were improved on the information sharing and joint verification of the transboundary movement and control of wastes, and 19 attempted illegal imports of solid wastes to China were thwarted. The *Circular on Delegating Powers for Accrediting Imported Scrap Metal Processors and Recyclers and Strengthening Accreditation*, and *Circular on Policy Improvements regarding Waste Electric Appliance and Electronic Product Processing Funds, etc.* were announced, and *Administrative Regulations on the Environmental Protection of Imported Waste Plastics* were promulgated. Model projects were initiated on municipal solid waste sorting and treatment of solid wastes in stock, aiming at promoting solid waste sorting and treatment of wastes in stock.

Atmospheric Environment

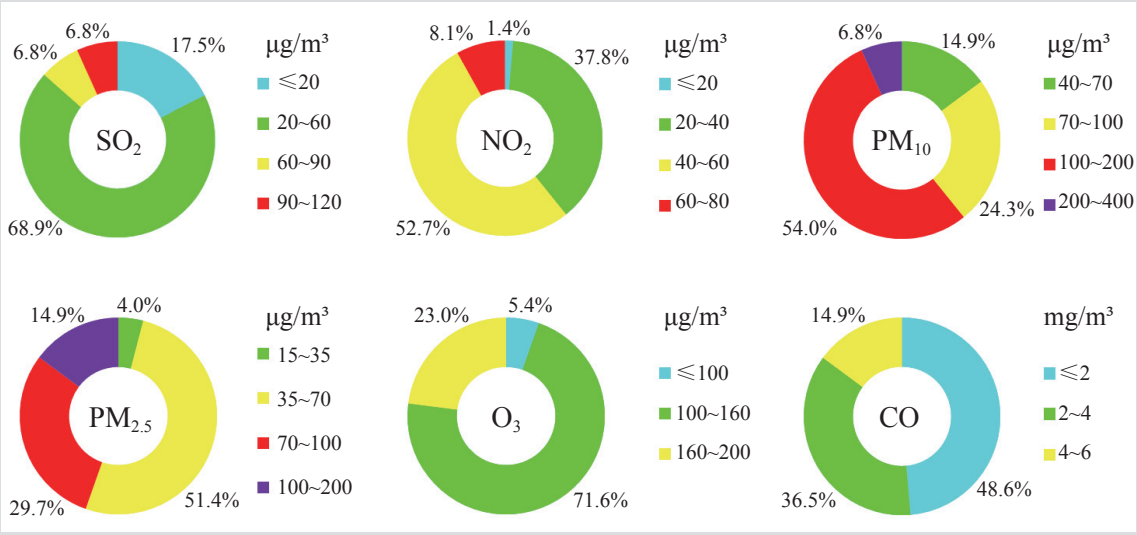
General Situation

The ambient air quality was not optimistic in Chinese cities this year. The acid rain pollution situation remained unchanged but still serious.

Air Quality

Seventy-four cities scheduled to enforce new ambient air quality standards at Stage I A total of 74 Chinese cities including cities seated in Beijing-Tianjin-Hebei region, Yangtze River delta, and Pearl River delta, as well as municipalities directly under the Central Government, provincial capital cities and cities listed separately in State plans, enforced the new ambient air quality standards in 2013 as scheduled. Among them, only three cities Haikou, Zhoushan, and Lhasa attained air quality standards, which accounted for 4.1%, the nonattainment cities reached 95.9%, based on the mean annual reading of SO_2, NO_2, PM_{10}, and $PM_{2.5}$, mean daily reading of CO, and the mean daily value of the maximum 8-hour O_3 reading measured in accordance with *Ambient Air Quality Standards (GB 3095-2012)*. According to the ranking of cities with good air quality, the top 10 cities were Haikou, Zhoushan, Lhasa, Fuzhou, Huizhou, Zhuhai, Shenzhen, Xiamen, Lishui, and Guiyang, and according to the ranking of cities with poor air quality, the top 10 cities were Xingtai, Shijiazhuang, Handan, Tangshan, Baoding, Jinan, Hengshui, Xi'an, Langfang, and Zhengzhou.

