Environmental Management Bureau
Department of Environment
and Natural Resources

National Air Quality Status Report 2003-2004

National Air Quality Status Report (2003-2004)

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Department of Environment and Natural Resources

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MEMORANDUM FOR HER EXCELLENCY GLORIA MACAPAGAL-ARROYO

THROUGH: HONORABLE EDUARDO ERMITA
Executive Secretary

FROM: The Secretary

SUBJECT: **NATIONAL AIR QUALITY STATUS REPORT (2003-2004)**

DATE: December 8, 2005

Respectfully transmitted is the National Air Quality Status Report (2003-2004). The report documents the quality of air in 2003 to 2004, sources of air pollutants, quantitatively assessing and evaluating the accomplishment of the Clean Air Act, in the improvement of air quality in major Philippine cities, particularly Metro Manila. It likewise discusses the policies, programs and projects implemented by the government, civil society, private sector, and the international development community to prevent air pollution, the issues and concerns and recommendations.

This report is submitted in compliance to Section 6 of Republic Act No. 8749 (Clean Air Act of 1999), and Section 4, Rule XIV of DENR Administrative Order No. 2000-81, Series of 2000, otherwise known as the said Act's Implementing Rules and Regulations.

MICHAEL T. DEFENSOR

Preface

It has been more than five years since the enactment of the Philippine Clean Air Act (CAA), a period long enough for its impacts to be quantitatively assessed. In evaluating the accomplishment of the CAA, the main parameter that must be used is the improvement of air quality in major Philippines cities, particularly Metro Manila. Assessment must be done not based on perception but on hard scientific data generated through monitoring and research activities.

The years 2003 – 2004 is an important period in the government's drive to clean the air, as major milestones specifically declared in the CAA and its Implementing Rules and Regulations (IRR) were achieved during this period.

These milestones included the following:

- Reduction of aromatics and benzene in gasoline to 35% and 2% by volume, respectively in 2003;
- Reduction of sulfur content of automotive diesel fuel to 0.05% by weight in 2004;
- Phase out of existing incinerators dealing with bio-medical wastes in 2004;
- Implementation of Euro 1 standards for new vehicles in 2003; and,
- Harmonization of emission standards for in-use vehicles with Euro 1 new vehicle standard.

These provisions of the CAA and its IRR, together with the other provisions implemented in the first three years of CAA implementation, should bring about measurable improvement in air quality in the Philippines.

The establishment of air quality monitoring stations in different parts of Metro Manila and other major cities in the year 2003 will make it possible to have a quantitative check on the improvement of air quality.

This National Air Quality Status Report for the years 2003 - 2004, as mandated by the CAA, reviews the status of air quality in the country, identifies critical areas and recommends interventions necessary in improving air quality.

Acronyms/Abbreviations Used

ADB - Asian Development Bank
AQMF - Air Quality Management Fund
ARMM - Autonomous Region of Muslim Mindanao
BOI - Board of Investments
CAA - Clean Air Act
CAMPI - Chamber of Automotive Manufacturers of the Philippines, Inc.
CAR - Cordillera Autonomous Region
CFCs - Chlorofluorocarbons
CME - Coconut methyl esters
CNG - Compressed natural gas
CH_4 - Methane
CO - Carbon monoxide
CO_2 - Carbon dioxide
COCAP - Concerned Citizens Against Pollution
CSU - Cavite State University
DAO - DENR Administrative Order
Dep Ed - Department of Education
DENR - Department of Environment and Natural Resources
DENR PAO - DENR Public Affairs Office
DOAS - Differential Optical Absorption Spectroscopy
DOE - Department of Energy
DOE OISMD - DOE Oil Industry Standard Management Division
DOH - Department of Health
DOST - Department of Science and Technology
DOST ITDI - DOST Industrial Technology Development Institute
DOTC - Department of Transportation and Communication
DTI - Department of Trade and Industry
EDB - Ethylene dibromide
EDC - Ethylene dichloride
EDSA - Epifanio delos Santos Avenue
EMB - Environmental Management Bureau
EMB AQMS - EMB Air Quality Management Section
EMB CMS - EMB Chemicals Management Section
EMB EEID - EMB Environmental Education and Information Division
EMB EPPD - EMB Environmental Planning and Policy Division
EMB NCR - EMB National Capital Region
GMA-7 - Global Media Arts - 7
GS - Good Shepherd
g/l - Grams per liter
HCs - Hydrocarbons
HFCs - Hydrofluorocarbons
IEC - Information, education and communication
IRR - Implementing rules and regulations
LBP - Land Bank of the Philippines
LGU - Local government unit
LLDA - Laguna Lake Development Authority
LPG - Liquefied petroleum gas
LTO - Land Transportation Office
LTO MID - LTO Management Information Division
MC/TC - Motorcycle/ tricycle

