

4<sup>th</sup> Regional EST Forum in Asia

# Control and Strategy for Reduction of Pollutants from Automobiles for Low-Carbon Green Growth in Korea

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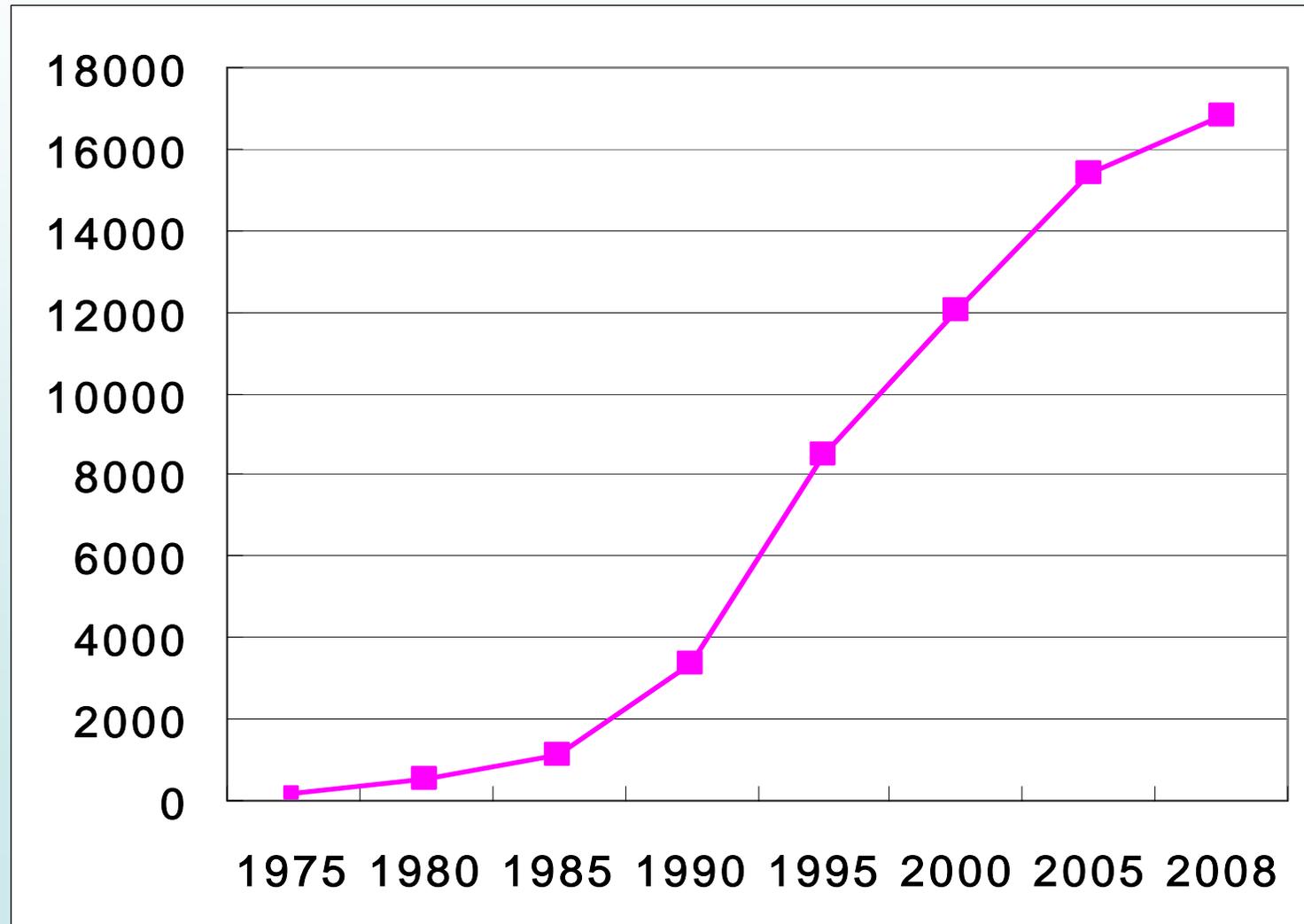
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# ◆ Policy Backgrounds and Circumstances

## Number of Vehicle Registration

Unit : thousand vehicles



# Air Pollutants by Source

(National Statistics, 2005)