Analysis of specific indicators found the mean annual concentration of SO_2 ranged between 7 μg/m^3 and 114 μg/m^3 among those cities and averaged 40 μg/m^3, and 86.5% of those cities attained air quality standard with regard to SO_2; the mean annual concentration of NO_2 ranged between 17 μg/m^3 and 69 μg/m^3 and averaged 44 μg/m^3, and 39.2% of those cities attained air quality standard with regard to NO_2; the mean annual concentration of PM_{10} ranged between 47 μg/m^3 and 305 μg/m^3 and averaged 118 μg/m^3, and 14.9% of those cities attained air quality standard with regard to PM_{10}; the mean

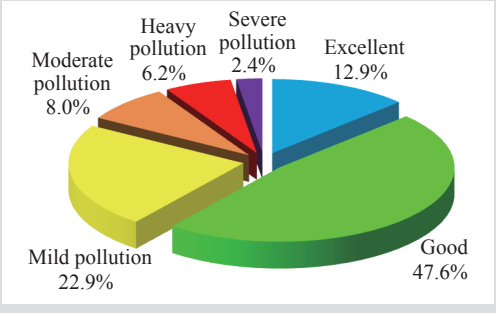


Percentage of ranges of pollution indicator readings among the 74 cities scheduled to enforce the new ambient air quality standards in 2013 at Stage I

annual concentration of $PM_{2.5}$ ranged between 26 μg/m^3 and 160 μg/m^3 and averaged 72 μg/m^3, and 4.1% of those cities attained air quality standard with regard to $PM_{2.5}$; the 90th-percentile value of the mean daily value of the maximum 8-hour O_3 reading ranged between 72 μg/m^3 and 190 μg/m^3 among those cities and averaged 139 μg/m^3, and 77.0% of those cities attained air quality standard with regard to O_3; the 95th-percentile value of the mean daily concentration of CO ranged between 1.0 mg/m^3 and 5.9 mg/m^3 among those cities and averaged 2.5 mg/m^3, and 85.1% of those cities attained air quality standard with regard to CO.

The percentage of ambient air quality attainment days averaged out at 60.5% among the 74 cities, and of nonattainment days at 39.5%. The percentage of attainment days ranged between 80% and 100% in 10 cities, between 50% and 80% in 47 cities, and below 50% in 17 cities.

Three key regions None of the cities seated in Beijing-Tianjin-Hebei region or Pearl River delta attained air quality standards this year. Among cities in Yangtze River delta, only Zhoushan attained air quality standards with regard to all of the six monitored pollutants.



Average percentage of the number of days with a certain air quality grading among the 74 cities scheduled to enforce the new ambient air quality standards in 2013 at Stage Ⅰ

Number of attainment cities with regard to the six pollutants in key regions in 2013

Region	Total No. of cities	SO_2	NO_2	PM_{10}	CO	O_3	$PM_{2.5}$	No. of all indicator attainment cities
Beijing-Tianjin-Hebei	13	7	3	0	6	8	0	0
Yangtze River delta	25	25	10	2	25	21	1	1
Pearl River delta	9	9	5	5	9	4	0	0

For the 13 cities at or above prefectural level in Beijing-Tianjin-Hebei region, the percentage of ambient air quality attainment days ranged between 10.4% and 79.2%, and averaged 37.5% this year. Among the nonattainment days, 20.7% were recorded with heavy pollution or severe pollution. The percentage of attainment days was below 50% in 10 cities. In this region, the majority of the nonattainment days (66.6%) recorded $PM_{2.5}$ as the leading pollutant, seconded by 25.2% with PM_{10} as the leading pollutant, and then 7.6% with O_3 as the leading pollutant.

In this region, the mean concentration of $PM_{2.5}$ registered 106 μg/m^3, and of PM_{10} 181 μg/m^3, none of the cities was able to attain air quality standards with regard to the two indicators. The mean concentration of SO_2 was 69 μg/m^3 and 6 cities were unable to attain relevant standard. The mean concentration of NO_2 was 51 μg/m^3 and 10 cities failed relevant standard. Seven cities were unable to attain air quality standard in respect of CO according to the mean daily equivalent value. Five cities were unable to attain air quality standard in respect of O_3 according to the equivalent value of daily maximum 8-hour readings.

The number of attainment days accounted for 48.0%, and the number of days registered with heavy pollution or severe pollution accounted for 16.2% in Beijing. The main pollutants were $PM_{2.5}$, PM_{10} and NO_2. The mean annual concentration of $PM_{2.5}$ was 89 μg/m^3, 1.56 times more than the standard; that of PM_{10} was 108 μg/m^3, 0.54 time more than the standard; and that of NO_2 was 56 μg/m^3, 0.40 time more than the standard. The daily maximum 8-hour reading of O_3 exceeded the standard by 0.18 time. Moreover, the capital city attained air quality standard with regard to SO_2 and CO.

