

Tripartite Policy Dialogue on Air Pollution

Air Quality Policy Report

The cooperation progress and outcome

November 2019

Japan

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1. Preamble

The atmosphere of East Asia is commonly shared among China, Korea and Japan. Hence, the air quality improvement is one of the top priority issues for the three countries to tackle in close coordination. In light of this situation, in parallel to the bilateral cooperation initiatives, the three countries started the Tripartite Policy Dialogue on Air Pollution (TPDAP) in 2014, to share information and exchange views on a variety of fields in a continuous manner regarding the policy measures and efforts from each country towards the air quality improvement.

In concrete terms, six times Policy Dialogues has been organized to exchange information on the latest air pollution policies, policy impacts, etc. from the three countries since the TEMM15 agreement in 2013. Following the 3rd TPDAP in February 2016, which established two Working Groups (WGI: Scientific Research on Prevention and Control, and WGII: Technology/Policy on Air Quality Monitoring and Prediction), the experts have shared the information and exchanged the views (See the table below for the meeting agenda of the WGs). As the TPDAP results have been reported to the TEMM meetings every year, the information exchanges through the Policy Dialogues have been insightful to each country to promote its various measures. Consequently, the air quality situations in the three countries have entered into an improving trend in recent years.

This report summarizes the air pollution policy measures of the three countries which have been exchanged through the TPDAP in the last five years, in a structure of the air quality improvement to date, future goals and strategies, and policy measures to achieve the goals. This report also suggests the future directions of the tripartite cooperation under the TPDAP.

<Working Group Meeting Agenda according to the Work Plans>

	WGI (Scientific Research on Prevention and Control)	WGII (Technology/Policy on Air Quality Monitoring and Prediction)
February 2016 The 3 rd TPDAP	The 3 rd TPDAP adopted the two WGs' work plans	
February 2017 The 4 th TPDAP	<ul style="list-style-type: none"> ▪ Economic methods to control VOCs (incentives and penalties) ▪ Experiences of VOCs control in petrochemical industry 	<ul style="list-style-type: none"> ▪ Measuring process for air pollutants (O₃, PM_{2.5}) and QA/QC system ▪ Development of air quality forecast models
February 2018 The 5 th TPDAP	<ul style="list-style-type: none"> ▪ Effective experience of control VOCs pollution in printing and coating industries ▪ Research and application of VOCs emission inventories 	<ul style="list-style-type: none"> ▪ Data management and publication of PM_{2.5} and O₃ monitoring results ▪ Emission inventory development methods for mobile sources other than vehicles (non-road sources, etc.)

<p>February 2019 The 6th TPDAP</p>	<ul style="list-style-type: none"> ▪ Effective experiences of controlling emissions from vehicles including emission standards, fuels standards, etc. ▪ Development of vehicle emissions inventories 	<ul style="list-style-type: none"> ▪ Monitoring results of PM2.5 species and modeling from certain air pollution episodes ▪ Issues towards developing a real-time monitoring data sharing among three countries
<p>February 2020 (TBC) The 7th TPDAP</p>	<ul style="list-style-type: none"> ▪ Emission controls of non-road sources including vessels, construction equipment, etc., fuel quality standards, etc. 	<ul style="list-style-type: none"> ▪ Remote sensing of air pollutants (development and placement of equipment, satellite observations), results from comparing with monitoring data

2. Summary of Air Quality Policy

2.1 Japan

Vision	Securing a Good Atmospheric Environment
Goal	Achieving Environmental Quality Standards related to Air Pollutants
Major Strategies	<p>Hereunder describes the PM2.5, which is a pressing issue in the recent years in Japan.</p> <ul style="list-style-type: none"> · To promote comprehensive measures concerning PM2.5 and its precursors in parallel with reinforcing scientific knowledge on these pollutants. · To promote bilateral and multilateral cooperations to achieve a broad-based air environment management on the Asian regional scale.
Progress Outcomes	<ul style="list-style-type: none"> · As a result of the policy efforts which have been promoted following the “Comprehensive Policy Efforts on PM2.5 (A Policy Package)” published in December 2013, and the “Paper on the Ways of Emission Reduction Policy Measures on Fine Particulate Matters within the Country (Interim Report)” compiled in March 2015, the following achievements were made. <p>The achievement rates in the recent years marked nearly 90% (88.7% and 89.9% as for the ambient air pollution monitoring stations, and 88.3% and 86.2% as for the road-side air pollution monitoring stations in FY 2016 and FY2017 respectively).</p> <p>Since 2013, the annual average PM2.5 concentrations of all of the air pollution monitoring stations have moderately decreased (the annual average PM2.5 concentrations in FY2017 were 11.6µg/m³ for the ambient air and 12.5µg/m³ for the road-side air).</p> <p>The number of occasions issuing the public alerts on PM2.5¹ decreased from 37 in 2013 to 2 in 2017.</p>

