

# Korea Environmental Policy Bulletin

Issue 1, Volume IV, 2006

## Execution of Special Measures to Improve Metropolitan Atmospheric Environment

### 1. Outline

#### A. Metropolitan Air Quality<sup>1)</sup>

Due to the government's aggressive execution of measures against atmospheric pollution such as the supply of low-sulfur oil and the obligation to use clean fuel, the levels of SO<sub>2</sub> and CO pollutions have improved. However, levels of secondary pollutants such as PM<sub>10</sub>, NO<sub>2</sub>, and O<sub>3</sub> are increasing due to industrial expansion, an increase of vehicles, etc.

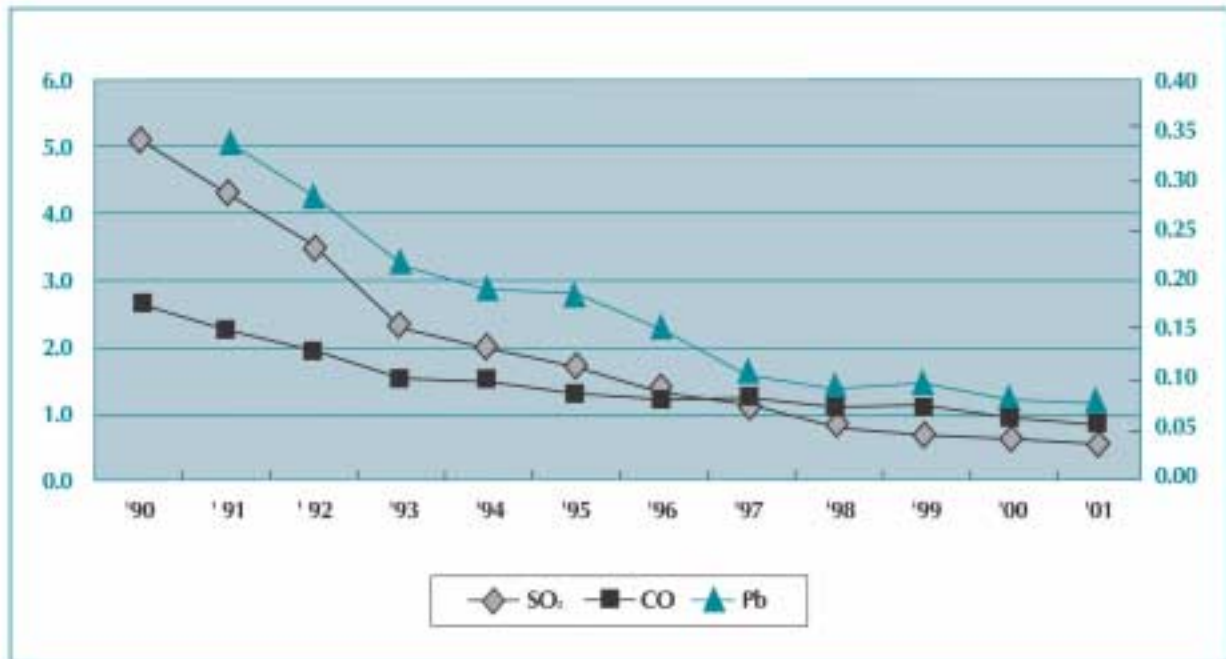
Thanks to the increase of clean energy supplies such as low-sulfur oil and LNG, the level of SO<sub>2</sub> has drastically decreased to that of advanced countries and now all measuring spots satisfy environmental standards. The level of CO is continuously decreasing, due to the substitution of heating oil(coal→kerosene, city gas) and the obligation to attach three elements catalyzing device, all measuring spots satisfying environmental standards as well. Concentration of Pb in the atmosphere is also decreased drastically due to the

<sup>1</sup> The data here are the status of atmospheric quality as of 2002 when the 'Special Law on the Improvement of Metropolitan Atmospheric Environment' enacted. The 'actual reality' was investigated to show the status of atmospheric quality at that time of enactment of the Law. Therefore, this pattern is developed all fitted to the status afterwards.

### C O N T E N T S

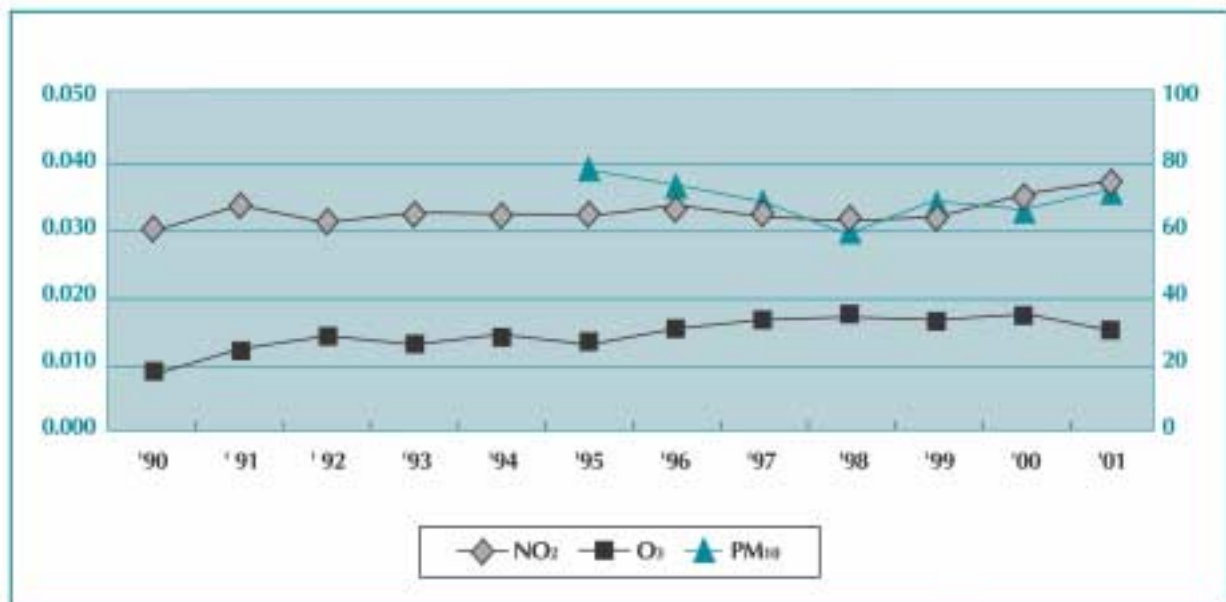
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supply of unleaded gasoline since 1987 (In 1996, the sale of leaded gasolines was prohibited).