For the 25 cities at or above prefectural level in Yangtze River delta, the percentage of ambient air quality attainment days ranged between 52.7% and 89.6%, and averaged 64.2% this year. Among the nonattainment days, 5.9% were recorded with heavy pollution or severe pollution. The

percentage of attainment days ranged between 80% and 100% in Zhoushan and Lishui, and between 50% and 80% in the remaining 23 cities. In Yangtze River delta, the majority of the nonattainment days (80.0%) recorded $PM_{2.5}$ as the leading pollutant, seconded by 13.9% with O_3 as the leading pollutant, and then 5.8% with PM_{10} as the leading pollutant.

In the delta, the mean concentration of $PM_{2.5}$ registered 67 μg/m^3, only Zhoushan, among others, was able to attain relevant standard, the remaining 24 cities were not. The mean concentration of PM_{10} was 103 μg/m^3 and 23 cities were unable to attain relevant standard. The mean concentration of NO_2 was 42 μg/m^3 and 15 cities were unable to attain relevant standard. The mean concentration of SO_2 was 30 μg/m^3 and all of the local cities in the delta attained relevant standard. Four cities failed air quality standard in respect of O_3 according to the equivalent value of daily maximum 8-hour readings. All of the cities were able to attain air quality standard in respect of CO according to the mean daily equivalent value.

The number of attainment days accounted for 67.4%, and the number of days registered with heavy pollution or severe pollution accounted for 6.3% in Shanghai. The main pollutants were $PM_{2.5}$, PM_{10} and NO_2. The mean annual concentration of $PM_{2.5}$ was 62 μg/m^3, 0.77 time more than the standard; that of PM_{10} was 84 μg/m^3, 0.20 time more than the standard; and that of NO_2 was 48 μg/m^3, 0.20 time more than the standard. The municipality attained air quality standard with regard to SO_2, CO, and O_3.

For the 9 cities at or above prefectural level in Pearl River delta, the percentage of ambient air quality attainment days ranged between 67.7% and 94.0%, and averaged 76.3% this year. Among the nonattainment days, 0.3% were recorded with heavy pollution. The percentage of attainment days was above 80% in Shenzhen, Zhuhai, and Huizhou, and between 50% and 80% in the remaining cities. In the delta, the majority of the nonattainment days (63.2%) recorded $PM_{2.5}$ as the leading pollutant, seconded by 31.9% with O_3 as the leading pollutant, and then 4.8% with NO_2 as the leading pollutant.

In this delta, the mean concentration of $PM_{2.5}$ registered 47 μg/m^3, and none of the cities was able to attain air quality standards with regard to this indicator. The mean concentration of PM_{10} was 70 μg/m^3 and 4 cities were unable to attain relevant standard. The mean concentration of NO_2 was 41 μg/m^3 and 4 cities failed relevant standard. The mean concentration of SO_2 was 21 μg/m^3 and all of the local cities in the delta attained relevant standard. Five cities were unable to attain air quality standard in respect of O_3 according to the equivalent value of daily maximum 8-hour readings. All of the cities were able to attain air quality standard in respect of CO according to the mean daily equivalent value.

The number of attainment days accounted for 71.0% in Guangzhou, and neither heavy pollution nor severe pollution was observed throughout the year. The main pollutants were $PM_{2.5}$, PM_{10} and NO_2. The mean annual concentration of $PM_{2.5}$ was 53 μg/m^3, 0.51 time more than the standard; that of PM_{10} was 72 μg/m^3, 0.03 time more than the standard; and that of NO_2 was 52 μg/m^3, 0.30 time more than the standard. Guangzhou attained air quality standard with regard to SO_2, CO, and O_3.

Haze

The visibility-based observation data from China Meteorological Administration showed the number of days with haze averaged out at 35.9 in China this year, up 18.3 from a year earlier, and reaching a historic high since 1961. Fog and haze frequented the central and eastern regions of China, and the number of days with fog or haze ranged between 50 and 100 in most of the land stretching from the central and southern part of North China to the north of Jiangnan area (area to the south of Yangtze River), even over 100 in some places.

