2019

Shanghai Ecological and Environmental Bulletin

Shanghai Municipal Bureau of Ecology and Environment

ADD：NO.100 DAGU ROAD SHANGHAI,CHINA

TEL：（8621）23111111

FAX：（8621）63556010

P.C：200003

According to the provision that “ the authorities of environmental protection of the people’s government at provincial level or above should issue the environmental bulletin regularly ”, which is stipulated in Article 54 of the Environmental Protection Law of the People’s Republic of China, and the provision that “ the Municipal Environmental Protection Bureau should issue a local annual environmental bulletin every year ”, which is provided for in Article 58 of the Shanghai Environmental Protection Regulations, 2019 Shanghai Ecological and Environmental Bulletin is hereby issued.

Shou ZiQi
General Director
Shanghai Municipal Bureau of Ecology and Environment
June 2020

Contents

An Overview

2019 was a crucial year in promoting pollution prevention and control. Guided by Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era, efforts were made in learning and understanding Xi Jinping's important speech during his visit to Shanghai as well as Xi Jinping's Thoughts on Ecological Civilization. Shanghai has coordinated the high-quality economic development, the battle against pollution and the innovative integrated development of the Yangtze River Delta, and successfully completed the environmental protection work of the Second China International Import Expo. All work tasks have progressed smoothly and the quality of ecological environment has improved steadily.

In 2019, the concentration of $PM_{2.5}$ in ambient air was 35μg/m^3 in Shanghai, satisfying NSAAQS. The quality of water environment improved compared to 2018. The water quality of monitored sections of the rivers inferior to Category V dropped to 1.1%. The quality of all centralized sources of drinking water were all in full compliance with the national standards for drinking water; the overall quality of soil environment in agricultural lands was good; the overall quality of the groundwater in Shanghai and that of marine environment remained stable; the sound intensity of regional ambient noise improved slightly; the ambient radiation was kept within normal range and the quality of ecological environment was good.

Status of Ecological Environmental Quality

Status of Ecological Environmental Quality

Ambient Air Quality

※ Overall Review

In 2019[1] there were 309 days when air quality index (AQI) varied in the range between excellent and good, and the annual rate of excellent/good-AQI days was 84.7%. Among the 309 days, there were

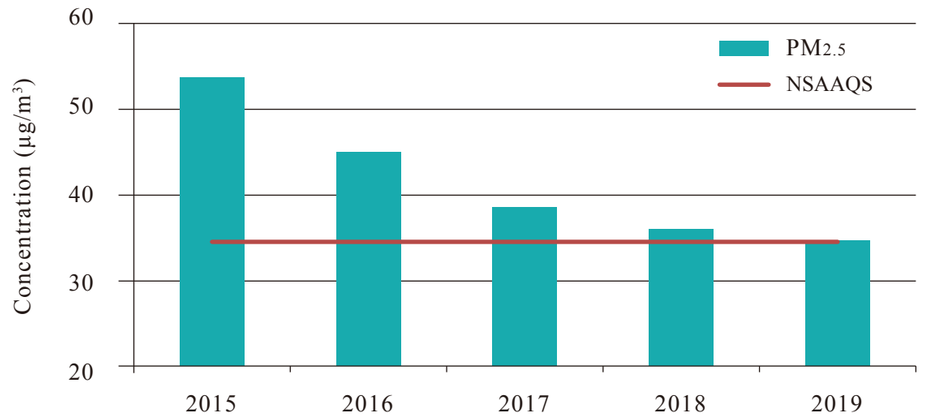
- 80 days when AQI was good;
- 229 days when AQI was moderate;
- 48 days when AQI denoted light pollution;
- 7 days when AQI denoted medial pollution;
- 1 days when AQI denoted heavy pollution.

Among the 56 days when air pollution occurred, there were

- 26 days, 46.4% of the total 56 days, when ozone was the primary pollutant;
- 25 days, 44.6% of the total 56 days, when primary pollutant was fine particulate matter ($PM_{2.5}$);
- 3 days, 5.4% of the total 56 days, when primary pollutant was inhalable particles (PM_{10}); and
- 2 days, 3.6% of the total 56 days, when primary pollutant was nitrogen dioxide (NO_2).

※ Primary Indicatives of Pollution

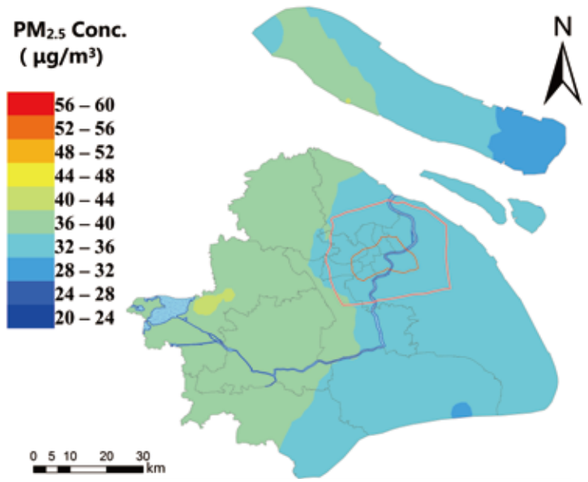
Fine Particulate Matter（$PM_{2.5}$）



Variations of annual average concentration of $PM_{2.5}$ in Shanghai from 2015 to 2019

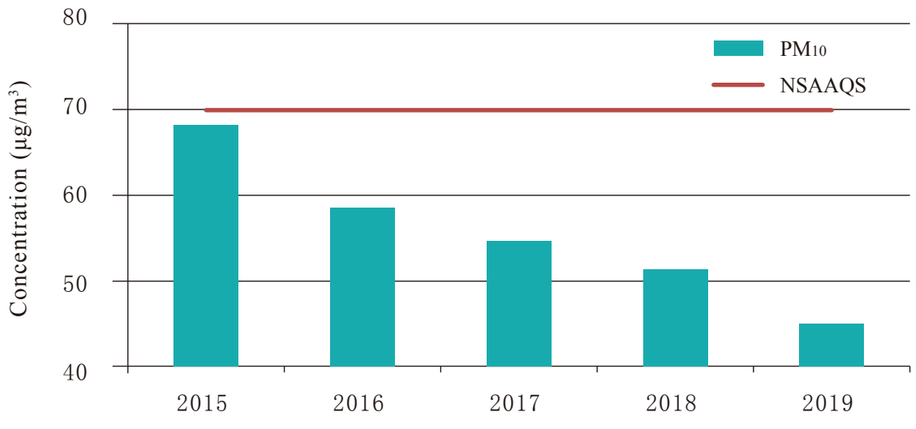
[1]Since 2019, the automatic monitoring of ambient air quality has been implemented in accordance with the amendment to the Ambient Air Quality Standard (GB 3095-2012). The relevant data of six major pollution indicators, namely the ambient air quality index (AQI), $PM_{2.5}$, PM_{10}, SO_2, NO_2, O_3, Co, can only be used for the overall trend judgment and not for absolute comparison with published data over the years.

In 2019 the average concentration of $PM_{2.5}$ in Shanghai was 35 ug/m^3, satisfying the standard of National Second Ambient Air Quality Standards (NSAAQS). The lowest average concentration of $PM_{2.5}$ occurred in September at 21 ug/m^3 while the highest occurred in December at 50 ug/m^3. The data monitored in the past five years showed generally the annual average concentration of $PM_{2.5}$ in Shanghai was decreasing. Spatial distribution of the concentration of $PM_{2.5}$ in Shanghai showed a downward trend from west to east.



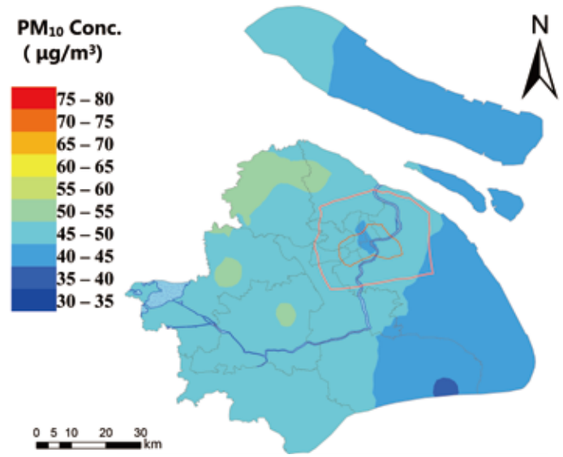
Spatial distribution of $PM_{2.5}$ concentration by district in Shanghai in 2019

Inhalable Particulate Matter（PM_{10}）



Variation of annual average concentration of PM_{10} in Shanghai from 2015 to 2019

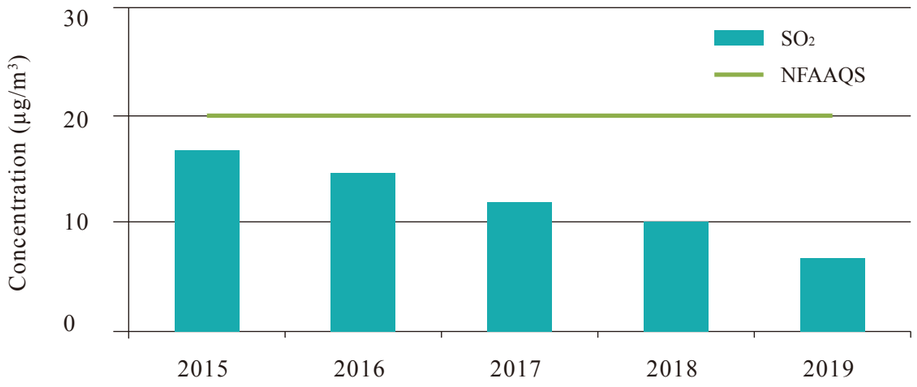
In 2019 the annual average concentration of PM_{10} in Shanghai was 45μg/m^3, meeting the NSAAQS. The data monitored in the past five years showed that the annual average concentration of PM_{10} has been falling down, and has met the NSAAQS for five consecutive years. The spatial distribution of the concentration of PM_{10} in Shanghai showed a downward trend from west to east.



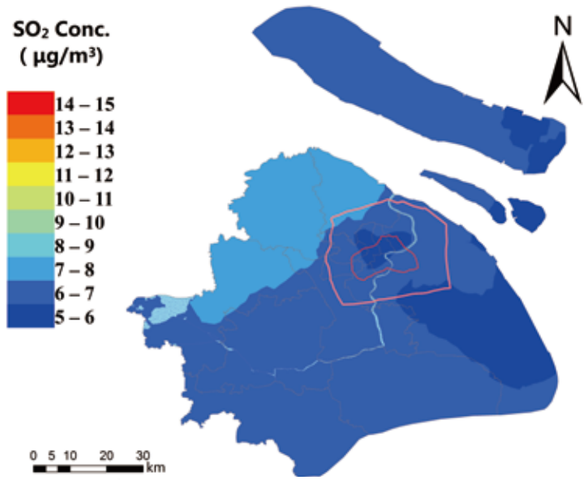
Spatial distribution of PM_{10} concentration by district in Shanghai in 2019

Sulphur Dioxide （SO_2）

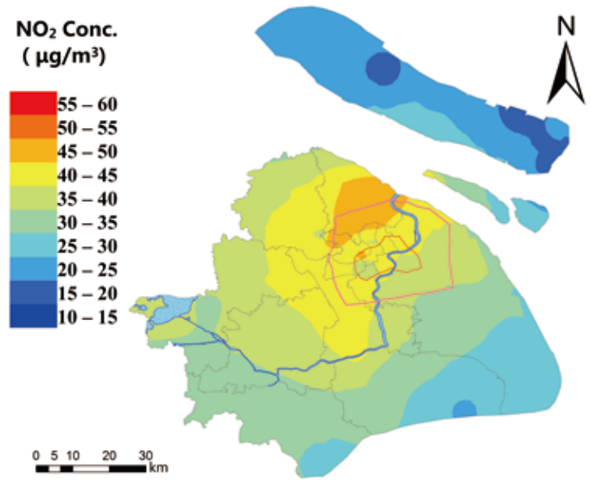
In 2019 the annual average concentration of SO_2 in Shanghai was 7μg/m^3, conforming to National First Ambient Air Quality Standards (NFAAQS). The data monitored in the past five years showed that the annual average concentration of SO_2 in Shanghai kept meeting NSAAQS and was on the downward trend on the whole. Generally, the concentration of SO_2 in all districts in Shanghai in 2019 was low.