Categories		Policy
Domestic measures	Stationary Sources (Soot, NOx, VOC)	<ul style="list-style-type: none"> · To enforce the legal restrictions on soot and NOx, and to examine additional measures focusing on the PM2.5 high concentration areas. · To enforce the legal restrictions on VOCs and to promote the voluntary approaches. · To promote the certification system for air-friendly fueling stations.
	Vehicles	<ul style="list-style-type: none"> · To enforce the new PM controls for GDI vehicles, in compliance to the new emission standards. · To promote and disseminate the vehicle emission controls comprehensively based on the Vehicle Control Act on NOx/PM.
	Vessels, Open burning, NH3	<ul style="list-style-type: none"> · To respond to the restrictions on fuel sulfur content according to the MARPOL Convention. · To follow up the implementation status of open fire prevention by the local government offices · To continue the controls to alleviate the nitrogen load based on the Water Pollution Control Act.
International Cooperation		<ul style="list-style-type: none"> · To promote effectively the bilateral and multilateral cooperations.
Reinforcing Scientific Knowledge		<ul style="list-style-type: none"> · To strengthen the monitoring system, · To improve the forecasting models. · To update the emission inventories

¹ A public alert on PM2.5 is issued when the daily average PM2.5 concentration is foreseen to exceed 70µg/m³ (tentatively set out as a guiding value).

2.2 People's Republic of China

Vision	Give blue skies to people and boost people's well-being
Goal	Significant reductions in total emissions of major air pollutants, decrease of PM _{2.5} concentration and fewer days of severe pollution.
Major Strategies	<ul style="list-style-type: none"> ● Strengthening rule of law ● Enhancing science and technology support ● Comprehensive emissions cut ● Innovative management ● Social Participation
Progress Outcomes	<p>Between 2013 and 2018</p> <ul style="list-style-type: none"> ● The average concentration of PM₁₀ nationwide had fallen by 27 percent to 71µg/m³ ● The average concentration of PM_{2.5} in the first 74 pilot cities implementing Ambient Air Quality Standard (GB3095-2012) fell by 42 percent to 42µg/m³

Area	Policy
Rule of Law	<ul style="list-style-type: none"> ● Improving Legal Framework ● Combining Administrative and Judicial Efforts ● Strengthened Law Enforcement
Science and Technology Support	<ul style="list-style-type: none"> ● Revision of Air Quality Standard ● Improving Air Quality Monitoring Network ● Causes of Severe Air Pollution and Solutions
Comprehensive Emission Cuts	<ul style="list-style-type: none"> ● Upgrading Industrial Standards and Companies ● Industrial Restructuring ● Optimizing Energy Structure ● Pollution Control of "Fuel, Road, Vehicle" ● Treatment of Non-Point Source Pollution
Management Innovation	<ul style="list-style-type: none"> ● Management System Reform ● Innovative Enforcement Methods ● Carrying through Responsibilities ● Response to Severe Pollution ● Improved Economic Policies ● Open Environmental Information
Social Participation	<ul style="list-style-type: none"> ● Easier Information Access ● Public Interest Litigation ● Improved Public Awareness ● Green Action ● Reporting Complaints ● Engaging in Decision Making

2.3 Republic of Korea

Vision	Toward the Clean Air and Blue Skies, Korea
Goal	Over 35 percent reduction of local PM _{2.5} emissions by 2024 * PM2.5 level(Nationwide): 26 µg/m ³ in 2016 → 16 µg/m ³ in 2024
Major Strategies	<ul style="list-style-type: none"> ◇ Accelerate reduction of emissions from major domestic sources ◇ Strengthen environmental cooperation, based on trust, in East Asia ◇ Secure public health with intensive protection of vulnerable groups ◇ Lay the solid science foundation to increase responsive capacity against fine dust ◇ Encourage citizen participation in and communication for fine dust policies
Progress Outcomes	<ul style="list-style-type: none"> ◇ Achievements of the Comprehensive Plan on Fine Dust Management (Sep 2017) <ul style="list-style-type: none"> ① PM2.5 level decreased by 2 µg/m³ in 2018 from the level of 2017. ② The emission reduction target for 2018 (30,495 tons) was achieved by 99.2%. ③ The number of Seoul's "good air quality days" increased in 2018 by 29 from those of 2017.

Categories	The 15 Major Strategic Policies	
Reduction of Domestic Emissions	Industry	<ul style="list-style-type: none"> ① Expand scope of total emission cap ② Strengthen inspection and control of business facilities
	Transportation	<ul style="list-style-type: none"> ① Significantly reduce emissions from old diesel vehicles and increase penetration rate of low-emitting vehicles ② Tighten standards for emissions from shipment and ports ③ Strengthen control of emissions from decrepit construction equipment
	Power Generation	<ul style="list-style-type: none"> ① Reduce fine dust emissions from decrepit coal-fired power plants ② Convert to eco-friendly energy (mid- to long-term)
	Agriculture and Daily Surroundings	<ul style="list-style-type: none"> ① Strengthen management of livestock environment ② Expand installation of low NOx boilers
Public Health	Protection of Public Health	<ul style="list-style-type: none"> ① Introduce Seasonal Management System to effectively respond to high concentration episodes ② Strengthen control of indoor air quality
International Cooperation	Clean Air Cooperation in East Asia	<ul style="list-style-type: none"> ① Promote an agreement for joint effort toward regional clean air in East Asia ② Expand collaborative projects with producing tangible results
Solid Foundation and Communication	Scientific Approach and Public Awareness·Communication	<ul style="list-style-type: none"> ① Strengthen forecasting and alarming system, for example, using the environmental satellite ② Implement the national project (R&D) for PM reduction strategies.

