

Co-benefits as a Policy Instrument attracting Global Attention

IES Korea project

**Cost-benefit analysis of Integrated
Environmental Strategies
in Seoul Metropolitan area**

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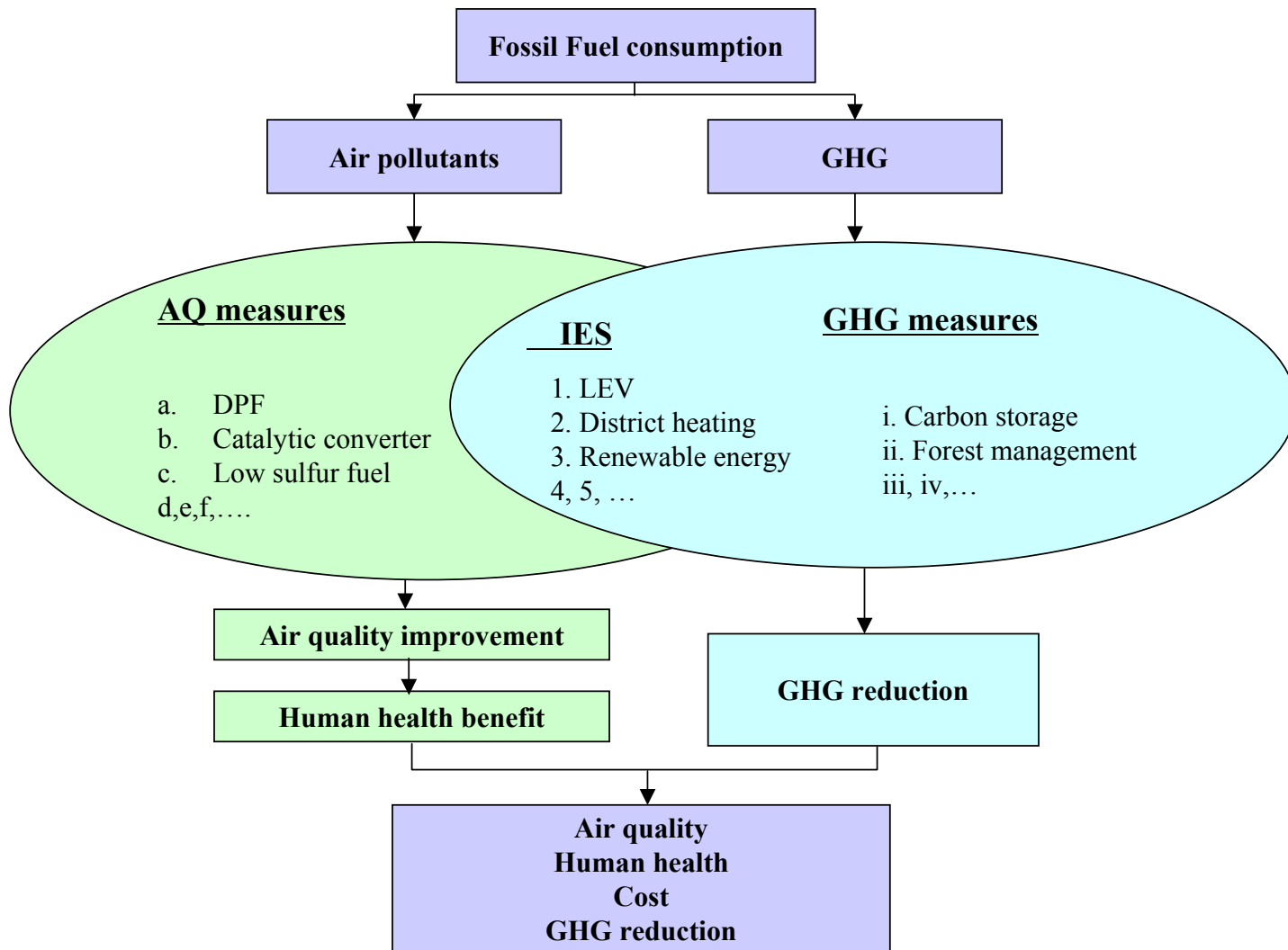
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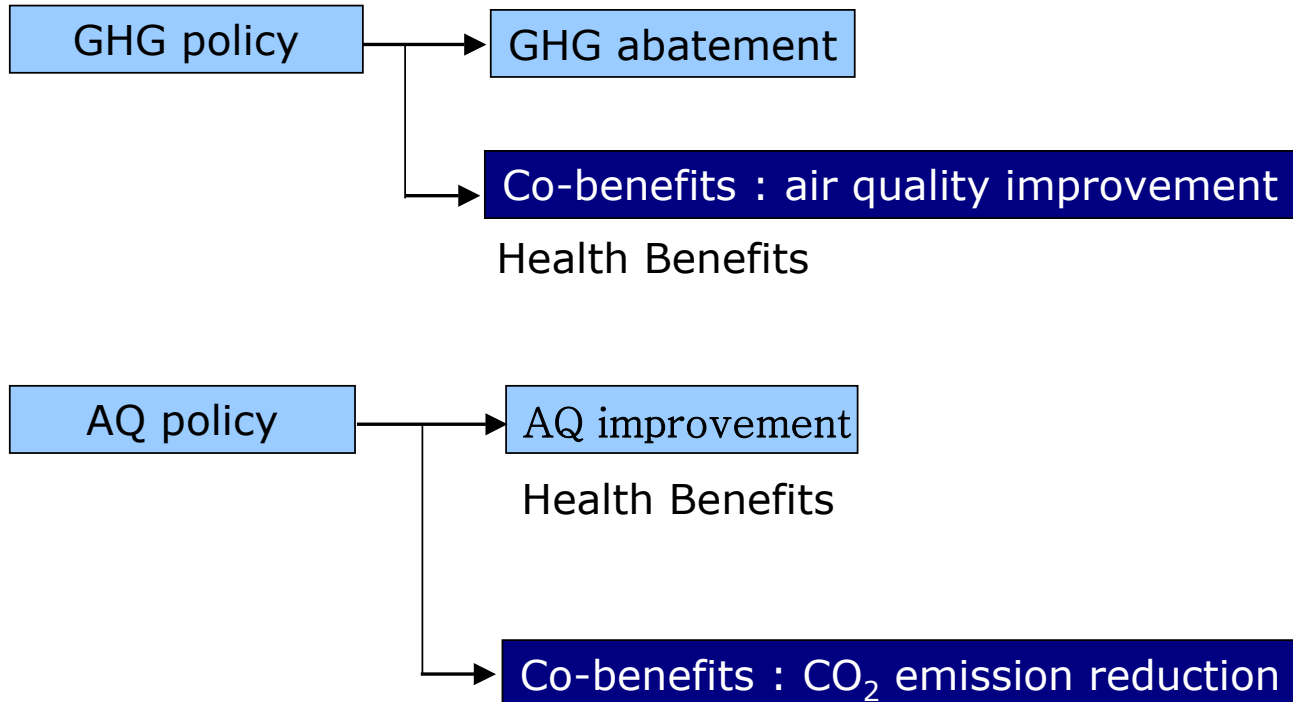
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□ Contents