<Figure 1> Improving trend of pollution level of SO<sub>2</sub>, CO, and Pb in Seoul

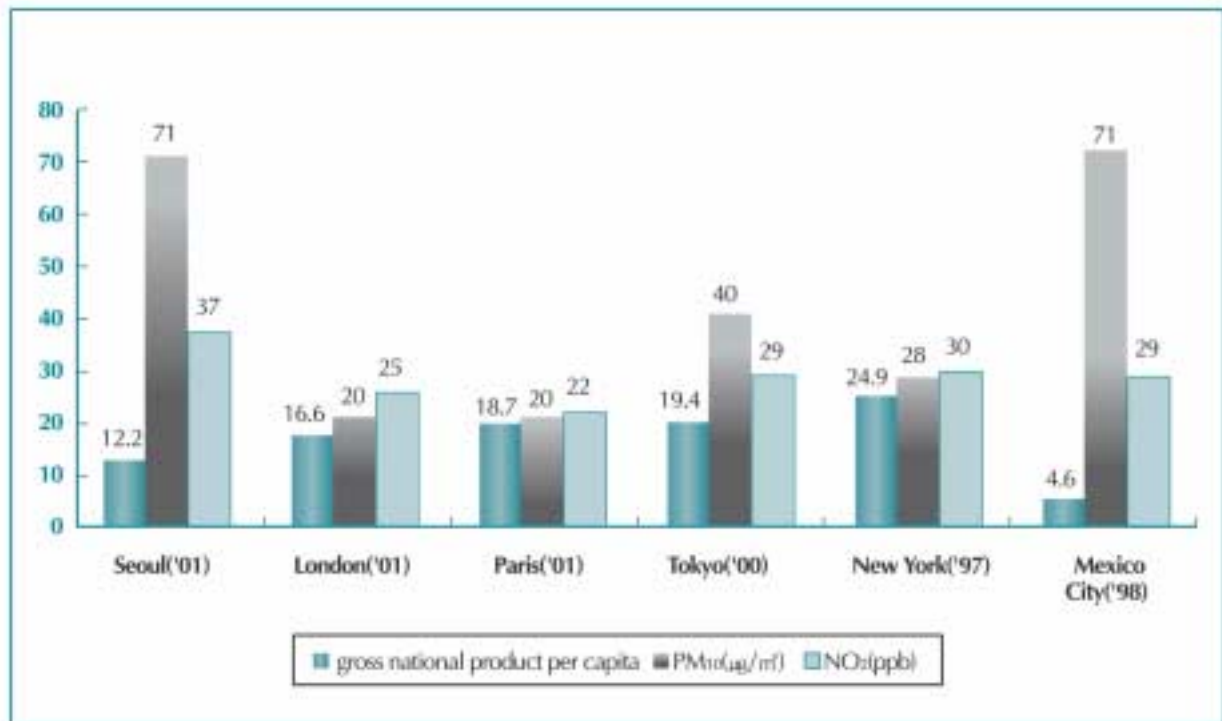
However, the pollution level of secondary pollutants such as PM<sub>10</sub>, NO<sub>2</sub>, and O<sub>3</sub> is continuously increasing due to the increase of auto exhausts.



<Figure 2> Contamination of NO<sub>2</sub>, PM<sub>10</sub> and O<sub>3</sub> in Seoul

Present pollution level of PM<sub>10</sub> in Seoul reaches 1.7~3.5 time higher than in major cities of

advanced countries while NO<sub>2</sub> reaches 1.7 times higher.



<Figure 3> Comparison between pollution level of Seoul vs. that of major foreign cities

Pollution in a metropolitan region is even higher than in other cities. 90 percent of total ozone warning, 99 percent of total number of times over

environmental standard of NO<sub>2</sub>, and 60 percent of total number of times that exceed the environmental standard of PM<sub>10</sub>.

