



IVERS

Integrated Vehicular Emissions Reduction Strategy

Seminar Road Transport Emissions in Indonesia,
University of Indonesia, Depok, March 21, 2017

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Outline

- Background
- Direct correlation: Industrial and Transportation Growth to the Air Pollution?
- Emissions Inventory: Jakarta case
- Estimated and fact air pollution
- Health effect of air pollution
- IVERS:
 - Fuel Quality
 - CBA and Cost Effective of Emission Reduction
 - Scenario improving air quality
 - Steps of IVERS
- Conclusion

Background

- Air pollution is serious threat for the people especially in urban areas.
- Land transportation shares around 12% of total national CO2 emission.
- NAP to reduce air pollution and mitigate GHG and black carbon from transportation sector (Presidential Decree).
- The challenges of FREE TRADE ASEAN ECONOMIC COMMUNITY (AEC) 2015, ASEAN MRA, and UNECA Regulation.
- Economic benefit on clean and green car (hybrid, NGV, LGV, Flexi Car, mass public transportation) to national economic benefit.
- **IVERS is an integrated effort to reduce vehicular emission by implementing simultaneous and parallel multi aspects activities of clean fuel, lower emission vehicle, appropriate traffic and transport management, emission standard and law enforcement**

Direct Correlation:

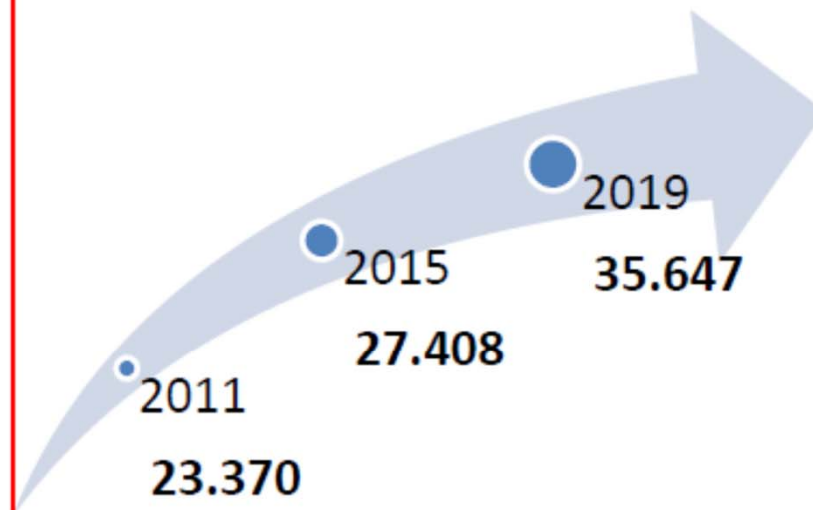
Industrial and Transportation Growth to the Air Pollution?

Growth and Equity Distribution of Industry



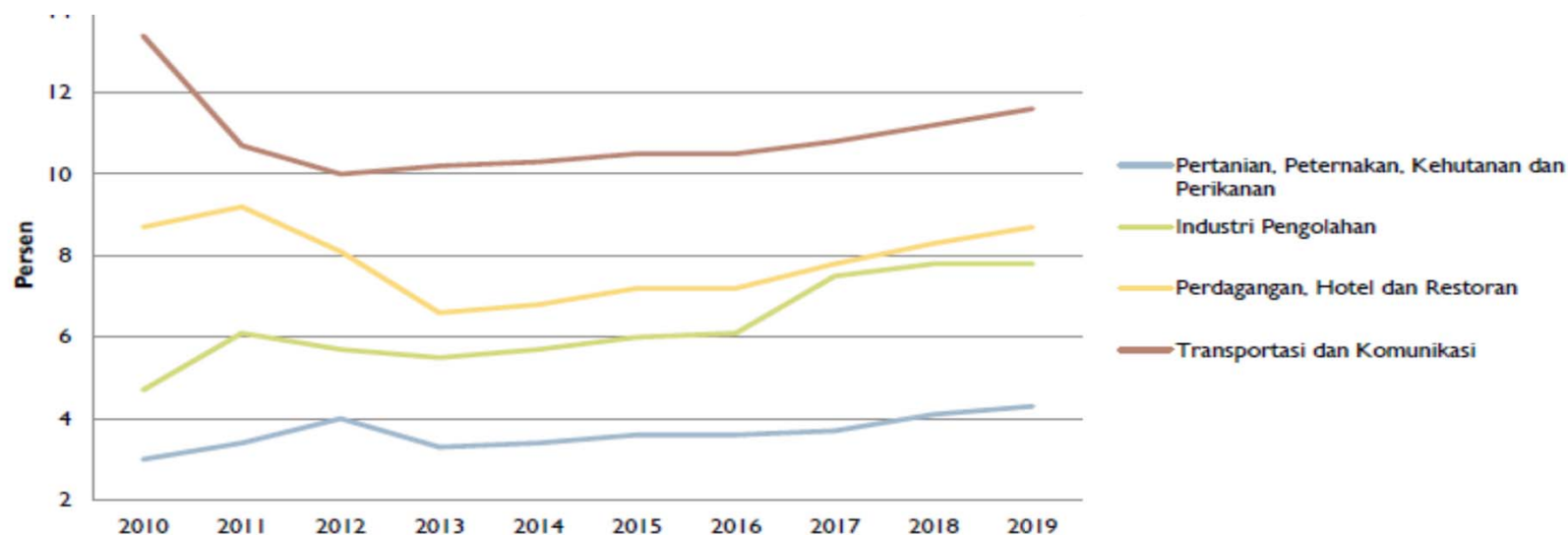
- Jumlah izin usaha PMDN dan PMA selama 2004-2009 adalah 2.768 PMA dan 693 PMDN
- Selama 2010-2013 dicapai total **9.055** izin usaha 6.997 PMA dan 2.058 PMDN

INDUSTRI SKALA BESAR DAN SEDANG



**PERLU TAMBAHAN DARI 2015 –
2019 ADALAH = 8.239 INDUSTRI**

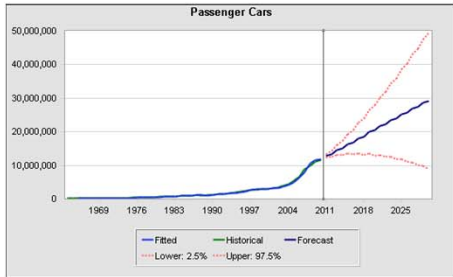
The Main Sectors of Industrial Growth



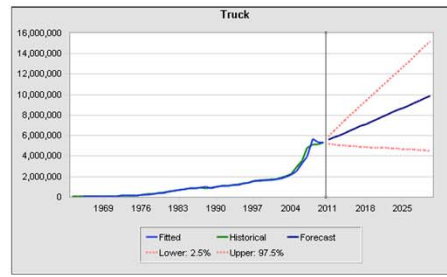
Sektor	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Pertanian, Peternakan, Kehutanan dan Perikanan	3.0	3.4	4	3.3	3.4	3.6	3.6	3.7	4.1	4.3
Industri Pengolahan	4.7	6.1	5.7	5.5	5.7	6	6.1	7.5	7.8	7.8
Perdagangan, Hotel dan Restoran	8.7	9.2	8.1	6.6	6.8	7.2	7.2	7.8	8.3	8.7
Transportasi dan Komunikasi	13.4	10.7	10	10.2	10.3	10.5	10.5	10.8	11.2	11.6

Forecasting of Vehicle number

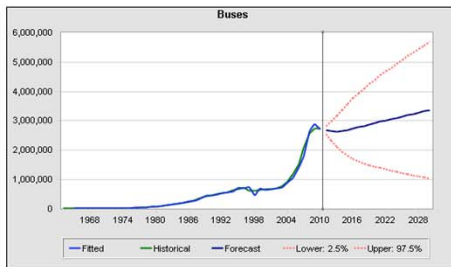
up to 2030



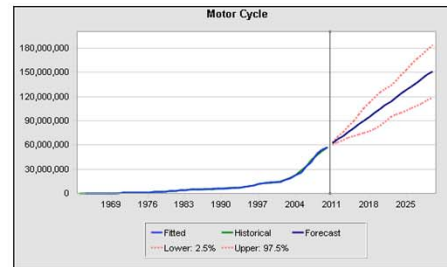
Best method : ARIMA(1,2,1)
Error measure (RMSE) : 232634.60



Best method : ARIMA(1,2,1)
Error measure (RMSE) : 176449.44



Best method : ARIMA(2,2,1)
Error measure (RMSE) : 69296.34

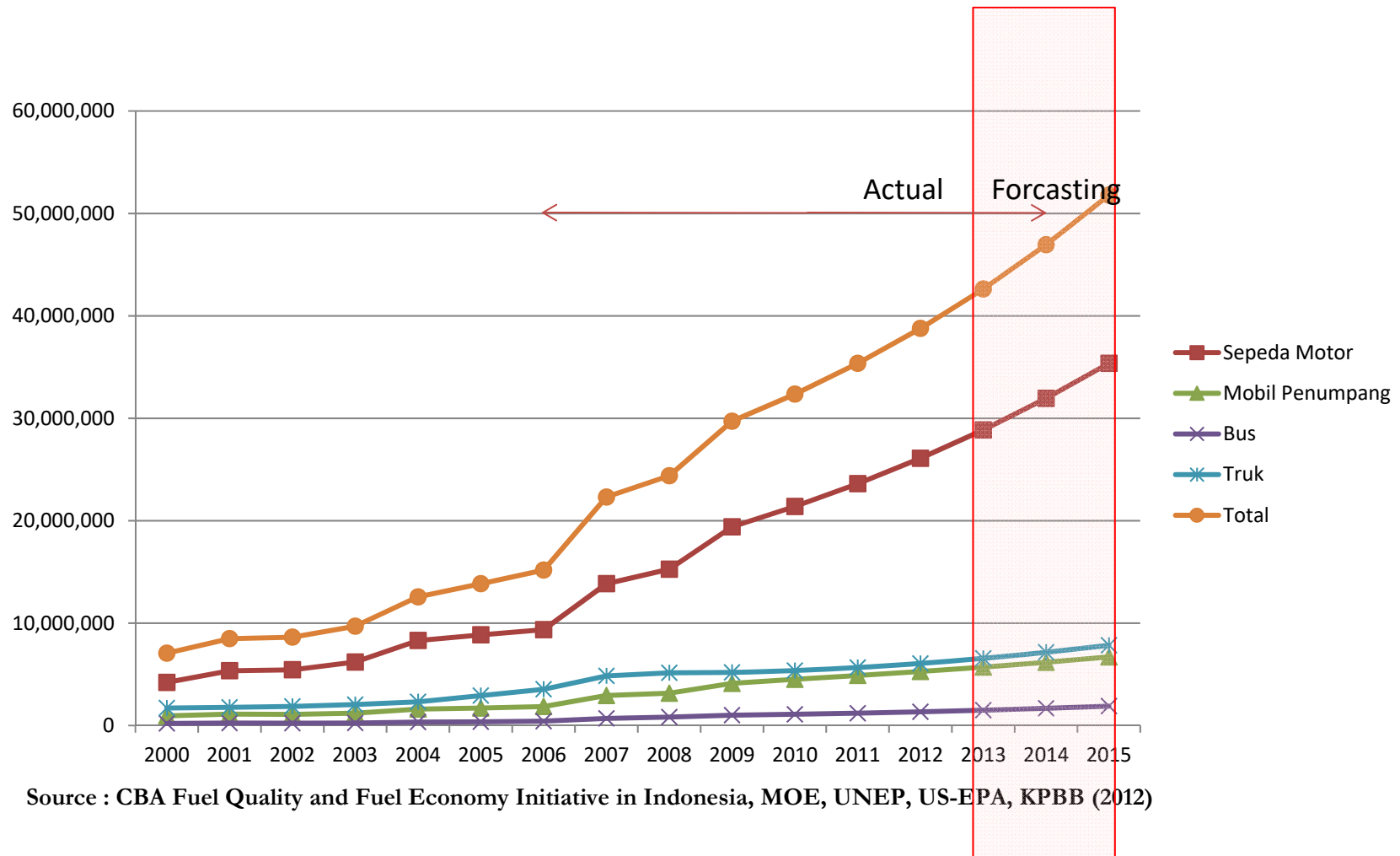


Best method : Double Exponential Smoothing
Error measure (RMSE) : 787400.81

Source : CBA Fuel Economy in Indonesia, USEPA-UNEP-KLH-KPBB, 2012

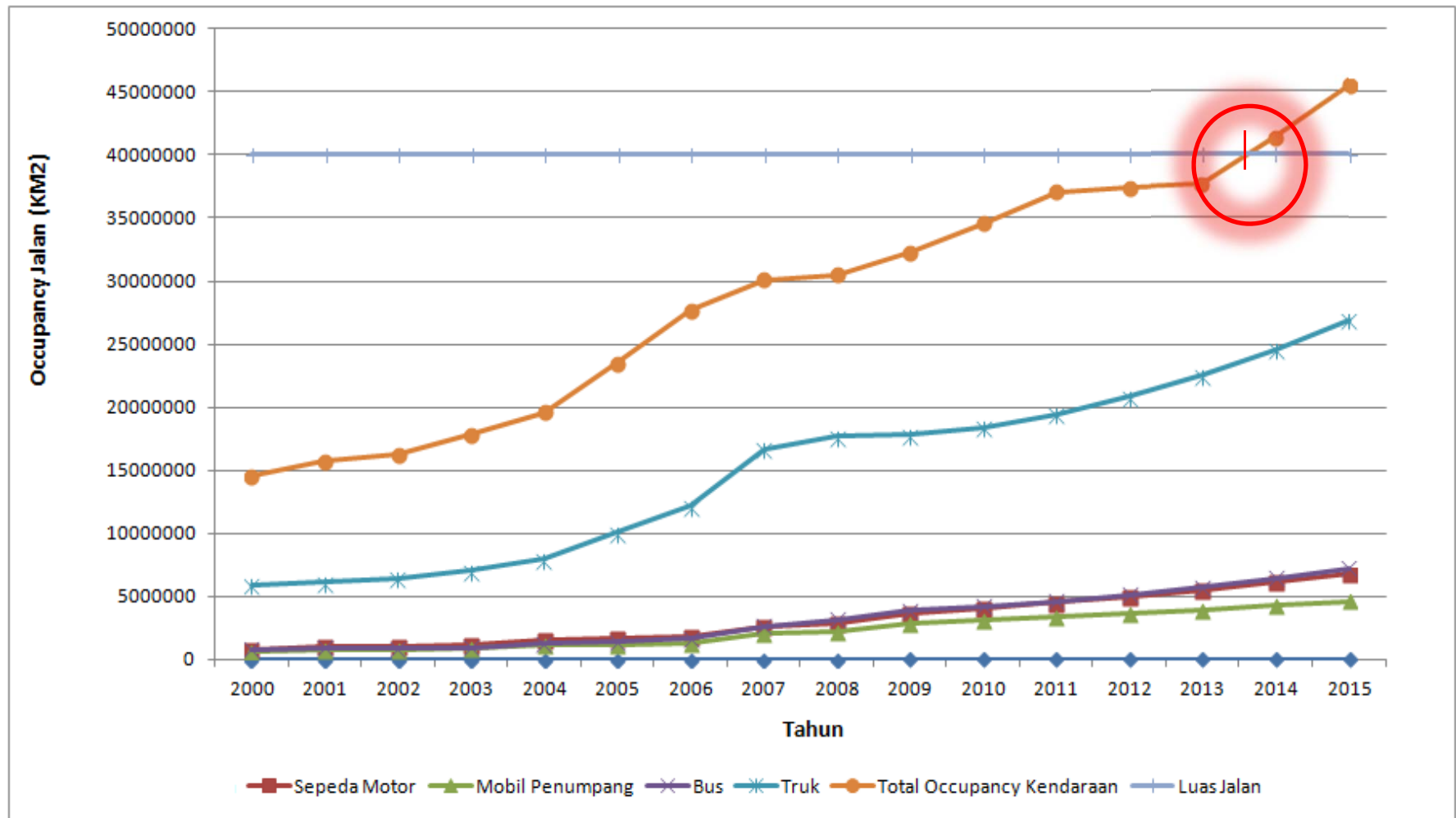
Total selling: 1.1 million cars, and 7 million motor cycles
Total population: 19 million cars of car and 59 million of motor cycles, 2013