- Concept of co-benefits
- Seoul Metropolitan area
- Research scope and tasks
- Preliminary results
- Future research tasks



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□ Objective

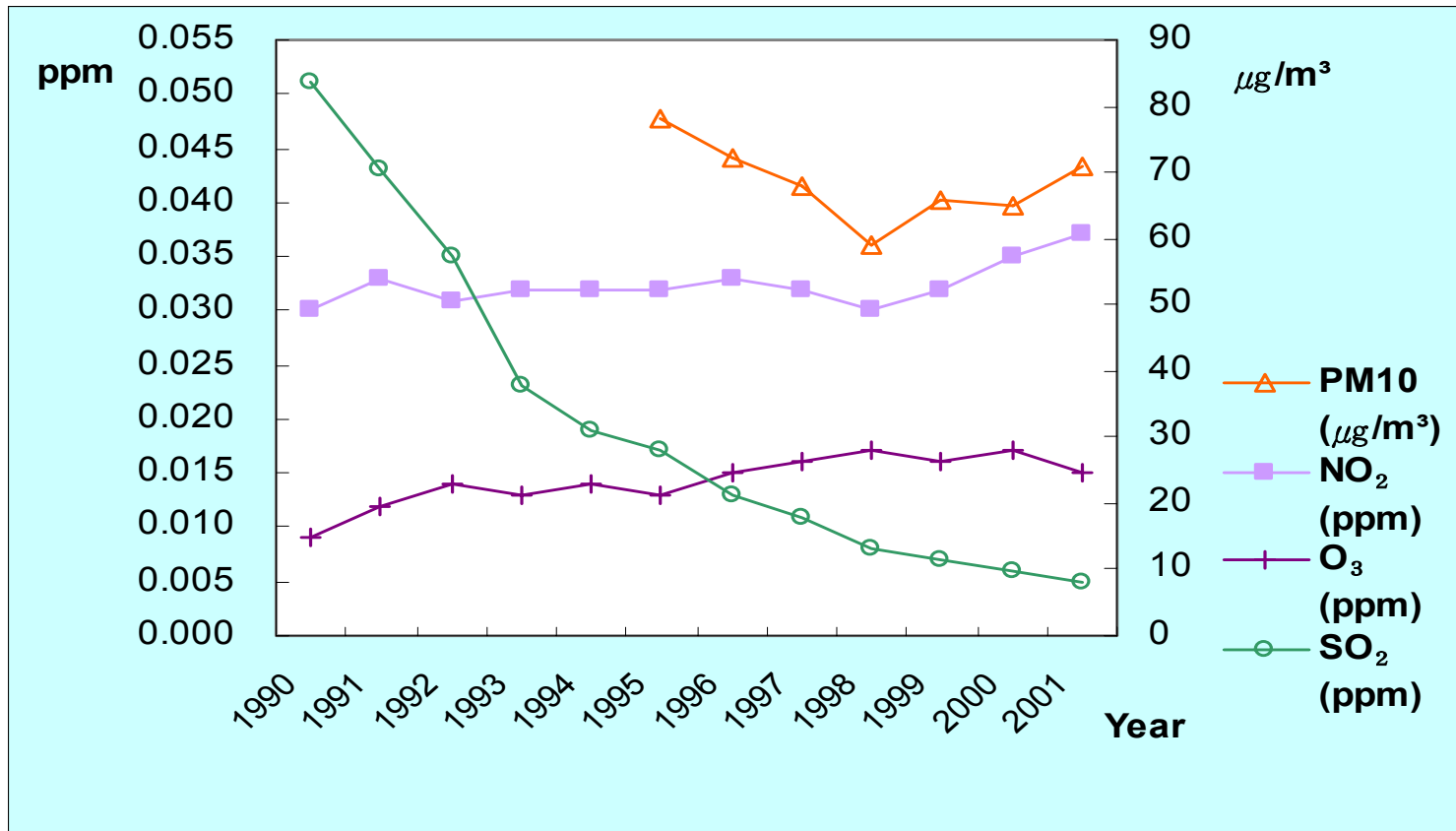
- To develop a cost-effective integrated environmental strategy improving the air quality and reducing GHG
- To analyze air quality management measures and GHG reduction measures for their co-benefit on emissions reduction
- Cost-benefit analysis considering cost, GHG reduction effects, and health impact

- Major research question

What is a most cost effective way to improve air quality and reduce GHG emission in SMPA?

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□ Air Pollution Trends in Seoul



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□ Why air quality problem is so serious in SMPA?

- Too many people!
- Too many cars!

