Seoul’s Air Quality Control & Vehicle Restrictions
I

Air Quality Trends & Policies
In 2017, levels of PM-10 and PM-2.5 increased by 7% and 9% from 2012, respectively.

While the levels of particulate matter have reduced, the change has slowed down since 2012.
NO. OF BAD-PM2.5 DAYS OVER PAST THREE YEARS

11 days in 2015, 13 days in 2016, 20 days in 2017
Geopolitical location: Dust blown into Korea from China and Mongolia
01 CAUSES OF SERIOUS PARTICLE POLLUTION

Impact of Climate Change

Higher temperature (unit: °C)

- 1973: 12.4
- 1980: 11.2
- 1990: 13.1
- 2000: 12.5
- 2010: 12.7
- 2016: 13.6

Lower precipitation (unit: mm)

- 1970: 1708.2
- 1980: 1242.4
- 1990: 2355.5
- 2000: 1186.8
- 2010: 2043.5
- 2016: 991.7

Lower Wind Velocity (unit: m/s)

- 1973: 2.6
- 1980: 2.6
- 1990: 2.4
- 2000: 2.2
- 2010: 2.5
- 2016: 2.3
CAUSES OF SERIOUS PARTICLE POLLUTION

**Sources of PM2.5 in Metropolitan Area**

- Vehicles: 29%
- Construction: 22%
- Heating: 12%
- Power Plants: 11%
- Fugitive Dust: 10%

*Other sources: Commercial sites 9%, Biomass burning 5%, etc.*

(Sources: National Institute of Environmental Research)

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**Sources of PM2.5 in Seoul**

- Vehicles: 25%
- Heating, Cooling: 39%
- Fugitive Dust: 22%
- Construction: 12%

*Other sources: Biomass burning 2%, etc.*

(Sources: Seoul Research Institute)

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**Geological Sources** = **Overseas 55%** + **Seoul 22%** + **Metropolitan 12%** + **Others 11%**
WHO classified PM -2.5 as Group 1 carcinogen (2013)

More premature deaths (OECD as of 2016):
17,000 in 2010 → 52,000 in 2060

Higher social costs
- In large cities, about KRW 450,000 of social costs are incurred for the increase in PM-2.5 by 1kg
- Decrease in labor productivity and crop yields will result in losses of KRW 2mn a year per person as of 2060.

Higher suicide rates: The group with highest exposure to PM-10 is 4.03 times more likely to commit suicide than the group with lowest exposure

Strong and innovative measures are urgent
CITIZENS’ POLICY PRIORITIES

Odd-even driving restriction on days with high PM levels
(1,867 respondents, %)
- For: 80%
- Against: 20%

Polluted vehicle restrictions in the city center
(1,867 respondents, %)
- For: 82%
- Against: 18%

Temporary shutdown of coal power plants in Spring
(1,867 respondents, %)
- For: 87.3%
- Against: 12.7%

Environmental values put before citizen convenience
(1,867 respondents, %)
- For: 83.5%
- Against: 17.5%
01 KEY AIR QUALITY CONTROL POLICIES

1. Natural Disaster
   ✓ Designation of ‘Particle Pollution’ as Natural Disaster
   ✓ Public measures to protect the safety of citizens

2. New alert
   ✓ Introduction of an alert for PM2.5 sensitive groups
     - Hand out of dust masks 1.5 mn persons/2.2bn KRW
     - Deployment of air purifiers: 6,806 places /2.9bn KRW

3. Emergency Measures
   ✓ Enforcement of Emergency PM2.5 Reduction Measures
   ✓ SMS alert services

4. Odd-even Driving ban
   ✓ Voluntary alternate day driving ban
   ✓ Shut down of public parking lots (6am~8pm)

5. ULEZ
   ✓ Dirty vehicle ban in Green Transportation Promotion Zone (ULEZ)
KEY AIR QUALITY CONTROL POLICIES

6. Green Construction
   - Old construction equipment retrofits
   - Mandatory use of eco equipment at all public and private construction sites from 2018