Variation of annual average concentration of SO_2 in Shanghai from 2015 to 2019



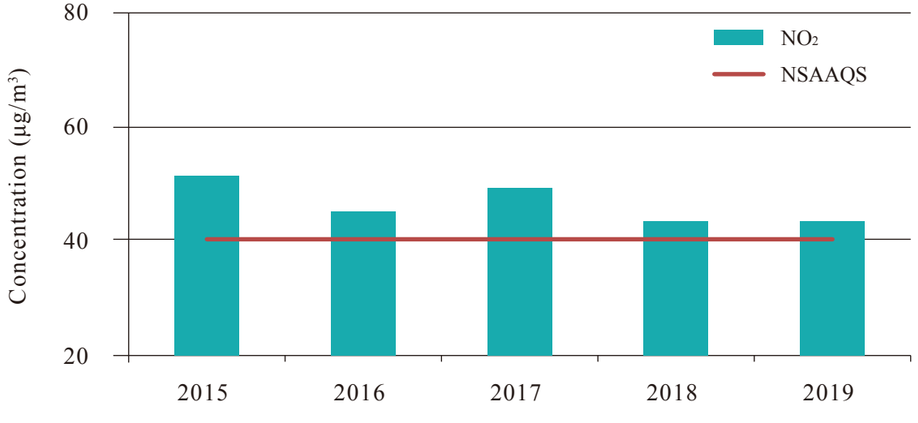
Spatial distribution of the concentration of SO_2 by district in Shanghai in 2019



Spatial distribution of the concentration of NO_2 by district in Shanghai in 2019

Nitrogen Dioxide（NO_2）

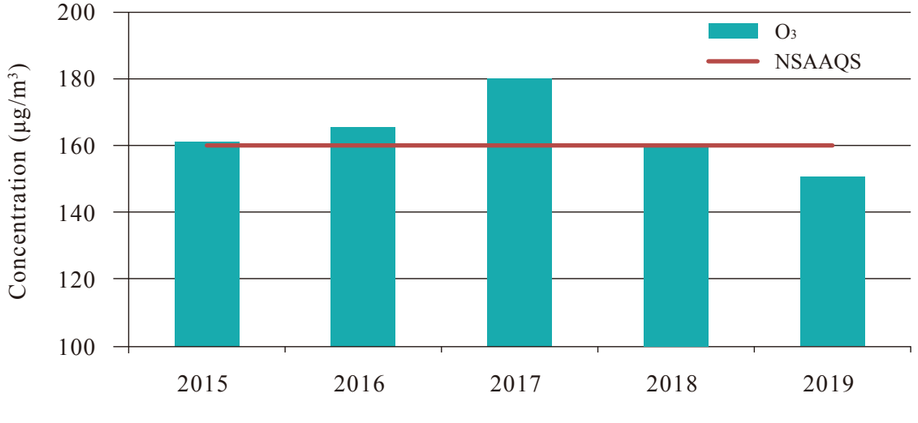
In 2019 the annual average concentration of NO_2 in Shanghai was 42 μg/m³, 2μg/m³ higher than the NSAAQS. The data monitored in the past five years showed that the annual average concentration of NO_2 in Shanghai failed to meet NSAAQS. In 2019 the spatial distribution of the concentration of NO_2 in Shanghai showed a tendency that it decreased gradually from downtown towards all directions. Generally, it was higher in west of the Huangpu River than in east of the river.



Variation of annual average concentration of NO_2 in Shanghai from 2015 to 2019

Ozone（O_3）

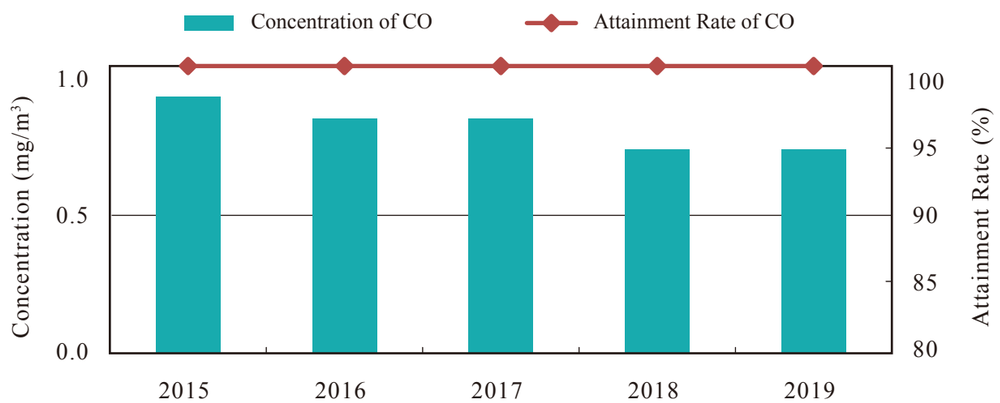
In 2019 the average concentration of O_3 in Shanghai, which was the ninetieth percentile monitored daily in the eight peak hours, was 151μg/m³, satisfying NSAAQS. 86.0%-93.8% data of the average concentration of ozone monitored daily in eight peak hours at the state-controlled spots in Shanghai were up to NSAAQS. The data monitored in the past five years showed that the ninetieth percentile of the average concentration of ozone monitored daily in eight peak hours was fluctuating around the standard line (160 μg/m³).



Variation of concentration of O_3 in Shanghai from 2015 to 2019

Carbon Monoxide （CO）

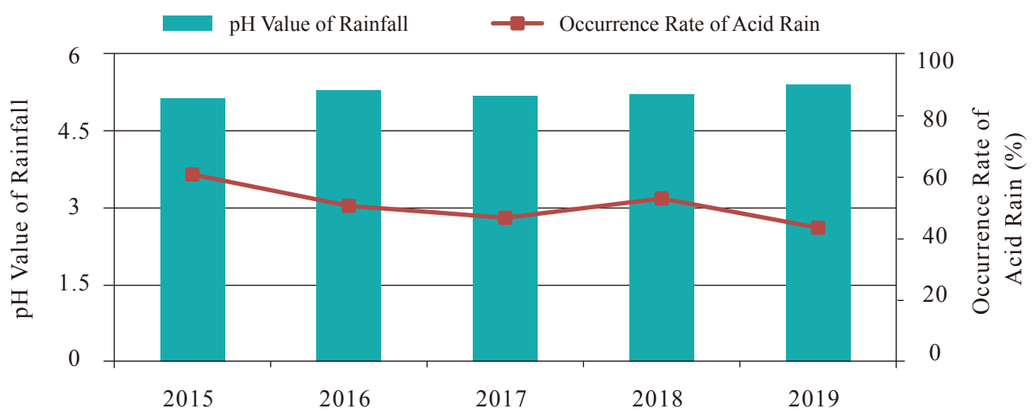
In 2019 the daily average concentration of CO monitored in Shanghai varied between 0.3mg/m³ and 1.6mg/m³, meeting NFAAQS. The annual average concentration of CO was 0.66mg/m³. The data monitored in the past five years showed that the daily average concentration of carbon monoxide has 100% met NFAAQS as the annual average concentration of carbon monoxide remained below 1.0mg/m³.



Variation of annual average concentration of CO in Shanghai from 2015 to 2019

Acid Rain

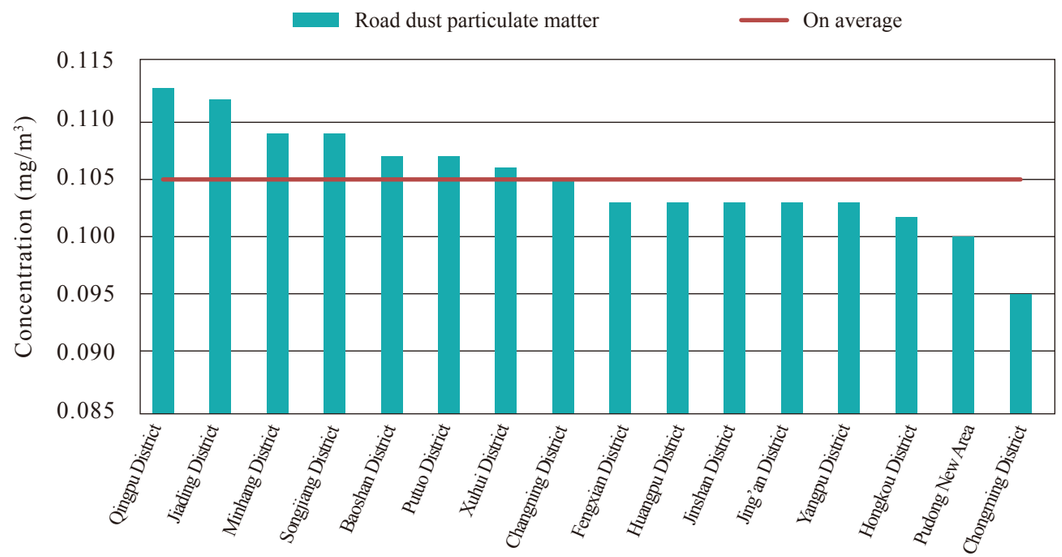
The average pH value of rainfall in 2019 was 5.34; the occurrence rate of acid rain was 44.5%, 9.3 percentage points lower than that in 2018. The data monitored in the past five years showed that the occurrence rate of air pollution caused by acid rain in Shanghai was coming down.



Variation of the average pH value of rainfall and the occurrence rate of acid rain in Shanghai from 2015 to 2019

Road Dust Particulate Matter

In 2019 the concentration of road dust particulate matter in Shanghai was 0.105mg/m³, 0.006 mg/m³ lower than that of 2018; while in different districts of Shanghai it varied between 0.095mg/m³ and 0.113mg/m³.



Concentrations of road dust particulate matter in different districts of Shanghai in 2019

Quality of Surface Water Environment

※ Water Quality of Main Rivers and Lakes

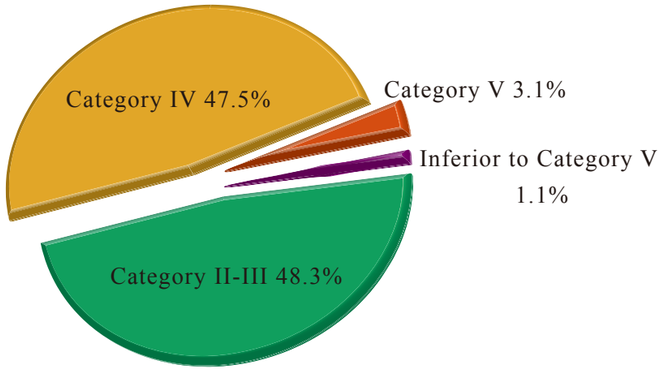
General Review

In 2019, the water quality of 48.3% of monitored river sections[2] in Shanghai was up to the standard of Category II and III; 47.5% of them fell into Category IV and 3.1% fell into Category V; and 1.1% of them has a water quality inferior to Category V. Major parameters of pollution were total phosphorus and ammonia nitrogen.

Generally, compared with that in 2018, water quality in main rivers in Shanghai improved slightly in 2019. The average concentration of permanganate index was 4.4mg/l, 4.3% lower than that in 2018; while the average concentration of ammonia nitrogen was 0.61mg/l, 35.1% lower than that in 2018; the average concentration of total phosphorus was 0.191mg/l, dropped by 7.3% from a year earlier.

Dianshanhu Lake was slightly eutrophic, having improved slightly compared with 2018.

[2]The total number of monitored sections of the rivers in Shanghai was 259.



Percentage of water quality categories
at the monitored river sections in Shanghai in 2019

Main Rivers

①The Huangpu River

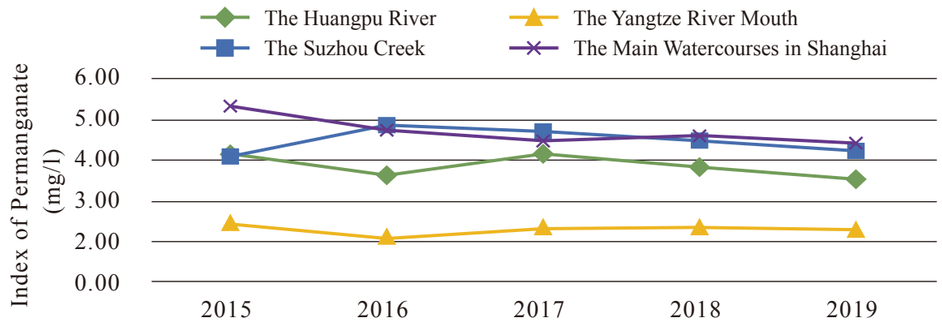
The water quality at five out of six sections of the Huangpu River was up to the standard of Category III, and the other one was classified into Category II. Compared with that in 2018, water quality improved a little on the whole, as the average permanganate index and average concentrations of ammonia nitrogen and total phosphorus were 7.7%, 12.1% and 11.4% lower respectively.

② The Suzhou Creek

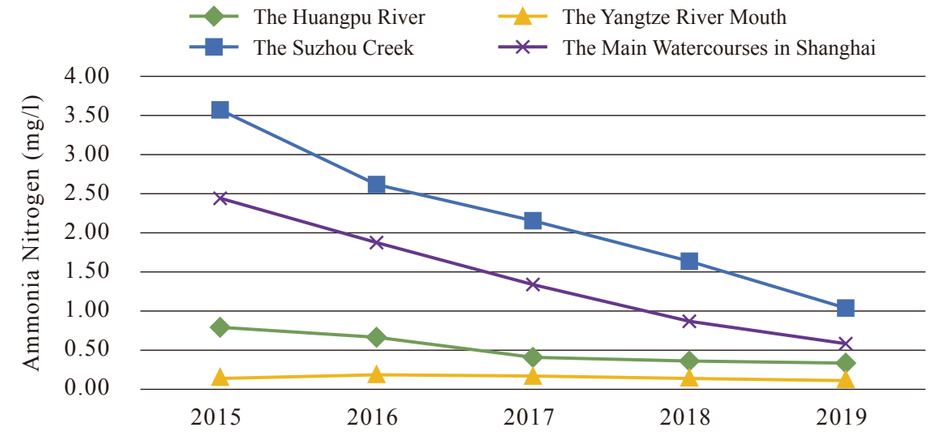
The water quality at all seven sections of the Suzhou Creek was classified as Category IV; major parameters of pollution were total phosphorus and ammonia nitrogen. Compared with that in 2018, water quality on the whole slightly improved, as the average permanganate index and average concentrations of ammonia nitrogen and total phosphorus were 8.7%, 36.9% and 15.8% lower respectively.