Vehicle Growth in Jakarta



Scrapped Car Program is the necessity

Road Occupancy & Potential Gridlock in DKI Jakarta





Vehicle and Traffic Jam



AIR POLLUTION

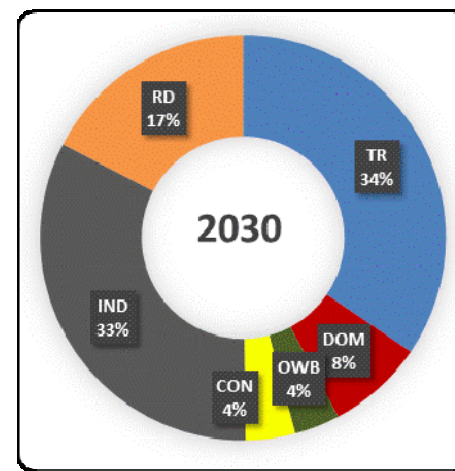
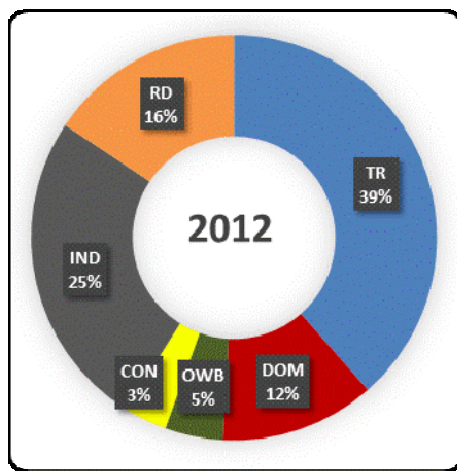
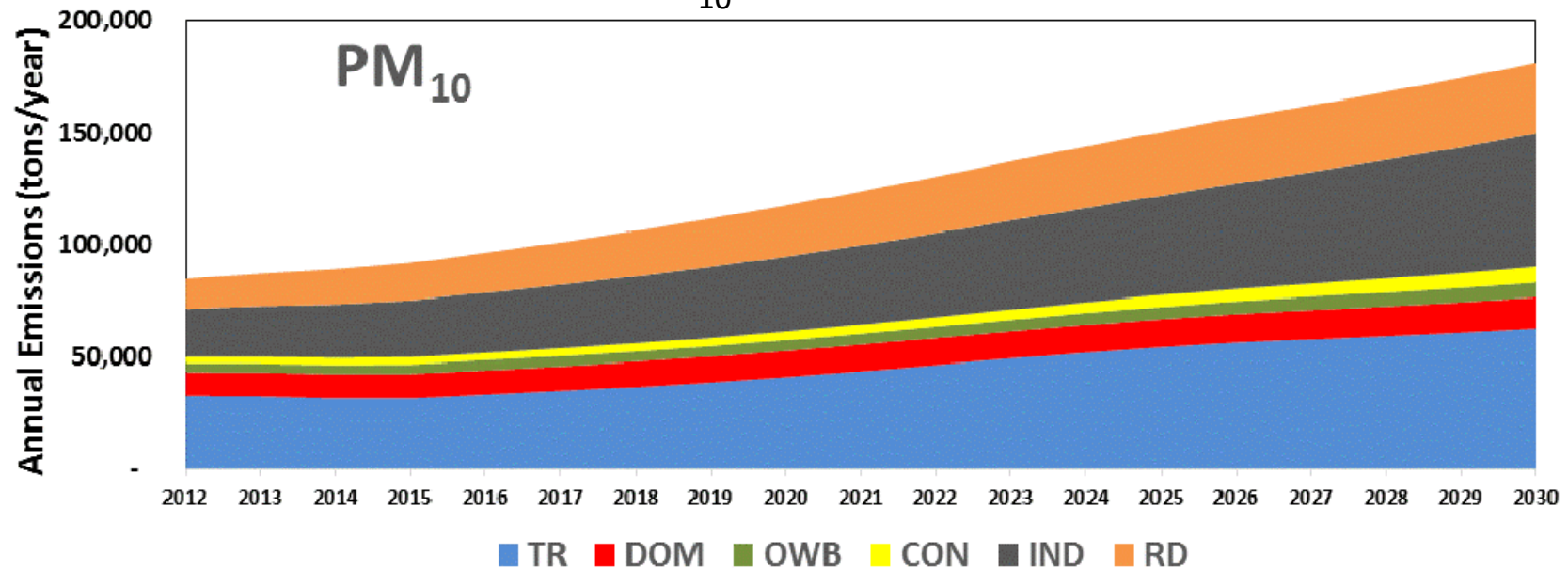
EMISSION INVENTORY RESULTS

BASE YEAR = 2012

PROJECTED TO 2030

Trend Air Pollution

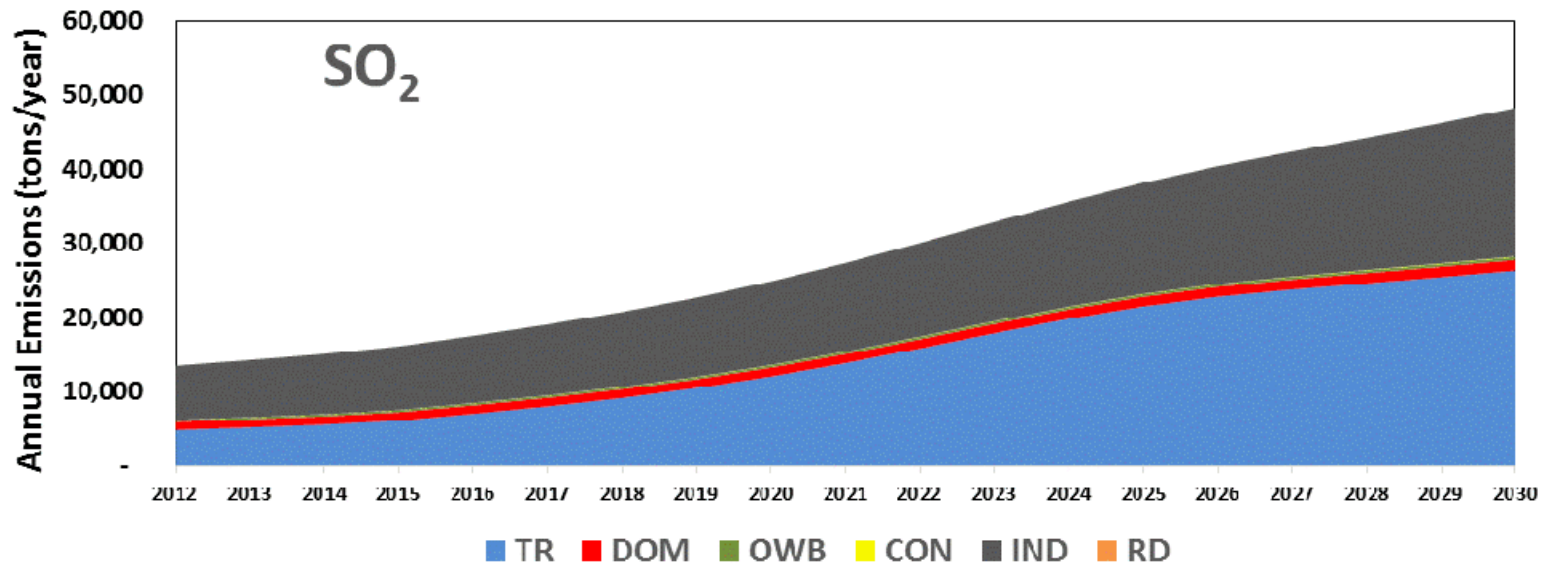
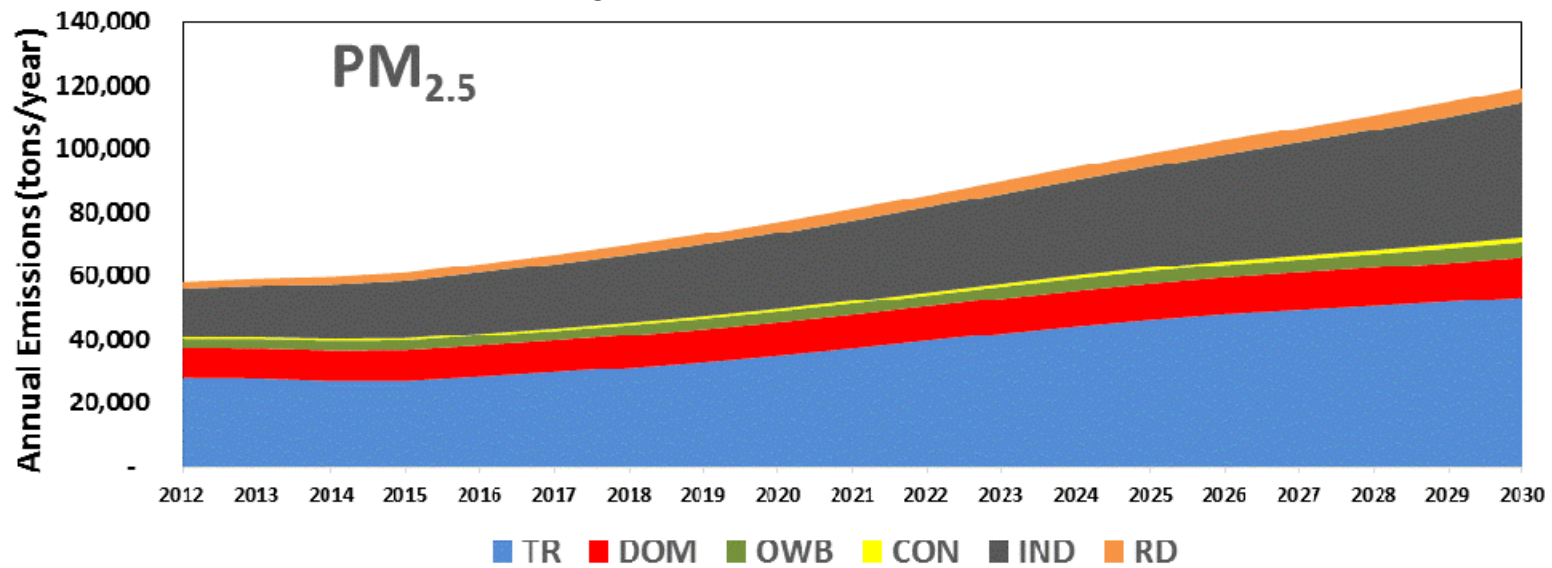
PM₁₀ - BAU 2012



Source: Breathe Easy Jakarta, USEPA, KLHK, DKI Jakarta, DRI, KPBB, CAA, SCIF, 2015

Trend Air Pollution

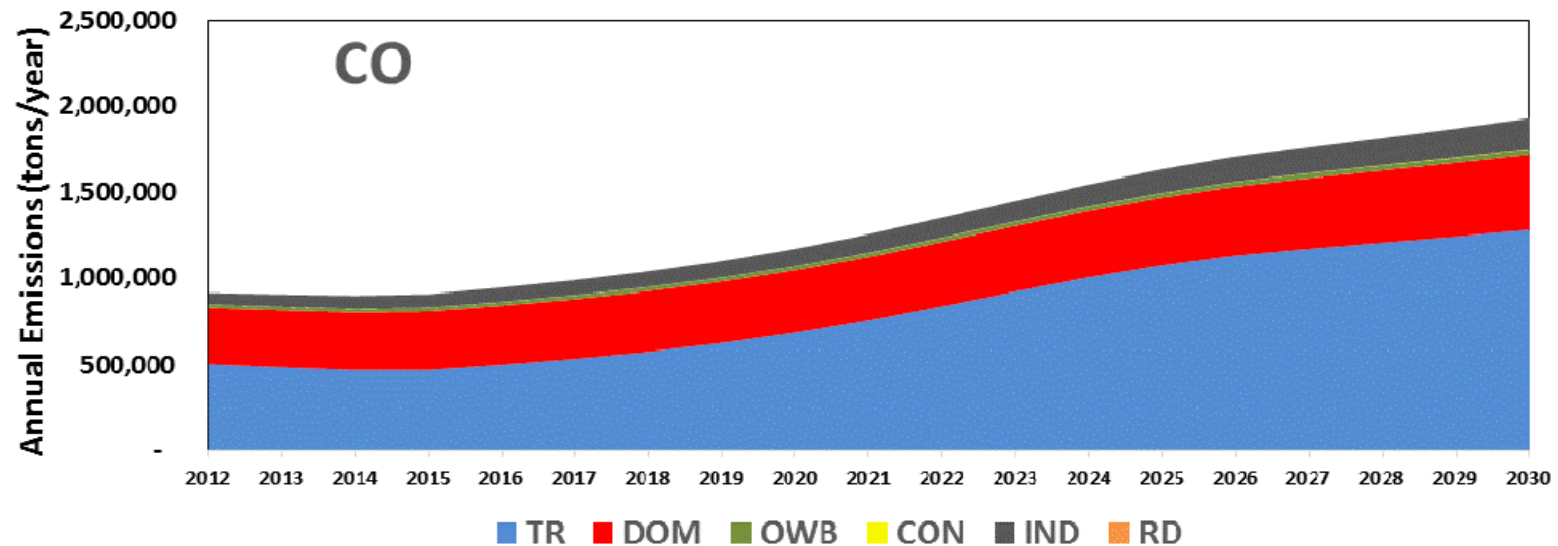
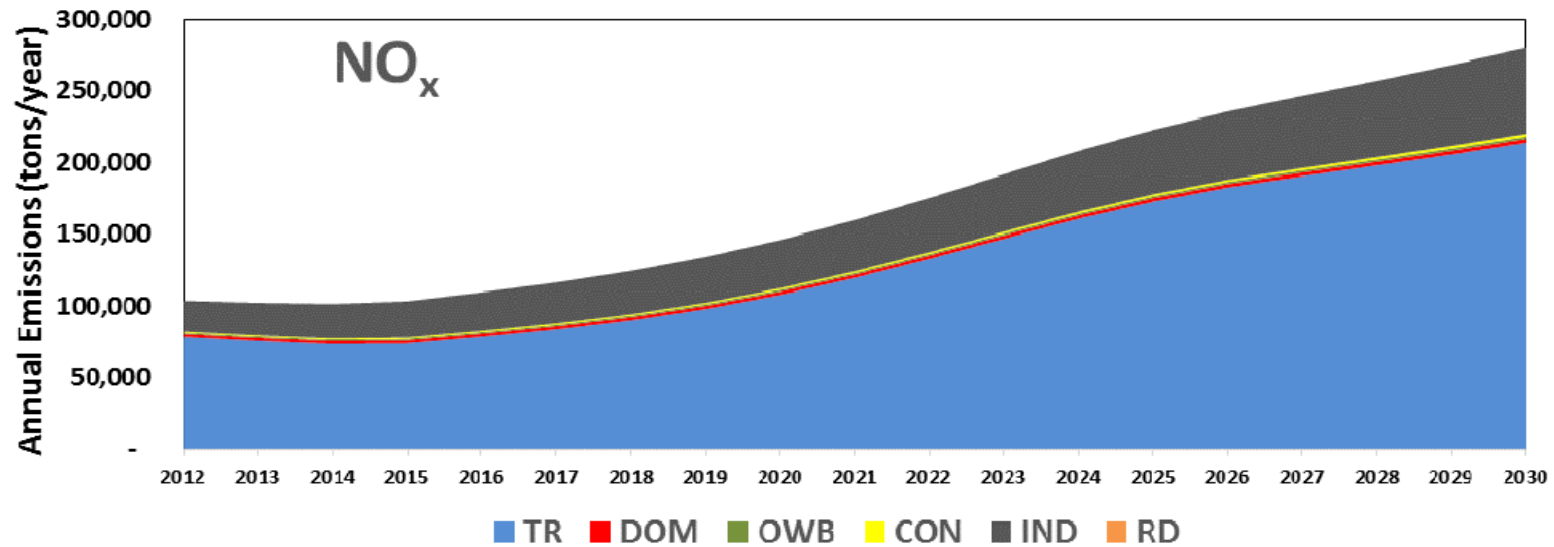
PM_{2.5} and SO₂- BAU 2012



Source: Breathe Easy Jakarta, USEPA, KLHK, DKI Jakarta, DRI, KPBB, CAA, SCIF, 2015