3. Main Air Quality Policy and Measures

3.1 Japan

3.1.1 Background

Various policy measures have been implemented for the air environment management in Japan, resulting to the 100% achievement rates or close to those rates for the SO₂, NO₂ and SPM Environmental Quality Standards in recent years.

Therefore, the following parts mainly describe the efforts to combat PM_{2.5}, which is one of the urgent issues in Japan nowadays.

Regarding PM_{2.5} in Japan, as a result of promoting the policy efforts based on the “The Comprehensive Policy Efforts on PM_{2.5} (A Policy Package)” published by MOEJ in December 2013, and the “Paper on the Ways of Emission Reduction Policy Measures on Fine Particulate Matters within the Country (Interim Report)” compiled by the Expert Committee on Fine Particulate Matters in March 2015, the general trends of PM_{2.5} air pollution are improving.

On the other hand, there still remain several areas with the low achievement rates of Environmental Quality Standards in the Kanto, Kansai, Seto Inland Sea, and Kyushu regions. As each region has different causes, it is important to take the measures reflecting the regional characteristics.

Also, as the researches on the health effect of PM_{2.5} are underway, it is essential to examine and implement the PM_{2.5} policy measures considering these situations.

Against the above background, MOEJ presented in March 2019 the schedule to examine and implement the PM_{2.5} policy measures between 2018 and 2020.

3.1.2 Policy Measures on PM_{2.5}; Present Situation and Points of Future Discussions and Implementations

(1) Domestic Measures

(i) Stationary Sources

Regarding soot and NO_x emissions from the stationary sources, the national emission standards are established under Air Pollution Control Act (APCA) targeting 33 types of facilities such as boilers, dryers, and diesel combustion facilities, etc., as well as more stringent standards are applied to the newly establishing facilities within nine regions of serious air pollution. Also, five prefectures establish severer emission standards for soot and dust, and MOEJ introduced total pollutant load control for the NO_x in the three regions.

On the other hand, as the recent studies have confirmed that soot and NO_x emissions from the emission facilities with relatively high concentrations account a large proportion of the total

emission volumes, MOEJ will examine necessary measures by analyzing in more details and focusing the areas of high PM_{2.5} concentrations. Furthermore, MOEJ continues supporting the local governments with their policy measures according to their regional conditions, by establishing the forecasting models available to the local governments.

Regarding the VOC emissions from the stationary sources, MOEJ has endeavored to reduce the emissions through a policy mix of regulatory controls and voluntary approaches and organizations since April 2006. As a result, the goal to reduce by 30% from 2004 to 2010 was more than achieved, to reduce by more than 40% in fact. Moreover, the VOC emissions in Japan has been a down-ward trend since 2010 (approximately 20% decreased from 2010 to 2017).

In the future, MOEJ will further promote the voluntary efforts, in addition to enforcing to a full extent the regulatory compliance based on the Air Pollution Control Act, with a view to further reducing the emissions. In particular, concerning the fuel gas evaporation from the fuel retailers, as a driving system to introduce the Stage² in Japan, the “SS certificate system,” or nicknamed as “e→AS Certification” was set up in February 2018 (302 fuel stations were certified as of the September 30, 2019), to be continuously promoted further in the future. Also, in March 2017, the fuel retailers’ association has just adapted its voluntary action plan with a goal to reduce the VOC emissions by 30% by 2024 compared from 2000. MOEJ will follow up the voluntary action plan in the future.

(ii) Vehicles

Concerning the vehicle exhaust emission controls in Japan, the first policy measure was introduced in 1966 to control CO emission from normal-size and small-size gasoline cars. Since then, the vehicle emission controls have been subsequently strengthened, taking into consideration the situations of air pollution, technological development and the trends of overseas vehicle controls. Currently, the vehicle exhaust emission controls are set by the fuel types and the vehicle types. The latest policy measure was in June 2018 to amend the Notice (Tolerable Volumes of Vehicle Exhausts) based on Air Pollution Control Act concerning the measures to reduce the motorbikes emissions, to control the fine particulate emissions from the GDI vehicles, and to control the fuel gas evaporation during parking. In the future, MOEJ will enforce the PM controls for all GDI vehicles based on this Notice.

Additionally, the Basic Principles to Reduce the Total Emission Volumes (established on March, 2011) based on the Vehicle Control Act on NO_x/PM aim to achieve the goal to satisfy the air quality standards related to NO_x and PM in the target areas by 2020. MOEJ promotes the comprehensive measures on the car exhausts such as replacing the conventional vehicles with the vehicles meeting the new emission standards, restricting the vehicle types inside the target areas,

² Measures to reduce vapor fuel gas, which is released when the vehicles are refueled. (measures for fuel stations)

and promoting eco-friendly driving, etc., aiming at achieving the 2020 goal. Regarding the next-generation vehicles, MOEJ sets the goal to achieve their share to be 50% to 70% out of the newly sold cars by 2030, and implements tax and subsidy measures to achieve the goal.³

(iii) Vessels, Open Burning, NH₃

Concerning vessels, MOEJ will appropriately implement the international regulations on the sulfur content of vessel fuels (the sulfur concentration cap being 3.5% at present will be reduced to 0.5%), to start on January 2020 based on The MARPOL Convention.