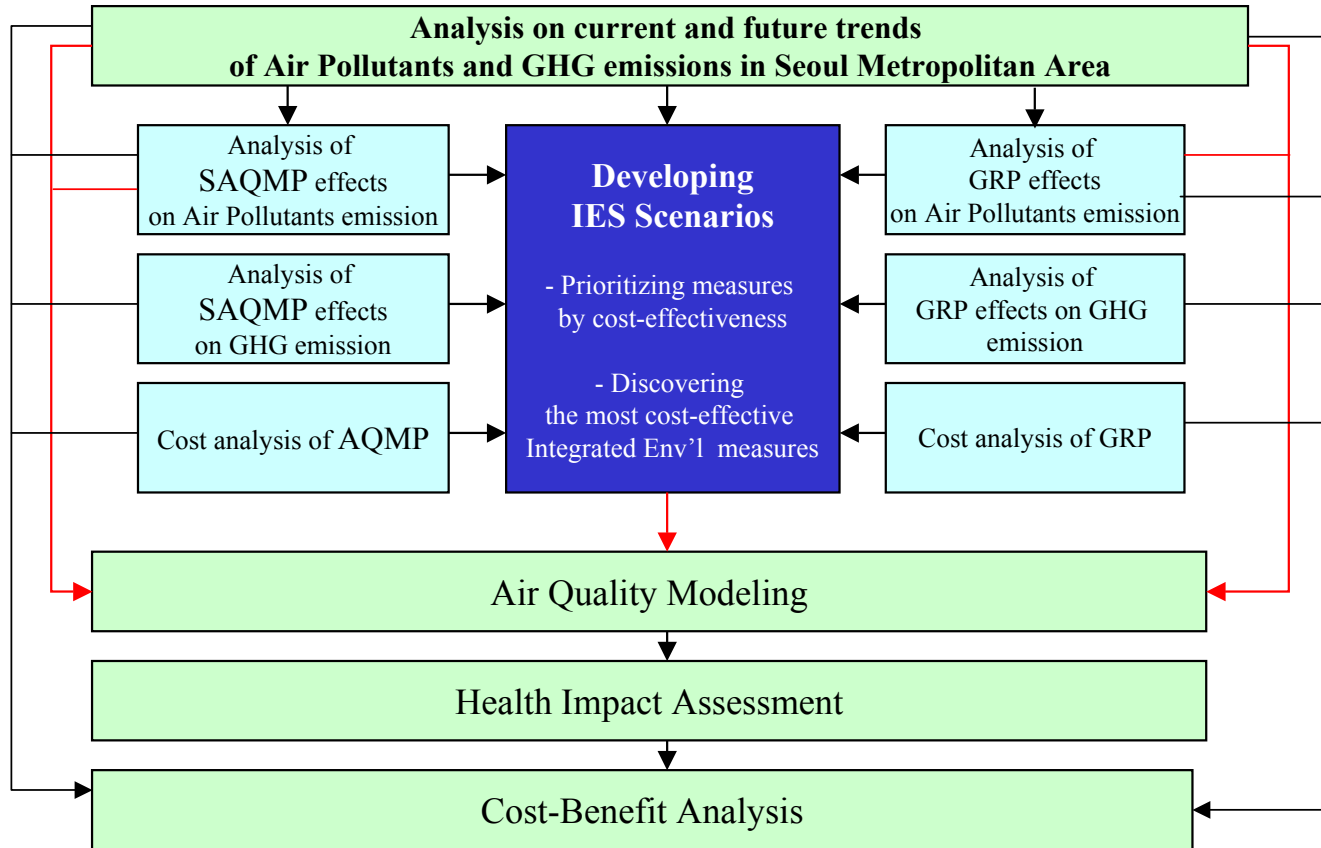
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□ Seoul Metropolitan Area

Category	Unit	National	Seoul Metropolitan Area			
			Total	Seoul	Incheon	Gyeonggi
Area	Km ²	99,852.0	11,700.5 (12%)	605.5	958.0	10,137.0
Population	Thousand	48,289	22,525 (47%)	10,331	2,582	9,612
Population Density	Person/km ²	483	1,925 (4times)	17,062	2,634	948
Gross Regional product	₩ Billion	561,789	251,220	114,153	25,513	111,554
Company	Number of Company	3,051,482	1,381,566	725,569	147,081	508,916
Employee	Person	14,336,604	7,175,802	3,878,833	699,233	2,597,736
Manufacturing Company	Number of Company	331,762	170,079	76,017	20,507	73,555
Vehicle	Thousand	12,914	5,983 (47%)	2,550	697	2,736

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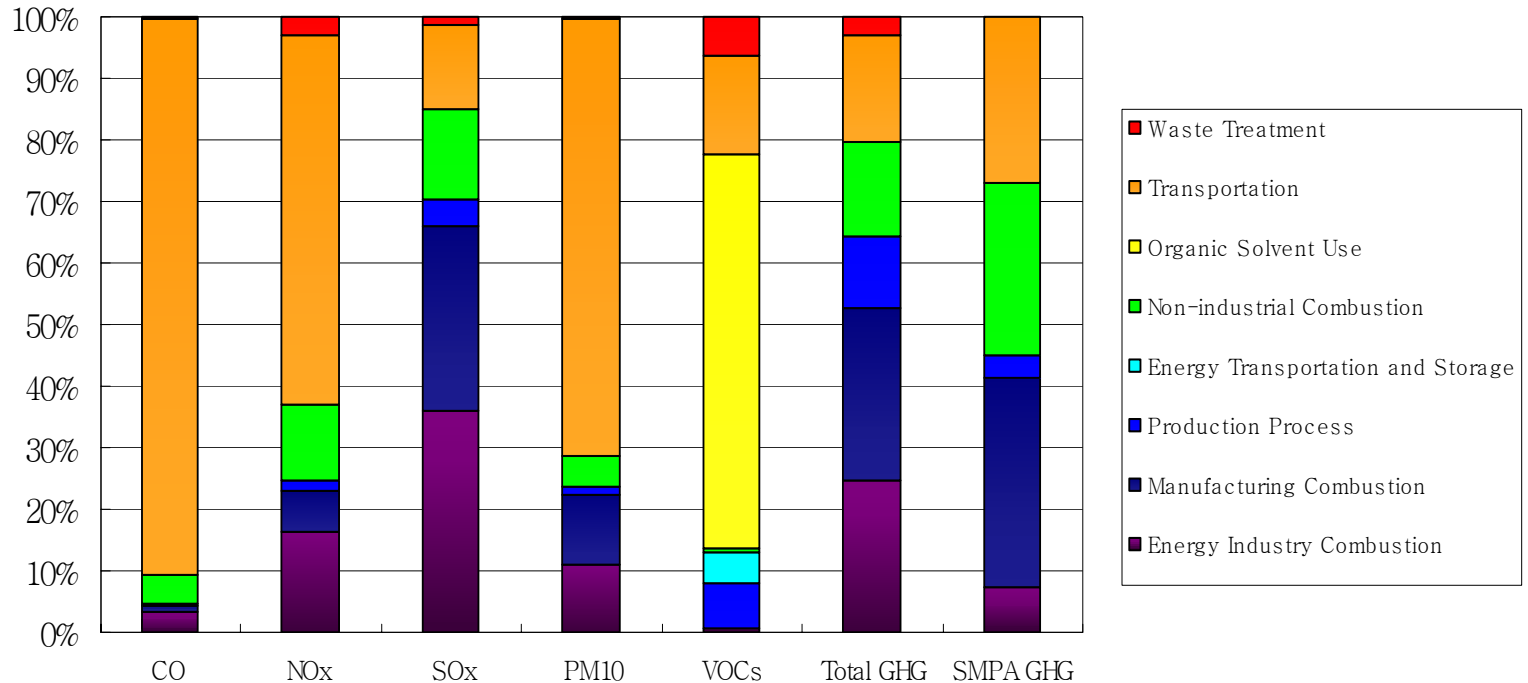
□ Research Framework