Trend Air Pollution

NO_x and CO - BAU 2012



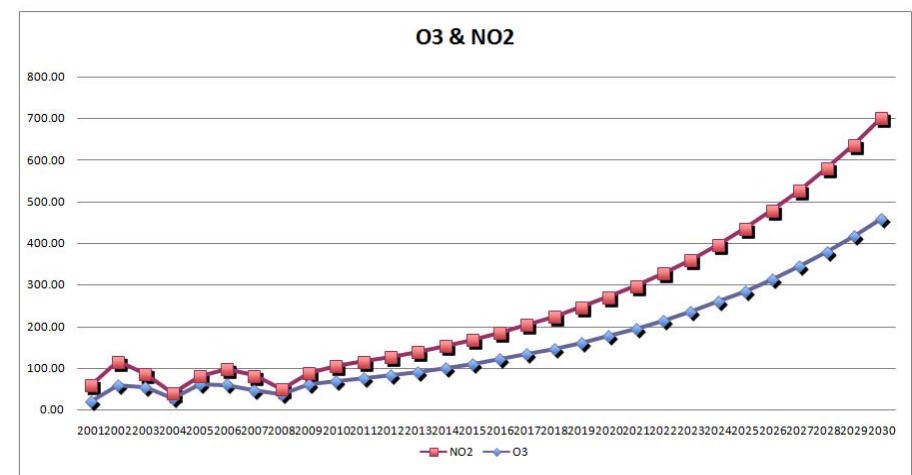
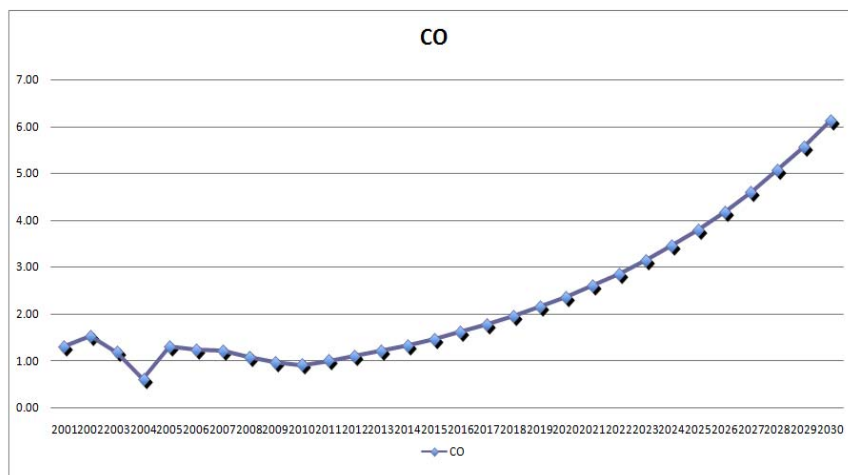
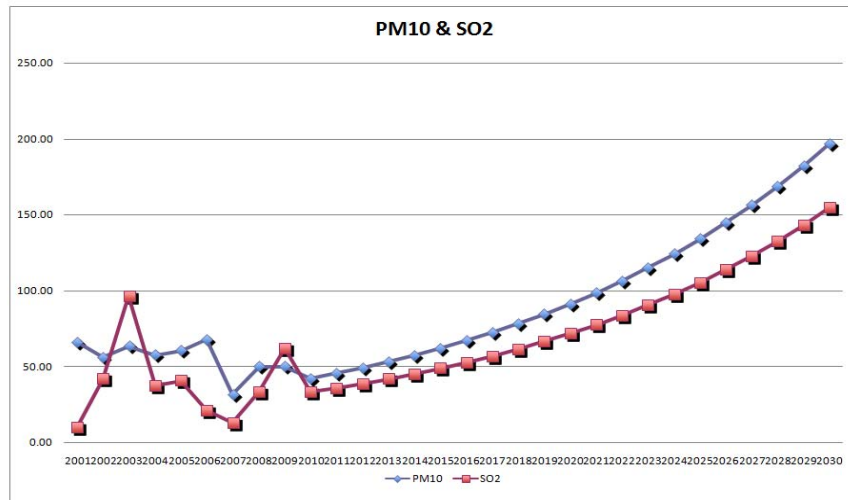
Source: Breathe Easy Jakarta, USEPA, KLHK, DKI Jakarta, DRI, KPBB, CAA, SCIF, 2015

Ambient Air Quality Projection

Jakarta Case

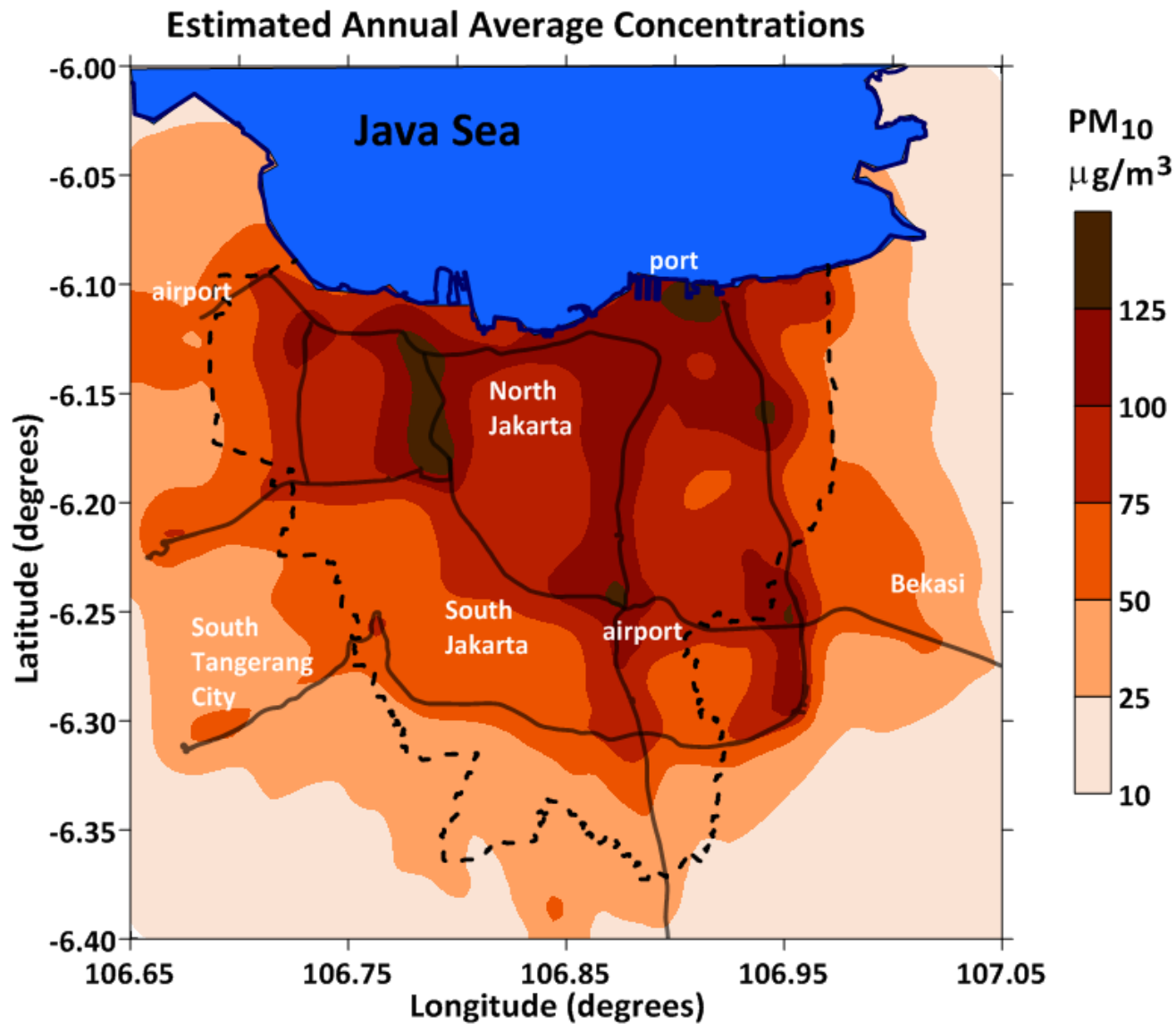
Base year = 2001-2010

Projected to 2030



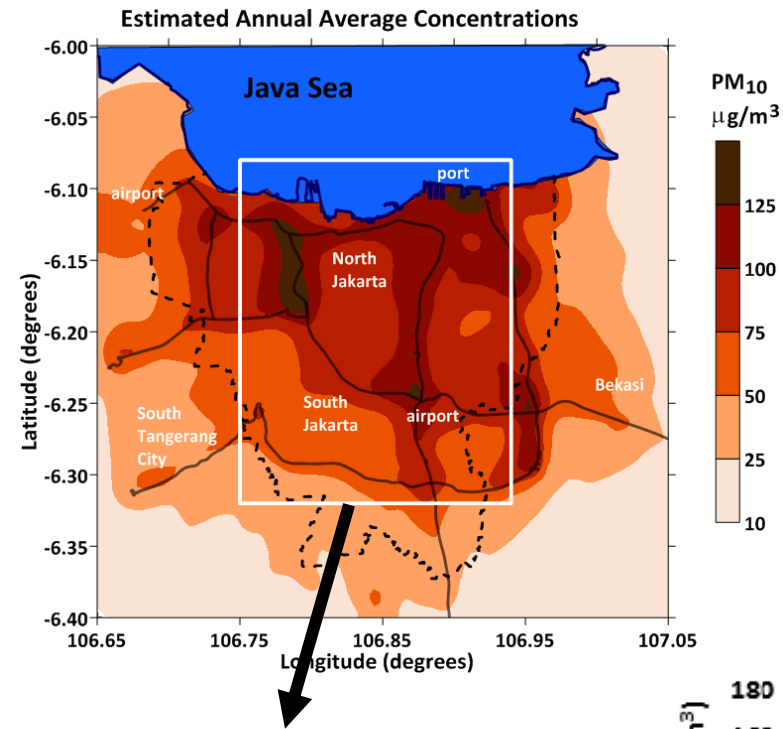
ESTIMATED AND FACT PM POLLUTION

Modeled using ATMoS dispersion model and WRF meteorological fields

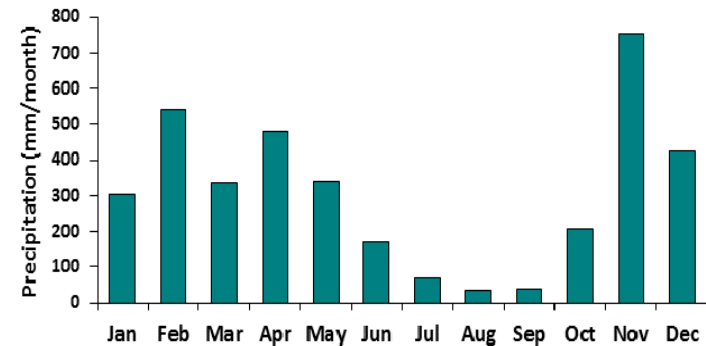


Source: Breathe Easy Jakarta, USEPA, KLHK, DKI Jakarta, DRI, KPBB, CAA, SCIF, 2015

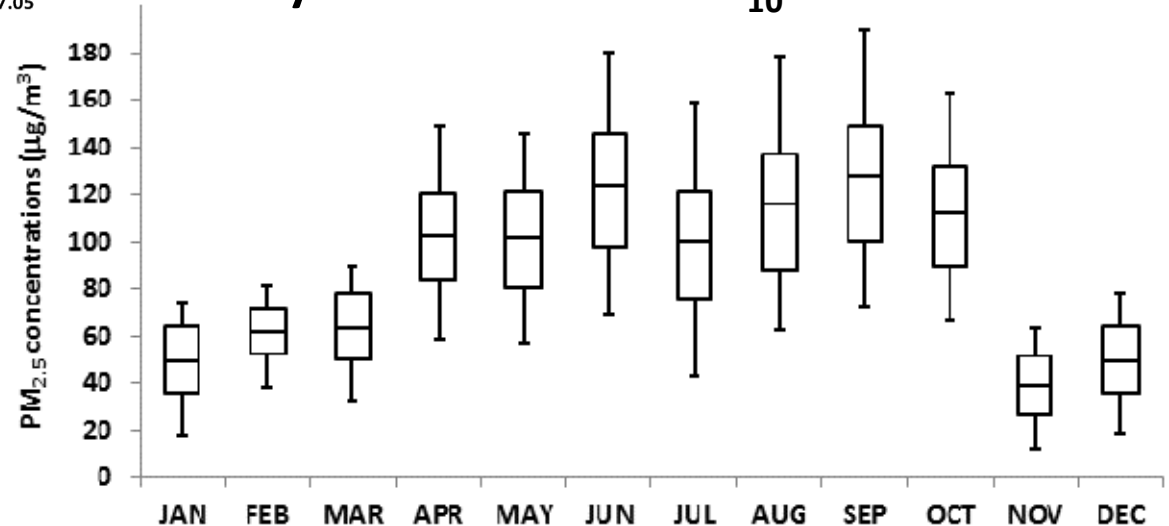
Modeled using ATMoS dispersion model and WRF meteorological fields



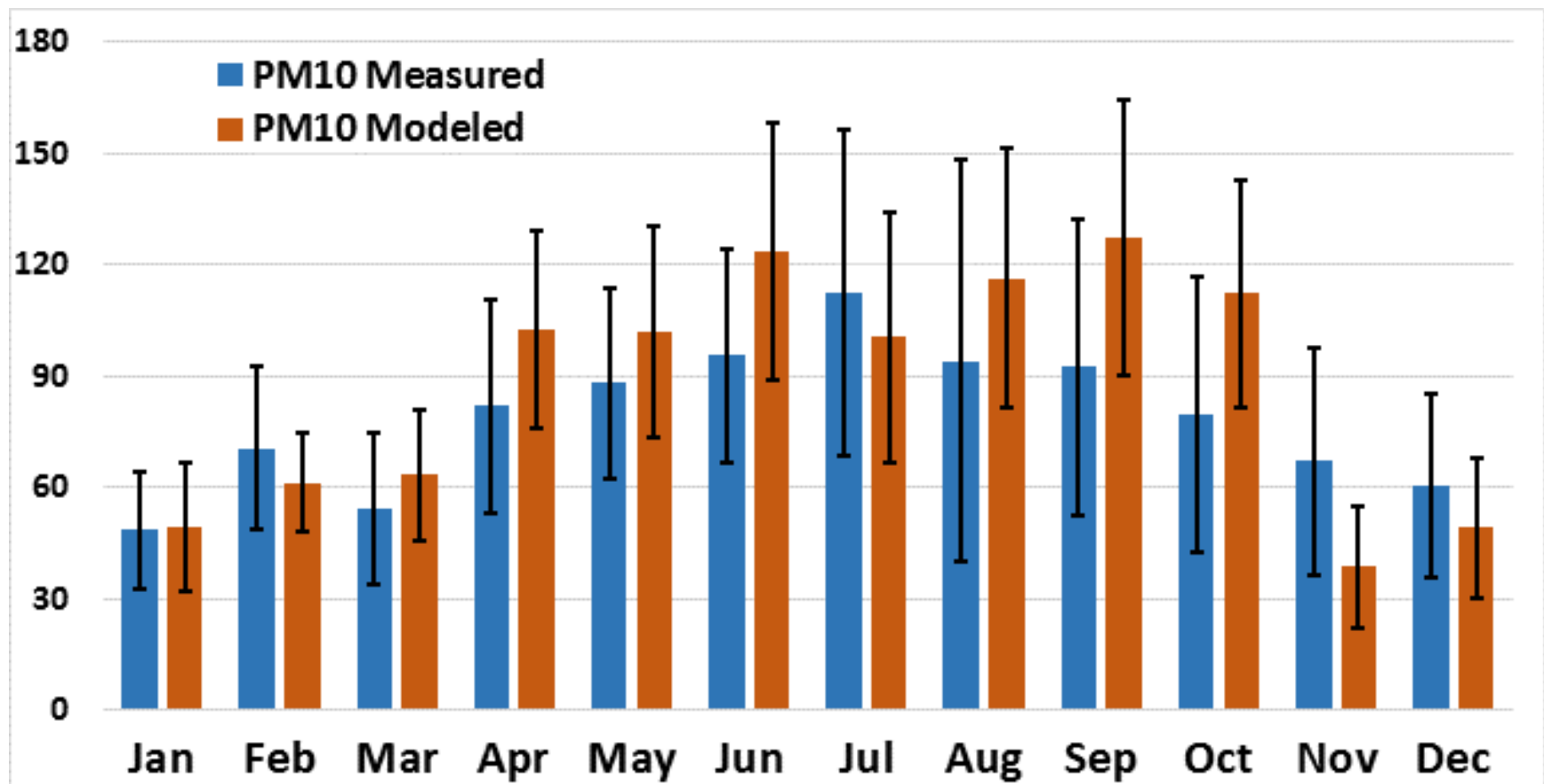
Designated Urban area



Monthly variation in the PM₁₀ concentrations

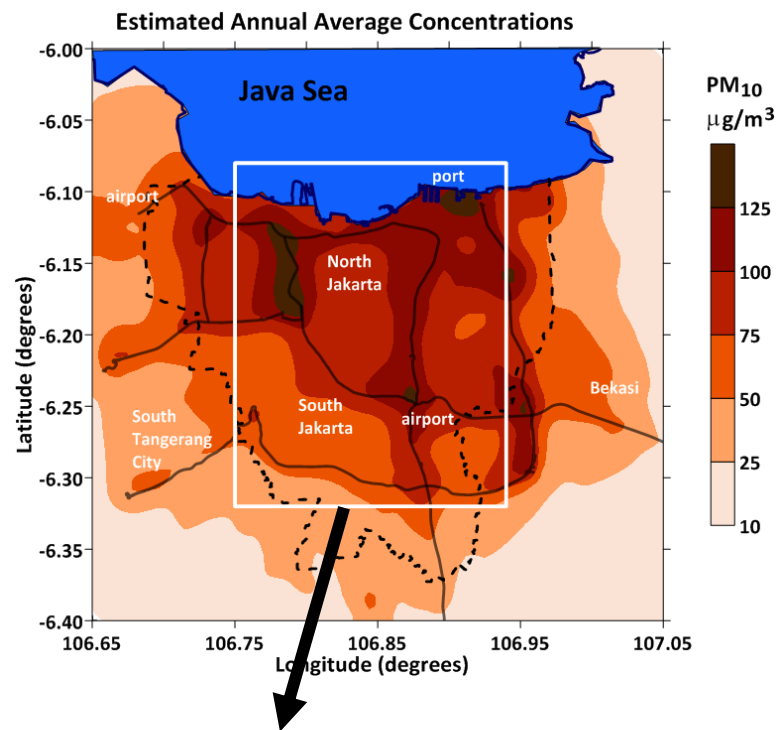


Comparison of ATMoS results over the urban area and average of all the stations



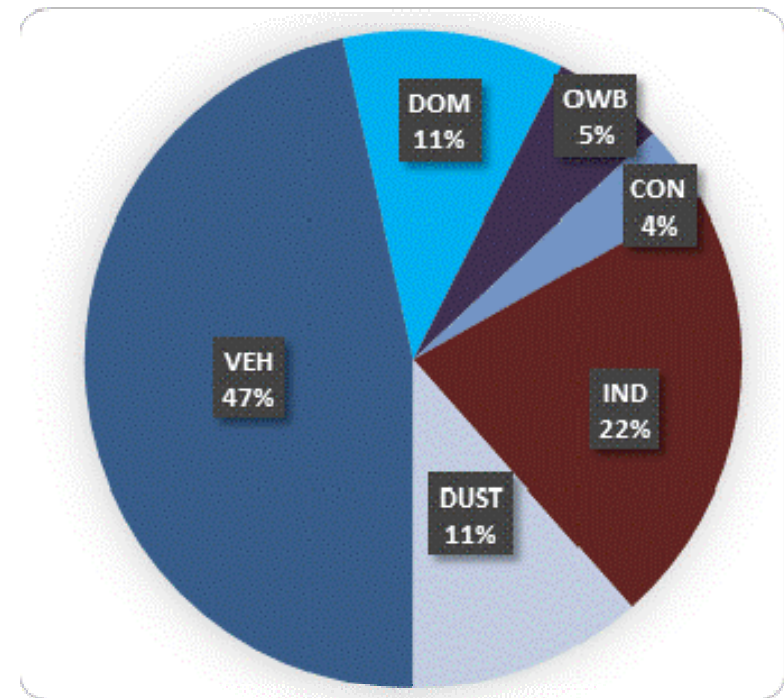
Source: Breathe Easy Jakarta, USEPA, KLHK, DKI Jakarta, DRI, KPBB, CAA, SCIF, 2015