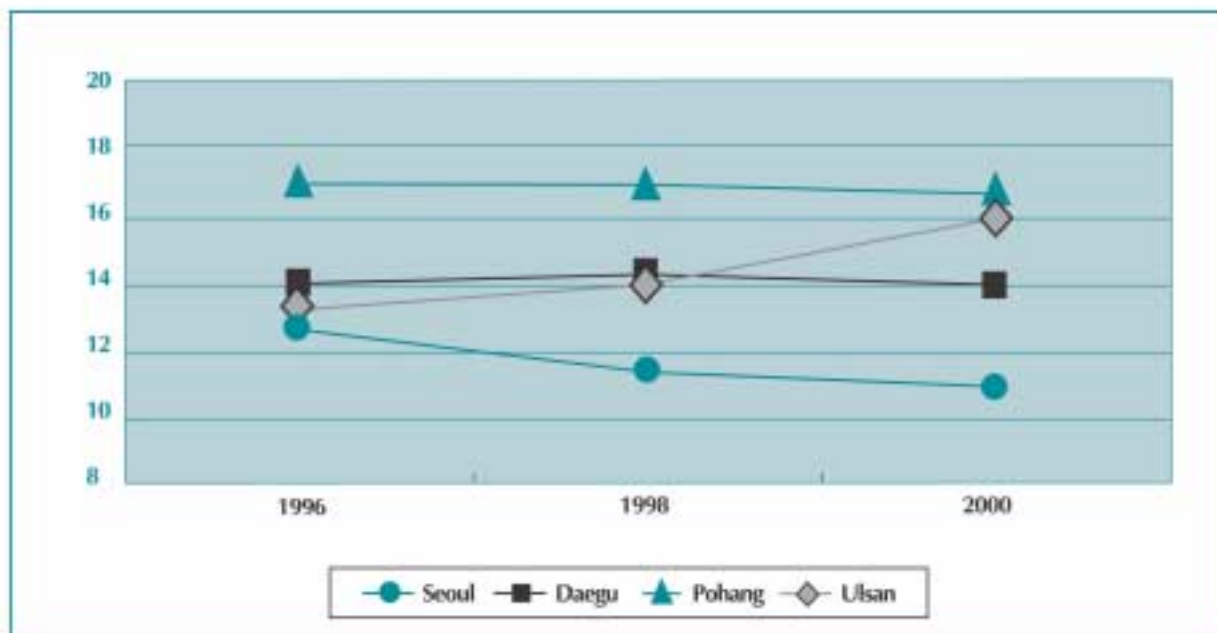
<Table 1> Comparison of atmospheric pollution level of metropolitan region vs. that of non-metropolitan region

	NO <sub>2</sub> (ppb)	O <sub>3</sub>		PM <sub>10</sub> (μg/m <sup>3</sup> )
		number of exceeding times	ozone warning	
metropolitan region	31	394 times	24 times	67
non-metropolitan region	22	390 times	5 times	53

As atmospheric quality of Seoul deteriorates like the above, annual average visibility distance is continuously decreasing while visibility distance

is more than 40% lower in Seoul(12.6km in 1996 →10.9km in 2000) than even that of industrial cities such as Ulsan(16km) and Daegu(13.9km).





<Figure 4> Visibility distance of major cities

The studies on the negative impact of atmospheric pollution by Korea and USA suggest that the atmospheric pollution can cost very high. According to the Korean research, the death toll by cerebral apoplexy increases by 1.5% and by 2.9% as  $PM_{10}$  and  $O_3$  increase respectively. Another study by USA shows that casualties by atmospheric pollution reach as much 3 times as those by traffic accidents.

When estimating on the basis of social costs by UNEP study that takes account of all the expenses including those from medical and agricultural damages by atmospheric pollution and air pollutants emission of metropolitan region, the annual social cost by atmospheric pollution in the metropolitan region amounts to 8,600 billion Won, or 3.6% of gross regional product of metropolitan region, leading to lower the national competitiveness.

According to an outcome of a research on health damages due to the atmospheric pollution, the death toll due to  $PM_{10}$  is estimated to be 9,641 persons a year in Seoul (Environmental Pollution Research Institute, Yonsei University, 2000). An early-dying rate among the population,

exposed to atmospheric pollution in Korea, amounts to 0.09%, which is higher than those of the advanced countries including France whose early-dying rate is known to be somewhere between 0.05% and 0.07%. (refer to the <table 1-2>). They say infant mortality rate is increased by 9% due to the atmospheric pollution, among which death rate due to the respiratory ailments is doubled (Ewha University, 2002). It is reported that, in case  $PM_{10}$  and  $O_3$  increase, numbers of the dead by cerebral apoplexy increase by 1.5% and 2.9% respectively (Joint research by the U. S. Harvard University and a Korean University Research Center). U.S. EPA (Environmental Protection Agency) has once released that the early dead due to the atmospheric pollution amounted to 3 times the dead due to the traffic accidents.

When the status of atmospheric pollution enters into serious phase, environment loses the assimilating capacity which leads to fall-off of living quality and affects production activity, and eventually deteriorates national competitiveness. During 2000, social cost for damages due to the atmospheric pollution in the metropolitan region was estimated to be 10,000 billion Won.

<Table 1-2> Comparison of the chronic dead due to PM<sub>10</sub>(1999)

Classification	Austria	France	Switzerland	Seoul	major 6 cities
The chronic dead(persons)	5,576	31,692	3,314	9,641	20,895
Rate of the early dead among exposed population (%)	0.07	0.05	0.05	0.09	0.09

## B. Cause of Deteriorating Atmospheric Quality

### 1) Increase of Population and Vehicles

The population density in the metropolitan region amounts to as much as 1,858 persons/km<sup>2</sup>, which means 46% of national population being concentrated to the metropolitan region, while areas of the region do not exceed 12% of national territory. This falls four times under the national average(473 persons/km<sup>2</sup>), and 65 times that of the U.S.(28 persons/km<sup>2</sup>). Between 1990 and 2000, the metropolitan population has increased by approximately 20%, from 18.34 million people to 21.91 million people.