- AQMP : Air Quality Management Plan
- GRP : GreenHouse Gas Reduction Plan

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□ Air Pollutants and GHG Emission by source in 2003



□ Special Law on Air Quality Improvement in SMPA

- AP and GHG reductions by the Special Law in SMPA

Source	Regulation	Detailed reduction measure	Reduced AP	Reduced GHG	
Point Source	Emission cap and Trade	Total amount regulation and Emissions Trading	SOx, NOx, PM10	CO ₂	
	Fuel regulation	Expansion of areas using low-Sulfur fuel	SOx, PM10		
	Emission allowance standard	Stricter Emission Allowance Standard Introduction of emission taxes on Nox	NOx, PM10		
	Incineration facility management		Stricter Emission Allowance Standard	SOx, NOx, PM10, VOC	
			Closure of small-scale incineration facilities		
			Expansion of the banned-material list Incineration capacity enlargement		
	Voluntary environmental agreement		Increase of environment-friendly firms	SOx, NOx, PM10	CO ₂
			Agreement on voluntary environmental agreement		
	Support and training		Distribution and training of Manuel for Best Facility Management by industry	SOx, NOx, PM10	CO ₂
			Environmental diagnosis, consulting, investment and financial support for small businesses		
			Cooperation Program on Air Pollution Reduction between Major Companies and outsourcing firms		
			Financial support for facility investment		

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□ Special Law on Air Quality Improvement in SMPA (Cont'd)

Source	Regulation	Detailed reduction measure	AP emission reduction	GHG emission reduction
Area Source	Fuel switching	Conversion of anthracite into natural gas in residential and commercial sector	SOx, NOx, PM10, VOC	CO ₂
		Expansion of areas using low-Sulfur and clean fuels	SOx, NOx, PM10, VOC	
	District air-conditioning and heating	district air-conditioning and heating	SOx, NOx, PM10	CO ₂
		Small-scale Community Energy System (CES)		
	NOx management	Low-NOx boilers	SOx, NOx, PM10, VOC	CO ₂
	Energy demand management	Encouraging the use of Alternative energy: solar-energy	SOx, NOx, PM10, VOC	CO ₂
		Indoor temperature standards	SOx, NOx, PM10, VOC	CO ₂
		Eco-building certification		

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□ Special Law on Air Quality Improvement in SMPA (Cont'd)

Source	Regulation	Detailed reduction measure	Reduced AP	Reduced GHG
Mobile Source	Vehicle manufacture	Stricter emission allowance standards for vehicle manufacture	NOx, PM10, VOC	
		Low emission vehicles	NOx, PM10, VOC	CO ₂
	Vehicle operation	DPF/SCR installation	NOx, PM10, VOC	
		DOC installation	PM10, VOC	
		Conversion to LPG	NOx, PM10, VOC	CO ₂
		old vehicle retirement	NOx, PM10, VOC	CO ₂
		Reforming Operating vehicle management system : vehicle inspections and maintenance, RSD (Remote Sensing Device), emission inspections and maintenance, OBD (On-board Diagnostics), etc.	PM10, VOC	
	Two-wheeled vehicle	Stricter emission allowance standards	VOC, NOx	
		Stricter quality standards for engine-oil		
		Regular inspection system		
	Fuel quality	Stricter quality standards for fuels	SOx	
	Traffic demand management	Designated Environmentally vulnerable area	SOx, NOx, PM10	CO ₂
		Congestions charges		
		Expansion of public transporting infrastructures		
		Industrial traffic demand management		
Parking demand management				
Encouraging the use of bicycles				

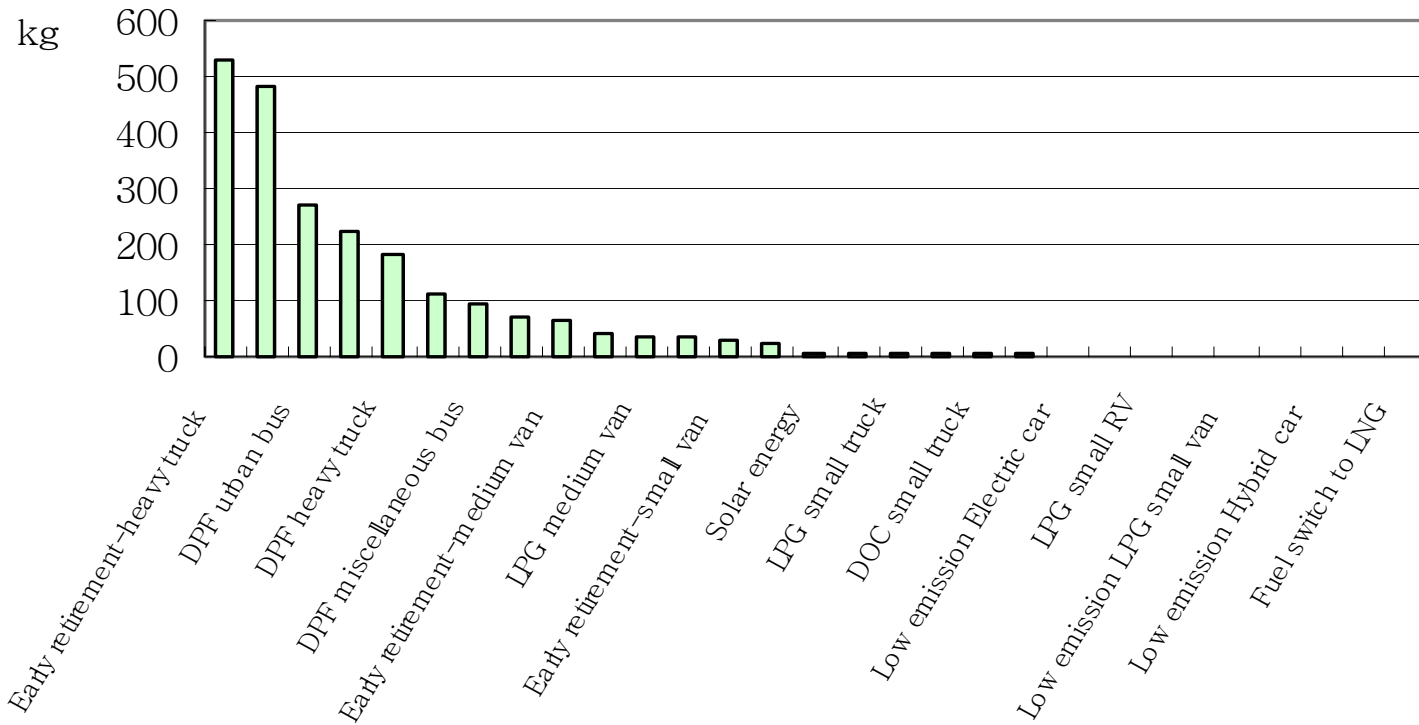
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□ GHG Reduction Plan in the Env'l Sector