Modeled using ATMoS dispersion model and WRF meteorological fields

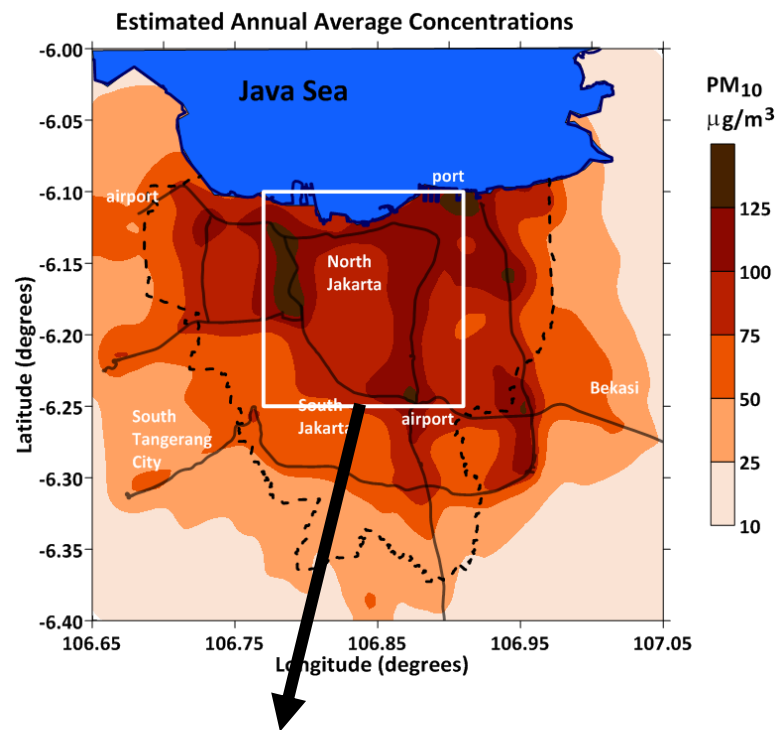


Designated Urban area

Average source contributions

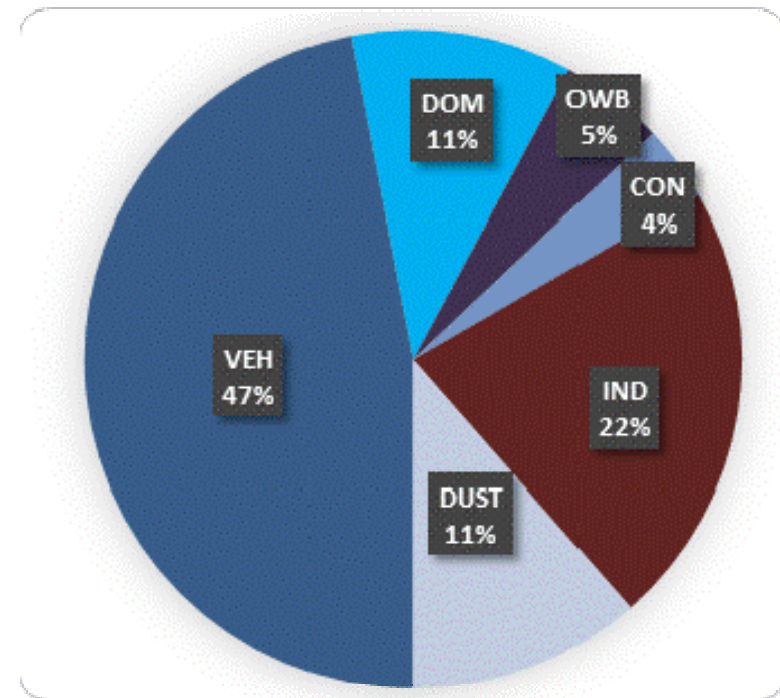


Modeled using ATMoS dispersion model and WRF meteorological fields

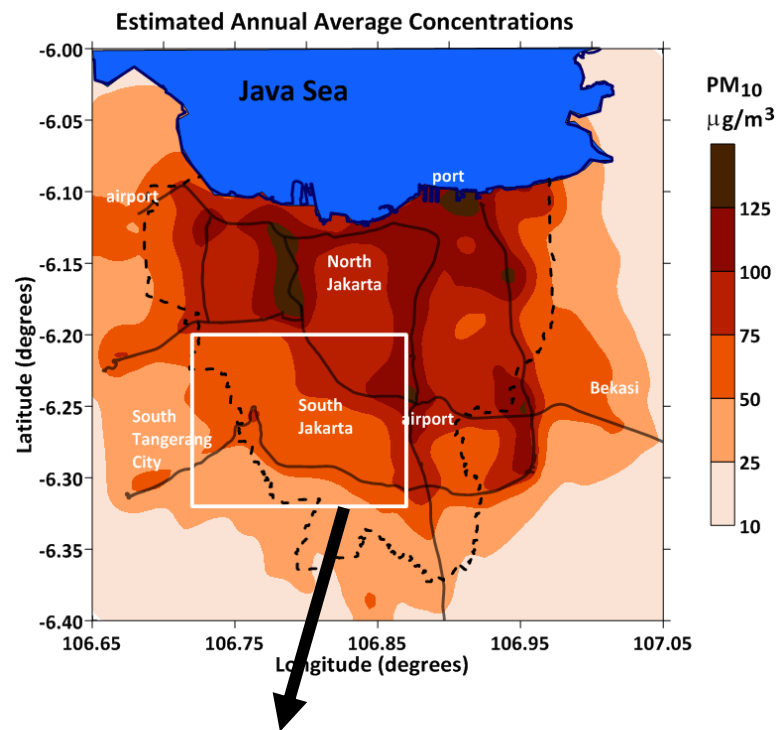


**Designated North Jakarta
area**

Average source contributions

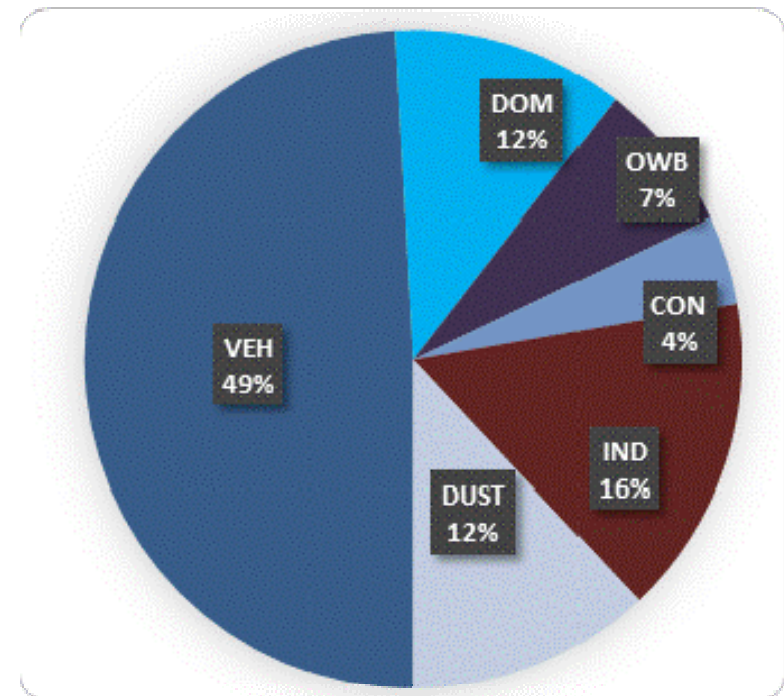


Modeled using ATMoS dispersion model and WRF meteorological fields

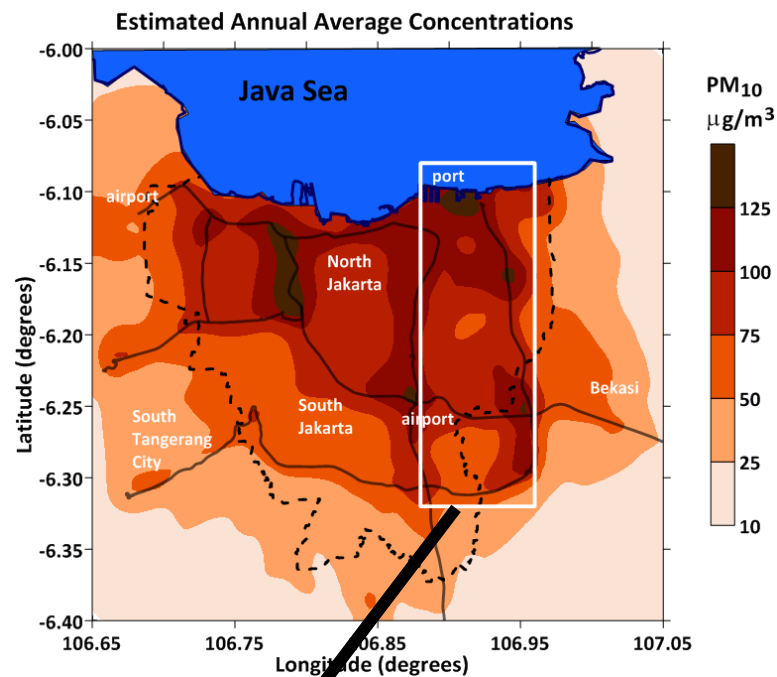


**Designated South Jakarta
area**

Average source contributions

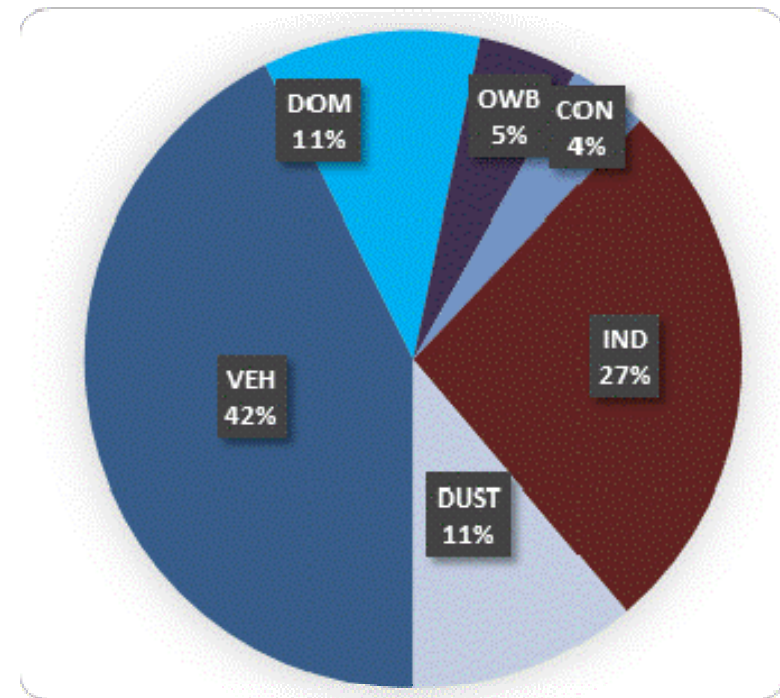


Modeled using ATMoS dispersion model and WRF meteorological fields

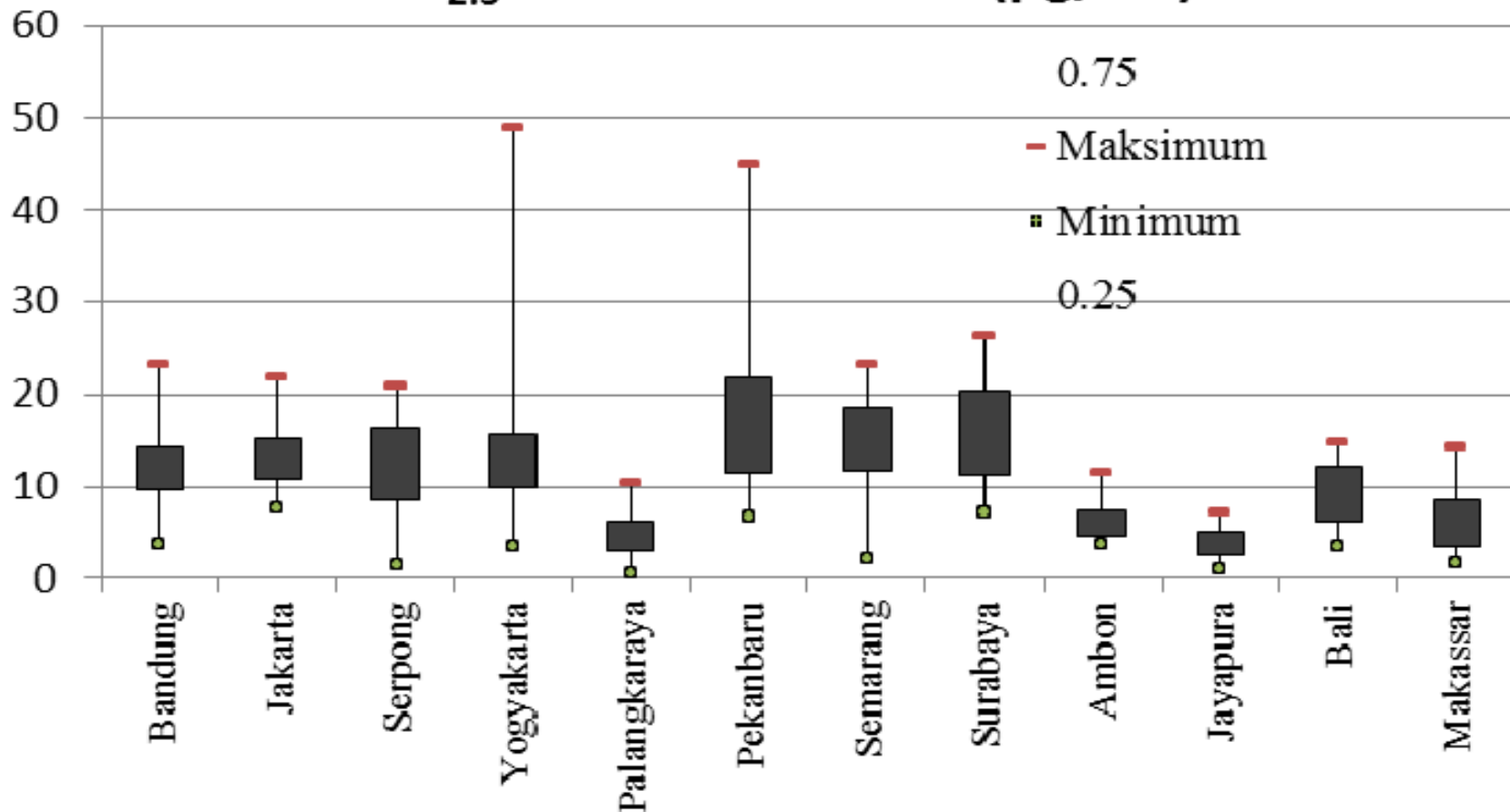


**Designated East Jakarta
area**

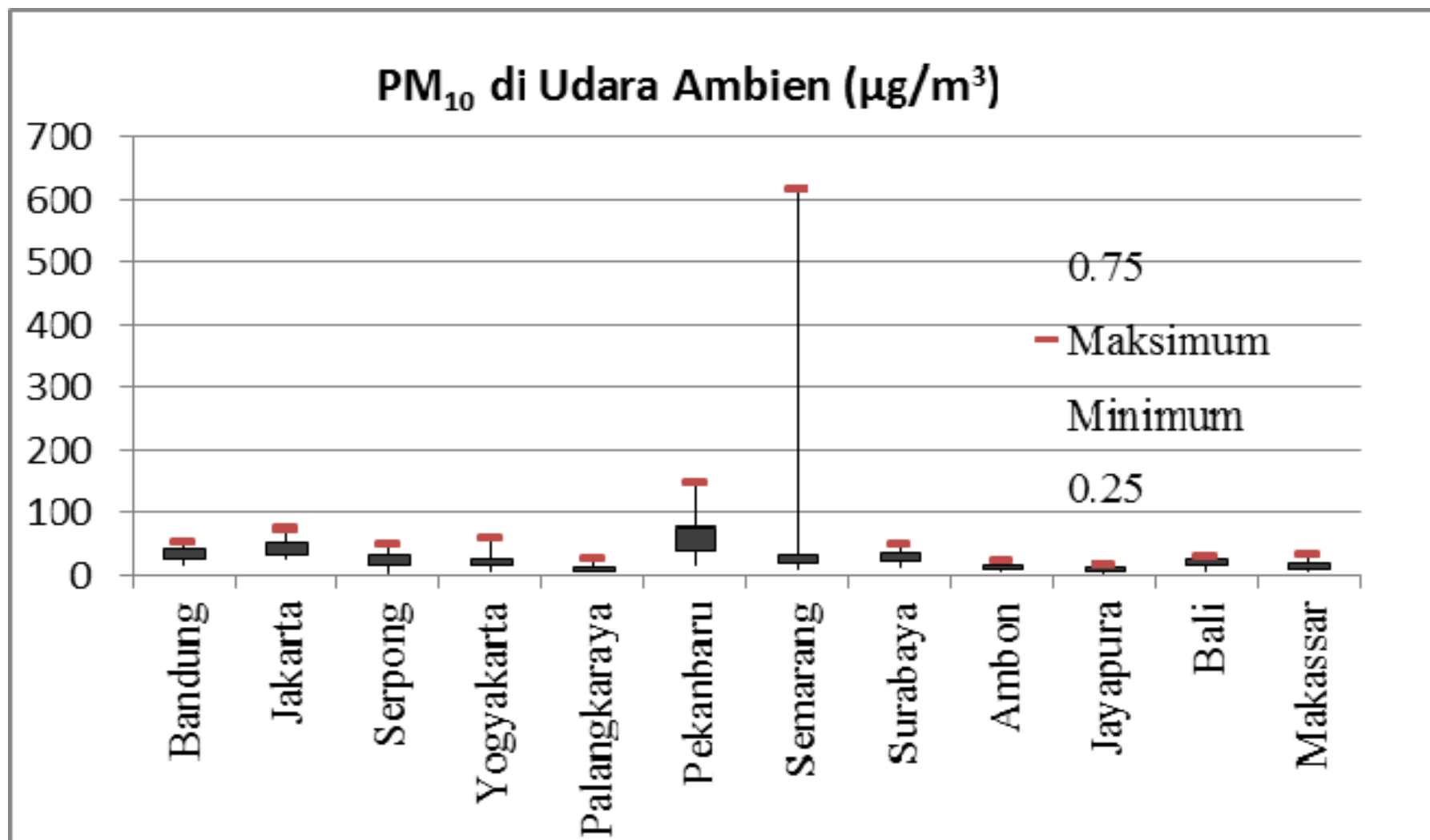
Average source contributions



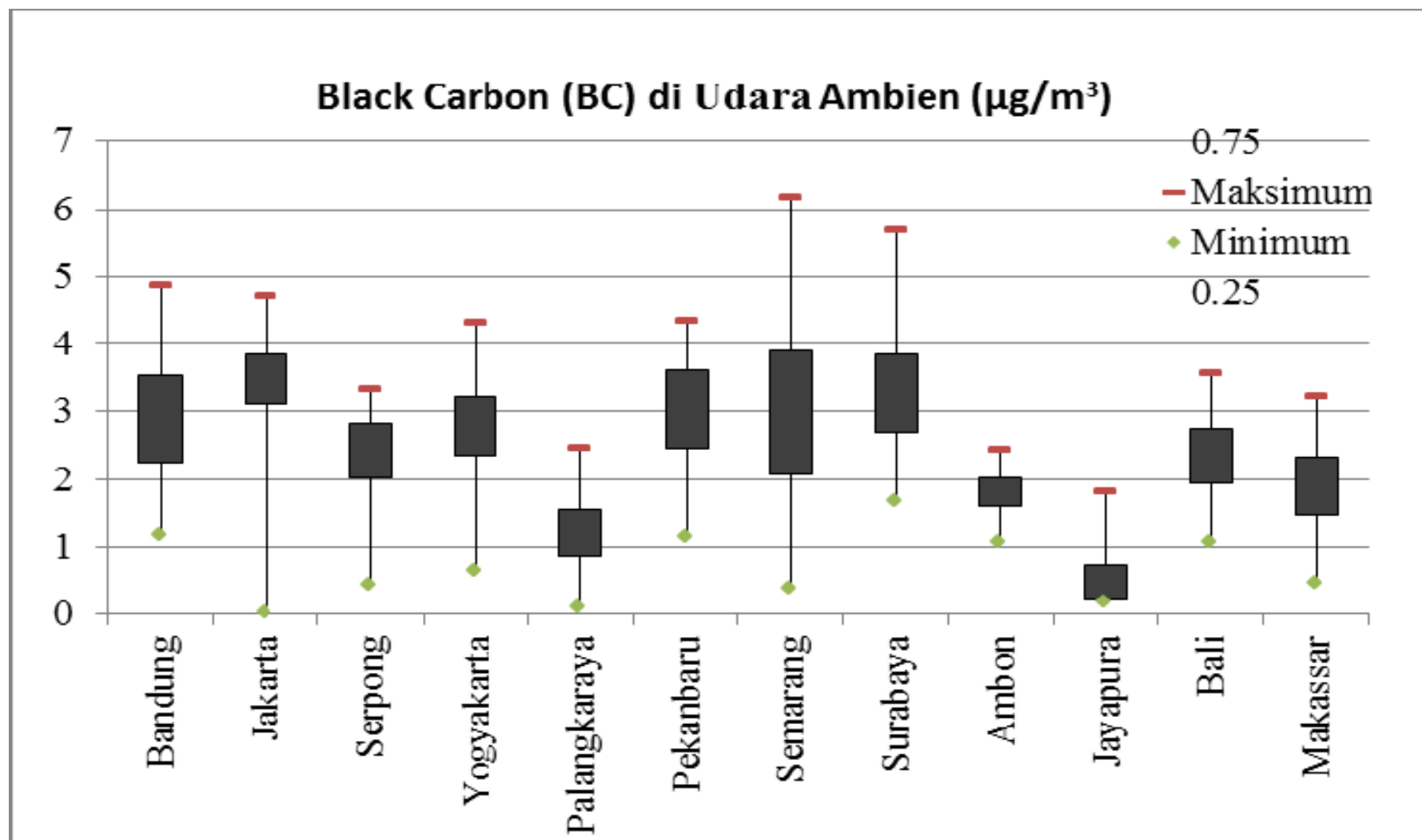
PM_{2.5} di Udara Ambien (µg/m³)



	Bandung	Jakarta	Serpong	Yogyakarta	Palangkaraya	Pekanbaru	Semarang	Surabaya	Ambon	Jayapura	Bali	Makassar
Maksimum	23.08	21.71	20.88	48.93	10.32	45.00	23.25	26.38	11.52	7.13	14.74	14.29
Mean	11.88	13.54	11.96	13.48	4.77	18.60	14.49	16.40	6.16	3.76	9.44	6.35
Minimum	3.79	7.54	1.36	3.51	0.42	6.72	2.12	7.03	3.73	0.98	3.44	1.55



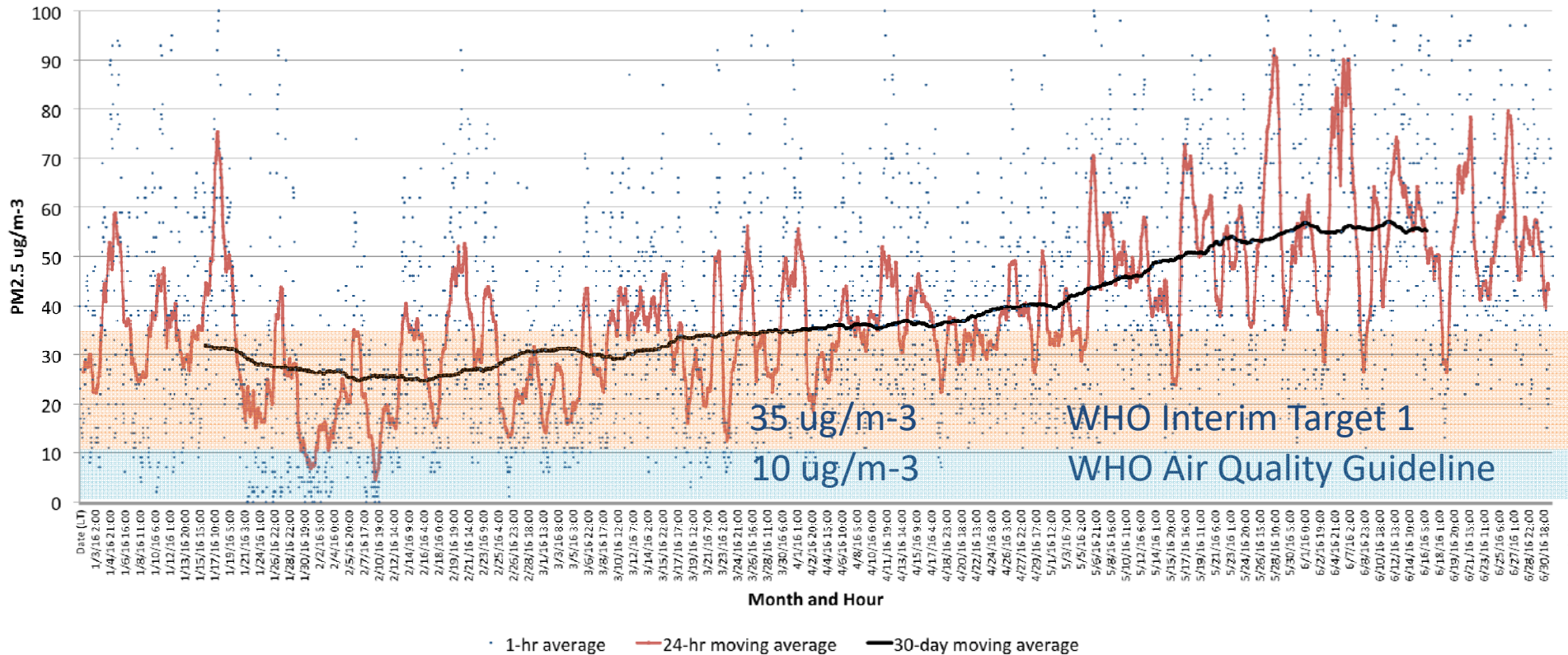
	Bandung	Jakarta	Serpong	Yogyakarta	Palangkaraya	Pekanbaru	Semarang	Surabaya	Ambon	Jayapura	Bali	Makassar
Maksimum	53.2	73.3	50.1	61.1	25.9	148.6	618.4	51.3	25.4	15.8	31.4	35.5
Mean	33.4	46.4	26.0	22.9	12.1	60.8	54.5	29.9	14.7	9.6	22.5	17.5
Minimum	15.9	27.0	4.4	5.9	6.4	16.7	9.0	13.5	8.4	4.4	7.4	8.3



	Bandung	Jakarta	Serpong	Yogyakarta	Palangkaraya	Pekanbaru	Semarang	Surabaya	Ambon	Jayapura	Bali	Makassar