7. Eco Boilers
   - Support for household eco boilers and industrial low-NOx burners
     - 6,000 units of boilers / 4,357 units of low-NOx burners by 2018

8. R & D
   - R&D support and expansion of research to nurture air quality startups

9. Environmental Diplomacy
   - Environmental cooperation with East Asian cities
     - East Asia Clean Air Cities
     - Seoul-Beijing MOU on environmental cooperation
       - Information exchange/Joint research on air pollution
       - ‘Seoul-Beijing Air Quality Forum / ‘Seoul-Beijing staff training program

10. Local Cooperation
    - Cooperation with state government
       - Air quality policy committee of state and local governments
EMERGENCY PM-2.5 REDUCTION MEASURES

Conditions

- The measure was enforced in Seoul alone (Jul 2017)
- It is enforced when the average (from midnight to 4pm) PM2.5 levels exceed 50μg/m³ and the next day's forecast is bad at 50μg/m³ or worse

Enforced five times this year (Jan 15, 17 and 18 & March 26 and 27)

Measures

- Public parking lot shutdown and voluntary odd-even driving ban
- Operation reduction of construction sites and high air pollution emitting facilities
- Public vehicle fleet suspension
- SMS warning services
- Deployment of Fugitive dust suction vehicles
- Handout of air purifiers at child care facilities and masks to the vulnerable

Benefits

- An estimated 3.3% (1.1 ton) of PM2.5 reduction
- Subway use up by 5.8% and bus use up by 9.4% (Jan)
Citizen-led PM reduction policies

**Citizen engagement**
- Citizen-led public campaigns
- More incentives for active citizens

**Focused Source control**
- Car Labeling Scheme
- Dirty Vehicle Restriction
- Tight policing on compliance

**Exposure reduction**
- Indoor air quality control at sites frequented by many people
- Make Seoul’s own standards to control indoor air quality

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Citizen-led PM reduction policies
Dirty Vehicle Restriction
Current Status

- Scope: across Seoul
- Target: Diesel cars weighing over 2.5 tons and registered before Dec 31 2005 + 33,000 commercial cars entering the Seoul metropolitan area over 60 days a year
- Cooperation agreement signed to expand the restriction to include other areas (August 2016)
  - I step (2017): Seoul
    - Police by Seoul
      - Fines for non-compliant cars (including car registers in Incheon and Kyunggi Province)
    - Police by Seoul, Incheon, and Kyunggi Province
      - Fines for non-compliant cars (including cars registers in other cities and provinces)
02 METROPOLITAN AGED DIESEL CAR RESTRICTION

Policing Status

- Methodology: Automatic Number Plate Recognition (ANPR)

- A warning is given to first violators, and fines of 200,000 KRW are imposed on repeated violators

- Policing trends

<table>
<thead>
<tr>
<th>구분</th>
<th>Total</th>
<th>2012-15</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameras</td>
<td>37/80</td>
<td>7/24</td>
<td>6/22</td>
<td>24/34</td>
<td>14/14</td>
</tr>
<tr>
<td>Vehicles</td>
<td>8,216</td>
<td>4,150</td>
<td>2,273</td>
<td>1,793</td>
<td>-</td>
</tr>
</tbody>
</table>
### Vehicles with high emissions

<table>
<thead>
<tr>
<th></th>
<th>EURO-3</th>
<th>EURO-4</th>
<th>EURO-5</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>5.0 g/kWh</td>
<td>3.5 g/km</td>
<td>2.0 g/kWh</td>
<td>Heavy duty trucks</td>
</tr>
<tr>
<td></td>
<td>2.5 times EURO-5</td>
<td>1.75 times EURO-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particle</td>
<td>0.10 g/km</td>
<td>0.04 g/km</td>
<td>0.005 g/km</td>
<td>Light duty trucks</td>
</tr>
<tr>
<td>Material</td>
<td>20 times EURO-5</td>
<td>8 times EURO-5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comparison between registered vehicles and their PM2.5 emissions in Seoul