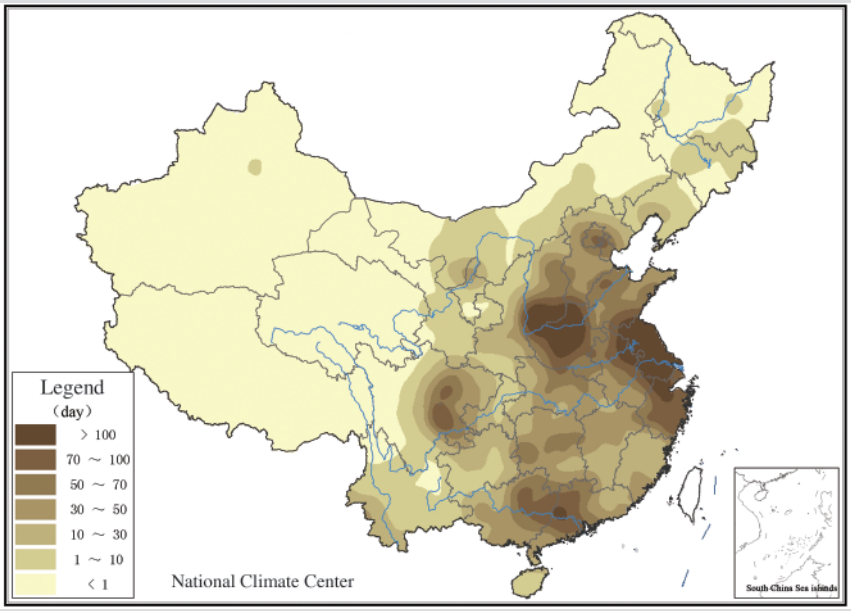


Diagram of the number of days with haze in China in 2013

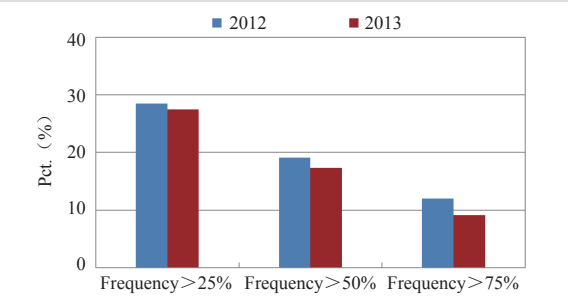
The air-quality based monitoring data from Ministry of Environmental Protection indicated two strikes of large-scale, regional haze pollution enveloping the central and eastern regions of China, one in January and the other in December. The haze pollution was geographically wide spread, prolonged, and causing high-severity pollution as well as skyrocketing pollutant density on both occasions; the leading pollutant was both mostly $PM_{2.5}$. The haze pollution in January lasted for 17 days straight, as a consequence, a total of 677 days (times) were reported with heavy pollution or severe pollution in the aforementioned 74 cities, including 477 days (times) with heavy pollution and 200 days (times) with severe pollution. Beijing-Tianjin-Hebei region and surrounding area were hit the hardest by the haze, the southern part of Hebei province in particular, with Shijiazhuang and Xingtai as the most polluted cities. The second round of large-scale severe haze pollution struck the central and eastern region of the country between December 1 and 9, resulting in 271 days (times) recorded with heavy or severe pollution in the 74 cities, including 160 days (times) of heavy pollution and 111 days (times) of severe pollution. Yangtze River delta, Beijing-Tianjin-Hebei region and surrounding area, and some places in northeast China suffered serious haze pollution, among which Yangtze River delta was hit the hardest.

Two hundred and fifty-six cities at or above prefectural level yet to enforce the new ambient air quality standards Up to 69.5% of the 256 cities attained ambient air quality standards this year, based on the mean annual concentration of three pollutants SO_2, NO_2 and PM_{10} evaluated in accordance with *Ambient Air Quality Standards (GB 3095-1996)*. Up to 91.8% of those cities attained relevant standard with regard to mean annual concentration of SO_2, and 1.2% failed Grade III standard. All of those cities were able to attain relevant standard with regard to mean annual concentration of NO_2, and 86.3% managed to have attained Grade I national standard. Up to 71.1% of those cities attained relevant standard measured by mean annual concentration of PM_{10}, and 7.0% failed Grade III standard.