Approximately half of nationwide registered vehicles are concentrated in the metropolitan region, and among these, about half are registered in Seoul, whose area does not exceed 0.6% of national territory. However, allowable emission is strictly restricted so that it can be meaningless if the number of pollution sources

increases rapidly. The most proper instance is the case of Diesel heavy vehicle. Allowable emission of PM<sub>10</sub> from Diesel heavy vehicle was reduced from 11.6 g/km in 1996 to 7.0 g/km in 2000. Nevertheless, the number of vehicles has increased 3.1 times to offset the effect of strengthening. Furthermore, the increased number of diesel RV vehicles evidently augment emission of pollutant. The number of diesel RV vehicles has increased approximately 3 times from 135,000 in 1995 to 477,000 in 2000. Diesel passenger vehicles emit as much as 1.8 times of NOx gasoline that passenger vehicles emit. The increase of old vehicles also becomes the cause of increase of emission. The rate of vehicles aged more than 10 years among total cars has been increased from 1.0% in 1994 to 5.1% in 2000 which owes to the wide diffusion of vehicles.

### 2) Increase of Energy Consumption

Energy consumption in the metropolitan region doubled from 18,000 TOE in 1990 to 36,000 TOE in 2000. In breaking up by section, transportation increased 2.3 times and power generation 5.7 times, both surpassing the increase rate of other sections.

<Table 1-3> Section-wise increasing trend of energy consumption (TOE)

Classification	'90	'95	2000
Total	17,902 (100%)	35,691 (100%)	36,215 (100%)
Heating	7,192 (40.2%)	11,938 (33.4%)	11,806 (32.6%)
Industry	4,598 (25.7%)	5,041 (14.1%)	6,174 (17.0%)
Transportation	4,835 (27.0%)	9,897 (27.7%)	10,961 (30.3%)
Power generation	1,277 (7.1%)	8,815 (24.7%)	7,254 (20.0%)



### 3) Improper Management of Secondary Air Pollutant

Atmospheric environment policy thus far has been focused on the solution of the problems caused by primary pollutants such as SO<sub>2</sub>, total atmospheric particulate matter, CO, and Pb. As a result, pollution levels originated from primary pollutants has improved a lot, obtaining epoch-making achievements of reaching the standards of the advanced countries. On the contrary, it is known that Korean government has not yet properly taken countermeasures against atmospheric pollution problems derived from secondary pollutants such as NO<sub>x</sub>, VOC, etc. After 1990, atmospheric pollution originated from secondary pollutants such as PM<sub>10</sub>, NO<sub>2</sub>, and O<sub>3</sub> entered into serious stage as the levels of NO<sub>x</sub>, VOC, etc. in the atmosphere are increased due to increase of vehicles. Although VOC is regulated being a causal material of smog phenomena, it is just at the primitive stage being applied to solve foul smell problem in Ulsan, Onsan, and Yoesu industrial complex, etc., which are the District of Special Measure. Although the atmospheric environment regulation district system has been enforced since 1999 to cope with secondary pollution problem in urban area, the effect is still meager and the measures end just in the regulation against sources of VOC and the reinforcement of standards of allowable emission against limited emitting facilities such as powerplants and incineration facilities.

### 4) Improper Pollutants Reduction Measures against Vehicles

#### A) Improper Reduction Measures for Emitted Gas against Diesel Vehicle

Despite continuous increase of the amount of emission of pollutant like smoke due to gradual superannuation of large-sized gasoline vehicle, measures for gasoline vehicles are delayed in its preparation. Contrastingly, in Tokyo, a specific emission reduction device is required for all diesel vehicles passing through the downtown since 2001, and in California, it is recommended

that a smoke disposal device in motor lorries is installed. Despite the high contribution of diesel vehicles to the vehicle-driven atmospheric pollution, recreational vehicle has continuously increased lately.

#### B) Insufficient Efforts to Reduce Gas Emission of Gasoline Vehicles

The three way catalytic converter, which has been obligatorily attached to gasoline vehicles since 1987, contributed much in reducing pollutant such as CO, NO<sub>x</sub>, and VOC. However, since the mid-1990s when most in-use vehicles were replaced by those with three way catalytic converter, few efforts has been made to further reduce pollutants from sharply increasing vehicles.

Moreover, although the performance of three way catalytic converter has been seriously gotten worse since the initial attachment seven or eight years ago, the catalyzer is not replaced, aggravating urban atmospheric pollution.

#### C) Insufficient Regulation against Non-road Mobile Source

Among non-road mobile sources, the exhaust of three kinds of construction equipments (total 28,000 units) - dump truck, concrete mixer, and concrete pump car is under regulation, whereas no regulation is imposed on forklift, crane, and bulldozer (total 69,000 units). Air pollutants from construction equipments should not be neglected because NO<sub>x</sub> from construction equipments accounts up to 12.7% of total NO<sub>x</sub> emission in metropolitan areas.

#### D) Low Railroad Transportation

The ratio of bus for transportation is high, whereas that of railroad with relatively small emissions is low. The transportation share of railroad in the metropolitan region is 33.8%, which is by far lower than that of Tokyo and Paris, which account for 66.7% and 49.2% respectively. In contrast, transportation share of bus in the same region accounts for as high as

28.8%, which is by far higher than that of Tokyo and New York, which is 7.3% and 15% respectively.

## 5) Unreasonable Energy Policy

Social cost concerning environmental pollution is not reflected to the energy price. Putting stress on the protection of industry and price stabilization, prices of light and heavy oil, which emit much of atmospheric pollutant, are fixed at relatively low level. Comparison of price of gasoline to diesel is 100:56, which indicates price of diesel in Korea is fixed at very low level, considering the same comparison of OECD countries is averagely 100:88. As a result, the use of diesel is increasing just for the reason that the

price is cheap, despite it emits a lot of atmospheric pollutant.