Maksimum	4.85	4.72	3.32	4.31	2.47	4.33	6.17	5.69	2.44	1.82	3.56	3.22
Mean	2.87	3.20	2.21	2.70	1.20	3.04	2.93	3.39	1.79	0.58	2.29	1.83
Minimum	1.16	0.00	0.42	0.64	0.09	1.14	0.38	1.65	1.06	0.17	1.04	0.44

Source: KLHK, 2014

Central Jakarta Air Quality – 2016



Data from US Embassy – Jakarta Central. See
[https://airnow.gov/index.cfm?action=airnow.global_summary#Indonesia\\$Jakarta_Central](https://airnow.gov/index.cfm?action=airnow.global_summary#Indonesia$Jakarta_Central)

Health and Environmental Effect

Health Effect

- Air pollution has threatened urban residents.
- WHO released the report in 2012 that 1/8 death worldwide or around 7 millions people die due to air pollution exposure:
 - 68.000 people died in Indonesia.

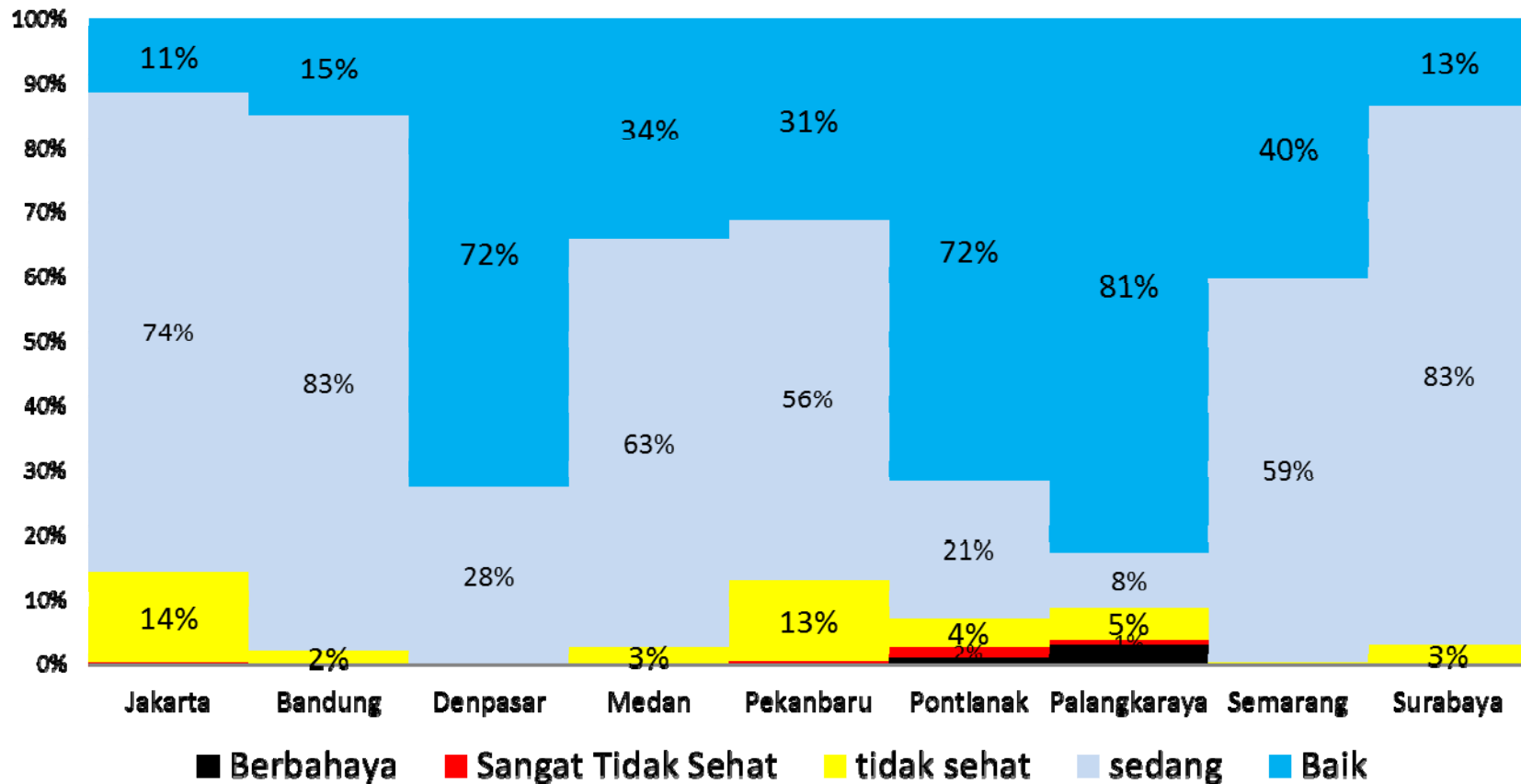
Release WHO/06, 25 March 2014

Health Effect - Jakarta Case, 2010:

- Total population of Jakarta is 9,607,787
- 57.8% of the Jakarta population were suffered by various air pollution-related diseases :
 - 1,210,581 people suffered by asthmatic bronchiale (compared with 500,000 population founded by Ostro 1994);
 - 173,487 people with bronchopneumonia;
 - 2,449,986 with ARI;
 - 336,273 people with pneumonia;
 - 153,724 people with COPD, and;
 - 1,246,130 people with coronary artery diseases.
- Total direct health cost IDR 38.5 trillions ~ USD 3.1 billions

Source : CBA Fuel Economy in Indonesia, USEPA-UNEP-KLH-KPBB, 2012

Health Effect



Sumber: PUSARPEDAL 2014

At the moderate status of air quality, it's meant the athletes will not able to reach their record. So, it would be a threat for Asian Games 2018 when we fail to improve air quality. Beside, it also will increase the risk for the people who suffered asthma.

