③ The Yangtze River Mouth

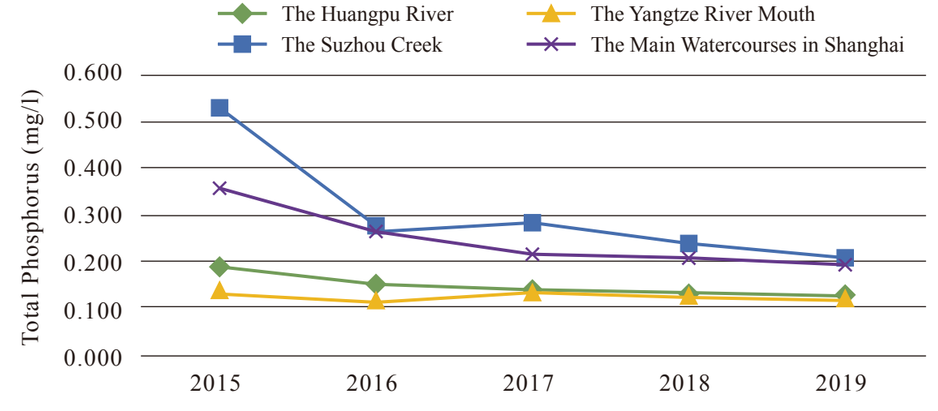
The water quality at three of the seven sections in the Yangtze River Mouth met the standard of Category II, and that at the other four met Category III. The overall water quality remains basically the same as that in 2018. The average permanganate index and average concentrations of ammonia nitrogen and total phosphorus were 4.2%, 7.1% and 6.0% lower respectively.



Variation of the average permanganate index in main rivers in Shanghai between 2015-2019



Variation of the concentrations of ammonia nitrogen in main rivers in Shanghai between 2015-2019



Variation of the concentrations of total phosphorus in main rivers in Shanghai between 2015-2019

※ Quality of Centralized Sources of Drinking Water

Shanghai is served by four centralized sources of drinking water, namely the Qingcaosha Reservoir, the Dongfengxisha Reservoir and the Chenhang Reservoir in the Yangtze River, and the Jinze Reservoir in the Huangpu River. In 2019, the four reservoirs were all in full compliance with the national standards for drinking water (at or above the Category-III water quality standards).

Quality of Groundwater Environment

In 2019, 13 national-level groundwater monitoring sites in Shanghai included in the national evaluation project for the environment and quality of groundwater were monitored by the Municipal Planning and Resource Bureau. The monitoring sites that were set up in line with the groundwater aquifer systems covered the shallow groundwater represented by the phreatic aquifers and the medium and deep groundwater dominated by the confined aquifers. The qualities of the groundwater monitored were also evaluated by the Bureau in accordance with the *Standard for Groundwater Quality* (GB/T 14848-2017). As shown by the evaluation result, the numbers of sites meeting the standard of Category III, VI and V were 2, 10, and 1 respectively, and accounted for 15.4%, 76.9%, and 7.7% of the total 13 sites. It was thus concluded that in 2019 the overall quality of the groundwater in Shanghai remained stable. Specifically, the evaluation result of the phreatic aquifers was mainly determined by the levels of iron, manganese, overall hardness and nitrite. The level of iron and manganese was high in the original phreatic aquifers, while the overall hardness and nitrite level might have been a result of human activities. The evaluation result of the confined aquifers was mainly determined by the levels of iron and manganese, which were both high in the original groundwater.

Quality of Marine Environment

※ General Review

In 2019, among all the monitoring sites in Shanghai's maritime areas, 20.5% of them were compliant with the Category-I or II standards for sea water quality, 10.3% compliant with Category-III or IV standards, and 69.2% inferior to the Category-IV standards. The main pollutants were inorganic nitrogen and active phosphate.

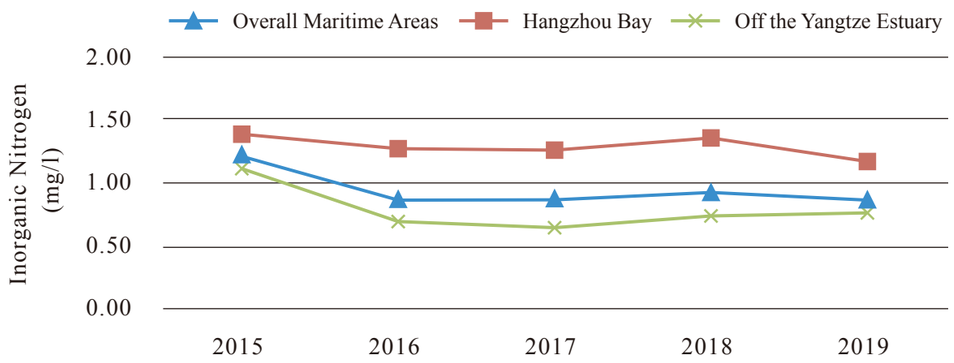
Compared with 2018, the number of monitoring sites that were compliant with the Category-I or II standards for sea water quality has increased by 9.7%, those compliant with Category-III or IV standards fell by 8.1%, and those inferior to Category-IV standards fell by 1.6%. In these maritime areas, inorganic nitrogen recorded an average level of 0.817 mg/l, which fell by 11.2% on a year-on-year basis; active phosphate of 0.0357 mg/l, which rose by 1.2% o an year-on-year basis; and average chemical oxygen demand of 1.40 mg/l, which fell by 29.0% on a year-on-year basis.

※ Offshore Area of the Yangtze Estuary

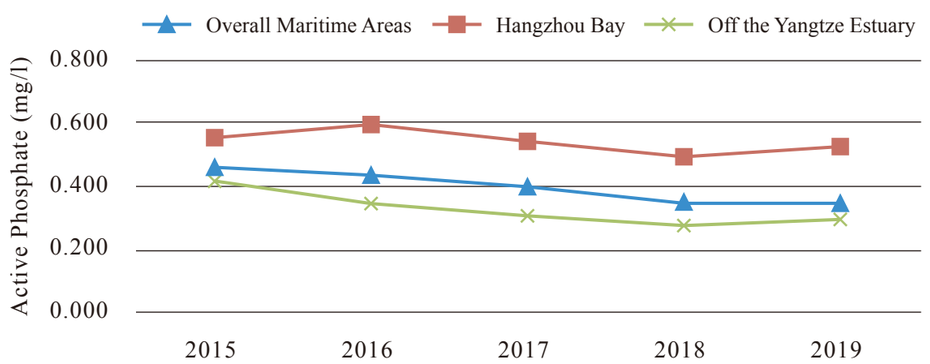
In the offshore area of the Yangtze Estuary, there were 25.0% of monitoring sites compliant with the Category-I or II standards for sea water quality, 12.5% compliant with Category-III or IV standards, and 62.5% inferior to the Category-IV standards. Among major pollutants, the concentration of inorganic nitrogen and active phosphate rose by 1.3% and 11.1% respectively, and the chemical oxygen demand fell by 26.1%.

※ Hangzhou Bay area

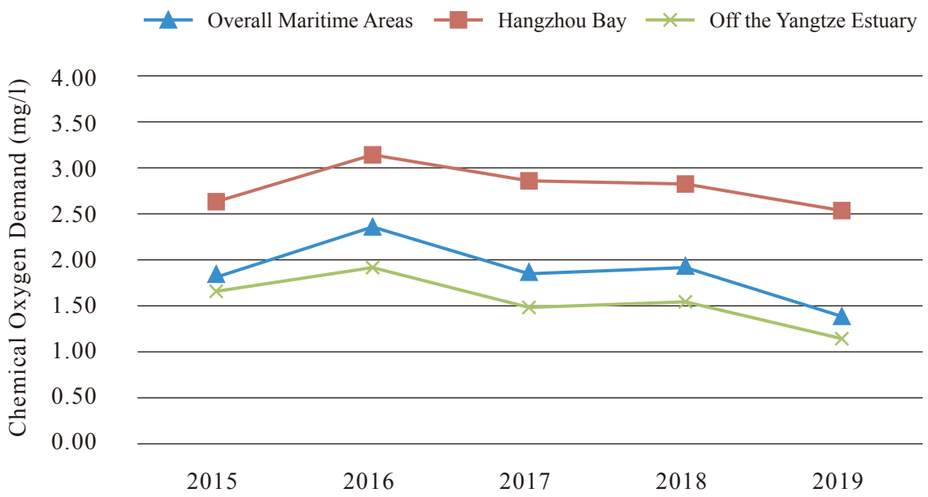
The qualities of sea water at all the monitoring sites in the Hangzhou Bay area were inferior to the Category-IV standards, which was the same as in 2018. Among major pollutants, the concentration of active phosphate rose by 7.5%, and the concentration of inorganic nitrogen and chemical oxygen demand fell by 12.9% and 10.3% respectively.



Variation of the concentration of inorganic nitrogen in maritime areas in Shanghai between 2015-2019



Variation of the concentration of active phosphate in maritime areas in Shanghai between 2015-2019



Variation of the concentration of chemical oxygen demand in maritime areas in Shanghai between 2015-2019

Quality of Soil Environment

The data monitored at the designated locations in the Shanghai national soil environment monitoring network between 2017-2019 indicated a good overall quality of soil environment of agricultural land in Shanghai.

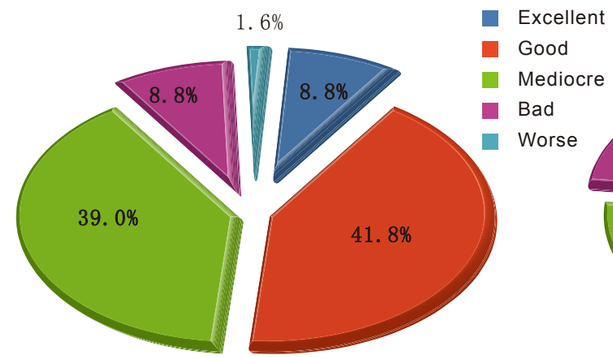
Quality of Sonic Environment

※ General Review

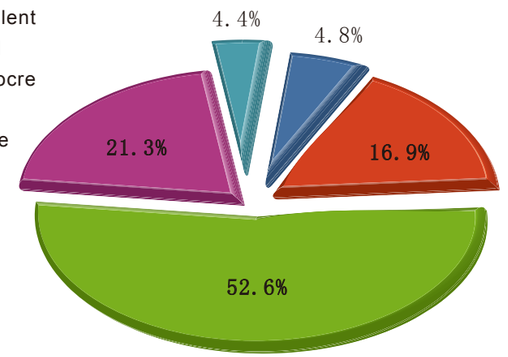
In 2019 the intensity of regional ambient noise in Shanghai was controlled within a good range. Road traffic noise was reduced.

※ Regional Ambient Noise

In 2019 the average equivalent sound intensity of regional ambient noise in Shanghai at daytime was 54.9 dB (A), 0.3 dB (A) lower than that in 2018; at night it was 47.7 dB (A), 0.6 dB (A) lower than that in 2018. The data monitored at daytime at 89.6% of the monitoring spots were excellent, good or mediocre, while at night the data monitored at 74.3% of the monitoring spots were excellent, good or mediocre.

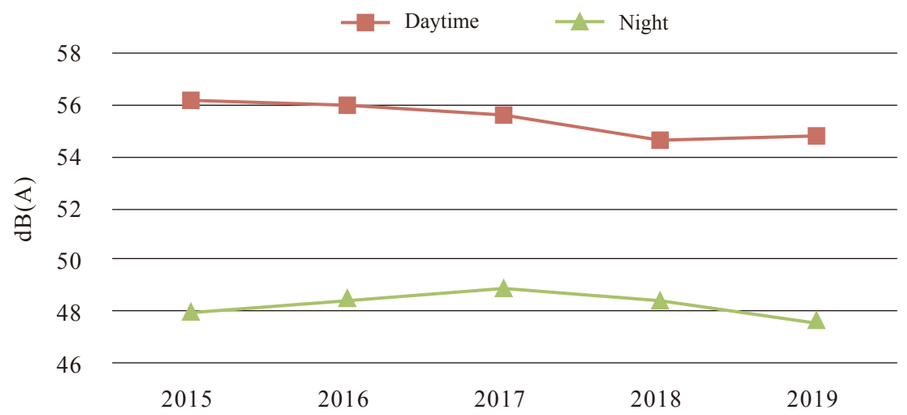


The percentage of regional ambient noise intensities in Shanghai at daytime in 2019



The percentage of regional ambient noise intensities in Shanghai at night in 2019

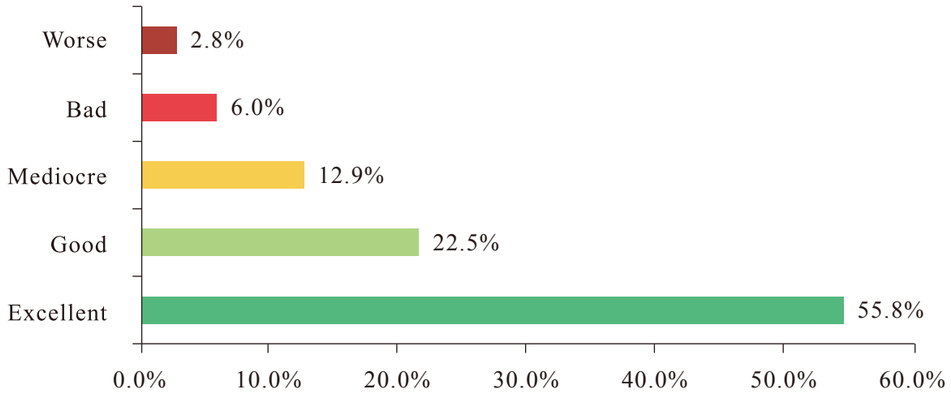
The data monitored in the past five years showed that the intensity of regional ambient noise in Shanghai remained around 55-56 dB (A) at daytime and 48-49 dB (A) at night, keeping stable on the whole.