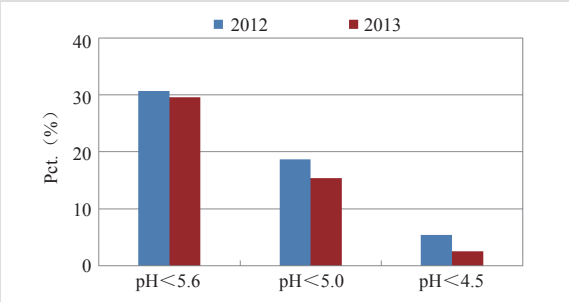
Acid Rain

Acid rain frequency Up to 44.4% of the 473 cities under precipitation monitoring program reported acid rain this year. The acid rain frequency was above 25% in 27.5% of those cities, and above 75% in 9.1% of those cities.

Acidity of precipitation The mean annual pH value of rainfalls was below 5.6 (acid rain) in 29.6% of the monitored cities, below 5.0 (relatively serious acid rain) in 15.4% of them, and below 4.5 (serious acid rain) in 2.5% of them this year. The proportion of cities with records of acid rain, relatively serious acid rain, and serious acid rain this year was down 1.1 percentage points, 3.3 percentage points, and 2.9 percentage points respectively from the previous year.



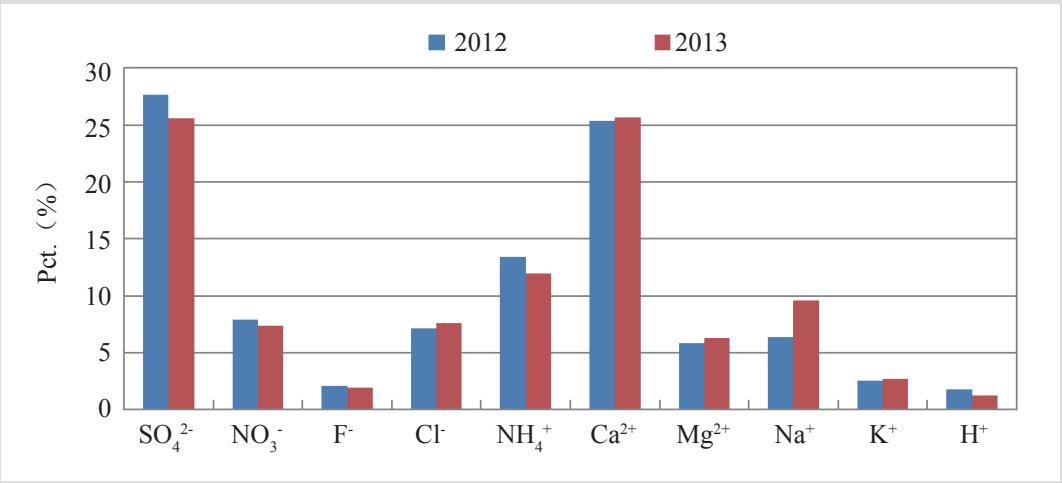
Year–on–year change of the percentage of cities with varied acid rain frequencies



Year–on–year change of the percentage of cities with varied mean annual pH values

Chemical composition The main positive ions in the precipitation were Ca^{2+} and NH_4^+ this year, which accounted for 25.7% and 12.0% respectively of the total ion equivalent. The main negative ion was SO_4^{2-}, accounting for 25.6% of the total ion equivalent; NO_3^- took up 7.4%. Sulphate was the leading acid-causing substance.

Geographical distribution of acid rain In 2013, the acid rain in China mainly spread along the mainstream of Yangtze River and to the south of the river's middle and lower reaches. The area included most parts of Jiangxi Province, Fujian Province, Hunan Province, and Chongqing Municipality, as well as Yangtze River delta, Pearl River delta, and southeast Sichuan Province. It was equivalent to around 10.6% of the national territory.