MO - Manila Observatory
MMAQISDP - Metro Manila Air Quality Improvement Sector Development Programme
MMDA - Metro Manila Development Authority
μg/Nm^3 - Microgram per normal cubic meter
μg/dl- Microgram per deciliter
MVIS - Motor Vehicle Inspection System
NAAQGV - National Ambient Air Quality Guideline Value
NAMRIA - National Mapping and Resource Information Authority
Nm^3 - Normal cubic meter
NGO - Non-governmental organization
NGV - Natural gas vehicle
nGy/h - Mini Gray per hour
NO_2 - Nitrogen dioxide
NO_x - Oxide of nitrogen
N_2O - Nitrous oxide
NPO - National Printing Office
O_3 - Ozone
Pb - Lead
PCA - Philippine Coconut Authority
PCBs - Polychlorinated biphenyls
PCIERD - Philippine Council for Industry and Energy Research and Development
PETC - Private emission testing center
PGH - Philippine General Hospital
PM_{10} - Particulate matter, 10 microns in diameter or smaller
$PM_{2.5}$ - Particulate matter, 2.5 microns in diameter or smaller
$PM_{2.2}$ - Particulate matter, 2.2 microns in diameter or smaller
PNOC EDC - Philippine National Oil Company Energy Development Center
PNRI - Philippine Nuclear Research Institute
PNS - Philippine National Standards
POPs - Persistent organic pollutants
PUP - Polytechnic University of the Philippines
ppb - Parts per billion
ppm - Parts per million
RA - Republic Act
SO_2 - Sulfur dioxide
SO_x - Oxides of sulfur
TMA/PHI - Truck Manufacturers Association/Pilipinas Hino Incorporated
TSP - Total suspended particulates
UNSCEAR - United Nations Scientific Committee on the Effects of Atomic Radiation
USAID - United States Agency for International Development
USCDC - United States Center for Disease Control
USEPA - United States Environmental Protection Agency
VOC - Volatile organic compounds

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AIR QUALITY STATUS

In 2003 and 2004, TSP concentrations in Metro Manila and in most of the major cities and urban centers nationwide exceeded the mean annual NAAQ guideline value for TSP. In 2004, the highest average annual TSP roadside concentration measured was more than ten times the 90 $\mu g/nm^3$ NAAQ guideline value.

PM_{10} concentrations in Metro Manila and Cagayan de Oro did not exceed the 24-hr NAAQ guideline value. However, the annual guideline value was exceeded in some sampling stations in Metro Manila such as Valenzuela and EDSA in Quezon City.

Although the Philippines does not have guideline value for $PM_{2.5}$, air quality monitoring data from various locations in Metro Manila showed that $PM_{2.5}$ levels exceeded the USEPA annual guideline value of 15 $\mu g/Nm^3$ and 24-hr guideline value of 65 $\mu g/Nm^3$.

SO_2 concentrations in Metro Manila and Cagayan de Oro City were way below the NAAQ 24-hr and annual guideline values.

In Metro Manila, the hourly ozone concentrations were above the NAAQ guideline value of 70 ppb for about three hours during daytime.

MAJOR ACCOMPLISHMENTS

Air Quality Monitoring. The Metro Manila Airshed Ambient Air Quality Monitoring Network started operation in October 2003. The Network is composed of ten automated stations that continuously measure real time concentrations of PM_{10}, $PM_{2.5}$, SO_2, NO_2, NO, ozone, CO, benzene, xylene, toluene, methane, non-methane hydrocarbon and total hydrocarbon.

Automatic ambient air quality monitoring stations were also established in Cagayan de Oro City and Cebu City.

Emissions testing of motor vehicles prior to registration. The requirement of passing emission test before registration was implemented starting January 1, 2003. Emission tests of private vehicles were conducted in PETCs authorized by the DOTC and duly accredited by the DTI. Public utility vehicles were given the option to have their vehicles tested in the LTO's Motor Vehicle Inspection System (MVIS) at a reduced rate. In 2004, the 377 Private Emission Testing Centers (PETCs) nationwide tested a total of 3,064,141 motor vehicles, with 98 percent of the vehicles tested passing the emission test.