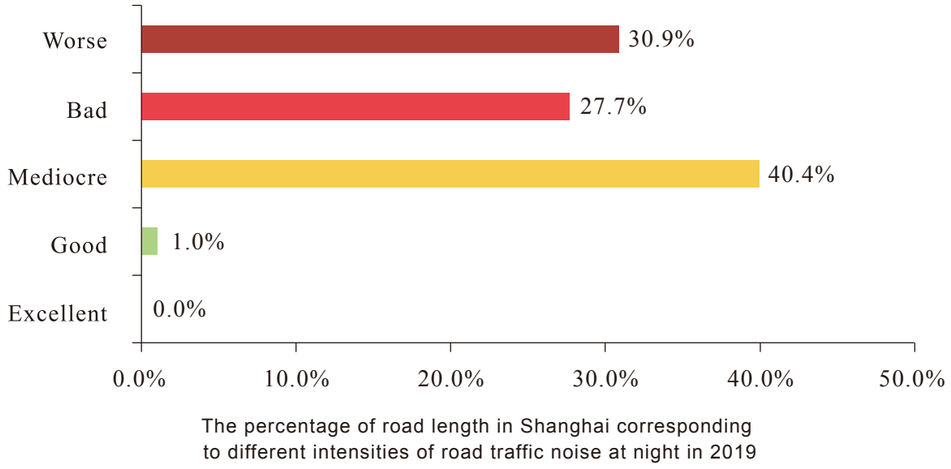
Variation of regional ambient noise intensity in Shanghai from 2015 to 2019

※ Road Traffic Noise

In 2019 the average equivalent sound intensity of road traffic noise at daytime in Shanghai was 68.3 dB (A), 1.0 dB(A) lower than that in 2018; at night it was 63.9 dB (A), 1.0 dB (A) lower than that in 2018. The data monitored at daytime in 91.2% of the total length of monitored road were excellent, good or mediocre, while at night the data monitored in 41.4% of the total length of monitored road were good or mediocre.

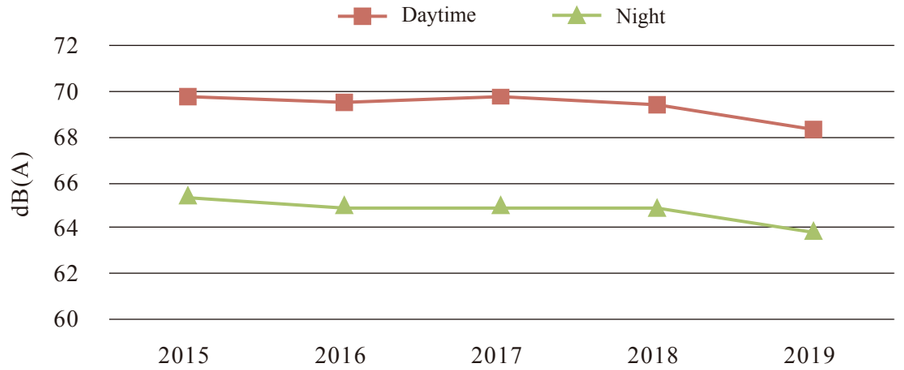


The percentage of road length in Shanghai corresponding to different intensities of road traffic noise at daytime in 2019



The percentage of road length in Shanghai corresponding to different intensities of road traffic noise at night in 2019

The data monitored in the past five years showed that the intensity of road traffic noise in Shanghai remained stable between 68 and 70dB(A) at daytime and between 64 and 66dB(A) at night.



Variation of road traffic noise in Shanghai from 2015 to 2019

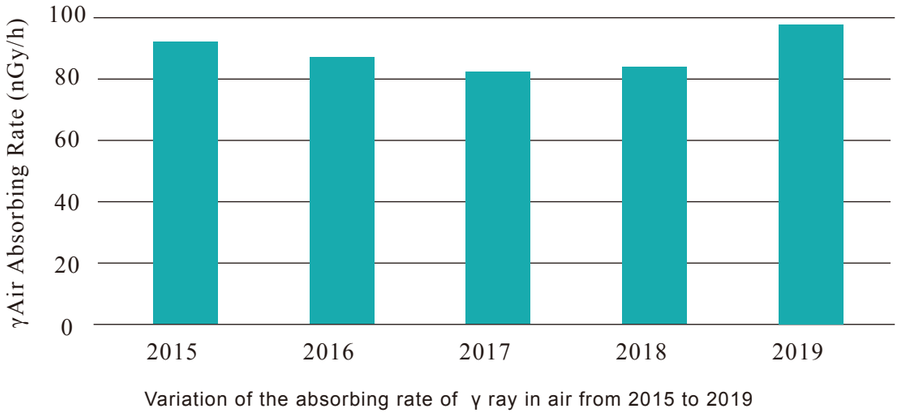
Quality of Radiation Environment

On the whole, the quality of radiation environment in Shanghai was good in 2019.

※ Ionization Radiation

In view of ambient radiation conditions, the monitored data of absorbing rate of γ ray in the air and accumulated radiation amount of γ ray, as well as the sample analysis of aerosol, rainfall, precipitate, vapor, surface water, groundwater, seawater, soil and biologics have shown that the activity and concentration of radioactive nuclide in air, water bodies and soil in Shanghai were at a normal level; the absorbing rate of γ ray in air monitored in different places in the city remained the same as those monitored in previous years.

Viewing the sites where nuclear technology was applied, the data of ambient radiation level monitored around radioactive sources (Category 1-5) and facilities of radioactive rays (Category 1-3) in Shanghai showed that the annually-accumulated radiation amount of γ ray in neighboring zones around these sites complied with the limits of exposure defined for the public and the professionals in the *Basic Standards for the Protection against Ionization Radiation and for the Safety of Radiation Sources* (GB 18871-2002).



Variation of the absorbing rate of γ ray in air from 2015 to 2019

※ Electromagnetic Radiation

In respect of electromagnetic radiation environment, the data monitored in the ten places—Shanghai Zoo, Gongqing Forest Park, Changfeng Park, Century Park, People's Park, Fengxian Guhua Garden, Jiading Confucius Temple, the business area (People's Square), the industrial area (Qingpu Industrial Zone) and the residential area (Zhongyuan Liangwan City)—showed that the industrial-frequency electric field intensity varied from 0.148v/m to 1.584v/m; the industrial-frequency magnetic induction intensity varied from 0.0153 μt to 0.0592 μt; and the composite electric field intensity from 0.14v/m to 0.93v/m. Compared with the data monitored in previous years, environmental background levels of electromagnetic radiation in Shanghai had no marked change.

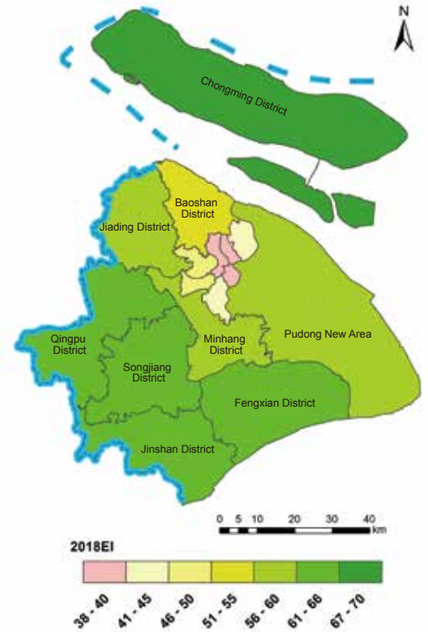
In regard to electromagnetic radiation sources, results of electromagnetic radiation levels monitored at Oriental Pearl TV Tower, Gulu 500kV Transformer Substation and another transformer substation, 500kV power transmission lines in Fenlin and another high-voltage power line, the satellite earth station, the radar station in Pudong Airport, the mobile communication substations, the maglev train and both sides along the electric railway showed that the industrial-frequency electric field intensity, the industrial-frequency magnetic induction intensity and composite electric field intensity in the surrounding environment with electromagnetic field and electromagnetic radiation (excludes ionization) have all met the relevant requirements stipulated in the *Limited Values Controlled for Electromagnetic Environment* (GB 8702-2014).

Ecosystem Status

As evaluated in accordance with the *Technical Criterion for Ecosystem Status Evaluation* (HJ 192-2015), the Ecological Index (EI) of Shanghai in 2018[3] registered 62.40, and the ecosystem was rated as good with relatively high vegetation coverage and biodiversity.

Compared with the city's ecosystem in 2017, the variance in EI (|ΔEI|) in 2018 was 0.20, and the whole ecosystem generally remained stable. Specifically, the Pollution Load Index was improved, and the Vegetation Coverage Index, Biological Richness Index, the Water Network Denseness Index and the Land Stress Index remained the same.

The ecosystems of all the districts in Shanghai in 2018 were rated as either good or average, with Chongming District, Jinshan District, Qingpu District, Fengxian District, Songjiang District, Pudong New Area, Jiading District and Minhang District rated as good, and other districts rated as average.



Shanghai's ecosystem status in 2018

[3]As of the date of publication of this bulletin, the data of 2019 is still under review, so the 2018 data is used here.

Main Tasks Fulfilled

Main Tasks Fulfilled

The Tough Battle of Pollution Prevention and Control

The Three-Year Action Plan of Environmental Protection

2019 was a crucial year in implementing Shanghai's seventh three-year action plan on environmental protection. Thanks to the coordination platform established by the Municipal Government's leading team of promoting environmental protection and improvement, the overall implementation of the action plan had been smooth. By the end of 2019, among the 250 projects of the seventh three-year action plan, 237 of them were started, which accounts for 95% of the total number of projects; and 104 of them were completed, which accounts for 42% of the total number of projects. To be specific, in terms of the **special action for water**, the Bailonggang sewage treatment plant renovation project for a higher standard of water quality and the Taihe sewage treatment plant construction project were completed. The capacity of Grade-I A-level sewerage treatment was improved by over 3.2 million m^3/day. The water quality improvement work of 558 km of waterway was completed. In terms of the **special action for air**, the total coal consumption of major coal consuming enterprises decreased by 3.3% year on year, and 3851 small and medium-sized oil or gas boilers were rebuilt as low nitrogen boilers. A total of 302,000 new energy vehicles were promoted in the market. In terms of the **special action for solid waste**, the coverage rate of domestic waste sorting and reduction reached 95%. The city's dry waste incineration and wet waste recycling capacity reached 24,850 tons/day, and the domestic waste landfill capacity reached 15,350 tons/day. In terms of the **special action for**

industries, *the Guiding Category of Restricted and Eliminated Projects for Shanghai Industrial Restructuring* (2020 Edition) was released. 1081 projects were completed and the industrial restructuring of 8 key regions (special projects) was started. The area of old and unused industrial land was reduced by 15.25 square kilometers. In terms of the **special action for agriculture and rural areas,** the comprehensive utilization rate of livestock and poultry manure was more than 96%, and manure treatment facilities and equipment were 100% available at large-scale livestock and poultry farms. The recycling rate of pesticide packaging waste reached over 99%. The comprehensive utilization rate of main crop straw reached 96%, and the renovation of 73,000 villages was completed. In terms of the **ecological special action**, an area of 11,300 mu was vegetated, with a forest coverage rate of 17.56%; 1201 hectares of green space, 210 kilometers of greenway and 400,000 square meters of vertical green space have been built, with a per capita green area of park space of 8.35 square meters. In terms of the **special action for circular economy**, 14 state-level and 21 municipal level parks were renovated for circular economy, and the construction of demonstration bases of national remanufacturing industry in Lingang area was continuously promoted; 13,998 recycling service points, 181 transfer points and 9 large-scale gathering areas were built for the purposes of integrating the “cleaning service network and recycling network”.

※ Prevention and Control of Air Pollution

In 2019, *the Shanghai Clean Air Action Plan* (2018-2022) was implemented. The 2019 *Distrct Level Task List for the Shanghai Clean Air Action Plan* and the 2019 *Key Actions for Shanghai's Air Pollution Prevention and Control* were issued. All tasks were in orderly progression.

In terms of fixed source pollution control, efforts have been made to promote the ultra-low emission transformation project of the iron and steel industry and the special treatment plan for industrial furnaces, completing ultra-low emission transformation of nearly 50% of Baoshan Iron and Steel's production capacity, and the treatment of 37 industrial furnaces. In addition, more than 1,081 enterprises have been restructured, 204 non-environmentally friendly enterprises and 70 enterprises with unorganized dust emission have been renovated.

In terms of the control of pollution from mobile sources, from January 1st, the unification of land vehicle diesel, ordinary diesel, and marine vehicle diesel has been realized in Shanghai. From May 1st, two new standards have been fully implemented among motor vehicle emission inspection agencies: *Limits and Measurement Methods for Pollutant Emissions from Gasoline Vehicles and Limits and Measurement Methods for Pollutant Emissions from Diesel Vehicles*. From July 1st, the city implemented the national 6b emission standards for light-weight vehicles in advance, and developed and launched the "Shanghai Environmental Protection Certification Assistant for Motor Vehicles". From October 1st, the city implemented areas of prohibited use of high-emission non-road mobile machinery, and carried out declaration and registration for non-road mobile machinery. Nearly 50,000 machines have completed registration. From November 1st, the city carried out emission testing for newly registered cars, and officially carried out OBD inspection and nitrogen oxides inspection for diesel vehicles during vehicle emissions inspection. From December 1st, the city fully implemented the vehicle emission inspection and mandatory maintenance system to achieve closed-loop management of motor vehicles that do not meet the inspection standards. In terms of eliminating old vehicles, policies have been made to expand the traffic control area of National III diesel trucks and subsidies for early elimination, and from October 1st, the city officially started providing subsidies for National III diesel trucks that were no longer used ahead of the usual lifecycle; and 33,000 old vehicles were eliminated throughout the year.

In other aspects, the scope of online monitoring of fugitive dust was expanded, with more than 3,600 monitoring locations in total; pilot projects for intensive treatment of lampblack pollution in commercial complex were carried out, with 863 completed.

※ Prevention and Control of Water Pollution

The *Implementation Plan for the Action to Prevent and Control Water Pollution in Shanghai* was further rolled out. As of the end of 2019, about 89.66% of the 87 construction projects, meaning 78 projects, had been completed, including 28 drainage system improvement projects in central urban area, rainwater and sewage diversion reconstruction project of municipal pipeline, and municipal rainwater pump station dry weather flow interception project in central urban area (21 stations). In addition, 68.9% of the total work in the 101 administration projects were finished, with 50 (49.5%) projects fully completed, including issuing the Shanghai negative list of industrial restructuring and energy efficiency guidelines, comprehensive renovation of small and medium-sized waterways, and the dredging of rivers in towns and villages.