Year–on–year change of the percentage of normality of main ions in precipitation

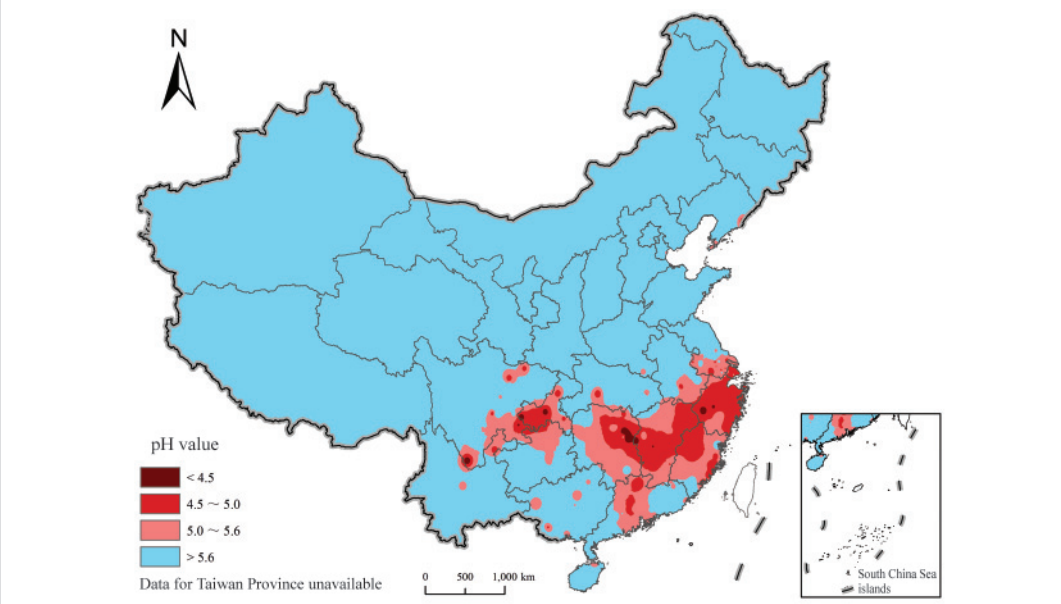


Diagram of the isoline of the mean annual pH value of precipitation in China in 2013

Measures and Actions

【Prevention and control of atmospheric pollution】 Substantial progress has been made in the implementation of the *Twelfth Five-Year Plan for Prevention and Control of Atmospheric Pollution in Key Regions*, the *Guidelines on Strengthening the Administration over Emergency Response to Heavy Pollution Weather Events* were promulgated, and the *Bulletin on Enforcing Special Emission Limits of Air Pollutants* and the *Guide to Preparation of Emergency Preparedness Plan for Heavy Air Pollution in Urban Areas* were circulated. Regulatory documents such as *Regulations on the Administration over Automobile Emission Inspection* were promulgated and implemented. The limits and measurement methods for exhaust pollutants from gas fuelled positive ignition engines of vehicles (Stage V) were effective as of January 2013. Thematic campaigns were carried out in key regions with regard to the inspection on efforts combating atmospheric pollution. The *Clean Air Research Initiative* was published, planning to break the technological bottlenecks in respect of the inventory of atmospheric pollution sources and integrated pollution reduction; air quality monitoring and pollution source apportionment; heavy pollution forecast, early warning, and emergency response regulation; regional air quality management; and environmental economic policies, and to establish State-level technical systems for prevention and control of atmospheric pollution. The establishment of "State Environmental Protection Key Laboratory of Sources and Control of Air Pollution Complex (SCAPC)", "State Environmental Protection Key Laboratory of Atmospheric Physical Simulation and Pollution Control", and "State Environmental Protection Key Laboratory of Vehicle Exhaust Control and Simulation" were under way.

【Air quality monitoring capacity building and improved information sharing】 The real-time readings of the six pollutants as well as the AQI readings were being announced according to the data from the 496 monitoring sites in the 74 cities scheduled to enforce the new ambient air quality standards in 2013 at Stage I. The capacity building for air quality monitoring in accordance with the new standard was provided to the 388 monitoring sites located in 87 cities scheduled to enforce the new air quality standard at Stage II. The real-time air quality data from 884 monitoring sites in 161 cities applying the new standard will become available in 2014. The "State Center of Ambient Air Quality Monitoring, Forecast, and Early Warning" was set up within the year, the *Programme on Monitoring and Early Warning of Heavy Pollution Weather Events in Beijing-Tianjin-Hebei Region and Surrounding Area (on trial)* was released, and *Detailed Rules of Implementation on Monitoring and Early Warning of Heavy Pollution Weather Events in Beijing-Tianjin-Hebei Region and Surrounding Area (on trial)* was prepared. Regional ambient air quality forecast was provided in Beijing-Tianjin-Hebei region as of October 1, 2013.