1908



1968



Crops damage

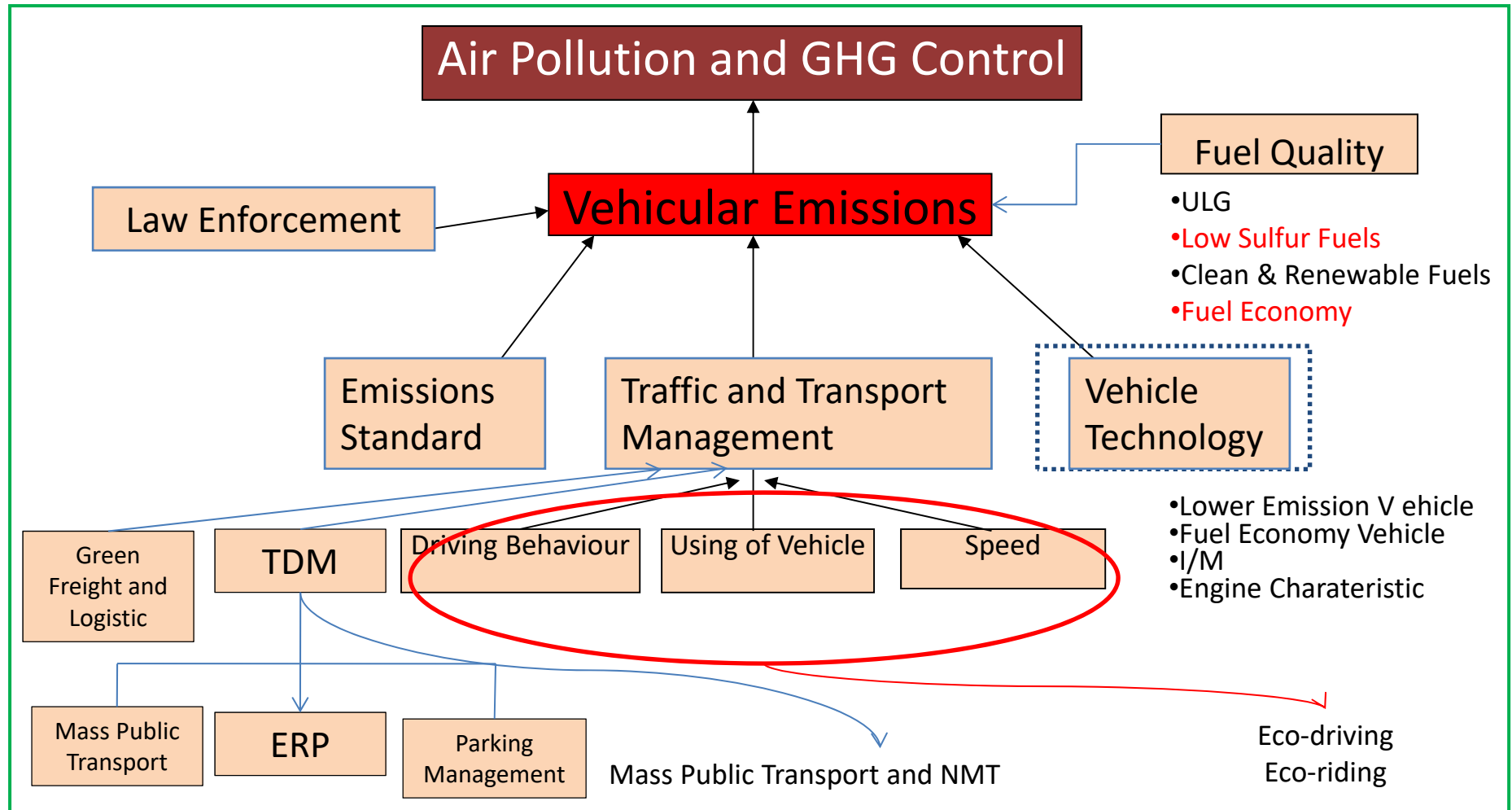


Photo: REUTERS/David Gray



Vehicular Emission Reduction Strategy

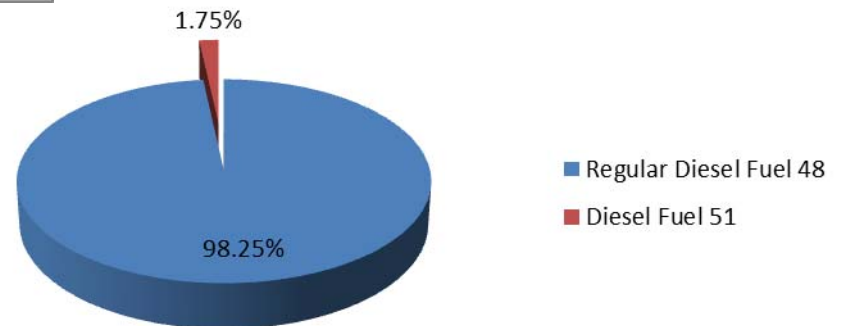
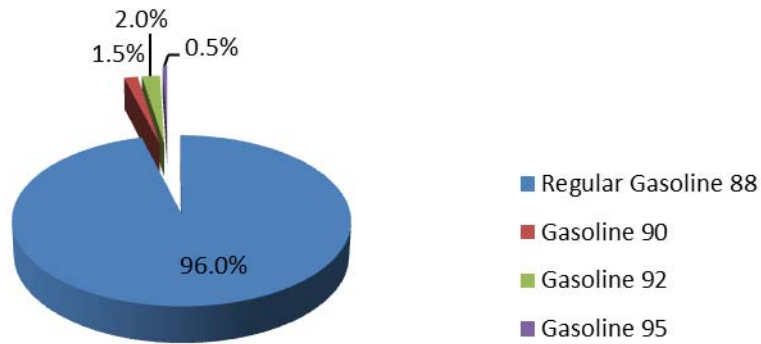
Vehicular Emission Reduction Strategy



IVERS is an integrated efforts to reduce vehicular emission by implementing simultaneous and parallel multi aspects activities on clean fuel, lower emission vehicle, appropriate traffic and transport management, emission standard and law enforcement