## 6) Adverse Meteorological Condition Impeding Atmospheric Circulation

As Seoul is located in the basin, metropolitan region has unfavorable condition for atmospheric diffusion. Not only emission pollutant, but also geographical features and atmospheric phenomena affect atmospheric pollution. Furthermore, as Korea lies in the west side of northeastern China discharging a lot of pollutants, atmospheric pollution becomes aggravated, especially in spring, due to the pollutants transported from the same region.



## 2. Execution of the Special Measure to Improve Metropolitan Atmospheric Environment

### A. Demand to Formulate Special Measure to Manage Atmospheric Pollution

It is predicted that the emission of pollutants continues to increase and the quality of atmosphere is continuously aggravated even though the standards of allowable emission of both automobiles and emitting facilities are reinforced as announced. This shows that since the air quality deterioration is caused by the increase of population, industrial facilities, and vehicles, single policy of reinforcing the allowable emission standards would not be competent enough to attain air quality as long as the emission sources are projected to increase. Once Korea is really determined to enhance quality of life by drastically improving quality of atmosphere, extraordinary practical measures should be taken which is fully competent to cope with the increase of the source of pollutants.

First of all, these special measures are required to establish precautionary atmospheric management system taking into account environmental carrying capacity. Population density reaches 1,858 persons/km<sup>2</sup> with 46% of total population living in the metropolitan region which only takes 12% of total land. The population in the metropolitan region has increased by 20% between 1990 and 2000, from 18.34 million persons in 1990 to 21.91 million persons in 2000. Population and energy consumption is projected to increase in the metropolitan area. And so it is hardly possible to fundamentally solve problems just by gradually reinforcing allowable emission standard against factories and vehicles. As we have experienced from the increase of vehicles, there is a limitation in just reinforcing the emission standard to cope

with emissions in excess of environmental capacity when the emission sources radically increase. Special measures are required in order to implement emission cap system and manage the diverse development projects within environmental carrying capacity

Second, it would be not easy to manage air pollutants crossing the provinces with the present decentralization system. Due to the unique topographical and meteorological features, metropolitan regions form the identical environmental sphere where air pollutants transport and affect each other by 20%~40%. Accordingly, the solitary emission reduction by each local government will halve the efficiency of air quality improvement. As far as pollution level is concerned, Seoul is affected not only by the pollutants emitted in Seoul, but also by those moved from adjacent districts such as Chungcheongnam-do, Incheon city, Gyeong-gi-do, and even from China. For the same reason, in order to integrate the air quality management, US government organized South Coast Air Quality Management District over the southern Californian sphere showing the most serious O<sub>3</sub> level.

Third, the policy integration between relevant policies with a strong affinity to air pollution, i.e. energy, industry, and city planning is insufficient. Since the energy-related works are scattered in ministries, there is a difficulty in pursuing the efficient and preventive countermeasures; Ministry of Commerce, Industry and Energy is in charge of demand and supply, demand management and development and supply of alternative energy, Ministry of Construction and Transportation city planning and transportation demand and Ministry of Environment energy use, vehicle use and air pollution abatement from



urban development. In order to solve the problems of atmospheric pollution by the roots, energy policy, city planning, and transportation demand administration, etc. should be linked with atmospheric policy.

Fourth, in order to substantially improve the air pollution, the relevant policies such as energy policy, city planning, and transportation demand management need to be implemented in connection with air pollution. Mandatory supply of low emission vehicles, epoch-making measures to abate exhaust and emission cap system are required.

Fifth, budgets for improving air pollution is insufficient. While there is an increasing demand for the improvement of atmospheric environment including supply of low emission vehicles, budgets fall far short of such demand. As of 2001, budget for air quality preservation was 64.7 billion Won, only 4.5% of total budget of the Ministry of Environment. And most budgets are allotted to supply of Natural Gas Vehicles. Such amount of budget is less than the cost for constructing 5km-long four-lane roads. To make the situation worse, most of that budget had only limited uses of propagating natural gas. With that amount, you couldn't build 5km-long four-lane road. It is hard to appropriate fund to improve atmospheric environment.

## B. Policy Execution Process

Generally, execution of measure for the improvement of metropolitan atmospheric environment has undergone 3-staged courses, formulation of special measures, enactment of special laws, and preparation of subordinate ordinance.

First, after 3 months consultations with environmental groups, industries, and academic world from April, 2002, the Special Measure for the Improvement of Metropolitan Atmospheric Environment(Draft Proposal) was initially prepared in July, 2002. Again collecting the

views from the relevant authorities, local autonomous government, industries, and NGO's, final Policy had come into being in December, 2002.

Second, a draft of the Special Law on the Improvement of Metropolitan Atmospheric Environment was finally prepared by the Arrangement Committee for the Special Law consisted of concerned persons of the National Assembly, NGO, and other experts in the field in August, 2002 in order to secure clean environment through the improvement of metropolitan atmospheric environment and to furnish legal ground for the Special Measure for the Improvement of Metropolitan Atmospheric Environment. However, economic ministries and industries severely resisted requesting to stop the attempt to enact the Special Law on the ground that it would hinder economic growth, despite the Presidential Inaugural Committee adopted enactment of the Special Law as a 'major subject of national administration' of 'Participation Government'. After many twists and turns, the process speeded up thanks to the President's special instructions. As it was forecasted negatively with the existing system of enactment and solution, a fresh form of governance was organized, eventually reaching to an agreement on the enactment of the Special Law in May 2003. Subsequently, further agreements were made on several points of contention on the win-win base for the benefit of all parties, by holding 9 times of task force meeting during 2 months. The Special Law was again reviewed at the public hearing held by the Committee of Environment and Labour, National Assembly, and, after all, was enacted/promulgated in December 2003.