Anti-Smoke Belching. In 2004 and 2003 a total of 16,250 and 21,141 diesel vehicles, respectively were apprehended for smoke belching. The reduction in the number of apprehensions from 2003 to 2004 was primarily because of the stoppage of operation of MMDA and DOTC.

Emission test of stationary sources. In 2004, the DENR conducted emissions testing of 213 stacks in 103 different facilities in the Metro Manila Airshed.

Airshed designation. The DENR has designated a total of 15 airsheds in the country including the four geothermal airsheds.

Emissions Standards. The EMB set the maximum HC emissions from motorcycles and tricycles at 7,800 ppm for those operating in urban centers and 10,000 ppm for those operating in rural areas or outside of the urban centers. (DAO No. 2003 – 25). The Bureau also issued revised emissions standards for in-use gasoline-fed and diesel vehicles (DAO 2003 – 51).

Fuels. Reduction of aromatics and benzene in gasoline to 35% and 2% by volume, respectively in 2003 and reduction of sulfur content of automotive diesel fuel to 0.05% by weight in 2004. The DOE created a Technical Committee on Petroleum Products and Additives, which formulated standard specifications for diesel, two-stroke (2T) lubricating oil and Coco-Methyl Esters (CME) as alternative fuel for diesel or for blending with diesel.

Alternative Fuels. Government vehicles were required to use diesel fuel blended with 1% CME by the Malacañang Memorandum Circular No. 55

Air Quality Management Fund. The Implementing Guidelines on the Operationalization of Air Quality Management Fund were issued (DENR-Department of Budget and Management Joint Circular No. 1).

Public Awareness. The Public Affairs Office (PAO) of the DENR and the Environmental Education and Information Division (EEID) of the EMB developed and conducted training courses and fora on clean air, and, spearheaded the launching activities for the Smoke-Free EDSA Campaign and the Linis Hangin Program.

POPs Elimination Program. The Philippine Senate through Senate Resolution No. 106 ratified the Stockholm Convention on POPs on February 2, 2004. The resolution was submitted to the Stockholm Convention Secretariat on February 27, 2004 and became legally binding on May 27, 2004.

LGU Initiatives. The City Government of San Fernando in La Union provided interest-free loans to operators of two-stroke tricycles to enable them to replace their two-stroke tricycles with four-stroke. The province of Cavite installed a 10 metric ton per day autoclave unit at the Emilio Aguinaldo Memorial Hospital for the disposal of health care wastes generated by the hospital and nearby medical establishments. Marikina City constructed 1.36 kilometers of dedicated bikeways on existing roads using local funding and a US$ 50,000 grant from World Bank. Makati City issued an ordinance in 2003 banning smoking in all public areas.

Tax Incentives. Assistance was extended by DENR to industries with the issuance of DAO 2004-53, which provided tax incentives to industry installing pollution control devices or retrofitting of existing facilities with mechanisms that reduce emissions.

Permitting. The DENR rationalized procedures to systematize air pollution permitting requirement (DAO 2004-26).

AIR QUALITY MONITORING SYSTEMS

The Department of Environment and Natural Resources (DENR), through the Environmental Management Bureau (EMB), monitors air quality in the Philippines to generate necessary information in formulating a comprehensive air pollution management and control program. The EMB regional offices regularly monitor roadside total suspended particulates (TSP) concentrations nationwide. Monitoring of ambient concentrations of air pollutants other than TSP is conducted only in Metro Manila and in the cities of Cebu, Cagayan de Oro, and Davao.

Metro Manila Airshed. EMB-NCR monitors roadside TSP concentrations in Metro Manila through its 12 sampling stations located near major thoroughfares as shown in Table 1.