Concerning open burning, MOEJ issued a Notice in March, 2018 to the local governments, which summarized the incidents where open burning caused the elevated concentrations of PM_{2.5}, the examples of disposing waste straws by using the ways other than open burning such as combing into soil, and the enactment status of local government regulations on preventing open burning, etc. In the future, MOEJ will follow up the local governments as appropriate regarding the local efforts to prevent open burning.

Concerning ammonia (NH₃), as the main sources are estimated to be fertilization to farmland and livestock excrement, some measures are taken to alleviate the nitrogen load to the environment in Japan. MOEJ controls the effluence and underground infiltration of waste water containing nitrate-nitrogen from the livestock and agricultural facilities according to Water Pollution Control Act. MOEJ also implements the water quality conservation measures for the lakes and inland waters, including eutrophication controls and underwater pollution prevention measures. These measures will be continued in the future.

(2) International Cooperation

MOEJ promotes the effective international cooperation to respond to the needs, through information exchanges in the city-to-city China-Japanese cooperation programs focusing on the “co-benefits” approach to reduce both air pollutants and GHG, as well as in the Joint Research on PM_{2.5} between Korea and Japan.

Also, MOEJ endeavors to develop the existing multinational frameworks e.g. EANET, APCAP, etc. so that the Asian region implements policy measures to combat air pollution more continuously and effectively.

Furthermore, taking into consideration the 3rd Joint Forum of APCAP and the 22nd EANET Intergovernmental Meeting to be held in 2020 in Japan, MOEJ disseminates by using these occasions a message to the international communities about the importance of measures to combat air pollution and the outcomes of the national and regional efforts.

³ Increased share of the number of next generation vehicles out of the total number of new vehicles sold from 16% in 2011 to 38% in 2018.

(3) Reinforcing Scientific Knowledge

MOEJ promotes to reinforce the monitoring system in order to gather the basic data necessary for implementing the PM2.5 measures. At the end of 2017, the number of operational air pollution monitoring stations of PM2.5 had increased to 1,038 as well as the number of the automatic monitoring stations of PM2.5 species reached 10 nation-wide, and MOEJ will continue these efforts.

Moreover, MOEJ studies the emission situations and the trends of the PM2.5 and other pollutants by the source category over the years. In parallel in 2018, MOEJ published the 2015 emission inventories of the PM2.5 and other pollutants, which is expected to be served for the air quality forecasting models (inventory data are entered to these forecasting models). As for the emission inventories, MOEJ will continue updating and improving the accuracy.

Furthermore, National Institute for Environmental Studies (NIES) has been developing the air quality forecasting model “VENUS” to assist the local governments issuing public alerts etc. In the future, the efforts will be made to upgrade the forecasting models so that these models may serve for evaluating the policy effects and identifying the additional measures.

3.2 People's Republic of China

3.2.1 General Outcome

(1) Overall Improvement Nationwide

Since 2013, China has improved its air quality while sustaining economic growth. In 2018, China's GDP grew by 39% over 2013; energy consumption and private vehicle ownership grew by 11% and 83% respectively, while air pollutants concentration dropped significantly. The average PM_{2.5} and SO₂ concentration in the first 74 cities implementing Ambient Air Quality Standard (GB3095-2012) fell by 42% and 68% respectively.

(2) Marked Improvement in Key Areas

In 2013, the Beijing-Tianjin-Hebei region, the Yangtze River Delta and the Pearl River Delta were designated as key areas for air pollution prevention and control. Regional joint pollution prevention and control has been carried out. In 2018, the average PM_{2.5} concentration in the three key areas were down by 48%, 39% and 32% from 2013. From 2015, the average PM_{2.5} concentration in the Pearl River Delta cities have reached the Ambient Air Quality Grade II standard for 4 consecutive years.

(3) Significant Emission Reduction

Since 2013, China's NO_x and SO₂ emissions have dropped by 28% and 26% respectively. NASA satellite data showed that the vertical column densities (VCDs) of NO₂ and SO₂ in China were moving firmly downward from 2013 to 2018: NO₂ VCD dropped by 20% overall, and 27%, 34%, and 24% for Beijing-Tianjin-Hebei region, the Yangtze River Delta and the Pearl River Delta respectively; VCD of SO₂ declined by 88% overall, and 79%, 86% and 76% respectively in the three regions.

3.2.2 Major Policies and Measures

(1) Rule of law

(i) Improving Legal Framework

Since 2013, China has formulated and revised a series of laws and regulations on air pollution control, such as the Environmental Protection Law, the Law on Prevention and Control of Atmospheric Pollution, the Law on Environmental Impact Assessment, the Environmental Protection Tax Law, the Law on Prevention and Control of Desertification, and the Energy Conservation Law, covering various fields of air pollution control.