Third, the subordinate ordinances prescribing the details of the Special Law are established in order to implement the Special Measure for the Improvement of Metropolitan Atmospheric Environment. However, it encounters another deadlock as relevant ministries and industrial sector requested atmospheric management zone be curtailed, the emission cap system reduced in the size of affected sources and readjusted in

implementation date, and the size of emission charge be drastically cut and 9 points of issues readjusted. In order to break through this deadlock, over 90 times of presentations, public hearings, and consultations were held to review problems pertaining to each industry and region for 7 months. Nevertheless, several further working level negotiations had to be held before they reached dramatic package settlement in September, 2004 by making mutual concessions.

The subordinate ordinance thus presented was finally promulgated in December 2004 after passing through the Restriction Reformation Committee, Vice-ministers Meeting, and Cabinet Council in October 2004.

## C. The Major Content of the Metropolitan Special Measure

### 1) The Outline of Measures

First of all, the measure to improve metropolitan atmospheric quality propelled by the Ministry of Environment is focusing on improving atmospheric environment administration system fundamentally.

The Ministry plans to reform atmospheric administration system from ex post facto concentration regulation method to prevention method, from dispersed administration to great-sphere administration, from short-term allopathic approach to medium and long-term approach. Further, various factors will be comprehensively considered, such as energy saving and city planning which affect atmospheric pollution, beyond individual administration against the sources of pollution such as factories and vehicles. And economic incentives for the industries will be reinforced supplementing the policy inclined to regulation so far.

Second, emission cap system for region and industry will be introduced, which estimates the

environmental capacity of relevant municipality and controls the industrial pollutants based on the emission cap system.

Third, measures will be actively taken to reduce atmospheric pollution from vehicles, which include the supply of low emission vehicles like electric vehicles, electric hybrid vehicles, and natural gas vehicles. Korean government also plans to reduce the emission at an operational stage through reinforcing emission standard as well as installing emission gas reduction device and substituting with low-emission engine for the vehicles in excess of standard.

In addition, Korean government will strengthen VOC management and establish eco-friendly management of city and energy.

Through all above schemes, quality of atmosphere will be improved to reach the level of advanced countries by 2012, and to reduce number of early death by 1,270 persons a year, as well as social cost due to atmospheric pollution by 3 thousand billion Won.

### 2) The Goal of Special Measures for the Improvement of Metropolitan Atmosphere

The Special Measure for the Improvement of Metropolitan Atmosphere will be carried out as 10 year plan from 2003~2012 during which period 4.73 thousand billion Won will be invested for the execution of the Special Measure.

The goals of the Special Measure are to improve metropolitan atmospheric quality to reach the level of advanced countries. Namely,  $PM_{10}$  will be improved to  $40\mu\text{l}/\text{m}^3$ , the level of Tokyo,  $NO_2$  to 21ppb, the level of Paris. Once these goals are achieved, it is expected the vision will be secured from the top of Namsan area.



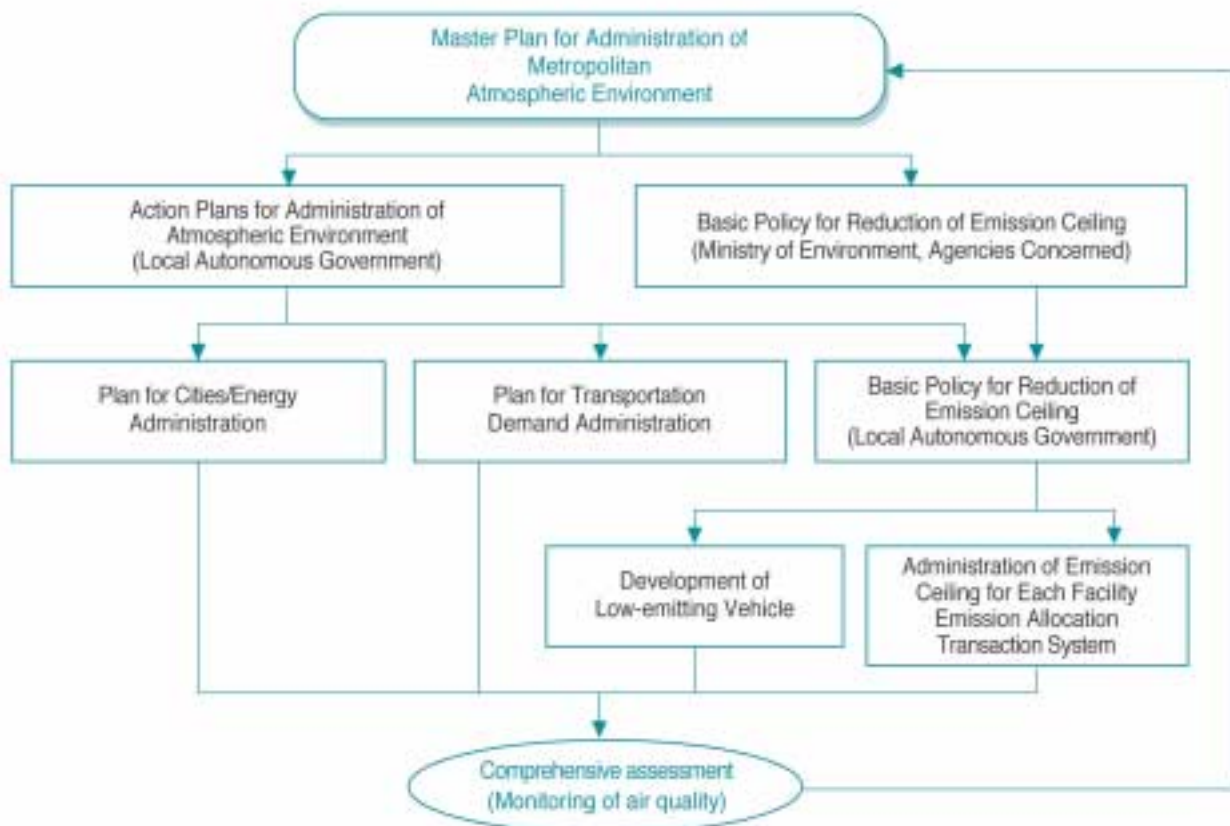
<Table 1-4> Goal of Atmospheric Quality Improvement