- **PM-2.5 배출량 비율**
  - 유로 2 이하: 4.3%
  - 유로 3: 8.4%
  - 유로 4: 14.2%
  - 유로 5: 23.8%
  - 유로 6: 11.3%

- **차량비율**
  - 유로 2 이하: 4.3%
  - 유로 3: 15.9%
  - 유로 4: 40.0%
  - 유로 5: 43.0%
  - 유로 6: 22.5%
## Selection of Target Vehicles (proposed)

<table>
<thead>
<tr>
<th>Targets</th>
<th>Option ①</th>
<th>Option ②</th>
<th>Option ③</th>
</tr>
</thead>
<tbody>
<tr>
<td>Targets</td>
<td>Diesel cars over 2.5 tons, registered before Dec. 2005 (cars with reduction devices excluded) 5th class</td>
<td>Diesel cars registered before Dec. 2005 (Pre-Euro3) (cars with reduction devices excluded) 5th class</td>
<td>Diesel cars registered before Sep. 2009 (Pre-Euro4) (cars with reduction devices included) 4th, 5th class</td>
</tr>
<tr>
<td>No. Registered Cars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seoul</td>
<td>80,000 (2.6%)</td>
<td>200,000 (6.3%)</td>
<td>410,000 (13.0%)</td>
</tr>
<tr>
<td>Metropolitan</td>
<td>320,000 (3.2%)</td>
<td>700,000 (7.0%)</td>
<td>1.44 mn (14.4%)</td>
</tr>
<tr>
<td>Nationwide</td>
<td>1.2 mn (5.3%)</td>
<td>2.2 mn (9.8%)</td>
<td>3.78 mn (16.8%)</td>
</tr>
</tbody>
</table>
02 SEOUl DReTlY VEHICLe RESTRICTION

Overview

✓ Scope: The entire administrative area governed by Seoul Special City

✓ Enforcement: When Emergency PM2.5 Reduction Measures are enforced after June 1, 2018 (6am~9pm)

✓ Targets: All diesel vehicles registered before December 2005
   (※ Retrofitted cars are excluded)

✓ Grace Period: by February 28, 2019 (Communication of its enforcement is needed)

① Diesel cars registered outside the administrative area
② Diesel vehicles weighing below 2.5 tons
③ Cars for people with disabilities
02 SEUL DIRTY VEHICLE RESTRICTION

Overview

✓ Priority targets: 320,000 diesel vehicles weighing over 2.5 tons registered in the metropolitan area
  - Targets after grace period: 2.2 million diesel cars registered anywhere in South Korea

✓ Fines for non-compliant cars: 100,000 KRW

❖ Emissions reduction of public fleet
  - All public fleet will be banned when the emergency reduction measures are enforce
  - But, fire trucks, cargo trucks etc. are exempted.
How to police non-compliant vehicles

Policing = 80 CCTVs at 37 spots + Portable policing systems (cars) + Policing staff
SEOUl DIRTY VEHICLE RESTRICTION

Expected PM reduction effects

PM-2.5 reductions (kg/일)

기준배출량: 3,250kg/일

대안 1
대안 2
대안 3

이행율 100%
이행율 80%
이행율 50%
이행율 40%

대안 1 대안 2 대안 3
33% 40% 65%
26% 32% 52%
17% 20% 33%
13% 16% 26%
**DOMESTIC TRENDS**

### Existing National Car Labeling Schemes

- **Low emission car label**
  - Ratings: 1~3 ratings
  - Benefits: discounts at public parking lots, exemption of congestion charges

- **Car energy efficiency label**
  - Information in the labels:
    - city fuel economy, highway fuel economy, combined fuel economy, combined CO₂ emissions (g/km), mileage per charge (km)
  - Benefits: discounts at public parking lots, exemption of congestion charges
5 Ratings

- The scheme comes in five ratings depending on how much air pollutants (HC, CO, NO\textsubscript{x}, PM) and CO2 cars release compare to the emissions standard.