(ii) Combining Administrative and Judicial Efforts

The Ministry of Ecology and Environment is working closely with the Supreme People's Court, the Supreme People's Procuratorate, the Ministry of Public Security and the Ministry of Justice for joint administrative and judicial enforcement at the national level. Relevant departments have

jointly issued the Interpretation of Issues Concerning Applicable Laws in Dealing with Criminal Cases of Environmental Pollution, stepping up efforts to crack down on pollution crimes.

(iii) Strengthening Law Enforcement

In 2018, China issued penalties in 186,000 administrative cases, 1.9 times that of 2015, with total fines of 15.28 billion yuan, 3.6 times that of 2015.

(2) Scientific and Technological Support

(i) Revision of the Ambient Air Quality Standard

In February 2012, the Ambient Air Quality Standard (GB3095-2012) was published, incorporating the monitoring of PM_{2.5}, thus identifying the six basic ambient air pollutants — PM_{2.5}, PM₁₀, SO₂, NO₂, CO and O₃. It also specified the limits and monitoring method of each pollutant.

(ii) Improving the Air Quality Monitoring Network

A “sky-earth-space” integrated monitoring system is in place, serving the routine monitoring of the atmospheric environment. Technologies have also been developed to monitor ground particulate matter composition, VOCs and ground-based remote sensing online.

(iii) Finding Causes and Solutions

In recent years, China has launched a series of key R&D programs dedicated to finding the causes and solutions of air pollution. In 2017, the then Ministry of Environmental Protection led the establishment of the National Center for Air Pollution Prevention and Control, organizing nearly 2,000 scientists and researchers for this endeavor. It also pioneered a “one city, one strategy” mechanism to realize fast and tailor-made transformation from research to policy in localities.

(3) Comprehensive Emission Reduction

(i) Promoting Environmental Upgrading of Enterprises

Since 2013, 15 emission standards for key industries have been formulated or revised. Pollution control facilities in key industries such as steel, cement and plate glass were upgraded in full swing, bringing down their 2017 intensity of pollutant discharge by more than 30% over 2012. In 2014, programs were launched to upgrade coal-fired power plants to conserve energy and reach ultra-low emissions. By the end of 2018, coal-fired generators of 810 million kw (80% of the total) had been improved to achieve ultra-low emissions, forming the world’s largest clean coal-fired power generation system.

(ii) Industrial Restructuring

Air pollution control measures of local governments have driven enterprises to keep upgrading, shut down backward production facilities and address overcapacity; as a result, the industrial structure kept optimizing. Share of the tertiary industry in China’s GDP kept increasing,

surpassing 50% for the first time in 2015, and reached 52.2% in 2018. Output of key industries such as thermal power, steel and cement has plateaued one after another.

(iii) Optimizing Energy Mix

In 2013, China put forward the concept of “total coal consumption control” in the Action Plan on Prevention and Control of Air Pollution, and set caps on coal consumption for key areas. Between 2013 and 2018, the share of coal in primary energy consumption slid from 67% to 59%, reversing the trend of rapid growth in coal consumption nationwide.

(iv) Coordinating “Fuel, Road, Vehicle” Pollution Control

- Push for Low-Sulfur Fuel

In 2017, implementation of the National V standard brought sulfur content in vehicle gasoline and diesel down to 10 mg/kg. In 2018, the standards for vehicle diesel, general diesel and some types of marine diesel were unified. On Jan 1, 2019, the National VI standard came into force.

- Restructuring Transportation

In September 2018, China issued the Three-Year Action Plan for Promoting Transportation Restructuring (2018-2020), specifying targets and measures for adjusting the transport structure and vigorously developing railway transport.

- Vehicle Upgrading

In less than two decades, China has raised the standards for vehicle emissions from National I to National V. In 2016, China unveiled the 6th stage Limits and Measurement Methods for Emissions from Light Vehicles. Compared with National I, National VI brought single car emission down by over 90%, with diesel vehicles’ particulate matter emissions slashed from 293 grams to 1.5 grams per 100 km.

- New Energy Vehicles

In 2018 alone, China manufactured and sold over 1.2 million new energy vehicles, more than half of the world’s total, bringing China’s ownership of new energy vehicles to 2.61 million.

(v) Treating Non-Point Source Pollution

For years, China has been reinforcing the ecological security barrier in the Northern sand control zone, through shelter forests, grassland protection, and wind-proofing and sand-fixing projects. As a result, desertification has been curbed and forest coverage increased, with a marked reduction of sand storms. China also contributed to the world’s greening endeavor. NASA satellite data showed that in the last 20 years, China contributed around 25% to global leaf area increase, more than any other country in the world.

(4) Innovative Management

(i) Reforming the Management System

- Central Inspections on Environmental Protection

A central inspection campaign for environmental protection was launched in December 2015, and it took three years to carry out the first-round inspections in 31 provinces, municipalities and autonomous regions nationwide. As a result, more than 500 environmental problems were delegated to local authorities to trace accountability; typical cases were exposed and more than 4,200 people were held accountable.

- Joint Prevention and Control

China has established coordinated air pollution prevention and control mechanisms in key areas, such as in and around the Beijing-Tianjin-Hebei region, in the Yangtze River Delta and the Fenhe-Weihe River Plain area, involving 12 provinces, municipalities and autonomous regions.