Concentrations of other pollutants are monitored through the Metro Manila Airshed Ambient Air Quality Monitoring Network, which started operating in October 2003. The Network is composed of ten automated monitoring stations that continuously measure real time concentrations and generate hourly average concentrations of PM_{10}, $PM_{2.5}$, SO_2,

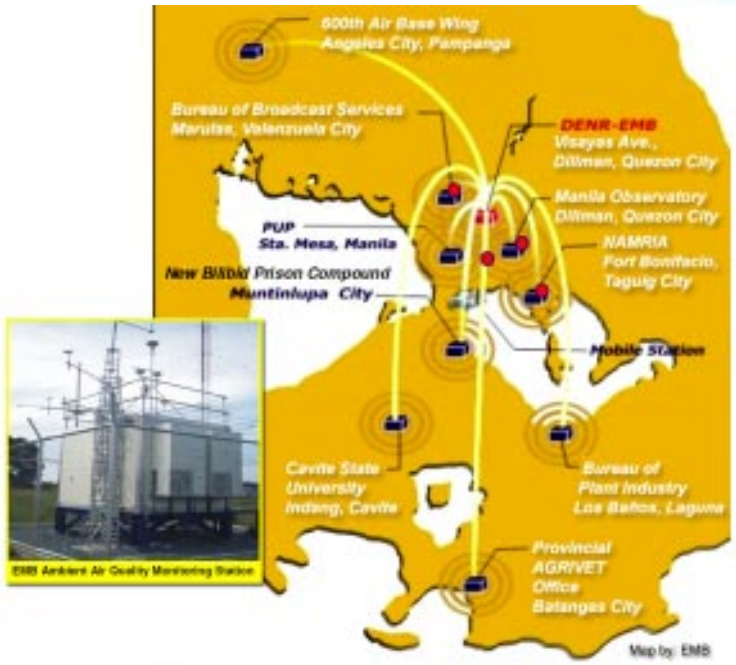
Table 1. EMB Roadside TSP Monitoring Stations in Metro Manila

- EDSA cor. Congressional Ave.
- EDSA – National Printing Office
- EDSA cor. East Avenue
- EDSA – MMDA Office
- EDSA cor. Taft
- Valenzuela City Hall
- Ateneo, Katipunan Ave.
- Mandaluyong City Hall
- Pasig – LLDA compound
- Ayala cor. Gil Puyat
- Pasay City Hall
- Rizal Avenue – Dep't. of Health

Source: ***EMB***

NO_2, NO, ozone, CO, benzene, xylene, toluene, methane, non-methane hydrocarbon and total hydrocarbon. However, only nine of the stations were operational by end of 2004, including the mobile station temporarily located in Valle Verde, Pasig City. Meteorological conditions that can influence the behavior of air pollutants like wind speed and direction, temperature, rainfall, radiation and humidity are also measured in these stations. The locations of the ten monitoring stations are shown in Figure1.

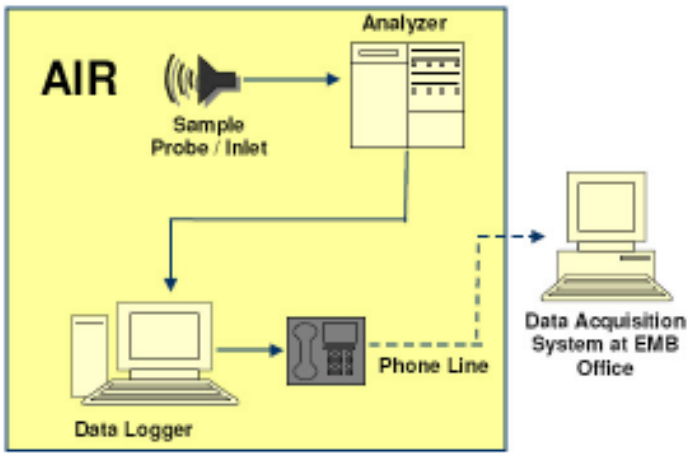
Figure 1. Location of the Metro Manila Airshed Air Quality Monitoring Network and PNRI Monitoring Stations



The monitoring equipment used in the different stations are listed in Table 2. Pollutant concentrations measured by the different equipment/analyzer are stored in data logger in the station and are transmitted to the data acquisition system located at the EMB Central Office in Quezon City (Figure 2). All stations follow the USEPA quality assurance/quality control procedures.

Aside from the EMB, the PNRI and the Manila Observatory conduct air quality monitoring in Metro Manila. In 2003, the PNRI measured PM_{10} and $PM_{2.2}$ using the Gent dichotomous sampler in two monitoring sites located in Ateneo and Poveda Learning Center. While the criteria pollutant is $PM_{2.5}$, the PNRI equipment measured $PM_{2.2}$. In 2004, it started the operation of two additional stations in Valenzuela City and NAMRIA. Locations of PNRI stations are shown in Figure 1. Three of the PNRI stations are co-located with the EMB real time monitoring stations and can thus provide source apportionment data for these sites. The Manila Observatory measured PM_{10} and $PM_{2.5}$ in 10 sites in Metro Manila as listed in Table 3. It also measured ozone, NO_2, SO_2, benzene, toluene and p-xylene at the Manila Observatory compound in Quezon City.