<table>
<thead>
<tr>
<th>Category</th>
<th>Grade1</th>
<th>Grade2</th>
<th>Grade3</th>
<th>Grade4</th>
<th>Grade5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air pollutant emissions + Carbon emissions</td>
<td>9~10</td>
<td>7~8</td>
<td>5~6</td>
<td>3~4</td>
<td>2</td>
</tr>
</tbody>
</table>

Different emissions between carbon and air pollutants are not well reflected in the ratings.
### National Car Labeling Scheme (Current)

- **Notification of the scheme** (April 25, 2018): 5 ratings (1 ~ 5)
  - Class 1: Electric, hydrogen fuel cell cars
  - Class 1-3: Hybrid cars
  - Class 1-5: Petrol and LPG cars
  - Class 3-5: Diesel cars

<table>
<thead>
<tr>
<th>Rating</th>
<th>Petrol-LPG Car</th>
<th>Diesel Cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electric, Hydrogen fuel cell vehicles</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Cars subject to 2009~2016 emissions standard (NOx+HC: below 0.019g/km)</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Cars subject to 2006~2016 emissions standard (NOx+HC: below 0.10g/km)</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Cars subject to 2000~2003 emissions standard (NOx+HC: below 0.720g/km)</td>
<td>Cars subject to post- 2009 standard (NOx+HC: below 0.353g/km)</td>
</tr>
<tr>
<td>4</td>
<td>Cars subject to 1988~1999 emissions standard (NOx+HC: below 1.930g/km)</td>
<td>Cars subject to 2006 standard NOx+HC: below 0.463g/km)</td>
</tr>
<tr>
<td>5</td>
<td>Cars subject to 1987 emissions standard (NOx+HC: below 5.30g/km)</td>
<td>Cars subject to pre-2002 standard (NOx+HC: below 0.560g/km)</td>
</tr>
</tbody>
</table>
Where are the labels?

- Where are the labels?
- Labels show vehicle emissions
CAR LABELING/SCORING SCHEME

1. I·SEÓUL·U (Class 1) Low-pollution vehicles

4. I·SEÓUL·U (Class 4) Euro4

5. I·SEÓUL·U (Class 5) Euro3

- Regulating cars with low rates with the introduction of Car Labelling Scheme
- Provision of incentives such as a discount on public parking fees and exemption from congestion charges
03 CAR LABELING/SCORING SCHEME

Design 1

Design 2

Design 3

Design 4
✓ "Know your car’s class" mobile application
✓ "I put my label on the front window" campaign using an online platform
✓ Notifying the car ratings via car tax bills
Polluted vehicle restriction in green transport promotion zone (ULEZ)

Restricting cars with low eco rates from entering the Green Transport Promotion Zone

- Area: (Phase 1) Green Transport Promotion Zone (inside the city center, 16.7km) → (Phase 2) Expansion to the entire Seoul
- Target: Cars with low eco ranks such as Class 4-5 (Diesel cars manufactured before Sep 2009)

Project operation (2018)
- Legislation of Ordinance on Support, etc. of Car Labelling Scheme in line with the MoE announcement
- Basic planning (Mar 2018 -) and establishment (Oct 2018 -) of the traffic-control system
- Prior guidance: CCTV to monitor non-compliant cars, vehicles and staff deployed to police compliance et etc.

Enforcement (2019)
- Before building the system: A prior notice made by an enforcement officer on driving restriction by using PDA (Grades 4-5)
- After building the system: Automated enforcement with the technology capable of reading car plates
Cleaner Sky,
Healthier City,
For future generations

Together with citizens,
Seoul will tackle air pollution
Thank You