- Special Campaigns in Autumn and Winter

As severe pollution occurs most often in autumn and winter, China has launched half-year (October to March) actions in autumn and winter in key areas, specifying targets for reducing PM_{2.5} concentration and days of heavy pollution. Regional joint prevention and control was conducted to slash pollutant discharge and mitigate the impact of heavy pollution weather.

(ii) Innovating in Enforcement Methods

In 2017, the then Ministry of Environmental Protection set up a monitoring and support project on air pollution control in key areas. Since 2018, on-site inspections to 666,000 locations was carried out, which helped local governments identify 52,000 eco-environmental problems, and reviewed the rectification progress of 38,900 problems found during the previous year's inspections.

(iii) Ensuring Diligence

The Action Plan setted out the responsibilities, assessment methods and accountability in achieving air pollution control targets. The then Ministry of Environmental Protection signed letters of commitment on air pollution prevention and control with provincial-level governments, which then formulated implementation rules and annual work plans and signed letters of commitment of the same kind with city and county governments. Hence, a multi-tiered management system of atmospheric environment has taken shape.

(iv) Responding to Heavy Pollution Weather

China has established an effective heavy pollution weather response mechanism, which covers the whole process of planning, forecasting, early warning, emergency emission cuts, law enforcement supervision and warning lifting, and has technical support from pre-analysis, in-process tracking and all the way to post-event evaluation.

(v) Improving Economic Policies

Since 2013, various localities and government departments across China have worked in unison to formulate a series of environment-related economic policies, which have effectively promoted the implementation of air pollution control measures.

(vi) Disclosing Environmental Information

Governments at all levels have proactively disclosed information for people to better participate in and supervise China's environmental governance. The disclosed information mainly includes laws and regulations, environmental statistics, administrative approval, law enforcement supervision, complaints and reports handling and environmental emergencies.

(5) Social Participation

China is building a government-led environmental management system with enterprises as the main actors and is participated by social organizations and the general public. In 2015, the new Environmental Protection Law empowered environmental social organizations to file public interest litigations. Between 2015 and 2016, Chinese courts accepted 96 environmental public interest litigations filed by these organizations. And with rising environmental awareness, people are actively participating in environmental supervision and decision-making through multiple channels such as the 12369 hotline, email, WeChat and Weibo. In 2018, 710,000 environmental violation cases were reported nationwide, with 51.6% involving air pollution. In addition, an environmental supervisor system has been established to urge governments and enterprises to diligently fulfill their environmental protection duties.

3.3 Republic of Korea

3.3.1. Recent Trends in Air Quality and Background

For the last few years, air quality has become an issue of grave national concern in Korea with the people experiencing the increasing number of fine dust advisories and warning issued especially in the spring and winter seasons. This shed new light on air quality policies to actively achieve the clean air and protect public health from air pollution. Responding to the need, the Korean government announced the “Comprehensive Plan on Fine Dust Management” on 26 Sep 2017. The Comprehensive plan was formulated with the joint effort by 12 Ministries including the Ministry of Environment, providing a road-map to reduce local PM emissions by 30 % by 2022 from the level of 2014. Under the guidance of the road-map, a package of reduction measures was introduced across all the sectors including industries, power generation, transportation, and daily surroundings. The comprehensive plan also highlights the importance of continuous effort to strengthen collaboration with the neighboring countries, for example, by introducing the issue as an agenda for bilateral and multilateral summits and seeking for a way to conclude a regional convention or agreement for joint effort towards air quality improvement. In accordance with the comprehensive plan, the environmental standard for PM_{2.5} was tightened, as of Mar 2018, to the levels of other developed countries and the foundation was laid to take preemptive actions for protection of vulnerable groups.

Despite the unprecedented actions having been taken, the government noticed further need for additional measures with the growing public demand for better air quality and the stricter environmental standard. Accordingly, it came up with the “Emergency and Regular Measures for Stricter Fine Dust Management” on 8 Nov 2018, with declaration of fine dust as a “social disaster” that requires disaster-level response when high concentrations occur. This complementary version for the comprehensive plan is expected to further to increase the reduction goal from the previous 30% by 2020 to 35.8 % by 2022.

With the need arising for laying a legal basis dedicated for systematic response to fine dust pollution, the Special Act on the Reduction and Management of Fine Dust was enacted on 24 Aug 2018. In addition, 1 trillion and 46 billion KRW of revised supplementary budgets were planned for more active response against fine dust, in Aug 2018.

Reflecting the changed condition as mentioned above and recognizing the necessity for compliance with the Special Act in implementing relevant actions, the government formulated the New Comprehensive Plan for Fine Dust Management in 1 Nov 2019. Also, it came up with special measures to take preemptive actions in responding to high concentration episodes. The measures will be in force, starting from Dec 2019.

In accordance with the Comprehensive Plan, 177 actions will be taken under 42 projects of 5 categories, namely, domestic emission reduction, international cooperation, public health, policy basis, and communication and public awareness. The 20.2 trillion KRW of budget will be executed for the actions from 2020 to 2024.