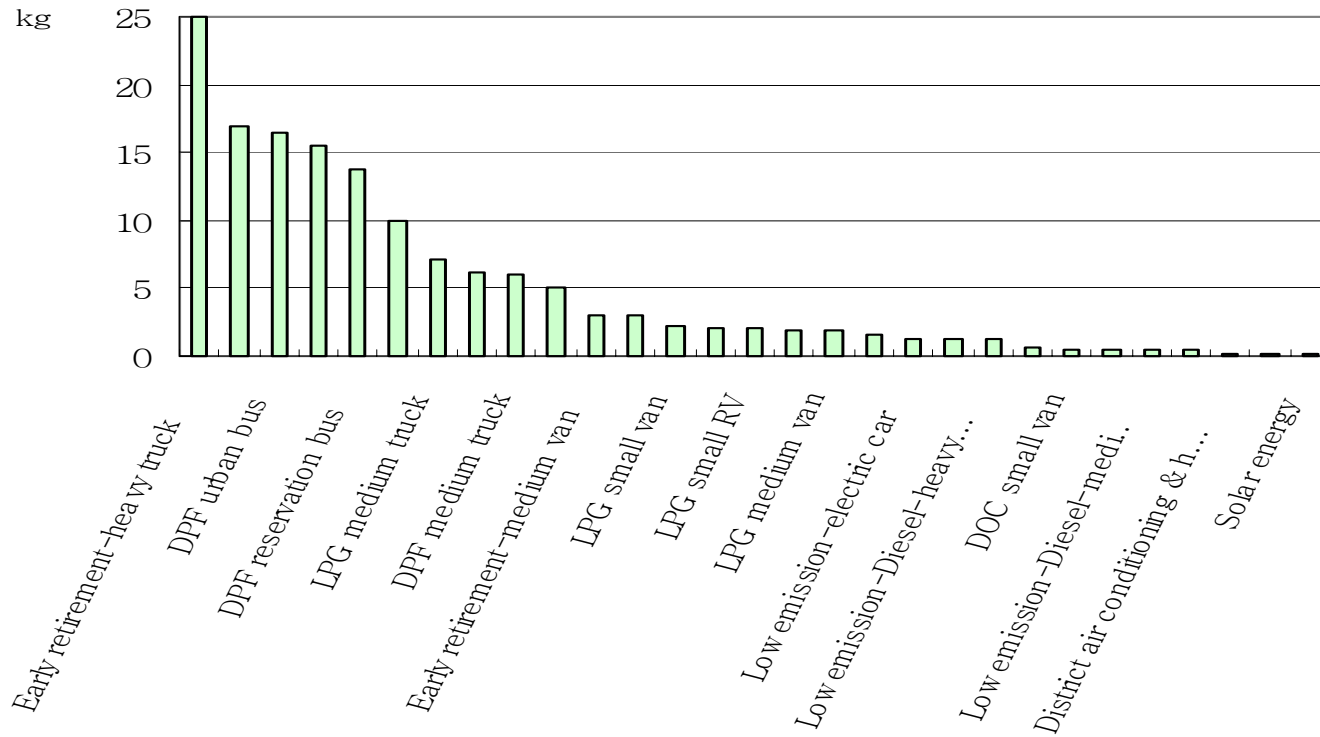
category	Detailed reduction measure	AP emission reduction	GHG emission reduction
Energy management in building	Eco-building certification	SOx, NOx, PM10	CO ₂
Transportation sector	Stricter regulations on idling engines	SOx, NOx, PM10	CO ₂
	Low emission vehicle	SOx, NOx, PM10	CO ₂
Waste management	Expanding Industrial Wastewater Treatment Plants	Foul odor	CH ₄
	Expanding Livestock Excretions Treatment Plants	Foul odor	CH ₄
	Expanding Wastewater Treatment Plants	Foul odor	CO ₂ , CH ₄
	Resource recovery of landfill gas	SOx, NOx, PM10, Foul odor	CO ₂ , CH ₄
	Food waste Recycling System	Foul odor	CO ₂ , CH ₄
	Encouraging clean fuel use (e.g. Bio-Diesel)	SOx, NOx, PM10	CO ₂

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□ NOx Emission Reduction from Air Quality Management Measures