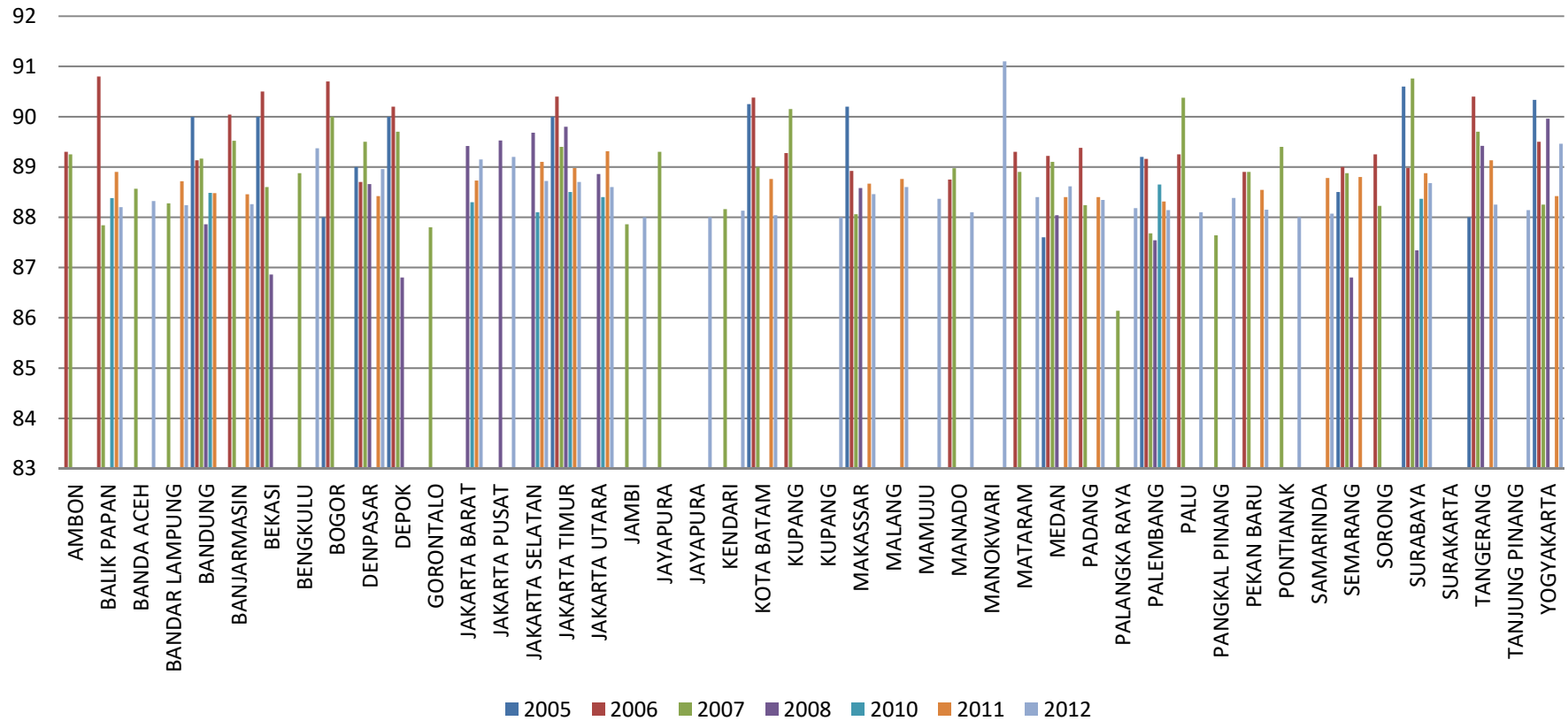
Fuel Quality

Fuels Types and Its Market Share

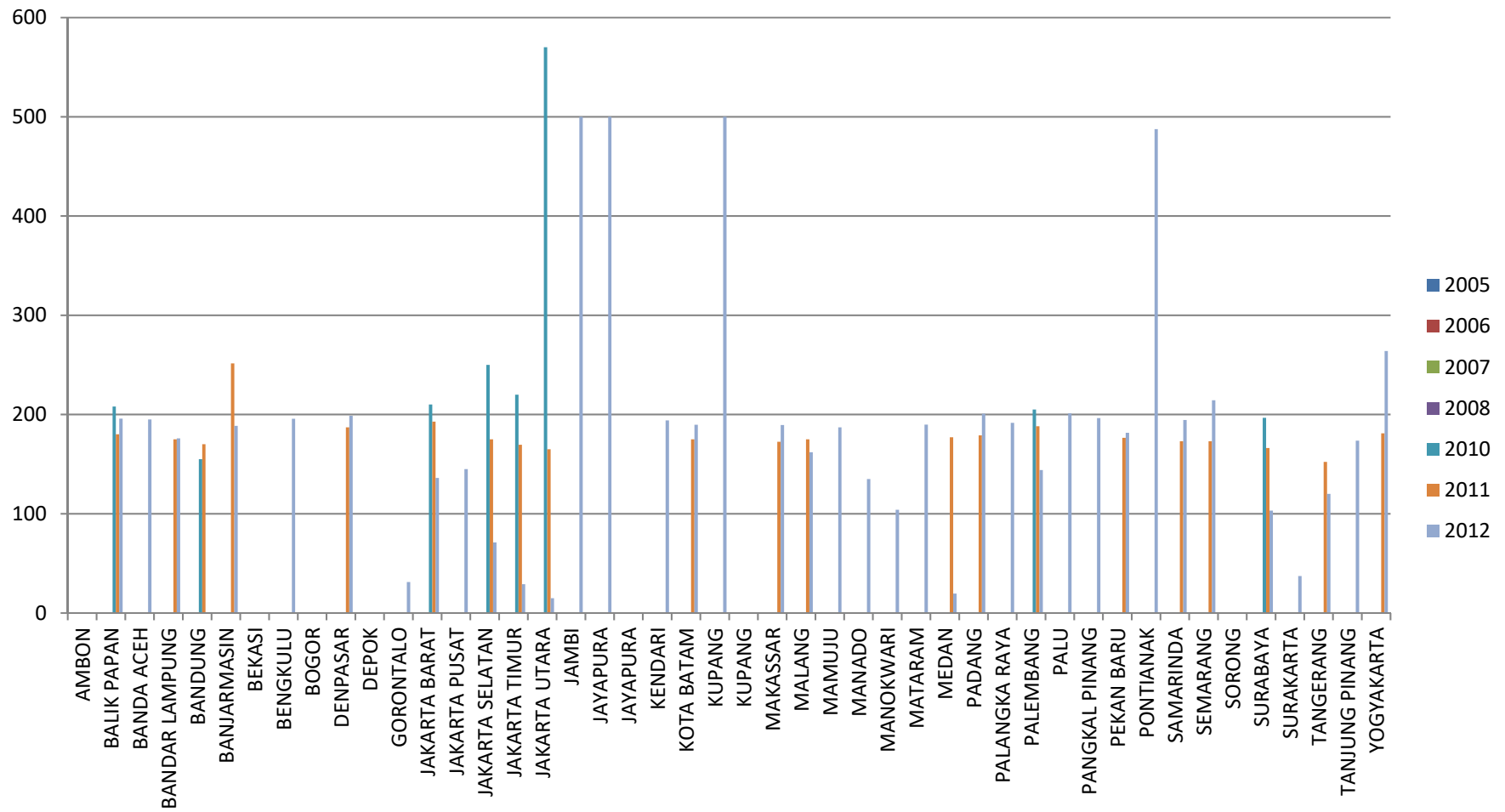


Gasoline - Series RON

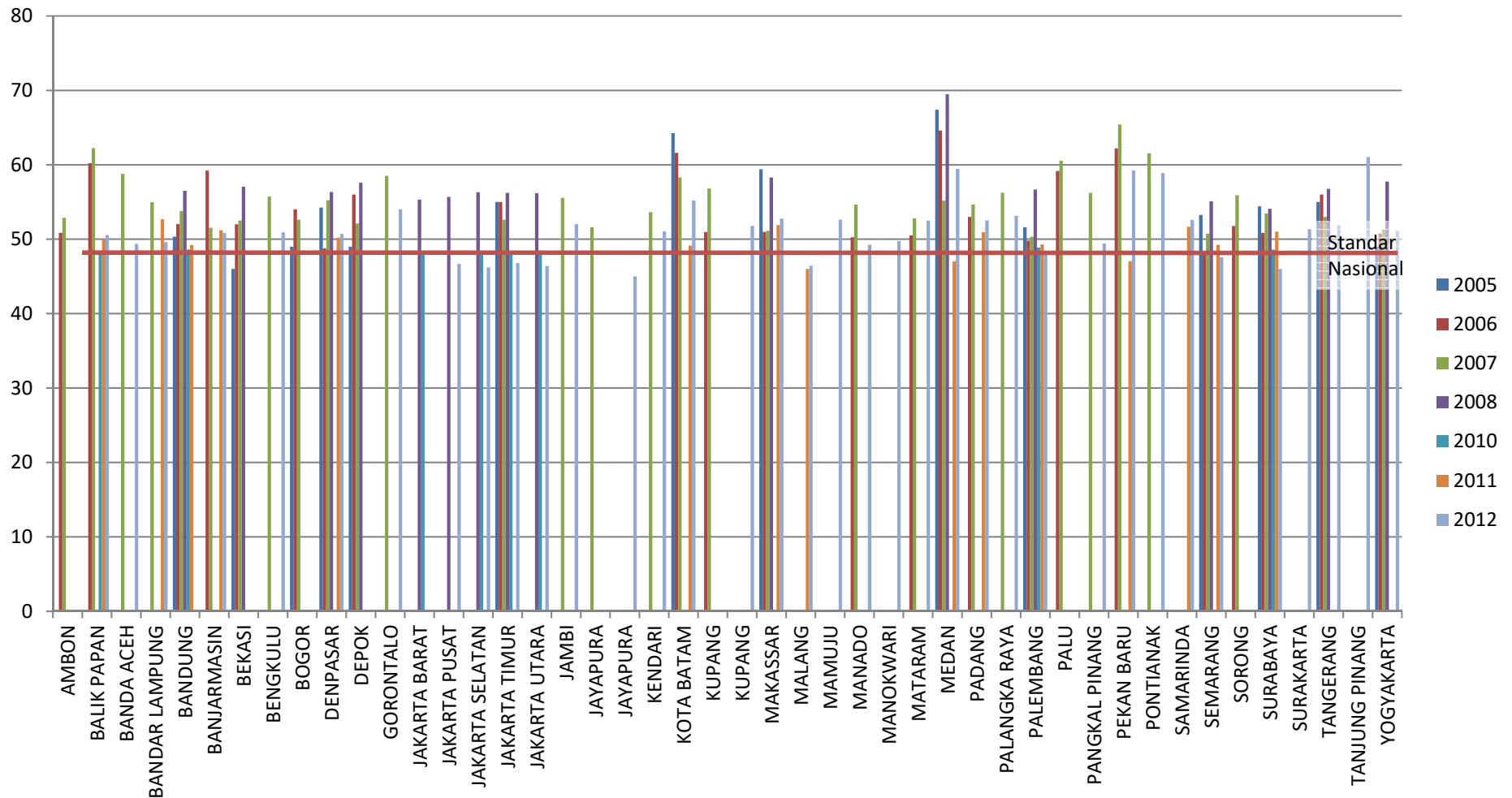
Chart Title



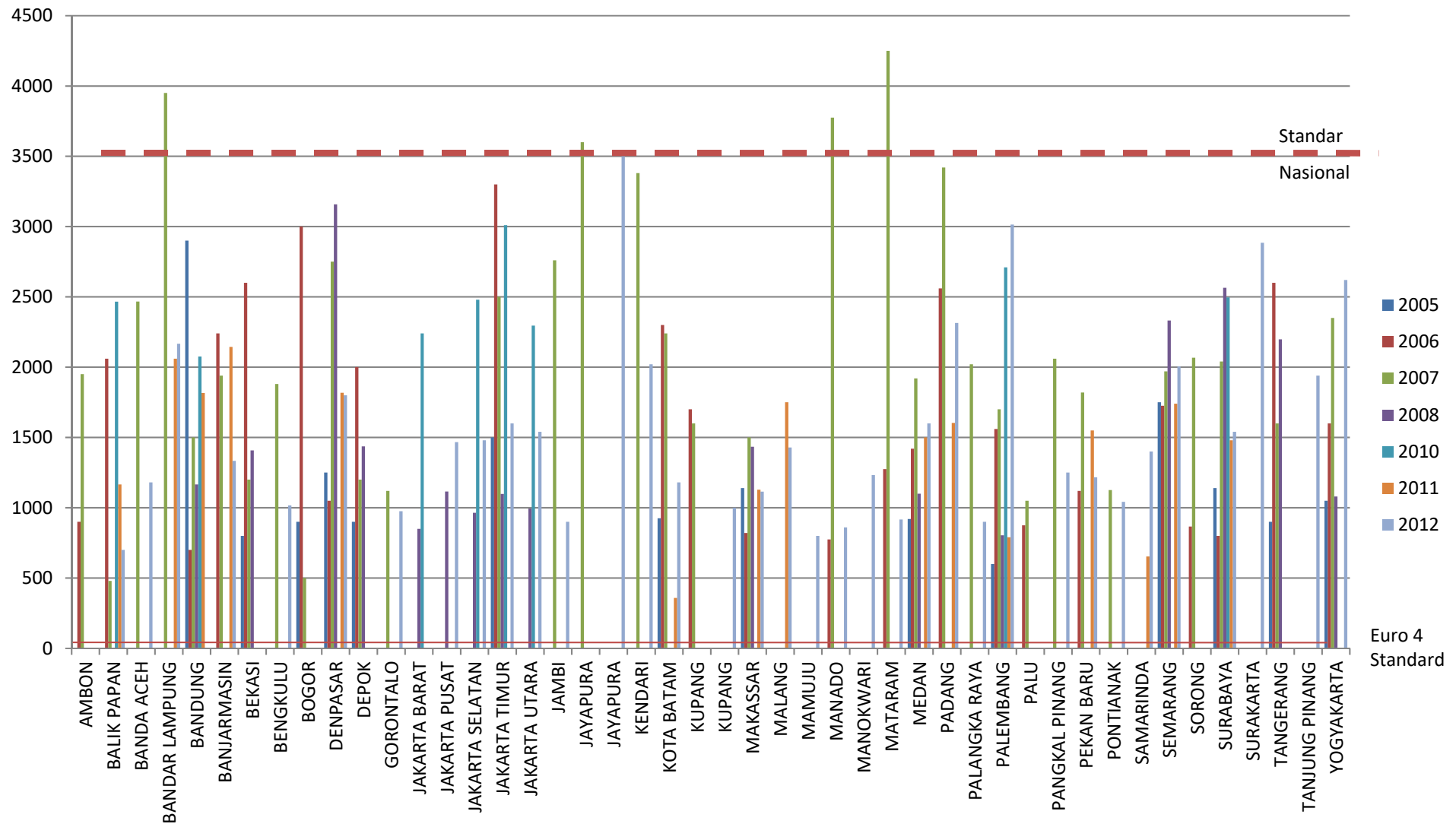
Gasoline - Series Sulfur



Diesel Fuel 48 - Series Cetane Index



Diesel Fuel 48 - Series Sulfur



Cost Benefit and Cost Effective Emission Standard

Fuel Economy - Policies Formula

Policy Option	Title	Description	Parameter and Its Source
1	Emission Standard	Implement Euro 2 at 2005, Euro 3 at 2015, and Euro 4 at 2020	Table Appendix 3. Adopted Emission Factors (g/km) at 80,000 km, source : Coffe (2005)
2	Fuel Efficiency +Option 1	Enhance fuel Efficiency 10 % by 2009	
3	CNG +Option 1	Convert to Gas for Passenger Cars and Bus, at least 1 % at 2009, 2 % at 2011, and at 5 % at 2021	Assume Cost for Gas Converter = \$800 , Gas Fuel CO NO HC PM Reduction 0.89 0.53 0 0.85 Sources Evaluating the Emission Reduction Benefits of WMATA Natural Gas Buses, www.eere.energy.gov
4	Catalytic Coverter+Option 1	Use Catalytic Converter to Diesel vehicles (25 % of Passenger Car, Bus, and Truck)	Cost for Catalytic Coverter = \$800 , Gas Fuel CO NO HC PM Reduction 0.0 0.15 0 0.5 Sources: Michael P.Walsh (May,2006)
5	Hybrid Technology + Option 1	Use Hybrid technology for Passenger cars and Bus, at least 0.05% at 2009, 0.1 % at 2011,0.5 % at 2016, and 1 % at 2021	Cost = \$10,000 Assume fuel efficiency increases about 4.1 times than non hybrid technology.
6	Scapped + Option 1	Scrapped the 50 % vehicles that more than 20 years old from 2009	
7	Biofuel + Option 1	Convert to Biofuel for Passenger Cars and Bus, at least 1 % at 2009, 2 % at 2011, and at 5 % at 2021	Cost for processing biofuel = IDR 4,584/Liter is taken from Hadi et.al,(2010), http://psp3.ipb.ac.id/jurnal/index.php/artikel/article/view/23 Gas Fuel CO NO HC PM Reduction 0.47 -0.22 0.46 0.55 Sources: Xue, J., Tony, E.G and Alan C.H (2011)
8	Public Transport + Option 1	Result passenger car and motor cycle shift to public transport at least 5% and 1% at 2011, 10% and 5 % at 2014, 20% and 10% at 2018 and 40% and 20% at 2025	Invest on bus rapid transit and busway (2005-2015), commuter line (2010-2020), and MRT (2015-2025). Cost for Investment is provided in table 9. We have limitation to consider operating and maintainance cost as well as expected revenue from tariff.
9	Leapfrog Emission Standard + Option 1	Implement Euro 2 at 2005, Euro 3 at 2013, and Euro 4 at 2016	Implement Euro 2 at 2005, Euro 3 at 2013, and Euro 4 at 2016

Cost Benefit and Effective

Vehicle Emission Standard

20015-2030

Cost Benefit

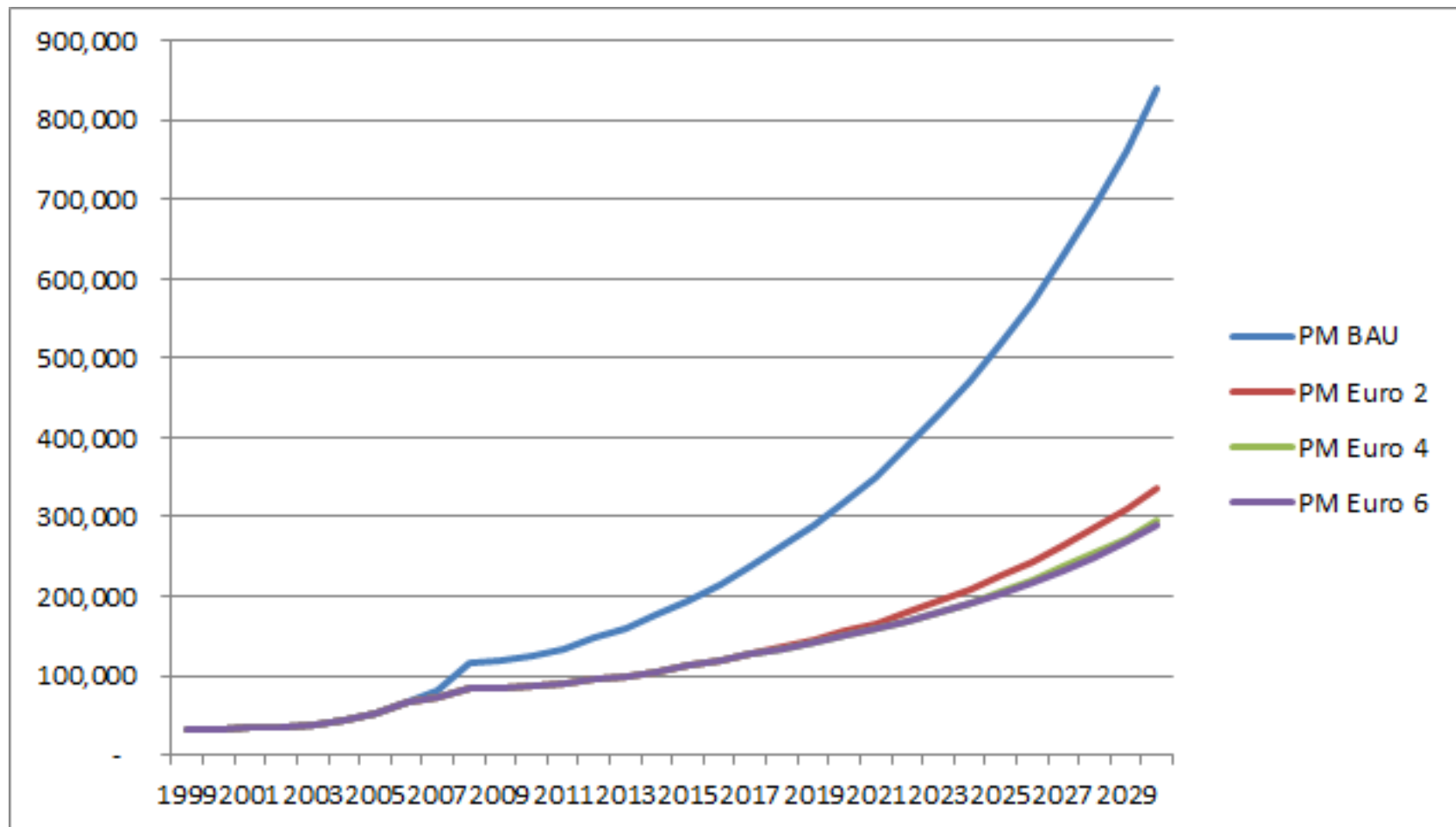
	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Cost									
Refinery Production	467,416	428,932	431,091	467,418	338,794	444,889	438,033	421,886	466,745
Technology Utilization	493,312	564,566	15,863	643,108	784,586	30,911	342,032	117,541	493,312
Total Cost	960,728	1,093,497	446,954	1,110,526	1,123,380	435,580	800,065	539,179	960,057
Benefit									
Health Improvement	1,656,264	2,646,587	1,532,923	2,012,137	2,854,542	1,657,728	1,657,729	1,648,883	1,648,305
Production Saving	27,712	157,528	52,277	27,712	448,393	34,237	57,186	189,923	31,387
Subsidy Saving	286,392	1,640,422	538,613	286,392	4,601,071	373,975	368,473	1,746,763	324,084
Total Benefit	1,970,368	4,444,535	2,124,813	2,326,241	7,904,005	2,077,940	2,514,840	3,585,569	2,003,776
FY 2005-2030									
Net Benefit	1,009,640	3,351,338	1,677,862	1,215,717	6,780,625	1,582,360	1,514,235	3,027,390	1,043,719
NPV; 50% 5 %	38,963	803,680	310,515	374,485	1,563,678	280,776	275,887	599,926	47,736
Net Benefit Average	38,832	128,898	64,538	48,736	260,793	80,580	55,241	116,438	40,143
FY 2005-2030									
Fuel Saving	286,392	1,640,422	538,613	286,392	4,601,071	373,975	368,473	1,746,763	324,084
NPV; 50% 5 %	71,395	469,465	127,900	71,395	1,098,827	91,202	144,873	388,089	84,727
Net Benefit Average	13,018	74,565	24,528	13,018	209,140	15,999	26,794	79,398	14,731

Cost Effective

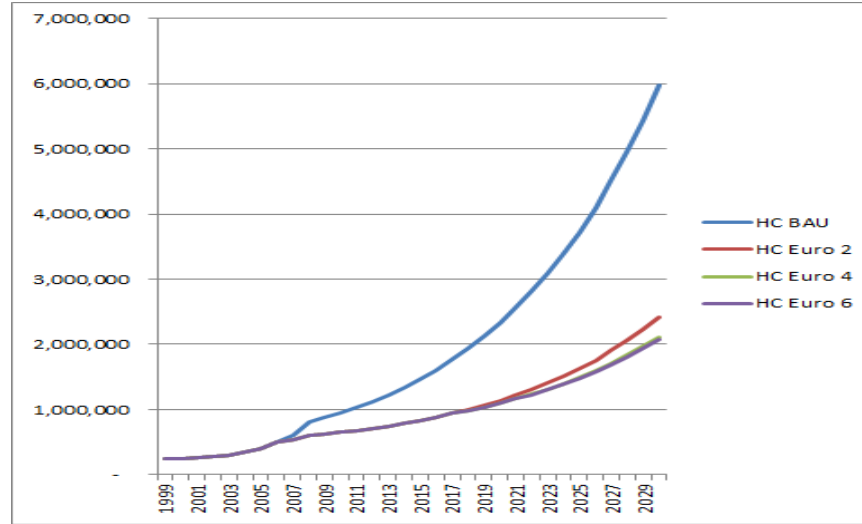
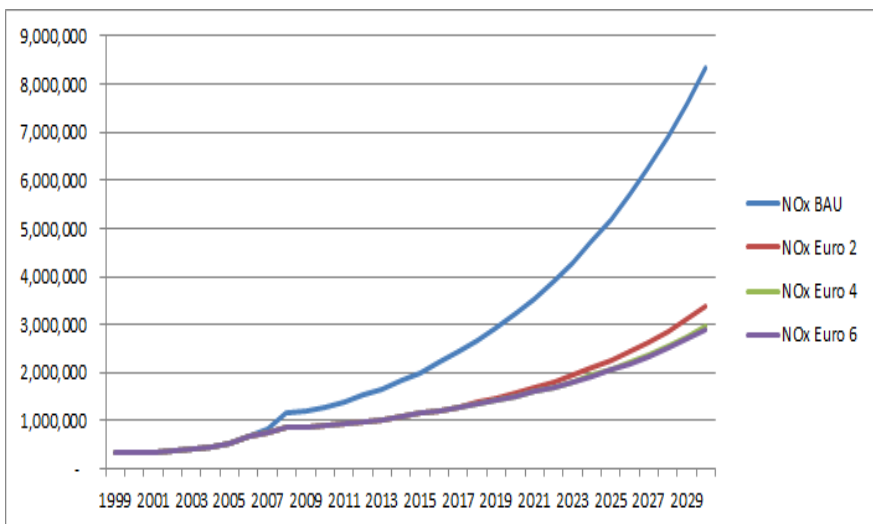
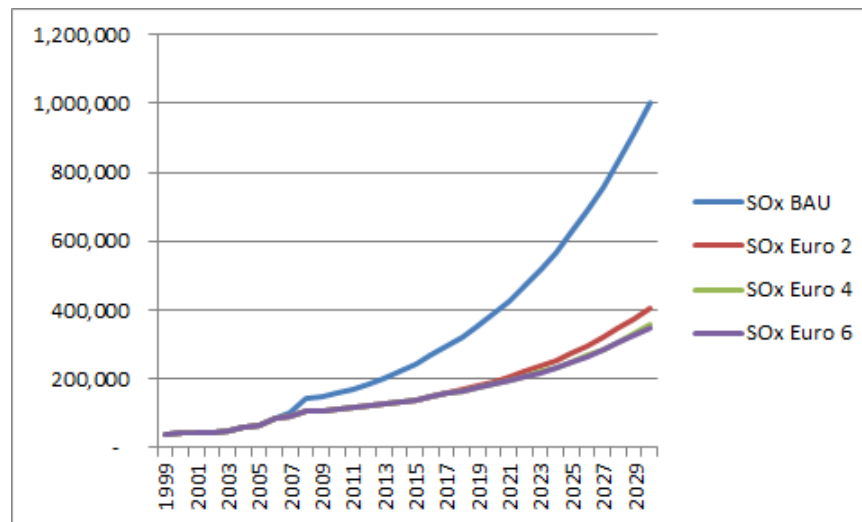
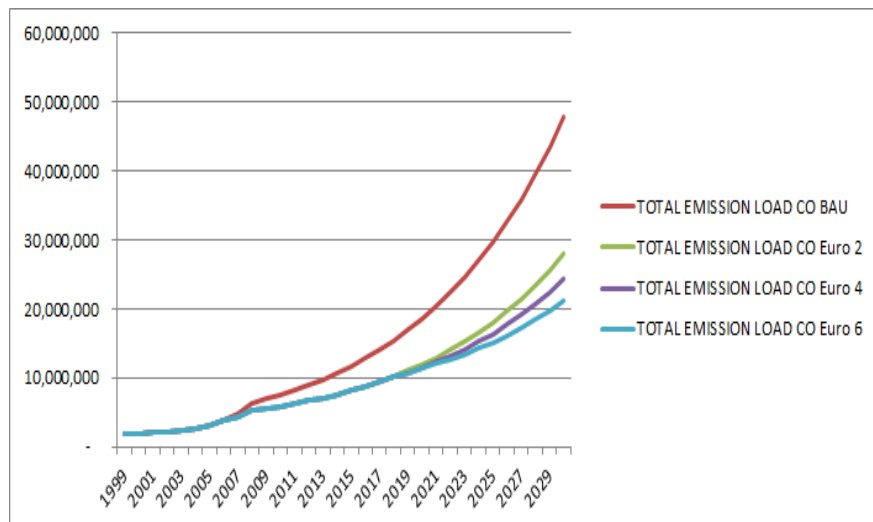
	Opsl 1	Opsl 2	Opsl 3	Opsl 4	Opsl 5	Opsl 6	Opsl 7	Opsl 8	Opsl 9
Cost (IDR billion)	960,728	1,093,497	446,954	1,110,523	1,123,380	495,580	800,086	539,179	960,057
Emissions Reduction (million ton)									
CO	9,142	12,869	8,231	9,142	13,565	9,156	9,190	12,488	11,519
NOx	6,269	11,548	6,524	7,596	13,621	6,327	6,204	6,799	7,903
HC	2,178	3,057	2,178	3,244	3,244	2,438	2,196	2,697	2,741
PM	663	768	671	776	776	664	668	684	858
Cost Effectiveness (IDR billion per million ton)									
CO	105	85	48	121	83	54	87	43	83
NOx	153	95	69	146	82	78	129	79	121
HC	441	358	205	342	346	203	364	200	350
PM	1,449	1,424	667	1,431	1,447	746	1,198	788	1,120