	'01		'12
- PM <sub>10</sub> (㎍/㎥)	71	→	40 (Level of Tokyo)
- NO <sub>x</sub> (ppb)	37	→	21 (Level of Paris)

In order to achieve these goals, it is planned to reduce emission of PM<sub>10</sub>, NO<sub>x</sub>, VOCs, and SO<sub>x</sub> by 40~70% of that of 2000.

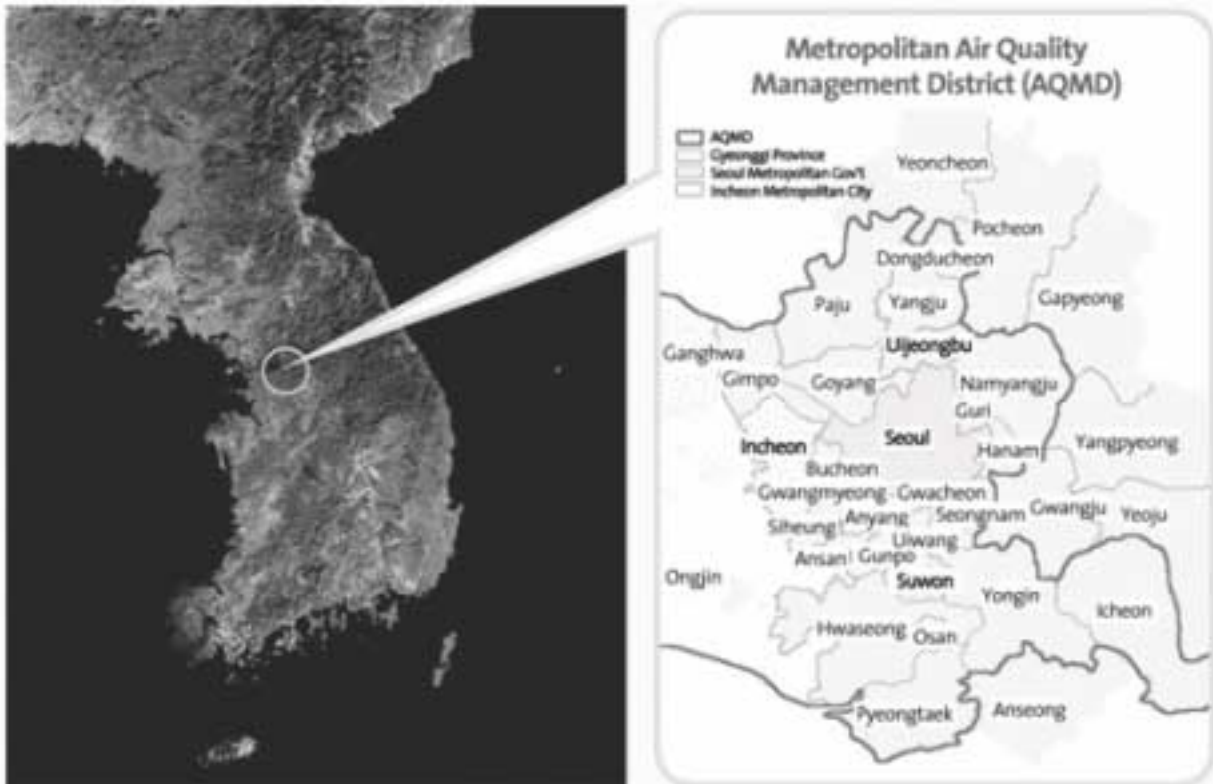
The affected areas of the Special Measures include Seoul, Incheon and Gyeong-gido. The goals will be set with comprehensively taking into account the present pollution level, geographical features, atmospheric diffusion, pollution sources distribution, and development prospect of each region.

In order to achieve these goals, the Ministry of Environment will establish the Master Plan for Administration of Metropolitan Atmospheric Environment which includes forecast of metropolitan pollutant emission and level of pollution, set-up of atmospheric quality administration target and affected region, regulation of emission ceiling in the industrial facilities, propagation of low-emission vehicles, while Seoul, Incheon, and Gyeong-gi-do will formulate and enforce action plans to carry out Master Plan.



<Figure 5> System Diagram of Plan for Administration of Metropolitan Atmospheric Environment





<Figure 6> Metropolitan air quality management district.

### 3) TAPL Management System

The Total Air Pollution Load (TAPL) management system entails a calculation of the environmental carrying capacity (or Regional Atmospheric Environmental Critical Loads), and a policy to 'cap' the amount of pollution discharge in the region. With the adoption of this system, the MOE allocates the maximum emission load per each pollutant and manages industrial activities accordingly.