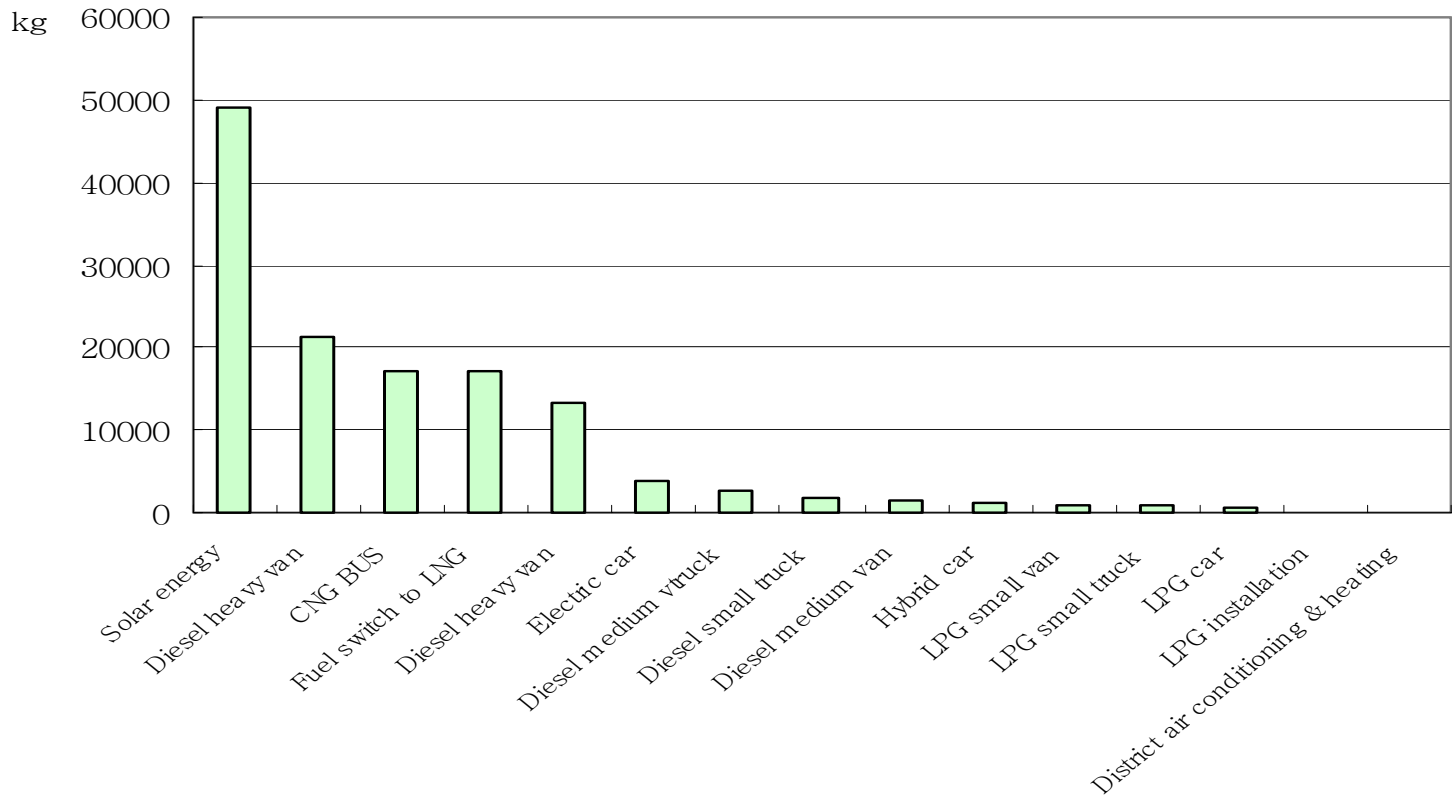


PM10 Emission Reduction from Air Quality Management Measures



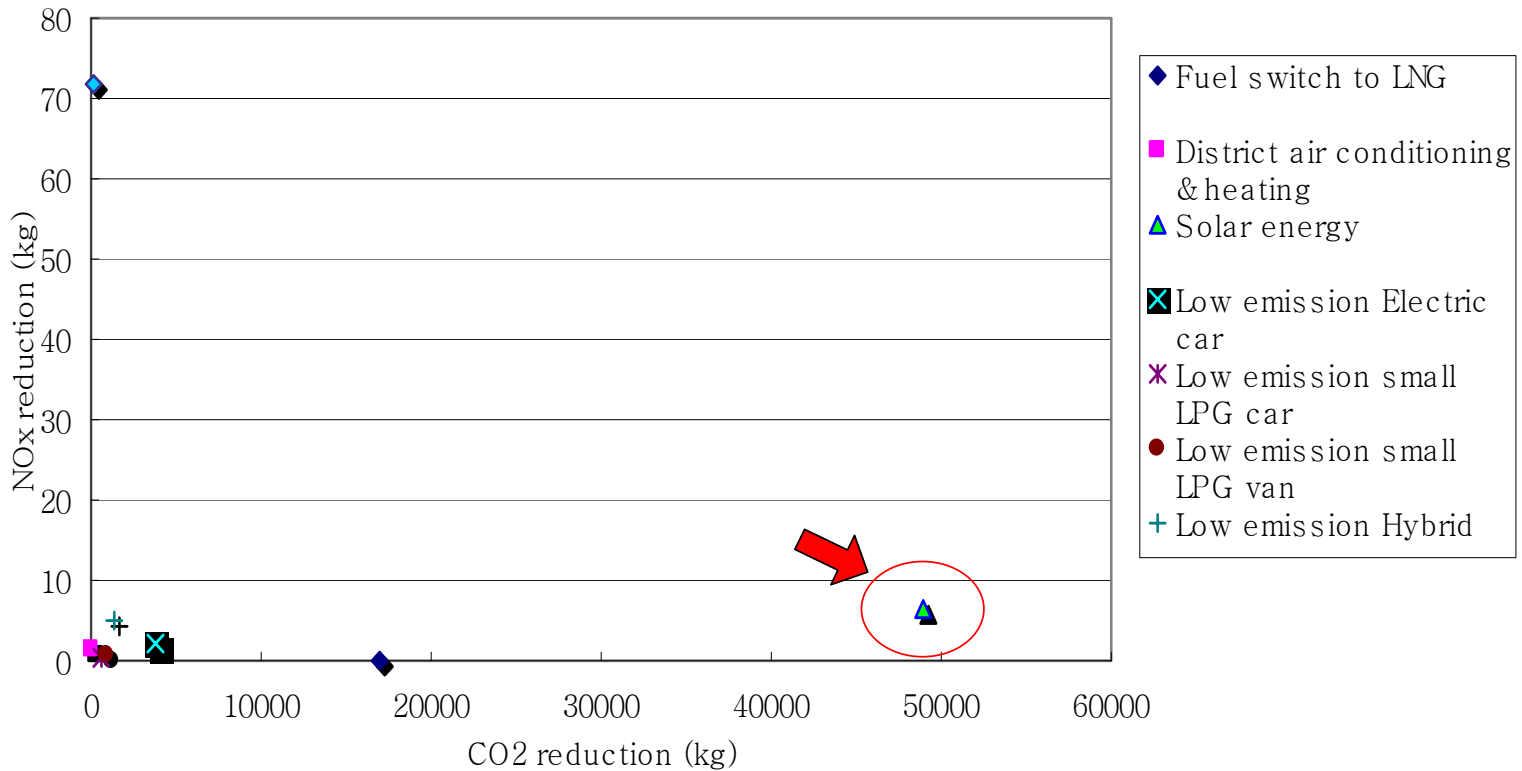
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☐ CO₂ Emission Reduction from Air Quality Management Measures