Unit : ton/year

Emission Source	Total	%	CO	NOx	SO <sub>2</sub>	PM <sub>10</sub>	VOC
Total	3,327,809	100	67,343	1,306,724	408,462	67,343	756,421
Energy Industry	579,343	17.4	35,889	390,895	139,064	8,229	5,326
Non-industry	238,142	7.2	79,759	93,658	58,706	2,978	3,041
Manufacturers	209,135	6.3	14,342	108,186	68,181	16,000	2,426
Manufactur Process	301,961	9.1	22,882	55,327	82,371	6,888	134,493
Energy storage	25,933	0.7	-	-	-	-	25,933
Organic solvent use	432,828	13.0	-	-	-	-	432,827
<b>Mobile source</b>	<b>1,172,403</b>	<b>35.2</b>	<b>25,313</b>	<b>455,217</b>	<b>5,190</b>	<b>25,313</b>	<b>102,198</b>
Non-mobile source	318,081	9.6	7,870	188,631	53,506	7,870	18,461
Waste treatment	49,983	1.5	64	14,811	1,444	64	31,716

# Air Pollutants by Source

(Seoul City Statistics, 2005)

Unit : ton/year

Emission Source	Total	%	CO	NOx	SO <sub>2</sub>	PM <sub>10</sub>	VOC
Total	337,061	100	161,873	107,257	8,050	4,311	75,970
Energy Industry	2,008	0.6	580	1,062	265	14	87
Non-industry	41,827	12.4	13,228	20,744	6,614	367	874
Manufacturers	1,907	0.6	458	1,346	35	3	65
Manufactur Process	1		0.01	1	0.3	0.01	0.08
Energy storage	3,364	1.0	-	-	-	-	3,364
Organic solvent use	45,877	13.6	-	-	-	-	45,877
<b>Mobile source</b>	<b>205,484</b>	<b>61.0</b>	<b>140,202</b>	<b>59,333</b>	<b>717</b>	<b>3,009</b>	<b>22,623</b>
Non-mobile source	35,107	10.4	7,193	23,937	249	913	2,815
Waste treatment	1,486	0.4	212	835	169	4	266

# OECD Comparison

(Vehicle per length of road)

Country	Number of Vehicles	Total length of road	Vehicle per 1km of road
Germany	45,793,000	230,735	199
<b>Korea('07)</b>	<b>16,428,245</b>	<b>103,019</b>	<b>159</b>
UK	30,970,000	371,913	84
Japan	71,727,000	1,152,207	63
Italy	35,363,000	654,676	54
France	33,090,000	893,500	37
US	216,309,000	6,348,227	34
Spain	20,636,000	663,795	31

## Proportion by Transportation type

Type	number of users(2007)	
	Total users (thousand people)	%
<b>Total</b>	<b>12,627,826</b>	<b>100.0</b>
Railroad	989,294	7.8
Subway	2,090,290	16.6
<b>Road</b>	<b>9,518,760</b>	<b>75.4</b>
Ship	12,634	0.1
Air	16,848	0.1

# Vehicles by Fuel Type

Unit : thousand vehicles

	2002	2003	2004	2005	2006	2008
<b>Total</b>	<b>13,949</b>	<b>14,586</b>	<b>14,882</b>	<b>15,397</b>	<b>15,895</b>	<b>16,794</b>
<b>Gasoline</b>	7,672 (55.0%)	7,760 (53.2)	7,703 (51.7)	7,800 (50.7)	7,916 (49.8)	8,256 (49.2)
<b>Diesel</b>	4,607 (33.0%)	5,054 (34.6)	5,385 (36.3)	5,650 (36.7)	5,869 (36.9)	6,136 (36.5)
<b>LPG</b>	1,625 (11.7%)	1,723 (11.8)	1,794 (12.1)	1,890 (12.3)	2,047 (12.)	2,321 (13.8)

# OECD Comparison

(Relative Diesel Prices, 2002)

	<b>Korea</b>	France	Germany	UK	Japan	US	OECD avg.
Diesel (commercial use)	<b>0.910</b>	0.645	0.715	0.901	0.624	0.997	0.706
Diesel (non-commercial use)	<b>0.910</b>	0.771	0.829	1.058	0.813	0.997	0.865
Unleaded Gasoline	<b>1.000</b>	1.000	1.000	1.000	1.000	1.000	1.000

\* Korea : Jan. 2009

**Policy measures to promote  
environment-friendly  
transportation**

# 1. Low- & Zero-Emission Vehicles

- **Natural Gas Vehicles (NGVs) have been introduced since 2000.**
- **Hybrid Vehicles have been distributed to public bodies with supports from the government since 2005**
- **Other LEV, ZEVs (electric, fuel-cell etc.) are still in development stage.**

## Compressed Natural Gas (CNG) Buses

- **1992** – started to develop CNG bus engines
- **1999** – Revised Air Quality Management Act (AQMA)
- **2000** – commercialized CNG buses as a replacement for old diesel-powered buses

# Number of CNG Vehicles

Unit : Vehicles

	Total	2000-2004	2005	2006	2007	2008
Bus	19,078	6,121	2,544	3,323	3,109	3,981
Garbage Truck	429	41	23	71	154	140
Mother Station	261	172	40	14	21	14

# Financial Support for CNG Buses



## Subsidy for CNG bus purchase

- US\$18,750/bus, US\$ 50,000/garbage truck



## Loan for CNG refueling station

- US\$ 0.6mil/station (4~5% interest rate)



## Tax Benefits

- Deduction on VAT & acquisition tax, environment improvement charge, etc.