The key of the special measures for high concentration episodes is the seasonal management system. It aims to implement reduction measures that are stricter than those taken in normal days, in order to decrease the base concentration during such episodes and lower the intensity and frequency of occurrence of high levels.

3.3.2 Major policies, progress, and outcomes

Supported by the series of ambitious plan for fine dust reduction and management, Korea achieved remarkable progress with actual decrease in the annual PM_{2.5} level from 25 $\mu\text{g}/\text{m}^3$ of 2017 to 23 $\mu\text{g}/\text{m}^3$ of 2018. For the same period of time, the number of poor air quality days where the level is higher than 36 $\mu\text{g}/\text{m}^3$ was reduced from 60 to 59, while the number of good air quality days where it is lower than 15 $\mu\text{g}/\text{m}^3$ escalated from 95 to 127.

1) Reduction of local PM emissions

As a result of carrying forward the following measures for mitigating emissions from the four major sectors including power generation, industries, transportation, and daily surroundings, the country reduced PM_{2.5} emissions by 9.4 % up to 2018 from the level of 2014:

- Power Generation: Permanent shut-down of decrepit coal-fired power plants earlier than expected (4 power plants, as of the end of 2019) and their conversion into environmental friendly generation (ex. LNG); and upper limit (80 %) imposed on generated power for high concentration episodes, starting from Oct 2018
- Industries: Introduction of Total Cap Regulation on TSP targeting business facilities in the Seoul Metropolitan Area on Jan 2018; stricter emission permissible levels on business facilities, starting from Jun 2018 for large sources and May 2019 for the others; and introduction of NOx emission charges on Dec 2018.
- Transportation: Early scrapping of 340,000 old diesel vehicles from May 2017 to Sep 2019; supply of low-emission vehicles such as hydrogen and electric cars (accumulation from 2010); and a permissible emission level newly set for diesel trains on Jun 2019.
- Daily Surroundings: Support provided for installation of 34,000 low-NOx boilers; tighter management for fugitive dust at construction sites, and other business facilities; and stricter control of VOCs in paint products and gas stations.

2) Emergency Reduction and Health Protection of Vulnerable Groups

The government introduced a range of measures to respond to high levels of PM_{2.5} with a special focus on protecting vulnerable groups against the polluted air.

When the PM_{2.5} concentration reaches high level, an order for emergency reduction measures is issued. The measures include driving restrictions for high-polluting vehicles, alternative-no-day-driving system in administrative and public institutions, shortened operation of places of businesses and construction sites, and an upper limit of generated power.

In addition, as part of the effort to protect the people particularly vulnerable to fine dust, it is allowed for schools to excuse students from a class for illness reasons. Also, government's supports are provided to replace school buses for children with LPG buses and to increase the number of air purifiers installed in classes.

3) Solid foundation for fine dust management

As of Mar 2018, the environmental standard for PM_{2.5} was tightened to the levels of developed countries, from 50 $\mu\text{g}/\text{m}^3$ to 35 $\mu\text{g}/\text{m}^3$, and the standards for indoor air quality (PM_{2.5}) were newly established for schools and kindergartens.

In addition, the Special Act on the Reduction and Management of Fine Dust is effective as of 15 Feb 2019, laying the foundation for operating the Public-Private Joint Committee for Special

Countermeasures under the leadership of prime minister, expanding the scope of emergency reduction measures, and protecting and supporting vulnerable groups.

National Council on Climate and Air Quality for Resolving Fine Dust Issues

The National Council on Climate and Air Quality (NCCA), a presidential committee, was launched on 29 Apr 2019, led by former UN Secretary-General Ban Ki-moon. The NCCA aims to combat fine dust pollution by collecting public opinions to formulate nationwide countermeasures and promoting collaboration with neighboring countries. Its particular focus is to reflect voices of citizens in seeking for a fundamental way to resolve the issues. In this regard, the NCCA is composed of representatives from different sectors. It plans to propose fundamental solutions to the government based on the opinions collected across the society and actively seek for a way to produce tangible outcomes of cooperation with other countries.

3.3.3 A step forward to clean air: Measures to be implemented until 2024

The Comprehensive Plan announced on 1 Nov 2019 is based on the citizens' policy suggestions having been collected by the National council on Climate and Air Quality in Sep of the same year. The suggestions are outcomes of a wide range of discussions participated by industries, local municipalities, experts, and 500 citizens.

First, for the **industry sector** the target coverage for emission control will expand to include the areas where large emission sources are concentrated. The scope of emissions cap regulation that currently only targets the Seoul Metropolitan Area (SMA) will further expand, starting from Apr 2020 to cover business facilities in other areas (SMA + Middle, Southeast, and South areas). The number of air pollutants covered under the cap regulation will also increase. From Apr 2020, TMS measurement data from 625 business facilities installed with the unit will be provide on a real time bases (currently published once a year) and state-of-art equipment such as drones and portable measuring vehicles will be used for constant monitoring of illegal emissions from facilities. In addition, in order to mitigate burdens of industries, supportive actions will be promoted, such as providing financial support for installing prevention facilities in small-scale businesses.