- Implementing Vehicle Emission Standard/Euro 4 by 2021 (Option 1) would be gain Total Economic Benefit IDR 1,970 T (health cost, production saving and fuel saving).
- Acceleration on implementing Euro 4 Standard by 2016 (Option 9) would be improve double Total Economic Benefit to be IDR 3,973 T and cut the cost of emissions reduction by 21.30%.

Scenario Local Air Pollution Reduction

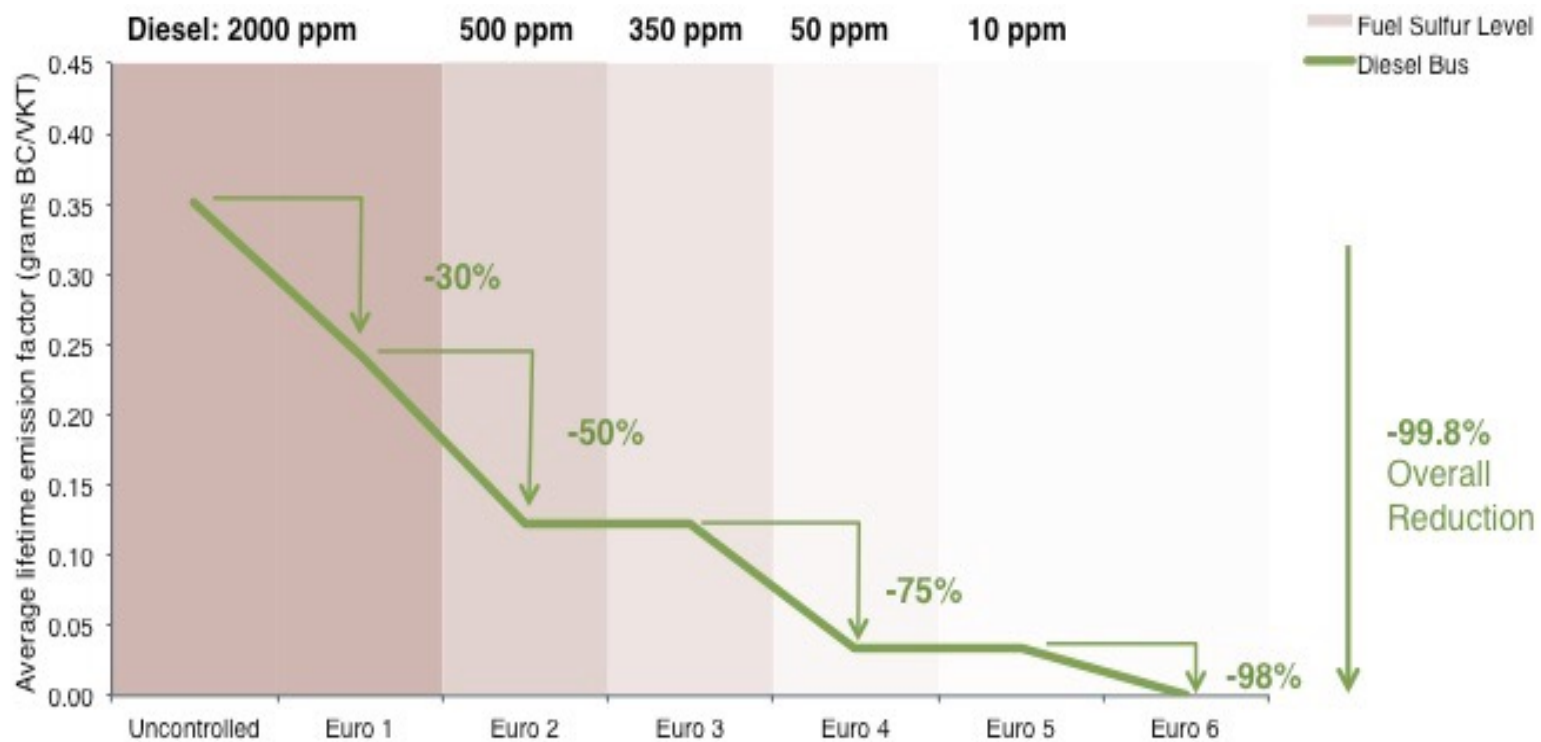


Scenario Local Air Pollution Reduction



Soot-free Urban Bus Fleet: Stage of Change

Stages of Black Carbon Emissions Control Based on European Regulatory Approach to Urban Bus Fleets



Source: COPERT Emissions Model

Gaseous bus (CNG/LNG/LGV) is crash program to implement soot-free buses with obstacle of low sulfur fuel supply

Emission Standards for New Light-Duty Vehicles

Country	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16		
European Union	E1	Euro 2					Euro 3				Euro 4				Euro 5					E6				
Bangladesh ^a											Euro 2													
Bangladesh ^b											Euro 1													
PRC ^a							Euro 1		Euro 2			Euro 3			Euro 4									
PRC ^c							Euro 1		Euro 2			Euro 3		Euro 4 only										
Hong Kong, China	Euro 1		Euro 2				Euro 3				Euro 4			Euro 5										
India ^d							Euro 1			Euro 2					Euro 3									
India ^e						E1	Euro 2				Euro 3				Euro 4									
Indonesia											Euro 2													
Republic of Korea											Euro 4				Euro 5									
Malaysia			Euro 1										Euro 2				Euro 4							
Nepal						Euro 1																		
Pakistan	No conclusive information available																							
Philippines									Euro 1				Euro 2										Euro 4	
Singapore ^a	Euro 1						Euro 2						Euro 5											
Singapore ^b	Euro 1						Euro 2				Euro 4						Euro 5							
Sri Lanka									Euro 1				Euro 2											
Taipei, China						US Tier 1										US Tier 2 Bin 7 ^f								
Thailand	Euro 1						Euro 2			Euro 3						Euro 4								
Viet Nam													Euro 2								Euro 4			

Sulfur Levels in Diesel

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
European Union					500					50(10) ^a				10							
United States	500										15										
Bangladesh							5,000														
Cambodia					2,000				1,500												
PRC (nationwide) ^{a, b}	5,000						2,000			2000 & 500											
PRC - Beijing	5,000						2,000		500	350			50								
Hong Kong, China		500					50					10 ^c									
India (nationwide)	5,000				2,500					500					350						
India (metros)	5,000				2,500	500				350 ^c					50 ^c						
Indonesia	5,000										3,500	3,500 (97.5%) 500 (2.5%)									
Japan ^d	500									50		10									
Republic of Korea	500							430	100		30	10									
Malaysia	5,000		3,000					500 ^e		500 ^f							50 ^c				
Pakistan	10,000						7,000 ^e														
Philippines	5,000					2,000			500											50	
Singapore	3,000		500								50								10		
Sri Lanka	10,000							5,000 ^d			500										
Taipei, China	3,000			500			350		100				50								
Thailand	2,500			500					350		150				50						
Viet Nam	10,000											500									

IVERS Steps

VEHICULAR EMISSION CONTROL ACTIVITIES PLAN

NO.	ACTIVITIES	COORDINATOR	01	02	03	04	05	06	07	08	09	12	13	14	15	16	17
1	FUEL DEVELOPMENT	MIGAS/ Ministry of Energy and Oil Industry			Step-0				Step-1				Step-2				Step-3
2	VEHICLE DEVELOPMENT	Automotive Industry		Step-0					Step-1				Step-2				Step-3
3	TRASFIC MANAGEMENT DEVELOPMENT	LOCAL GOVERNMENT			Step-0				Step-1				Step-2				Step-3
4	EXHAUST EMISSION REG. DEVELOPMENT	Ministry of Environment				Step-0			Step-1				Step-2				Step-3
5	LAW ENFORCEMENT DEVELOPMENT	Ministry of Transport and Ministry of Industry					Step-0		Step-1				Step-2				Step-3

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1. FUEL IMPROVEMENT TARGETS

COORDINATOR : MIGAS/Ministry of Energy and Oil Industry

NO.	TARGET POINTS	STEP-0	STEP-1	STEP-2	STEP-3
1	GASOLINE SPECIFICATION	by Metallic Octane Booster	High Octane Mogos Comp.	Benzene, Aromatic, Oxyg.	Matching WWFC (include S max = 50 PPM)
2	DIESEL SPECIFICATION	High Sulfur (500 PPM)	Low Sulfur (300 PPM)	Very Low Sulfur (100 PPM)	Matching WWFC (Max = 50 PPM)
3	FUEL ADDITIVIES	No Additive	Generation III (Tank -> EFI)	Generation V (Tank->Chamber)	Generation VII (Tank->Exhaust)
4	OIL FOR 2-STROKE E/G	Sulfur (500 PPM)	Sulfur 300 PPM Additive Gen-III	Sulfur 100 PPM Additive Gen-V	Sulfur 50 PPM Additive Gen-VII
5	CNG & LPG	Current Spec. Supply Range Limited	Sulfur Spec. Range Cover Java	Semi Spec. Range Cover National	Full Specification for Automotive
6	FUEL HANDLING EVAPORATED IMPROVEMENT	Nozel Evapo. Standardized	Tank Evapo. Transportation	Storage Evaporated Procedure	Refinery Evaporated Procedure

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2. VEHICLE TECHNOLOGY DEVELOPMENT TARGETS

COORDINATOR : AUTO-INDUSTRY ASSOCIATION

NO.	TARGET POINTS	STEP-0	STEP-1	STEP-2	STEP-3
1	NEW TYPE VEHICLE DEVELOPMENT	Carburetor or Diesel Inject.	Electronic Fuel Injection or Direct Inject.	EFI + Catalytic Converter Oxydation	• EFI + CCRo + O₂ Sensor • Technology Improvement Options: • Hybrid • EV • FEV
2	CURRENT PRODUCTION VEHICLE DEVELOPMENT	Carburetor or Diesel Inject.	Electronic Fuel Injection	EFI + Catalytic Converter Oxidation	CC Close Loop Line off
3	RETROFITTING CATALITIC CONVERTER DEVELOPMENT	Particel Dust Collector	Catalytic Converter Oxidation	Close Loop Catalytic Converter	+ O ₂ Sensor
4	FUEL CONVERTER KIT DEVELOPMENT	Bi-Fuel Kit	Dual Fuel Kit	Semi Full Dedicated Kit	Fully Dedicated Engine

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3. TRAFFIC MANAGEMENT IMPROVEMENT TARGETS

COORDINATOR : LOCAL/CITY GOVERNMENT

NO.	TARGET POINTS	STEP-0	STEP-1	STEP-2	STEP-3
1	MASS TRANSPORTATION SYSTEM	BRT	Add. Track & Train Series	Fly Over Track and add Train	New Train and Fly Over Train
2	TAX INCENTIVE ENVIRONMENT SYSTEM	Price LG > ULG	Public Bus by Alternative Fuel	In Used Car by Retrofitting	Using Mass Transport
3	PUBLIC TRANSPORTATION SYSTEM	Bus GVW>10 T by CNG	All of Bus by CNG or LPG	Taxi by CNG or LPG	All of Public Transport by CNG or LPG
4	ROAD NETWORK SYSTEM	Fly Over in Toll Road	Fly Over in Public Road	Fly Over in Main Cross	Fly Over in Each Crossroad
5	TOWN REBOIZATION AND GREEN ZONE	Hard Trees On Protocol Road	Hard Trees On Streets	One House by One Hard Trees	Jungle Town Each Municipal
6	FLEXIBLE OFFICE HOUR SYSTEM	Student & Employee Diff. starting	Different Finish Office Hour	Schedule start Working Time	Working Time Together in 10 ⁰⁰ ~ 15 ⁰⁰

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4. EXHAUST EMISSION REGULATION TARGETS

COORDINATOR : Ministry of Environment and Forestry

NO.	TARGET POINTS	STEP-0	STEP-1	STEP-2	STEP-3
1	TYPE APPROVAL REGULATION FOR NEW TYPE VEHICLE	Idle Test or Free Acceleration	Mode Test Cycle	Mode Test And Evapor. Test	Zero Emission Level
2	PERIODIC INSPECTION FOR USED VEHICLE	Government Facilities	Main Dealer Workshop	Independent Workshops	Retrofitting Workshop
3	REGULATION FOR SPECIAL PURPOSE ENGINE	Portable E/G Emission Limit	Special Purpose Vehicle	Tractor and Forklift Emission Limit	Engines Emission Limit
4	EVAPORATED OF FUEL HANDLING REGULATION	Nozzle for LG and ULG Evaporated Limit	Handling & SPBU Evapo. Limit	Storage Tank Evaporated Limit	Refinery Evaporated Limit

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5. LAW ENFORCEMENT TARGETS

COORDINATOR : Ministry of Transport & TRAFFIC POLICE

NO.	TARGET POINTS	STEP-0	STEP-1	STEP-2	STEP-3
1	TYPE APPROVAL EMISSION TEST LABORATORIES	Idle Tester and Free Acc. Test	Chassis Dyno & Test Bench	Chassis Dyno and Evapo. Test	World Wide Test Laboratories
2	PRODUCTION CONFIRMITY TEST FACILITIES	One for Each Main Dealer	One for Each Plant	+ Independent Body Lab.	World Wide Test Lab.
3	PERIODIC INSPECTION WORKSHOP	Government Facilities	Main Dealer Workshop	Dealer Workshop	Independent Garages
4	PORTABLE EMISSION TEST FOR TRAFFIC POLICE	For in Used Vehicle Taster	For Special Purpose Vehicle	For Storage Evapora. Tester	For Refinery Evaporator Tester
5	EMISSION LEVEL MONITORING REGION	3 Points in Each Big City	5 Points in Each Big City	+ 1 Points Each City	+ 3 Points Each City
6	EMISSION DATA MANAGEMENT SYSTEM	Type Approval Data Link	Periodic Inspection Data Link	Production Confirmation Data Link	All of Emission Data Integrated

Conclusion

- Air pollution is still threaten and suffer people especially in the urban areas with high density of traffic, with PM as dominant parameter.
- Need an integrated efforts to reduce vehicular emission by implementing simultaneous and parallel multi aspects activities (clean fuel, lower emission vehicle, appropriate traffic and transport management, emission standard and law enforcement)
- Fuel quality is still not comply to vehicle standard, especially Sulfur content .
- Need to improve fuel quality with lower Sulfur content, and other appropriate fuel properties to adopt lower emission vehicle standard-Euro 4 which has been signed by Minister of Environment and Forestry.
- Keep the consistency and sustainability efforts on low emission mobility: non motorized mobility (walking, cycling), cleaner fuel vehicle and its availability of cleaner fuel supply (NGV/LGV, bio-fuel vehicle, hybrid, EV, FEV, etc.), and mass public transportation.

Thank You

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I Want My Fresh Air