## 2. Enhancement of Emission Standards

- Emission standards for vehicles have been enhanced to the level of advanced countries by 2006.

< Passenger vehicles >

- Gasoline : LEV  ULEV\* (starting 2004)
- Diesel : EURO-3  EURO-4 (starting 2006)
  - ☛ 1~2 years behind compared with other advanced countries

- The next enhancement on emission(EURO-5, 2009.9) will take place simultaneously with EU

\* Gasoline : California ULEV

### 3. ATTs for Diesel Vehicle



After-treatment technologies (ATT) such as DPF, DOC considered for reducing emission from diesel commercial vehicles

- Special Act for Seoul Metropolitan Air Quality Improvement Measures goes into effect 2005.
  - DPF : Diesel Particulate Filter
  - DOC : Diesel Oxidation Catalyst



The ATTs project in seeking the appropriate technology for the Korea's environment began in 2004 and duty-bounded from 2006.

## 4. Development of Auto/Oil Program

 Integrated consideration of vehicle emission and oil quality standards are needed to find appropriate mobile source control policies

 Mandatory Ultra-Low Sulfur content Diesels (under 30 ppm) by 2006

- With efforts to bring early supply of ULSD by 2<sup>nd</sup> half of 2004 thru tax breaks
  - 1998(500 ppm) → 2002(430 ppm) → 2006(30 ppm)  
→ 2009(10 ppm)

## 5. Measures for Construction Machinery

- Starting July 2004, US Tier-1 level emission standard have been applied to 6 types of construction vehicles (excavators, bulldozers, forklift, loader, roller, crane)
- From 2005~2007, gradually increased to Tier-2 level emission standard
- From 2009 Tire-3 level emission standard

## 6. Smog-Check for Existing On-Road Vehicles



**In order to improve the accuracy of regular emission check-up, loaded smog-check program introduced**

**2002 : Seoul**

**2003 : Incheon, Gyeonggi-do**

**2004 : Daegu**

**2005 : Busan**

**2006 : Daejeon, Gwangju, Ulsan, Youngin**

**2008 : Cheonan, Cheongju, Jeonju, Changwon,  
Pohang, Gimhae**

**- 15% failure rate on smog-check (2005)**

## 7. Enhancement of quality standards for automotive fuel

- Establish quality standards for each kinds of automotive fuel
- Gasoline : Regulations on lead, phosphorus, smokeless, benzene, etc.
- Diesel : Regulations on sulfur content, cetane number

## 8. Control of Idle

- Idle: Economic loss and generation of automobile emission gas
  - Fuel consumption expenses of 79.4 billion won and social cost of 55.8 billion won caused by automobile emission gas
- Legislated regulations on unnecessary idle in terminal, garages, etc in 2002
- Enacted and enforced measures banning idle in 14 municipalities and provinces

## 9. Strengthening the Recall System



Emission System Recall introduced in 1992

- 1<sup>st</sup> Recall in 1995

- 2<sup>nd</sup> Recall in 2005

- 3<sup>th</sup> Recall in 2006

➤ Promoting to introduce a reporting system on defects in components which control and reduce automobile emission gas

## 10. On-Board Diagnostics (OBD)

- Introduced in US (1996) and EU (2000)
  - Gasoline vehicle(OBD II)
  - Diesel vehicle(EOBD)
- Will be gradually introduced in Korea starting in 2005
  - **Gasoline passenger cars :**
    - Large vol. '05(10%), '06(30%), '07(100%)
    - Small vol. '05(10%), '06(30%), '07(50%), '08(75%), '09(100%)
  - **Diesel passenger cars :**
    - '06(new cars), '07(all cars)

# 11. Establishment of Environmental Zone

-  Performing establishment of environmental zone already in Stockholm and London
-  Restriction old- aged vehicles and encouraging low emission vehicles

## 12. Others

-  TDM(Travel Demand Management)
-  FAS(Fleet Average System)
-  EST (Environmentally Sustainable Transport)

**Thank You for Attention**

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