Figure 2. Flow Diagram of the Metro Manila Air Quality Monitoring Network



Cebu City has an automatic ambient air quality monitoring station located at the University of San Carlos, Talamban Campus. The station has PM_{10} samplers and an open-path system such as DOAS (Differential Optical Absorption Spectroscopy) to measure NO_2, ozone, SO_2 and benzene concentrations continuously and to report average concentrations on an hourly basis.

Cagayan de Oro City has a monitoring station similar to Cebu City located at the Xavier University Campus.

Davao City in 2004 has four operational manual monitoring stations measuring SO_2, NO_2 and ozone.

Cebu City ambient air quality monitoring station located at the University of San Carlos Campus.

Table 2. Monitoring Equipment in the Ambient Air Quality Monitoring Network in Metro Manila Airshed

PARAMETER	EQUIPMENT/METHOD
Ozone	UV Photometric Ozone Analyzer
SO_2	Pulsed Fluorescence SO_2 analyzer
CO	Gas Filter Correlation CO analyzer
NO_X	Chemiluminescence
HC	Cross-flow modulated selective combustion type method with a hydrogen ion detection method
PM_{10}, $PM_{2.5}$	Beta Attenuation Monitor (BAM)
BTX	Open-path analyzer - DOAS (differential optical absorption spectroscopy)

Table 3. Manila Observatory's PM_{10} and $PM_{2.5}$ Sampling Sites

SITE	SITING TYPE	LOCATION	SAMPLING DATES
MO	Mixed	Manila Observatory, Ateneo de Manila Univ., Quezon City	08/00 - present
GS	Background	Good Shepherd Spiritual Center, Antipolo City	02/02 - present
Inarawan	Background	Barangay Inarawan, Antipolo City	02/03 – 05/03
Las Piñas	Residential	BF Alamanza, Las Piñas City	09/02 – 01/03
NPO	Traffic	National Printing Office, EDSA, Quezon City	05/04 – 05/04
PGH	Commercial	Gynecology Dept., Philippine General Hospital, Manila	05/02 – 05/04
Pasig	Industrial	Chason Southville Executive Homes, Pasig City	09/02 – 05/04
Pateros	Residential	Barangay Martinez del 96, Pateros	02/03 –05/03
Taguig	Agricultural	Barangay Calzada, Taguig	02/03 –05/03
Valenzuela	Industrial	Barangay Mapulang Lupa, Valenzuela City	09/02 –05/03

Ambient Concentrations of Criteria Pollutants

Criteria pollutants are air pollutants for which the National Ambient Air Quality (NAAQ) Guideline Values have been established under the Clean Air Act of 1999 as shown in Table 4. EMB monitors the concentrations of these criteria pollutants, which include total suspended particulates (TSP); particulate matter 10 microns in diameter or smaller (PM_{10}); sulfur dioxide (SO_2); nitrogen dioxide (NO_2); carbon monoxide (CO); lead (Pb); and ozone (O_3).

Table 4. Philippine National Ambient Air Quality (NAAQ) Guideline Values

POLLUTANTS	Short Term			Long Term		
	µg/Nm³	ppm	Averaging Time	µg/Nm³	ppm	Averaging Time
TSP	230	-	24 hours	90		1 year
PM_{10}	150	-	24 hours	60		1 year
Sulfur dioxide	180	0.07	24 hours	80	0.03	1 year
Nitrogen dioxide	150	0.08	24 hours			
Photochemical oxidants as ozone	140 60	0.07 0.03	1hour 8 hours			
Carbon monoxide	35 µg/Nm³ 10 µg/Nm³	30 9	1hour 8 hours			
Lead	1.5	-	3 months	1.0		1 year

Source: ***Philippine Clean Air Act of 1999, section 12***

TOTAL SUSPENDED PARTICULATES (TSP)

In 2004, the annual mean TSP guideline value was exceeded in all of the twelve roadside TSP monitoring stations in Metro Manila, while in 2003, it was exceeded in nine of the ten monitoring stations (Figure 3). The intersection of EDSA and Congressional Avenue registered the highest annual mean concentration (at 275 µg/Nm³) in 2004 while in 2003 the highest mean concentration was measured at the Valenzuela City Hall (at 247 µg/Nm³).