Until recently, Korea's environmental regulations - such as the emission standards system - monitored the pollution level by each emitter (e.g. smoke stacks). Although this system was effective in controlling the pollution level of each emitter, it was unsuccessful in constraining the total amount of pollution because it lacked control over the increasing number of emitters.

For this reason, the MOE introduced the TAPL management system to allocate a total volume of allowable emission exhaust for each industrial site (e.g. industrial plants). Also, an Emissions Trading System is being adopted to create a market for emission permits trading, which will in turn benefit those who have kept the amount of emission discharge below the allowable level.

### 4) Supply of Low Emission Vehicles

Emissions from vehicles account for roughly 51% of NO<sub>x</sub>, 58% of PM<sub>10</sub>, and 85% of CO concentration in the metropolitan air, making emission reduction measures for vehicles and the supply of low emission vehicles(LEV)/zero emission vehicles(ZEV) an important key to improving the ambient air quality. The new

Special Law on Seoul Metropolitan Air Quality Improvement categories LEV/ZEV into type 1,2,3 according to the level of pollution reduction.

Starting from 2005, nearly all government bodies in the metropolitan area will be required to purchase a certain portion of newly purchased vehicles with LEV/ZEVs. On the manufacturer side, automakers selling more than 3000 vehicles/yr in the metropolitan region are advised to supply LEV/ZEVs at a ratio set together with the government.

## 5) Controlling Vehicles in Operation

Old vehicles that were manufactured according to past emission standards emit a greater amount of air pollution than the newer vehicles. Therefore, taking active measures to reduce emission from vehicles that are in operation are critical to bring drastic improvement in the air quality. First, recognizing that diesel vehicle exhaust emissions account for 100% of PM<sub>10</sub> and 75% of NO<sub>x</sub> discharged by cars, MOE strengthened emission standards for diesel vehicles in operation. Also, those who fail the emissions testing will be required to attach Diesel Particulate Filters (DPF) or Diesel Oxidation Catalysts(DOC), or to retrofit with "cleaner" engines. Necessary subsidies will be provided to encourage these activities.

## 6) Fuel Quality Improvement

Starting from October 2004, through tax

incentives, only low-sulfur fuels will be supplied in the Metropolitan area. Current national fuel standards on sulfur contents are 430ppm for diesel, however, the new low-sulfur fuels will possess less than 30ppm sulfur content. Furthermore, by introducing a grade scheme for fuel qualities, the MOE is encouraging the consumers to make environmentally sound choices.

## 7) VOCs Reduction

Volatile Organic Compounds (VOC), which are highly challenging to control, is a general term for organic compounds in their liquid or vapor state. In addition to posing threats to humans, VOCs, when combined with NO<sub>x</sub> in the ambient air, generates ozone due to its character of high photochemical reactivity. In order to reduce VOCs at source, the MOE mandates paint manufacturers to decrease the rate of organic solvent content in paints by 30%, and encourages the use of water-based paint.

## 8) Energy Management

In order to coordinate an environmentally sound energy pricing system, the MOE has revised the tax rate on diesel vehicles with higher emission exhaust levels. Also, based on the 'Polluter Pays Principle,' the Ministry has amended its regulation to impose Environment Improvement Charge on diesel gas itself, instead of imposing charges on the vehicles that run on diesel gas.

### 3. Successful Results

Through establishing the specific and tangible subordinate ordinance to enforce Special Act on Metropolitan Air Quality Improvement and strongly executing the follow-up measures, Korean government set the basis for successfully implementing Special Measures on Metropolitan Air Quality Improvement.

Firstly, once of the major achievements would be the wide propagation of low-emission vehicles. Supply of vehicles with low-emission engine such as hybrid vehicles, two-wheeled electric vehicles and low-emission shuttle buses continued through the persistent consultation with auto-makers.

Secondly, concerned Ministries, three local governments and related experts jointly investigated the emissions from each industrial emitter in metropolitan areas, established the way of determining emissions and emission ceiling allocation factor and conducted the pilot cap and trade system, completing the preparation for emission cap regulation in metropolitan areas.

Thirdly, concerning the clean energy project, advanced propagation of low-sulfur oil would be evaluated as an example success. However, the Ministry of Environment is still expected to take an active role in promoting renewable energy and strengthening energy demand management.

Lastly, one of the outstanding achievements in executing measures on metropolitan air quality improvement is to establish the role model of solving the problems in policy-making through consultation and discussion with various stakeholders, different from the past cases

unilaterally led by central government. For instance, Ministry of Environment made lots of consultations and held many explanatory meetings with relevant governmental agencies including the Ministry of Planning and Budget, the Ministry of Commerce, Industry and Energy, local governments and industrial sectors, etc. However, most of all, way of deriving agreement in the course of enforcement of the Special Law by having many presentations against concerned staffs of local autonomous governments and industries, many consultations with the government agencies concerned such as the Ministry of Planning and Budget and the Ministry of Commerce, Industry and Energy, and industries such as the Korea Chamber of Commerce and Industry, and 9 task force meetings with work level staffs became the model of fresh policy discussions grouping for reasonable solutions through dialogues and compromises, differently from customary practice up to now, in which policies were driven one-sided by central government. It would be a good example of preventing policy failure and enhancing degree of perfection by spreading knowledges and shaping out consensus through far-reaching discussion from the initial stage of policy decision.

Finally, such efforts like enacting the special law to improve atmospheric quality in metropolitan region where the state atmospheric quality is severely deteriorated, establishing practical atmospheric environmental policy, and constructing infrastructure for the execution of policy could be evaluated as a monumental achievement in 25 years of Korean history of atmospheric environment policy.





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ISBN 89-8464-123-5

2006 WD-08(1)