The battle for clean water was firmly continued. To meet the goals of fully cleaning black and odorous rivers by the end of 2018 and eliminating Category-V waters by 2020, efforts were made to further implement the river and lake chief system, carry out the Clean Water Plan pillared on the Phase-IV Comprehensive Restoration of Suzhou Creek (“Phase-4 Suzhou Creek Restoration”), and push ahead the three-year action plan on Category-V water control to win the

battle against black and odorous rivers. The task for 2019 was overfulfilled with over 7,600 Category-V rivers among the 18,800 rivers cleaned and the portion of Category-V rivers reducing to 7.8%. The investigation and restoration of the Yangtze River outfall was implemented; the Special Work Plan for the Investigation and Restoration of Shanghai Yangtze River Outfall was issued; the UAV aerial survey was completed; and the investigation on Yangtze River's secondary and tertiary outfalls was carried out in collaboration with the Ministry of Ecology and Environment.

※ Pollution Control and Prevention of Soil and Groundwater

The Law of People's Republic of China on the Prevention and Control of Soil Pollution **was implemented**. First, the soil environment management system for construction land was established. The Municipal Bureau of Ecology and Environment distributed the *Regulations on the Review of Reports on the Investigation, Risk Assessment and Effect Assessment of Soil Pollution of Construction Land in Shanghai (for Trial Implementation), Measures for the Management of the Expert Database for the Review of Reports on the Investigation, Risk Assessment and Effect Assessment of Soil and Groundwater Pollution of Construction Land in Shanghai, Notice on Regulating Provisions of Third-party Review of Reports on the Investigation, Risk Assessment and Effect Assessment of Soil and Groundwater Pollution of Construction Land in Shanghai, and Guidelines for Risk Control and Remediation Assessment of Soil Pollution of Construction Land in Shanghai (For Trial Implementation)*, which helped establish a more developed review procedure, standardized the work of experts, and developed more uniform review standard and regulations. Second, the supervision of key organizations was strengthened. The Municipal Bureau of Ecology and Environment issued *the Notice on the Investigation of Potential Soil and Groundwater Pollution Hazards in Key Supervision Units of Soil Pollution in Shanghai and the Work Guide Investigation of Potential Soil and Groundwater Pollution Hazards in Key Supervision Units of Soil Pollution in Shanghai (Trial)*, to strengthen the supervision and guidance on the prevention and control of soil pollution in key units of soil pollution to be supervised in Shanghai. Third, the management of agricultural soil environment was strengthened. The Municipal Commission of Agriculture and Rural Areas, together with the Municipal Bureau of Ecology and Environment and the Bureau of Planning and Resources, jointly issued the *Work Plan for Soil Environment Protection in the Concentrated Area of Cultivation Land of Prioritized Protection in Shanghai*, actively implementing the classified management of agricultural land on the basis of the classification of soil environmental quality of agricultural land.

The *Implementation Plan for the Action to Prevent and Control Soil Pollution in Shanghai* was carried out. In 2019, the city successfully completed the key annual tasks of the *Action Plan to Prevent and Control Soil Pollution*. First, the integration of the detailed investigation results of agricultural lands and the quality classification of the soil environment of cultivated land were completed. The investigation of soil pollution in the land used by enterprises in major polluting industries in Shanghai was pushed forward. Second, the prevention and control of pollution sources was enhanced. The prevention and control of pollution in heavy metal related industries was pushed forward, and decrease in the use of chemical fertilizers and pesticides was achieved throughout the year. Third, classified management of agricultural land was implemented, while determining and promoting safe use of polluted farmland and returning heavily polluted farmland to forests. Fourth, the access management of construction land was strengthened, and the list of high-risk and restorative construction land was issued to the public. Fifth, the list of 163 major polluting enterprises of soil environment was published to enhance information transparency.

***The Implementation Plan for Prevention and Control of Groundwater Pollution in Shanghai* was issued**. In accordance with the requirements of the National *Implementation Plan for Prevention and Control of Groundwater Pollution*, and focusing on the overall objectives of "protection, construction, coordination and implementation", the Municipal Bureau of Ecology and Environment, together with other 8 authorities including the Municipal Water Authority, issued the *Implementation Plan for Prevention and Control of Groundwater Pollution in Shanghai*, and accelerated the deployment of the prevention and control of groundwater pollution.

※ Ecological Environment Protection in Agriculture and Rural Areas

Working hard to control pollution in agriculture and rural areas. In 2019, the city issued the *Implementation Plan for the Actions to Control Agricultural and Rural Pollution in Shanghai*. The plan includes 4 aspects and 14 main tasks, focusing on the outstanding problems of agricultural non-point source pollution and ecological degradation, the problems of rural residential environment improvement and the weak supervision of rural ecological environment etc., refining task requirements and emphasizing the implementation of measures. Based on the "mandatory tasks" and "mandatory indicators" proposed by China, Shanghai has established 25 key assessment indicators for agricultural and rural pollution control. The work is scheduled quarterly to ensure that the measures are implemented in place and the work is effective. By the end of 2019, 19 of the 25 assessment indicators have been completed ahead of schedule, and the efforts to meet the remaining 6 indicators and tasks are advancing steadily.

Strengthening the supervision and guidance of rural environmental protection and agricultural non-point source pollution. First, the collection and treatment of rural domestic sewage was promoted. In 2019, according to the national requirements, the city issued the *Discharge Standard for Water Pollutants of Rural Domestic Sewage Treatment Facilities*. Investigation and monitoring of water pollutant discharge of rural domestic sewage treatment facilities was carried out to facilitate the normal operation of the rural domestic sewage treatment facilities built in Shanghai. Second, the comprehensive utilization of crop straw was promoted. Support policies were made to implement the fourth round of comprehensive utilization of crop straw, in order to further guide, encourage and promote the comprehensive utilization of straws. The long-term management mechanism was given full play, continuing to carry out UAV inspection and flight inspection to prohibit straw burning during the time of sowing, ploughing and harvesting, with a higher frequency and wider coverage of municipal inspection. Third, practical application of information technology was widely used. Big data was used for system analysis to make sure the management measures are more specific. The impact of non-point polluting sources of planting and aquaculture on the water environment was analysed to put forward effective management and control measures. Fourth, pollution control of livestock and poultry breeding industry was strengthened. Recovery of resources was the fundamental way to dealing with the waste from livestock and poultry breeding, promoting green management methods such as the combination of planting and breeding, and using straws as fertilizers in the farmland. The utilization rate of livestock and poultry manure has reached over 96%. In accordance with the

deployment of the Ministry of Ecology and Environment and the Ministry of Agriculture and Rural Areas, the regulations on prohibited areas of livestock and poultry breeding were updated and a thorough survey of such areas were conducted, further defining the areas that are prohibited from livestock and poultry breeding.

» Institutional Reform for Ecological Civilization

※ Overall Progress

In 2019, the city steadily promoted various reform tasks issued in recent years and made new reform measures. The outcome of these reform tasks were synergetic and continuously strengthened the development of an environmental governance system. The whole-process domestic waste sorting was strongly promoted, and the accuracy rate of waste sorting in the city was over 90%. In the special assessment by the Ministry of Housing and Urban-rural Development on domestic waste sorting in 46 cities in China, Shanghai continued to rank first. The standards and specifications for the recycling of construction waste was established to promote third-party treatment of pollution. The database of river and lake chief system was established and improved, with "one river, one policy" implemented. Efforts were made to support the second round of environmental protection supervision by the central government, to achieve full coverage of municipal environmental protection supervision which was the first round of supervision. The reform of environmental protection agencies was implemented. The pilot reform scheme of compensation for the damages to the ecological environment was pushed forward at a faster speed. The audit of natural resources assets upon the departure of government leaders was continued. Reform of the environmental assessment approval system was fully launched. A lateral

compensation mechanism for the ecological environment of river basins was established. The *Measures for the Management of Shanghai Wetland Directory (Provisional)* was issued, and the transfer of the comprehensive management functions of natural reserves was almost completed.

※ Environmental Protection Supervision

Developing a supervision system. In order to further refine and implement the functions and responsibilities of environmental protection supervision, the Municipal Bureau of Ecology and Environment has issued the *Guidelines for Comprehensive Supervision of Environmental Protection in Shanghai and the Compilation of Regulations for Environmental Protection Supervision in Shanghai*.

Inspection by the central government. In July 2019, the Central Inspection Group of Ecological Environment Protection carried out inspection work in Shanghai, and the Municipal Bureau of Ecology and Environment took the lead in the preparation, coordination, and logistic support for the inspection, rectifying problem while being inspected. By the end of 2019, 39 out of 46 rectification projects have been completed in the first round of inspection by the Central Inspection Group of Ecological Environment Protection, and the other 7 projects, such as water environment improvement and sludge disposal projects, were advancing orderly. In the first round, 1893 complaint letters have been sent to the Central Inspection Group, and 1881 of those cases have been closed; in the second round, 2481 complaint letters have been sent to the Central Inspection Group,1688 have been fully closed, and 520 are considered closed for the time being.

Municipal supervision. In 2019, the municipal ecological environment protection supervision was carried out in 8 districts in two batches, of which 4 districts' supervision feedbacks have been provided. There were more than 180 issues involved. Now more than 120 rectification items have been completed, with a completion rate of about 66%. At the same time, the first draft of supervision accountability plan has also been made.

※ Preparation and Management of the “Three Lines and One List” Document

The preparation of "Three Lines and One List" (the "three lines and one list" refers to the red line of ecological protection, the bottom line of environmental quality, the top line of resource utilization and the access list of environment) was completed. Under the guidance of the Ministry of Ecology and Environment, focusing on the overall goal of building an "ecological city" in 2035, oriented by the goal of environmental quality improvement, benchmarking the highest standard and the best performance, making joint effort through coordination, focusing on key tasks and promoting the work in an orderly manner, the preparation of the “Three Lines and One List” was completed and successfully obtained technical approval at the national level. The document mainly includes three aspects: first, 293 environmental control units in three categories have been defined to initially build a district management and control system of ecological environment covering the whole city; second, from the perspectives of spatial layout constraints, pollutant emission control, environmental risk management and control, and resource utilization efficiency, an access list was made, dividing projects into three categories according to environmental protection standards: prioritized, important and general, while the environ-

mental management and control requirements of each unit of space was defined as a guideline for the green and high-quality industrial development; third, data management system of the "three lines and one list" is built simultaneously, which has the display functions such as corresponding query of environmental management and control unit and access list, import of pollution source data, and dynamic database management functions.

The demarcation of the red line for ecological protection areas was promoted. In January 2019, the Municipal Bureau of Ecology and Environment, together with Municipal Bureau of Planning and Resources, Shanghai Administration Department of Afforestation and City Appearance and Municipal Bureau of Ocean Affairs, completed the pilot work of demarcating red lines of the ecological protection areas in Songjiang and Minhang districts. In August, based on the *Notice on Evaluating the Red Lines for Ecological Protection Areas* issued by the Ministry of Natural Resources, and the *Technical Regulations of Demarcation of Red Lines of Ecological Protection Areas* issued by the Ministry of Ecology and Environment, the Municipal Bureau of Planning and Resources, Shanghai Administration Department of Afforestation and City Appearance and Municipal of Water Authourity (Ocean Affairs) started the work of red line evaluation and demarcation (land area only) of ecological protection areas within Shanghai. In December, the Municipal Bureau of Ecology and Environment, Municipal Bureau of Planning and Resources and Shanghai Administration Department of Afforestation and City Appearance issued the *Work Plan for Red Line Demarcation of Ecological Protection Area (land) in Shanghai*. On the basis of the pilot scheme and in combination with the latest results of the red line assessment, the demarcation of the red line for ecological protection areas (land area) in the city was fully implemented.

※ Reform of Environmental Impact Assessment Approval System

Authorized by the Ministry of Ecological Environment, the reform of the Environmental Impact Assessment (EIA) approval system was carried out in Shanghai, establishing a "1 + 8 + 5" policy system of environmental impact assessment approval, which includes 1 overall plan, 8 important systems and 5 safeguard measures. The results include:

First, classified management. A list of key industries under classified management was issued. About 20% of the projects in the key industries were classified as having a huge environmental impact and high risks, which were subject to strict environmental assessment approval and in-progress and post-completion supervision. General projects that are not listed in the list of key industries will be classified and subject to simplified measures such as exemption from EIA, simplification of EIA, as well as notification and commitments.

Second, reducing the number of EIA projects. The list of Projects Exempted from EIA in Shanghai was revised to include projects with small environmental impact and low risks. About a quarter of the city's construction projects are exempted from EIA procedures to effectively optimize the business environment and reduce enterprise costs.

Third, optimization and simplification. The Implementation Opinions of Linking Planning EIA and Project EIA was issued. In areas where planning EIA measures are implemented, project EIA was simplified. Measures for public participation in the EIA of construction projects were issued, optimizing the frequency and time of public participation, and canceling household questionnaire survey. The Management Measures for Notification and Commitment of EIA

Approval of Construction Projects was issued. For some projects with prepared reports, notification and commitment management will be implemented immediately.

Fourth, strengthening supervision. The measures for in-progress and post-completion supervision and management were formulated to strengthen supervision from three aspects: supervision force, supervision content and supervision methods. In terms of supervision power, three levels of supervision have been established at city, district and town level. In terms of content of supervision, differentiated in-progress and post-completion supervision measures were taken for projects subject to approval, notification commitment or record-keeping. In terms of supervision methods, the scope of online monitoring of pollution sources was continuously expanded, making use of science and technology to expand supervision methods, as well as big data and information technology to enhance supervision ability.

Fifth, optimizing services. The environmental protection rules for various industries were made to clarify the environmental management requirements for specific industries, guiding enterprises to better perform their responsibilities. The "all in one network" of environmental assessment was realized, with construction companies submitting applications online, Ministry of Ecology and Environment making approval online, and application documents categorized, standardized and electronically archived.