Second, measures for the **transportation sector** include revision of tax system related to old diesel vehicles such as providing subsidies for early scrappage and increasing acquisition and possession taxes. Purchase of new diesel vehicles will be restricted by gradual increase in the tax on diesel fuel. From 2020, automakers will be given with a mandatory goals to meet for sales of low emission vehicles and charging stations for electric and hydrogen cars will significantly increase (15,000 rapid electricity charging units and 450 hydrogen charging stations by 2025). In addition, the standards of using shipment fuel oils will be gradually tightened and low-speed zones will be designated near large-scale ports. The standards for emissions from construction and agricultural machines will be strengthened to the level of those in the EU by 2020.

Third, the plans for the **power generation** sector include intensive control over emissions from coal power plants in operation and decrease in the share of coal-fired power generation in the national energy mix with an aim at convert it into more sustainable one. The temporal shut down period of coal-fired power plants will be adjusted from the current Mar-June to Dec-Mar when high concentration episodes occur more frequently. In addition, the scope of coal-fired power plants covered by the actions of temporal shut down and upper power generation limits will expand, within a level that does not compromise the stable power supply. The 6 old decrepit

power plants will be permanently shut down by 2021, a year earlier than previously planned by 2022. Also, it will review the additional targets of permanent shut-down.

Lastly, for the **agricultural and daily surroundings**, more inspections will be carried out to prevent illegal incineration of agricultural wastes and secure the infrastructure of collection and separation of such wastes. In addition, in order to reduce ammonia emission from the sector, malodor standards will be re-established before 2021 in parallel with actions to encourage voluntary management. For the stricter control of VOCs, the target areas where installation of gasoline vapor recovery units is obligatory will expand from the current SMA to the entire air quality management zone (SMA + Middle, Southeast, and South areas).

3.3.4 Special measures for accurate response for the seasons with frequent high concentration episodes: Implementation plan for Dec to Mar

The high concentration episodes of fine dust in Korea mostly occur from Dec to Mar from interaction among foreign contributions, local emissions, and weather conditions. In this regard, the government formulated special measures that include preemptive emissions reduction and intensive actions for public health protection during such season from Dec to Mar.

This key measure, seasonal management system, was introduced with full consideration the citizens' suggestions collected by the NCCA in Sep 2019. It covers responsible actions in both private and public sectors, with a special focus on enhancing on-site practices.

For continuous reduction of emissions from industries during the period, about the public-private joint group of about 1,000 inspectors and state-of-art equipment are mobilized for an intensive inspection of illegal emissions. For the power generation sector, up to 14 coal-fired power plants out of 61 will be temporarily shut-down from Dec to Feb and up to 27 in Mar, and the rest will be covered by upper power generation limits, while ensuring the stable power supply.

For the transportation sector, driving the old 5-class vehicles in the SMA will be restricted after a certain period of guidance. Also, as a part of effort to provide exemplary actions by the public sector, administrative and public buildings of SMA and 6 Special Governing Cities and Provinces will implement an alternative day-no-driving system.

For the daily surrounding sector, one or more intensive management roads will be designated for each of local municipalities nationwide for effective and unified collection and processing of agricultural residues in rural areas. In addition, for the purpose of protecting the public health, air purifiers will be installed in classrooms of kindergartens and schools across the nation by Dec 2019. The government will intensively monitor the compliance with guideline for responsive actions during high concentration episodes. It will also provide masks to low-income groups and outdoor workers.

During the period, step-by-step actions will be taken, according to the level of fine dust. In collaboration with the pan-governmental control tower, it will gradually strengthen the emergency actions to ensure 100% protection of public health.

4. Implication and Future Direction for Tripartite Cooperation

The air environment problems are the most urgent issues not only for East Asia but also for the Asia Pacific region. In the last ten years, the emissions of SO₂, NO_x, etc. have been in a decreasing trend⁴, thanks to the various policy measures established and implemented by the concerned countries.

On the other hand, it is required to reinforce the measures further to improve the air environment, in order to protect the peoples' health and maintain their quality of life, provided that the economic growth is foreseen to continue in the Asian Pacific region.

A remarkable progress has been observed with regard to the air pollution controls for PM_{2.5} etc. in China, Korea and Japan, as a result of the international cooperation activities including the TPDAP, as well as the continued implementation of domestic controls over the emission sources. Though the time has been limited during each year's meetings, it has been tremendously fruitful for the administrators and experts of different fields to gather together from the three countries, share the latest experiences, and discuss the future cooperation directions etc. in the last five years.

Each country plans to promote its own policy measures as described in the chapters II and III.

Although the policy directions and goals are different among the three countries, it is essential that the neighboring three countries in East Asia make efforts in close coordination towards the air environment improvement, which continues to be an important and commonly shared issue.

The three countries will continue to promote the TPDAP by sharing policies and knowledges in air-pollution control of each country, deepening the cooperation among us and further strengthening our efforts for the air environment improvement, taking into consideration of each country's needs and constraints in the future. The 7th TPDAP, planned in early 2020, will start the full-scale discussions on the details of the TPDAP future directions.

⁴ AIR POLLUTION IN ASIA AND THE PACIFIC: SCIENCE-BASED SOLUTIONS,(the United Nations Environment Programme (UNEP),January 2019),p.66