Monitoring data also showed that TSP concentrations were highest at stations located near intersection of major roads. Five roadside monitoring stations registered improvements in TSP concentrations while the other five stations recorded deterioration.

In major cities and urban centers outside Metro Manila, the annual mean TSP guideline values were exceeded in 18 out of the 24 monitoring stations in 2004 and in 26 out of 32 in 2003 (Table 5). In 2004, the monitoring station in Bocaue, Bulacan registered the highest TSP mean value of 859 µg/Nm³. This value, which is almost ten times the NAAQ guideline value, was attributed to the presence of rice mills near the sampling site. Other cities, which registered TSP concentrations at more than twice the NAAQ guideline values were Baguio City, Alaminos City, San Fernando City in La Union, Calapan City, Iloilo City

TOTAL SUSPENDED PARTICULATES (TSP) are small solid or liquid particles suspended in air. Major sources of TSP are diesel vehicles and coal-burning power plants. Dust is also a major source of TSP especially during the dry months. Dust can come from unpaved roads and contruction activities.

NAAQ Guideline Values for PM10

- 230µg/Nm³ (24-hour)
- 90 µg/Nm³ (1-year)

¨2003 the highest mean concentration was measured at the Valenzuela City Hall (at 247 µg/Nm³).

Table 5. Annual Mean Roadside TSP Levels in Major Cities and Urban Centers in the Philippines, 2003 – 2004 (µg/Nm³)

REGION	CITY/ PROVINCE	LOCATION	2003 Min	2003 Max	2003 Annual Mean	2004 Min	2004 Max	2004 Annual Mean
CAR	Baguio City	Session Road	84	658	229	104	287	204
1	Alaminos City	Jolibee Bldg.	77	673	312	ND	ND	ND
1	San Fernando City	City Plaza	44	294	183	ND	ND	ND
1	Laoag City	Heroes Bldg.	ND	ND	ND	78	190	130
2	Tuguegarao City	Tanza	15	136	59	118	346	198
3	San Fernando City	San Jose	ND	ND	ND	5	514	117
3	Bulacan	Iba, Meycawayan	ND	ND	ND	5	604	101
3	Bulacan	Saluysoy, Meycawayan	14	450	148	21	711	141
3	Cabanatuan City		24	225	102	ND	ND	ND
3	Bulacan	Wakas, Bokaue	236	1238	859	ND	ND	ND
4-A	Cavite City	Trece Martires	11	334	84	21	336	79
4-A	Batangas	Alangilang	35	268	144	10	358	127
4-B	Calapan City	Sta. Isabel	38	1266	214	ND	ND	ND
5	Legaspi City	Barriada	14	424	87	34	444	110
5	Iriga City	San Nicolas	19	714	108	7	473	110
5	Naga City	Panganiban Drive	14	198	84	8	731	13
6	Iloilo City	Jaro Police Stn.	55	394	182	70	530	177
6	Iloilo City	La Paz Plaza	16	317	104	17	374	92
7	Cebu City	Oportos Residence	ND	ND	ND	12	232	72
7	Cebu City	Baricuatros Res.	ND	ND	ND	15	646	117
7	Cebu City	Canos Residence	ND	ND	ND	11	395	93
8	Tacloban City	P & M Bldg.	ND	ND	ND	47	198	100
9	Zamboanga City	ZCMC	110	334	220	154	376	237
9	Zamboanga City	Buenavista St.	125	336	212	167	299	226
9	Zamboanga City	San Jose Rd.	120	288	221	175	301	227
9	Zamboanga City	Zamboanga E.Z.	ND	ND	ND	14	94	39
9	Zamboanga City	Fish Port Complex	ND	ND	ND	22	101	47
11	Davao City	Purok 3, Sasa	27	95	56	39	249	97
11	Davao City	J. P. Laurel	30	175	64	120	285	185
11	Davao City	Bangkerohan	42	262	97	ND	ND	ND
11	Davao City	Agdao	47	272	92	194	680	335
11	Davao City	Nova Tierra Subd.	ND	ND	ND	22	88	42
11	Davao City	Quirino Ave.	ND	ND	ND	133	602	249
11	Davao City	Km. 10 Kabantan	ND	ND	ND	18	92	39
12	General Santos	Cargil (Phils.), Inc.	104	190	135	ND	ND	ND
12	South Cotabato	Banga	82	101	92	ND	ND	ND
12	South Cotabato	PolomoloK	ND	ND	ND	87	151	99
12	South Cotabato	Suralla	ND	ND	ND	80	109	93
12	South Cotabato		ND	ND	ND	83	114	95
12	North Cotabato	Makilala	83	99	91	ND	ND	ND
13	Butuan City	New Asia	45	152	83	45	185	96