※ Reform of the National Ecological Environmental Damage Compensation System

In 2019, Shanghai has fully implemented the reform tasks of the national ecological environmental damage compensation system. Under the general framework of *Implementation Plan for the Reform of the Ecological Environmental Damage Compensation System in Shanghai, the Opinions of the Shanghai Higher People's Court on Hearing Civil Cases of Ecological Environment Damage Brought by the Government* was issued, along with supporting measures for investigation, consultation, restoration assessment and information disclosure. The system was constantly improved, and implementation practices steadily promoted.

» Other Key Tasks

※ Management of Sewage Discharge Licenses

The task of issuing sewage discharge licenses was completed on schedule. In 2019, in accordance with the requirements of the *Catalogue of Classified Management of Sewage Discharge Licenses of Fixed Pollution Sources (2017 Edition)*, the city issued the notification on the issuance and management of sewage discharge permits in April 2019 (first batch) and October 2019 (second batch), and made an announcement on the *Liberation Daily*. The purpose was to promote the issuance of sewage discharge permits at fixed pollution sources in more than 20 major polluting industries such as automobiles and electronics. Responsibilities were divided between the Departments of Ecology and Environment at both city and district levels, and more than 2300 sewage discharge permits have been issued and more than 300 have been changed.

The quality of the issuing sewage discharge permits was improved. The standard template of the sewage discharge permits in major polluting industries such as automobile and electronics was compiled as a guideline for all district's work of issuing sewage discharge permits. *The Notification on the Quality Evaluation of the Sewage Discharge Permit Issued in 2018* was published, and a comprehensive quality evaluation of over 200 sewage discharge permits issued in 6 industries in Shanghai in 2018 was carried out. The result of the evaluation showed that the quality of the sewage discharge permits issued in 2018 has significantly improved compared to 2017.

"Permit-based Supervision" was pushed forward and implemented. Upon publication of the Notification on Carrying Out the Special Law Enforcement Inspection of Sewage Discharge License in 2019, special law enforcement inspection on businesses that were issued the pollution discharge license in 2018 in the slaughtering, water treatment and other industries. Illegal actions such as unlicensed pollution discharge were cracked down. The licensed companies were encouraged to enhance their management effort after the license was obtained.

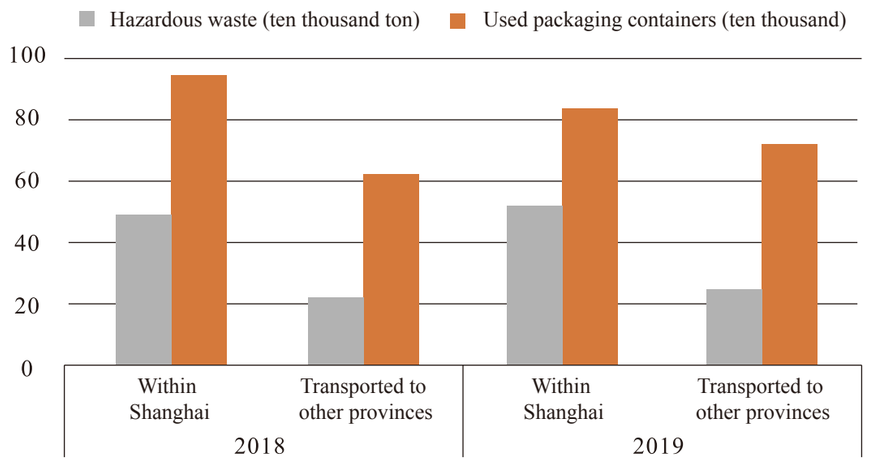
※ Emission Reduction

In 2019, The Municipal Bureau of Ecology and Environment, together with the Municipal Development and Reform Commission, issued the *2019 Key Work Arrangement of Energy Conservation, Emission Reduction and Addressing Climate Change in Shanghai*, which clearly defined the annual pollution reduction goals and responsibilities of the various departments in each district. Based on this document, the annual performance evaluation of the emission reduction of major pollutants in each district was completed. A balance of indicators of total emission amount of major projects in Shanghai, such as Pudong Tesla, was achieved. This ensured the

rapid development and orderly implementation of major projects in Shanghai. The municipal government authorities involving eco-environment, development and reform, economy and information technology, agriculture, rural areas, finance, water management, statistics and energy supervision worked together to promote firmly the construction of various projects of pollution management and emission reduction, thus ensuring high efficiency and smooth operation of emission reduction facilities. The verification of the Ministry of Ecology and Environment indicated that chemical demand of oxygen and the emission amount of ammonia nitrogen, sulphur dioxide and nitrogen oxides were respectively 39.70%, 16.10%, 45.03% and 20.05% lower than those in 2015, fulfilling the annual emission reduction tasks ahead of the assignment, and completing the pollutant reduction goal of the "13th five-year plan" assigned by the central government to Shanghai in advance.

※ Management of Solid Waste

In 2019, there were 33 units in Shanghai licensed to deal with comprehensive disposal of hazardous waste, inncluding into six categories: landfill, incineration, physical-chemical treatment, comprehensive utilization, collection and used-packaging containers treatment. Annually, 914,500 tons of hazardous waste was disposed and 1,719,000 used-packaging containers were treated. There were three landfill enterprises with a total approved land-filling capacity of 126,200 tons of hazardous waste annually and 10 incineration enterprises with a total approved capacity of incinerating 349,900 tons of hazardous waste (excluding medical waste).



Hazardous Waste Transported out of Shanghai from 2018 to 2019

In 2019,
- 535,200 tons of hazardous waste (not including medical waste) were transported and disposed within the city;
- 852,400 used-packaging containers were disposed within the city;
- 303,400 tons of hazardous waste and 723,100 used-packaging containers were transported to other provinces for disposal;
- 55,700 tons of medical waste were harmlessly disposed and the rate of centralized and harmless disposal was 100%.

In 2019, there were five companies in Shanghai qualified to deal with discarded home appliances and electronic products in Shanghai, whose total dismantling capacity was 4,451,200 items. Throughout 2019, 1,516,600 items of abandoned home appliances and electronic products were collected, and 1,553,600 items (weighing 43,100 tons) have been dismantled, including 847,600 TV sets, 57,300 refrigerators, 82,400 washing machines, 223,600 air conditioners and 330,200 computers (converted number) and 12,500 microcomputer devices.

※ Supervision over Radiation Security

The license of radiation security was issued under municipal approval for nearly 284 companies in 2019. Sanction of radioactive isotope transfer was given for 250 batches, approval for radioactive construction projects were given to 20 companies, while radioactive isotope and radioactive rays equipment were exempted for 31 times. Nearly 1023 site supervision were made. Radioactive waste was collected at 69 sources and 7300kg radioactive waste were stored.

Reforms to streamline administration, delegate powers, and improve regulation and services were implemented. The materials submitted for the 13 administrative approval items of radioactive projects was reduced by 54.4%, while the approval time was reduced by 50%. The approval process for each item was optimized by "reducing steps"; reducing travel, as all items can be processed online or through express delivery with no need to travel.

The Municipal Bureau of Ecology and Environment, together with the Municipal Bureau of Telecommunication Administration, organized the Department of Ecological Environment of each district, Offices of Telecommunication Infrastructure Construction Management of each district, and telecommunication operators, to carry out the special verification action for the implementation of the *Shanghai Memorandum on Environmental Protection of Telecommunication Base Stations*.

During the China International Import Expo, radioactive isotopes was strictly managed and controlled. Contingency measures were taken in the venue regarding nuclear, chemical and biological emergency, to ensure all activities were held as planned.

※ Protection of Marine Environment

2019 is the first complete year after the responsibility of marine environmental protection was fully transferred to the Municipal Bureau of Ecology and Environment. Starting from the new responsibilities and new positioning, the Municipal Bureau of Ecology and Environment coordinated the environmental protection of both land and sea and pushed forward the work in an orderly manner. Based on the specific work requirements of the protection of marine ecological environment in China, the 2019 *Key Tasks of Marine Ecological Environment Protection in Shanghai* was issued; the preliminary study of marine ecological environment protection planning during the fourteenth five year plan of Shanghai was pushed forward; the "four systems" was established and developed, including supervision of land-sourced pollutants discharged into the sea, investigation and monitoring of marine environment, administrative approval of marine projects, and information-based supervision and management of marine environment. Marine ecological environment protection network was established at both municipal and district level, and a law enforcement cooperation platform for the protection of marine environment was established in collaboration with China Coast Guard.

※ Supervision and Administration of Natural Reserves

In May 2019, in accordance with the relevant requirements of China regarding the protection of the Yangtze River, the Municipal Bureau of Ecology and Environment, together with the Shanghai Administration Department of Afforestation and City Appearance etc., carried out special supervision and inspection actions at the four nature reserves in Shanghai. In June, the responsibilities of managing the Shanghai Jiuduansha Wetland National Nature Reserve as well as the comprehensive management of all nature reserves in Shanghai were transferred from the Municipal Bureau of Ecology and Environment to the Shanghai Administration Department of Afforestation and City Appearance, and the division of management responsibilities of the nature reserves was further defined in accordance with Shanghai's institutional reform plan. In July, the Municipal Bureau of Ecology and Environment worked with the Shanghai Administration Department of Afforestation and City Appearance, the Municipal Committee of Agriculture and Rural Areas, the Municipal Water Authority, and China Coast Guard in Shanghai, to carry out the special action of "Green Shield 2019" to strengthen the supervision of natural reserves. The self-inspection and in-field spot check of 12 natural reserves in Shanghai was completed, further consolidating the work basis of the departments in charge of each natural reserve and promoting the effective solutions to existing problems.

※ Comprehensive Environmental Improvement in Key Areas

2019 was a crucial year in the second round of comprehensive environmental improvement in Jinshan District. Scientific planning and comprehensive deployment were made at the municipal level. Jinshan District, Fengxian District, Shanghai Chemical Industry Park, Shanghai Petrochemical and other entities were active in fulfilling their responsibilities, and the relevant commitees offices and departments have joint forces to facilitate a smooth progress of the overall environmental improvement efforts. Key results include: shutting down a number of enterprises such as Jinri Sunshine Stone Factory and Shanghai Jinjie Packaging Materials Co., Ltd.; completing a number of industrial upgrading and environmental improvement projects such as

Bauhinia Paint, Guxiang Chemical Technology and Yingweida Nylon Chemicals; completing the remediation of social polluting sources such as Zanyi Construction Materials and Shanghai Municipal Engineering Materials; 12 hectares of green land were built; establishing villages (streets, towns and industrial zones) without forbidden residential structures, constructing beautiful rural areas, and completing rural domestic sewage collection and treatment and other regional environmental remediation projects; completing infrastructure projects such as the reconstruction and expansion project of Jinshan Domestic Waste Treatment Plant (Phase I) and sludge disposal project; completing capacity-building projects such as the construction of Jinshan Comprehensive Air Pollution Observation Station, development of polluting source fingerprint database for main polluting enterprises in chemical industrial parks.. The environmental quality of Jinshan District continued to improve, with less complaint on environmental matters and improved experience of citizens.

※ Actions to Tackle Climate Change

The carbon emission intensity continued to decline as required. According to preliminary statistics, in 2018, the carbon dioxide emission per unit of GDP in Shanghai was 0.642 tons / 10,000 RMB, down 6.61% year-on-year and 16.6% compared to 2015.

In 2018, the carbon market management was successful. The Municipal Bureau of Ecology and Environment organized the management work of carbon emission monitoring, reporting, verification and review of carbon trading enterprises in 2018. The clearing of quota in 2018 was successfully completed, achieving a 100% fulfillment rate in six consecutive years. Shanghai's carbon market has been working well, and the cumulative volumn of various types of carbon trading ranks first in China. In 2018, the total spot trading volume of carbon in Shanghai’s carbon market has been working well, and the cumulative volumn of various types of carbon trading ranks first in China. In 2018, the total spot trading volume of carbon in Shanghai’s carbon market was 26.9494 million tons, a year-on-year increase of 22.05%; the total turnover was RMB 295 million, a year-on-year increase of 52.55%.

Steady progress has been made in the development of the national carbon trading system. First, a system development plan was issued and constantly improved. Shanghai was in active communication with the state authorities and organized professional teams to formulate and develop the plan on the improvement of carbon trading system technology and its implementation scheme. The Implementation Scheme of Natioanl Carbon Emission Trading System was drafted in 2019 and reported to the Ministry of Ecology and Environment. Second, developing the cardon system according to national requirements. Led by the government of Shanghai, the project company has obtained the project approval and completed the tendering work of the national carbon trading system, steadily promoting the development of the system and relevant rules. The software development of the trading system and the hardware deployment of the mechanical room was almost completed, and the first draft of the trading rules and relevant details was almost completed as well.

The marketing of the National Low Carbon Day was carried out in an orderly manner. On the morning of June 19, the Municipal Bureau of Ecology and Environment held a marketing event of the 2019 National Low Carbon Day in Hongkou District, Shanghai. Based on the theme of "Reduce Carbon Emission to Protect the Blue Sky" and the key tasks of the municipal government in 2019, and focusing on "plastic reduction ", the reduction of plastic waste from the source and recycling of plastic waste were promoted. Low-carbon lifestyle and consumption was promoted in the society. "Media integration" was given full play during this effort, and an event of “creative marathon of plastic reduction” was held in collaboration with new platforms in emerging industries such as Eleme, expanding ways to raise people’s awareness of a low carbon lifestyle.