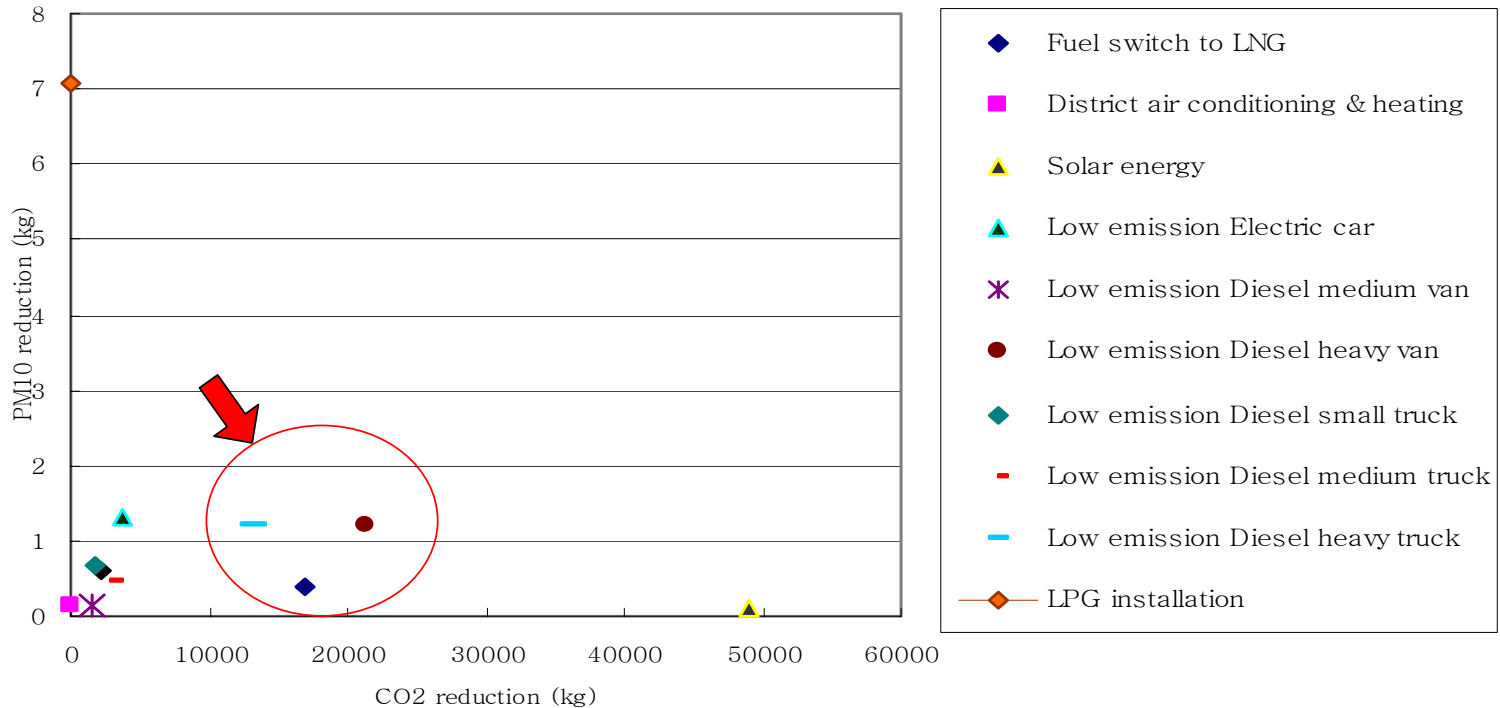
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Relationship between NOx and CO₂ emission Reduction from Each Measures



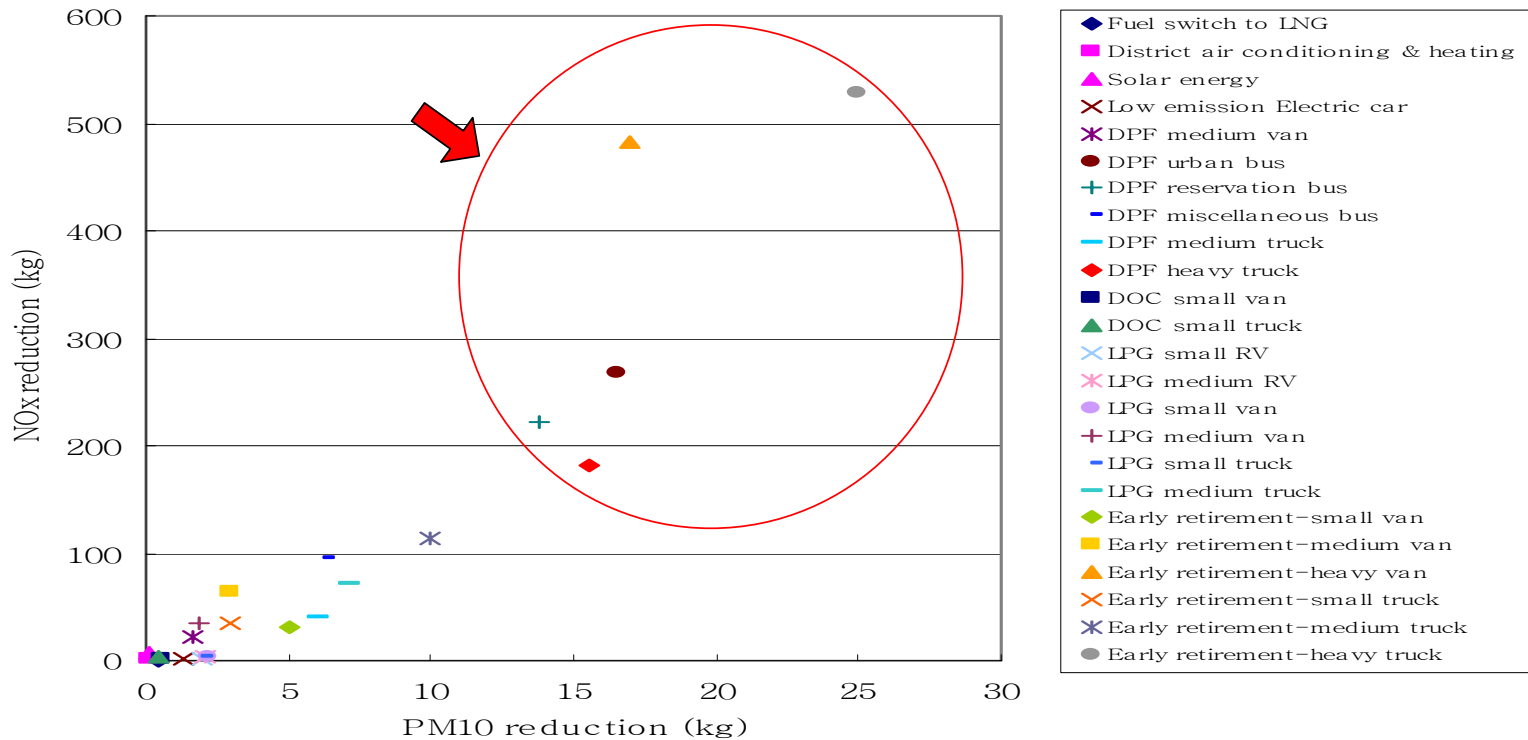
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□ Relationship between PM10 and CO₂ emission Reduction from Each Measures