※ Census of Pollution Sources

In 2019, the city continued to promote the second national census of pollution sources, ranking the top in terms of data quality. The list of basic units of pollution sources was reviewed and any missing items have been added to make sure the list was not repetitive or missing any information. Responsibilities of census data quality were defined, while an “8 step” quality control system was established. Data review and revision, as well as calculation of amount of pollutants have been carried out in nearly 40,000 survey units that were visited in Shanghai, improving the quality of supporting materials. Three rounds of sampling were carried out to ensure the completeness, authenticity and accuracy of the census report. The work of centralized review and joint review of data was strengthened, comparing and analyzing the census data results of various pollution sources with social and economic indicators, environmental statistics and data from relevant authorities to ensure the reliability of the data. The preparation of census work summary report, data analysis report, package of census diagrams, and census bulletin report, etc was started. The approval standards for census files were issued, and sorting and approval of census files was completed. The data management platform was improved, building a basic functional system of "one chart, one database, one set of statistics methods". The preliminary work of the application of the census result was carried out to serve public decisions-making related to the environment. In August 2019, the second national census of pollution sources developed by the Ministry of Ecology and Environment, the quality of census data in Shanghai has ranked second in China.

※ Collaboration in the Yangtze River Delta Region

In 2019, three provinces and Shanghai City thoroughly studied and implemented General Secretary Xi Jinping’s instructions on the development and ecological and environmental protection in the Yangtze River Delta Region. As the integration of the Yangtze River Delta is now a national strategy, these regions took the opportunity and accelerated their steps of making arrangements and preventing pollutions. Shanghai played a leading role during this process, coordinating actions taken by Pollution Prevention and Control Offices of different regions in the Yangtze River Delta. This further strengthened the connection in the Yangtze River Delta Region in terms of integrated development, promoting the joint protection and treatment of regional ecological environment.

The joint prevention and control of air pollution was enhanced in an all-around manner. Regions in the Yangtze River Delta spontaneously adopted the 6th-Phase National Emission Standards to regulate the light vehicles ahead of other areas, replacing gasoline and diesel according to regulations in the Standards and fully implemented the principle of “Three Petroleum Used in Conjunction”. The *Action Plan for Collaborated Treatment of Pollution Caused by Diesel Trucks in the Yangtze River Delta Region (2018-2020)* and the *Measures for Dedicated Management of Freight and Container Transportation in the Harbors of Yangtze River Delta Region (Shore Power Included)* both took effect. From 2019, all ships entering the controlled water

zone were regulated to use low sulfur oil with no exception. Actions were taken to conduct comprehensive treatment of autumn-winter air pollution and the “two 3%” target set by the central government was achieved.

Joint prevention and control of water pollution was continuously promoted. The *Inter-Provincial Cooperation for the Protection of Water Resources in Taipu River- Joint Plan for Warnings on Water Quality* was released. The mechanism for consultation and cooperation between heads of Taihu Lake and Dianshanhu Lake was established.

Collaborative innovation in the system of ecological environment was promoted. In key prefectural-level cities, information of forecasts and warnings, normal and super air quality index collected, as well as data about key sources of pollution were shared online. *The Memorandum on Information Sharing for Joint treatment of Water Environment around Taihu Lake* was signed, and the information-sharing platform for joint treatment of water environment around Taihu Lake has been put into operation.

The foundation of regional joint prevention and control was strengthened. The first "Green Yangtze River Delta" forum was held. The *Memorandum on Facilitating the Establishment of Joint Mechanism for Ecological Enviroment in the Areas (Below Provincial Level) around Yangtze River Delta* was signed. Local governments of Qingpu, Wujiang and Jiashan signed the *Framework Agreement on Integrated Comprehensive Treatment of Ecology and Environment.*

Supporting Measures

Supporting Measures

Institutional Reform

Based on the requirements of institutional reform, the Municipal Party Committee established the Shanghai Municipal Ecology and Environment Bureau in November, 2018. In February, 2019, the CPC Shanghai Municipal Committee made an official reply to the rules regarding the function allocation, internal institution and human resources of the Shanghai Municipal Ecology and Environment Bureau. Meanwhile, the Committee adjusted the ecology and environment protection function of multiple departments, including Department of Ecology and Environment, Department of Agriculture, Department of Natural Resources, and Department of Water Management (Ocean Management). After the reform, the Shanghai Municipal Ecology and Environment Bureau consists of 15 divisions, it is now responsible for 17 major functions, and is equipped with a directly affiliated Party Committee. By the end of March, 2019, all districts in Shanghai have basically completed the institutional reform of their ecology and environment bureaus.

Besides, the comprehensive law enforcement reform of Shanghai"s ecology and environment has been completed. The General Office of CPC Shanghai Municipal Committee released the *Implementation Plan for Further Comprehensive Administrative Law Enforcement Reform on Shanghai's Ecological and Environmental Protection*. The Law Enforcement Corps of the Municipal Ecology and Environment Bureau has also been established. All districts have established district-level comprehensive law enforcement team for ecological and environmental protection, which was conducted in accordance with the Notice on *Questions about Institutional Organization of Comprehensive Administrative Law Enforcement Reform*.

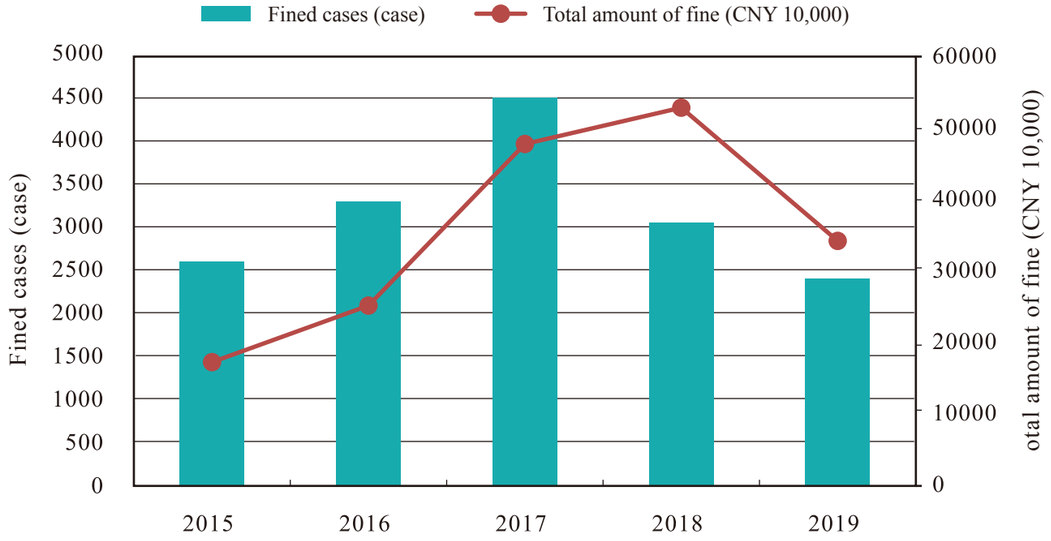
Input in Environmental Protection

In 2019, the annual input for environmental protection in Shanghai amounted to CNY 107,925 billion, equaling to 2.8% of Shanghai's GDP this year. To be specific, the input for urban environmental infrastructure construction was CNY 45,566 billion, the input for prevention and control of sources of pollution was CNY 26,543 billion, the operation cost of environmental protection facilities was CNY 14,770 billion, the input for rural environmental protection was CNY 13,849 billion, the input for ecological protection and construction was CNY 4,329 billion, the input for circular economy and miscellaneous was CNY 1,891 billion, the input for environmental management capacity building was CNY 0,987 billion, accounting for 42.2%, 24.6%, 13.7%, 12.8%, 4.0%, 1.8% and 0.9% of the total input respectively.

Environment-Concerned Legislation

In 2019, efforts have been made to amend rules and regulations of local government, centering around key areas such as environmental impact assessment. Aligning with rules and regulations such as the amended Environmental Impact Assessment Law, considering measures for the city's environmental assessment reform, the government conducted an overall amendment on *Shanghai's Measures for Implementing PRC's Environmental Impact Assessment*. The amendment was conducted to change the rules that were inconsistent with higher law and to further consolidate the achievements of Shanghai's environment impact assessment reform. Meanwhile, researches were conducted to study local legislation about soil pollution prevention; surveys and post-legislative assessment were made to study local rules and regulations about the pollution caused by catering industry and dust, which prepared Shanghai for future legislations. Besides, *Shanghai's Measures for Preventing Pollutions caused by Hazardous Wastes* has been annulled, as it no longer applies to the current managerial requirements.

Environmental Law Enforcement



Administrative Fine Made by Shanghai Municipal Ecology and Environment Bureau from 2015-2019

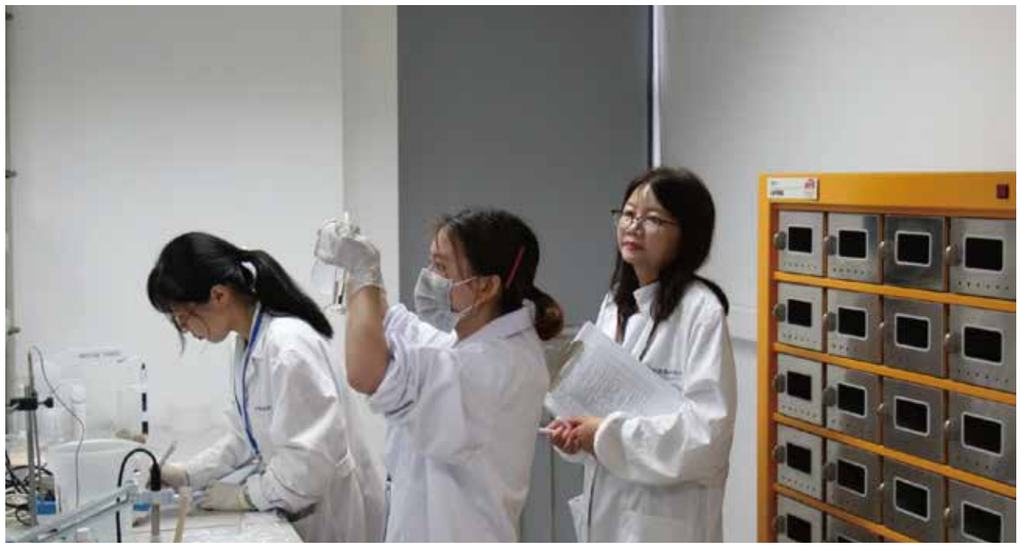
In 2019, 2427 cases have been investigated into and dealt with by the municipal ecological and environmental system, a total amount of about CNY 0.34 billion was fined. A variety of law enforcement measures have been implemented, with 2 fined cases daily, whose total amount reached CNY 1.227 million. Moreover, 121 cases were sealed up and distrained, and 11 cases were limited for production or stopped from production for rectification. Persons who were legally liable in 13 cases of the same kind were punished with administrative detention, and 28 cases of violations of environmental law were transferred to the police.

Environmental Impact Assessment Management

In 2019, Shanghai implemented the environmental impact assessment institutional reform and adopted the "Three Lines and One List" system, giving impetus to high-quality green economic development. The city started from the emission license system, reinforcing the management of pollution sources, with firm adherence to the bottom line of the environmental quality and risks. The Departments of Ecology and Environment at both municipal and district levels have examined and approved 4,935 EIA documents of projects, among which there were 130 reports on environmental impact and 4,805 EIA statements. Meanwhile, 44,577 EIA register forms were put on records.

Environmental Monitoring

In 2019, Shanghai further established the air quality monitoring and early warning system, and is now capable of predicting and forecasting the air quality by 7-10 days in advance. The city further developed law enforcement and management applications to monitor the data of dust online, and explored the car-mounted mobile air quality monitor; the project aimed at achieving automatic monitoring of water quality around the Yangtze River Economic Zone has been carried out in an orderly manner. Now 150 surface water environment automatic warning stations have been established, and the data collected could be shared in the municipal network. The city has made further regulations on sewage disposal entities regarding the requirements of self-monitoring and data application. *The Notice on Further Regulate the Self-Monitoring and Check of Sewage Disposal Entities* has been released; the *Regulations on Operation of Automatic Pollution Source Monitoring Facilities and Application of Automatic Monitoring Data to Law Enforcement* was also amended. The Municipal Ecology and Environment Bureau joined force with departments such as the Municipal Market Supervision Bureau to conduct key inspections under the "Two Random" principle, further regulating the quality of social monitoring institutions. The Bureau also released the *Notice on Pilot Projects of Credit Evaluation on Shanghai's Social Service Supervision System for Environmental Monitoring*, and carried out credit monitoring process by utilizing the Internet. Social monitoring institutions were motivated to participate in city-level selection and examination competition. Shanghai received the 3rd prize for team award, 2nd and 3rd prize for individual award in the final of National Competition of Ecology and Environment Monitoring for Professionals.



Environmental Science and Technology

In 2019, Shanghai organized 61 science research projects around key tasks in the area of ecology and environment, including major dedicated researches such as *Research on Strategy of Restructuring Transportation in Yangtze River Delta and Its Beneficial Impact on Air Quality, Research on Key Technologies for Reducing Mercury Pollution Released into the Yangtze River, Research on Methods for Isolating Polluted Soil and Underground Water, Research on Key Technologies for Monitoring the Ecological Conservation Red Line and the Definition of Buffer Zone, Research on the Green Supply Chain Management in Yangtze River Delta and Related Pilot Programs, etc.*

The Environmental Damage, Release Pattern and Risk Control of Chemicals, as the project of top priority in Shanghai Academy of Environmental Sciences, won the 2nd prize of 2018 Shanghai Science and Technology Improvement Award; *the Risk Prevention and Control of Exposing Crowd to Regional Environmental Pollution and its Application*, as the project of 3rd priority in the Academy, won the 2nd Prize of National Science and Technology Improvement Award. *Research on Key Technologies for Online Monitoring of Air Pollution in the Gathering Area of Chemical Plants and Its Application*, which is conducted by the Shanghai Environmental Monitoring Center, won the 2nd prize of 2019 Environmental Protection Science and Technology Award.

Environmental Standard

In 2019, the central government proposed the requirement of adopting special emission limits among key industries of key control areas in 19 provinces (city, district), including "three areas and ten clusters" such as the Yangtze River Delta. In order to implement such a requirement, with the approval of municipal government, the Municipal Ecology and Environment Bureau released the *Notice on Adopting Special Emission Limit Regulated by National Air Pollutants Emission Standards in Key Industries*. The Bureau also organized the amendment of *Standards for Third-Party Environmental Services* (DB31/T 1179-2019), and made the *Water Pollutant Emission Standard for Rural Domestic Sewage Treatment Facilities* (DB31/T 1163-2019).

Environmental Informationization

In 2019, the Municipal Ecology and Environment Bureau made every effort to create a "All Accessed via One Website" platform, attempting to make data travel more and make citizens travel less via data-sharing applications, which further optimized the environment for doing business. The Bureau completed 28 environment-concerned affairs and made 7 public services accessible via the "All Accessed via One Website" platform, now these services can be dealt with online. Meanwhile, in accordance with the two "Cut by Half" requirements, the Bureau revolutionarily streamlined the process of services, promoting E-Stamp and E-License, reducing the number of materials required for review and approval, optimizing the process of review and approval, and contributed to the application of E-License in 6 affairs, including environmental assessment and radiation licensing. Based on the principle of "Monitoring All Situations on One Screen and Managing the Whole City with One Website", the Municipal Ecology and Environment Bureau designed a system consisting of ecological and environmental index that could manifest how the city is operating, taking the first step of ecological and environmental management and air quality assurance, which were integrated into the city's operational system. The Bureau also promoted the establishment of ecological and environmental big data management platform, integrating the data regarding pollution sources and quality of environment etc., achieving full life cycle management, including steps such as data collection, quality control and open utilization. Meanwhile, the integration and revision of the Bureau's website have been completed, systems such as the online monitoring and management system of industrial dust and noise have been established, cyber security training of the city's ecological and environmental system has been carried out to ensure website security.

Environmental Industry Service

In 2019, the Municipal Ecology and Environment Bureau actively prompted the third-party pollution treatment and environment protection services in the industrial zone, and organized the compiling of Standards for Third-Party Environmental Services. The Shanghai Environmental Industry Association completed its reelection under the guidance of the Bureau. Meanwhile, the Bureau participated in the 20th China IE Expo, 2019 Macau International Environmental Exhibition, 2019 Hong Kong International Trade Fair on Environmental Protection, and technical exchange forums such as "One Belt One Road" and "Green Silk Road".

International Cooperation

Shanghai further participated in green supply chain demonstration projects. The Bureau actively promoted the regional communication and cooperation regarding the green supply chain, proposing to conduct related pilot programs via regional cooperation and to hold forums to promote the regional cooperation on the green supply chain. The Bureau actively assisted the trainings in enterprises of Jiangsu and Zhejiang Province, as well as the seminars regarding regional green finance. The Bureau cooperated with 9 departments including the Municipal Commerce Commission to select Shanghai's demonstration enterprises based on the innovation and application of supply chain.

Shanghai started a new round of demonstration cooperation on atmospheric environment improvement with Japan. The Bureau joined force with Shanghai Academy of Environmental Sciences and Shanghai Environmental Monitoring Center, and initiated *Pilot Projects of Small-Scale Decentralized Air Pollution Prevention in Catering Industry* and *Research on Pilot Projects of Wide-Range Ozone Treatment and Conservation in Key Areas.*

The city continuously initiated environmental protection projects with Sino-Italian cooperation. Trainings in Italy and local trainings in Shanghai were organized to promote capacity-building projects.

Shanghai promoted the communication with Hong Kong and Macau. Mutual review of automatic air quality monitoring system was held between Shanghai and Hong Kong, periodical communication mechanism on environmental protection was preliminarily formed between Shanghai and Macau. Meanwhile, Shanghai has participated in the Macau International Environmental Exhibition for 5 consecutive years.

Important delegations have paid visits to Shanghai throughout this year, including the delegation led by vice president of European Commission and the delegation led by the head of Italian Ministry of Environment. In June, Chen Yan, the deputy mayor of Shanghai met with Sergio Costa, the head of Italian Ministry of Environmental, Territorial and Marine Protection and his delegation.

Team Building and Performance Improvement

Education activities with the theme of "Keeping in Mind the Initial Intentions and Missions" was carried out in an orderly manner. The Municipal Ecology and Environment Bureau made great efforts to learn and understand Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era. Under the guidance of "Keeping in mind the initial intentions and missions, identifying the weakness and take actions", aiming at "Making progress via theoretical training, learning through ideological and political education, initiating actions and shouldering responsibilities, finding solutions to deal with people's problems, setting examples by being honest and upright", the Bureau organized a general themed education activity. The Bureau and its 7 affiliated units all formed leading teams, made work plans, and established working mechanisms. With the guidance of party and government leaders, and the examples set by over 70 division-level leaders, the Bureau held 71 seminars, conducted over 80 researches, reviewed 478 problems and searched solutions one by one. 74 reports were published, among them, 3 were published by mainstream media including *Learning Power and Liberation Daily*. After the themed education, all party members in the Bureau developed a better understanding of Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era, and became more confident and determined about achieving Ecological Civilization.

Activities were held to facilitate the performance of the leading team. Shanghai held "Letters Home with Initial Intentions" recitation activity to celebrate the 70th anniversary of the founding of P.R.C., carried out joint learning activity and promoted the cooperation with various branches under themes such as "Integrated Green Development in the Yangtze River Delta", held activities such as "Grow Along with My Motherland" writing competition and "My Home Country and I" flash campaign, which created good ambiance for patriotism education and study. Reform on the duty and rank of civil servants completed, and the major duties of public institutions clearly defined.The Bureau firmly adhered to the principle of offering positive incentives, selected and allocated leaders of all categories, which boosted the morale of the leading team and encouraged them to make innovations. The Bureau cooperated with the Organization Department of Municipal Committee to hold seminars with the theme of "Win the Battle of Preventing and Controlling Pollution" and trained over 120 people of the municipal management team, which implemented Xi Jinping's Thoughts on Ecological Civilization. Trainings of various forms have been organized to improve members' capability of fulfilling duties and to clearly define duties of officials at all levels. The Bureau is problem-oriented, adhering to the requirement of "Reducing the burdens of grassroot officials this year", promoting large-scale researches as a routine and a mechanism. The Bureau kept improving the "Four Responsibilities Coordination" mechanism, enhancing the monitoring of law enforcement disciplines, and continued to facilitate the performance of officials. Efforts have been made to emphasize major tasks such as environmental protection monitoring, environmental protection law enforcement, exhibition assurance, which provided great opportunities for officials to practice and grow into good ecological and environmental protection force. The Bureau organized the appraisal to select outstanding entities according to their contribution to the ecological and environmental protection. 150 individuals, 30 groups and 30 projects were awarded. The Shanghai Academy of Environmental Sciences, the Shanghai Environmental Monitoring Center and the Shanghai Radiation Supervision Station were awarded with the title of Shanghai's Advanced Units.

Involvement and Supervision of the Public

→ Involvement and Supervision of the Public

» Accepting Suggestions and Handling Proposals

In 2019, 94 written proposals and motions from the deputies of the Municipal People's Congress (MPC) and the Municipal Party Committee members of CPPCC were received by Shanghai Municipal Ecology and Environment Bureau (formerly Shanghai Municipal Bureau of Environmental Protection), among which there were 48 suggestions from the MPC (11 for the Bureau to process, 1 for cooperative processing, 36 for supporting processing) and 46 proposals from the CPPCC (10 for the Bureau to process, 5 for cooperative processing and 31 for supporting processing). Besides, the Municipal Ecology and Environment Bureau processed 5 cases proposed by the National People's Congress and CPPCC. All of them were satisfactorily handled in time; both the rate of process and the rate of satisfaction were 100%. Some key environmental protection issues that concerned the deputies from the MPC and CPPCC include: facilitate the integration of ecology and environment in the Yangtze River Delta, remediate and recycle the soil, enhance the protection of the source of drinking water, collect and deal with hazardous wastes, protect marine ecology and amend *Rules on the Prevention of Shanghai's Radioactive Pollution* etc.

» Hearing Complaints

In 2019, the eco-environmental system of Shanghai received 32,535 reported cases of all kinds in total, of which 28,550 cases were received from the citizen hotline 12345, a year-on-year decrease of 8.6% and 3,985 from the hotline 12369, an online management platform for reporting of environmental protection violations (via WeChat or website), with a year-on-year decrease of 52.4%. The categories of the reported cases received via hotline 12345 include: 17,420 cases of air pollution, 61.0% of the total mainly in fields of industrial waste gas, catering waste gas and undefined odor; 3,586 cases of noise pollution, 12.6% of the total, mainly in fields of industrial noise and catering noise; 1,917 cases of automobile related consultancy, which comprises 6.0% of the total; 1,591 cases of water pollution, 5.6% of the total. Also, there were 1,420 cases of construction projects, 5.0% of the total; and other complaints and consultancy includes solid waste, electromagnetic radiation, air quality, and government and industries ethos, which comprises 9.8% of the total.

In 2019, 7,091 pollution cases were received via letters, calls and visits, 18.1% decrease year on year. Among them, there were 3,477 cases of air pollution problems, 49.0% of the total and

mostly about catering waste gas, industrial waste gas and undefined odor; 1,625 cases of noise pollution, 22.9% of the total and mostly about industrial noises; 593 cases of water pollution, 8.4% of the total and mostly about industrial waste water; 1,396 cases of other complaints, that comprises 19.7% of the total.

Coping with Environmental Emergency

In 2019, 130 cases of environmental emergency occurred, most of which were about fire, traffic accident and other safety issues. The environmental protection departments at both municipal and district levels have handled the cases on the spot properly and effectively based on the on-site processing standards, which didn't affect the surrounding areas. According to the standard for incident classifications in the *National Environmental Emergency Plan*, no reported cases reached the standard of normal environmental emergency.

Model Units of Environmental Protection

In 2019, the Ministry of Ecology and Environment recruited experts to review and assess the Northern Shanghai Hi-Tech Service Zone, based on the standards for National Ecological Industry Demonstration Zone. Meanwhile, in the 2018 review and assessment of National Ecological Industry Demonstration Zone, Shanghai Zhangjiang Hi-Tech Zone and Shanghai Minhang Economic and Technological Development Zone received the grade "Outstanding".

Publicity for Environmental Protection

In 2019, Shanghai thoroughly implemented Xi Jinping's Thought on Ecological Civilization, centered around critical works such as high-quality economic development, battle against pollution and integrated development in the Yangtze River Delta, published a variety of news reports around key tasks such as battles to protect blue sky, clean water and unpolluted soil, biological environment monitoring of the central government, reform on environmental assessment mechanism etc. This year, the relevant Shanghai environmental news reports were distributed and reposted in various media outlets for 97,000 piece-times, of which 5,001 piece-times of distribution from district-level media outlets; and the Shanghai Municipal Ecology and Environment Bureau published 1,197 posts on its WeChat account and 7,750 posts on Weibo.

With the theme of "I am a Contributor to Beautiful China", various publicity campaigns celebrating the World Environment Day on June 5 were carried out throughout the city, "Three-Year Action Plan" outstanding groups and individuals were selected and awarded, top 10 "Brilliant Ideas" about Shanghai's environmental protection were collected from the public, the country's 2nd batch of environmental protection facilities became open to the public, the awarding ceremony of the city's 3rd batch of environmental education bases was held. The Bureau also cooperated with Shanghai Railway Procuratorate to promote people's awareness of ecological and environmental protection, as well as increasing their garbage sorting knowledge through campaigns held in campus, residential areas and subway stations, urging people to sort garbage on their own. The Bureau also cooperated with the Shanghai Association of Science and Technology to hold the 2019 "Popularizing Science to Build a Beautiful City" activity. Public service advertising on ecological and environmental protection was released, posters and billboards for promoting the World Environment Day on June 5 were made, MV of themed song *Make China More Beautiful was performed by environmentalists in Shanghai and released, Brochure of Green Living-Special Brochure about Opening Environmental Protection Facilities to the Public* was made, hand-in-hand public service advertising was shown on screens of subway trains, etc.

The Bureau continued to promote the opening of environmental protection facilities to the public and the establishment of environmental education bases. In 2019, 22 national environmental protection facilities in the city opened to the public, receiving more than 10,500 visitors in total. Besides, 43 units have been listed by the Department of Ecology and Environment as the 3rd batch of national environmental protection facilities that are open to the public. 26 environmental education bases were reviewed and awarded in 4 batches. The Bureau actively promoted the cooperation between social environmental protection organizations and university societies, participated in the online activities held by Shanghai ENGO Salon, and kept close contact with the city's environmental protection organizations and university societies to carry out education activities about ecological and environmental protection.

From 1st May, 2019, the “Shanghai Environment” website of Municipal Ecology and Environment Bureau adopted a new domain: http://sthj.sh.gov.cn, and the updated website was available from 1st October. With an intensive UI design and a flat column structure, the new version of website can be divided into 6 parts: All Accessed via One Website, Situation of Work, Demonstration of Government Affairs, Standards of Law and Regulations, Quality of Ecological Environment, Ecological and Environmental Management. The search engine was optimized, the published data can be visualized, bringing a easier-to-use experience to users. In 2019, the website of "Shanghai Environment" released 2,278 pieces of government information and received 18,813,664 visitors. Throughout the year, the Bureau actively promoted the publicity of government affairs, setting columns on the new website, including columns such as Publicity of Decision-Making, Publicity of Implementation, Publicity of Management, Publicity of Service and Publicity of Outcome. A public service dedicated column was also set to publicize ten categories of information about key areas of environmental protection. In 2019, the Municipal Ecology and Environment Bureau received the title of “Outstanding Unit” in the open assessment of Shanghai’s government affairs.