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Relationship between NOx and PM10 emission Reduction from Each Measures

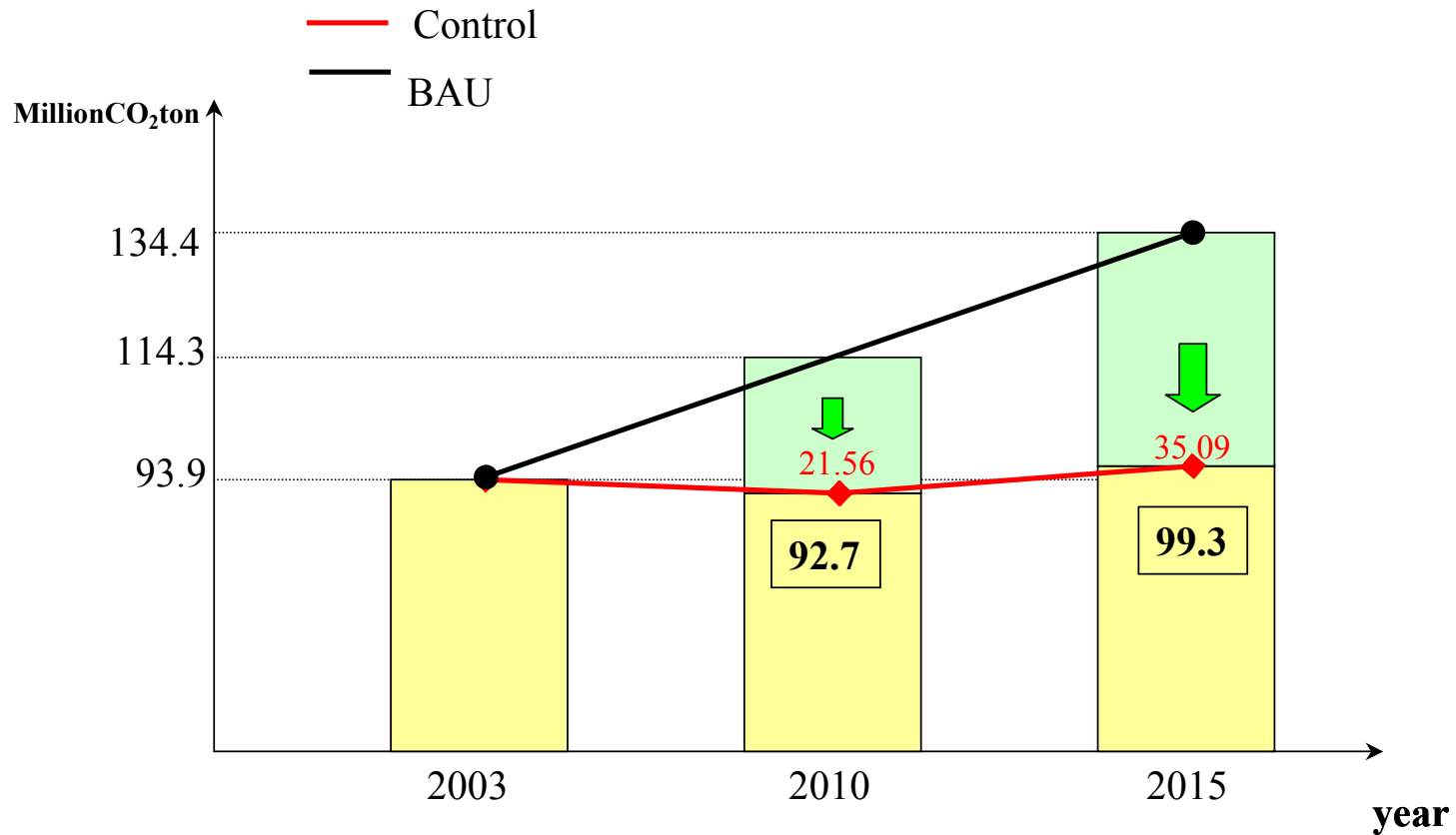


❑ Co-benefit of Seoul Air Quality Management Plan: CO₂ Emission Reduction (2014)

Source	Measure		Amount of CO ₂ Reduction (ton/year)
Mobile Source	Low Emission Vehicles	Electric Vehicles	41,604
		Hybrid Vehicles	166,997
		Natural Gas Vehicles	123,785
		LPG Vehicles	33,761
		Gasoline Vehicles	402,169
	Vehicle Operation	LPG Installation	8,730
	Total		777,046
Area Source	Fuel Regulation	Conversion of anthracite into LNG	21,980
	Supply of Group Energy	District heating	25,664
	CES	Supply CES to Non-industrial combustion/commercial and public organization	123,645
	Supply of Alternative Energy	Increase the supply of solar energy	225,226
	Total		396,515
Point source	Fuel Regulation	Conversion of Coal and B-C oil into LNG	2,838,000
	Low Nox boiler		4,245,000
	Total		7,083,000
Total			8,256,561

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GHG emission from Environmental Side: waste and Transportation



□ GHG emission Reduction Target from Environmental Side (CO₂ MT)

		2010	2015
Waste	Resource Recovery of LFG	4.8	4.4
	Waste Reduction	0.5	0.6
	Restriction on Landfill of Food Waste	2.2	2.7
	Total	7.5	7.7
Transportation	Increase the Number of Natural Gas Buses	0.22	0.35
	Restriction on Idling of Cars	0.07	0.08
	Low emission vehicle	0.03	0.38
	CO ₂ emission standard	13.74	26.59
	Total	14.06	27.39
Total (GHG emission Reduction Target)		21.56	35.09

□ Next steps

- To analyze emission reduction from GHG abatement measures
- To estimate cost of each measures
- To develop emission scenarios
 - BAU
 - Air quality
 - GHG reduction
 - IES

□ Next steps (Cont'd)

- Air quality modeling: EPA-MODELS3/CMAQ
- Health impact analysis: BenMAP
- Cost-benefit analysis

Thank You!

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