LEGEND:

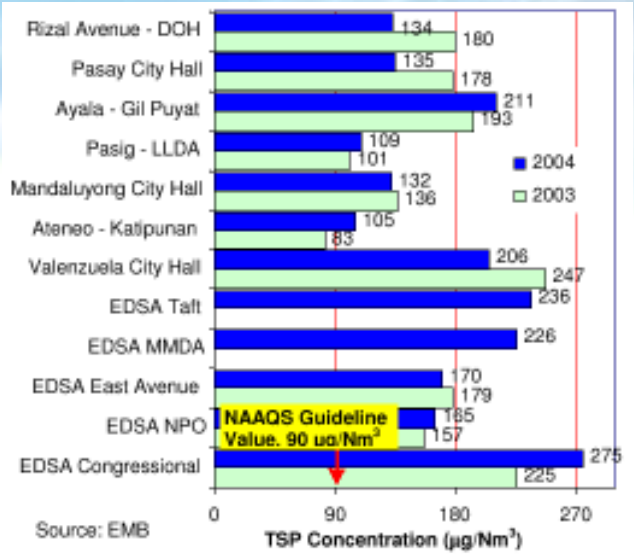
- 0-90 µg/Nm3
- 91-180 µg/Nm3
- 181-270 µg/Nm3
- above 270µg/Nm3
- ND – no data

Source: ***EMB***

and Zamboanga City. In 2003, the highest TSP annual mean concentration was monitored in Agdao, Davao City at 335 μg/Nm³ with Baguio City, Tuguegarao City and Zamboanga City registering concentrations at more than twice the NAAQ guideline value.

The data on TSP levels should be viewed as indicative of the pollution level at the vicinity where the monitoring stations were located and cannot be seen as representative of the TSP concentration of the city or province where the stations were located. Stations, which recorded very high TSP levels, are in general, located on the roadsides. Roadside TSP includes vehicle exhaust and resuspended dust.

Figure 3. Annual Geometric Mean of Roadside TSP Levels in Metro Manila, 2003 - 2004 (mg/Nm³)



PM_{10}

From June to December 2004, relatively higher PM_{10} concentrations were measured in monitoring stations within Metro Manila compared to those outside Metro Manila as shown in Figure 4. The annual mean PM_{10} concentration for the nine monitoring stations has not been determined as monitoring only covered six months.

TOTAL SUSPENDED PARTICULATES (TSP) are small solid or liquid particles suspended in air. Major sources of TSP are diesel vehicles and coal-burning power plants. Dust is also a major source of TSP especially during the dry months. Dust can come from unpaved roads and contruction activities.

NAAQ Guideline Values for PM_{10}
- **150** μg/Nm³ (24-hour)
- **60** μg/Nm³ (1-year)

In 2003, PNRI PM_{10} monitoring stations in Quezon City showed that the 24-hr guideline value had not been exceeded. PNRI-monitored PM_{10} concentrations were from 42.2 to 46.9 μg/Nm³ at its Poveda Learning Center station and from 46.2 to 53.5 μg/Nm³ at its Ateneo de Manila station. These concentrations were well below the PM_{10} ambient air quality guideline values. In 2004, similar conditions were monitored by PNRI with none of the monitoring stations recording PM_{10} concentration exceeding the 24-hour and annual NAAQ guideline values as shown in Figure 5. Based on analysis conducted on samples it collected from its monitoring stations, PNRI identified fuel burning and soil as the major sources of PM_{10} in Metro Manila.

Monitoring conducted by the Manila Observatory also showed that the 24-hr guideline value was not exceeded in 2003 and 2004. However, annual mean guideline value for PM_{10} was exceeded along EDSA and in Valenzuela City as shown in Figure 6.

In 2003, PM_{10} concentrations in Cagayan de Oro City were below the NAAQ guideline value (Figure 7). The maximum 24-hr average concentration was 75 μg/Nm³ and the annual mean was 39 μg/Nm³. Average monthly PM_{10} concentrations were higher during the dry season (February to May) compared to the rest of the year.

Figure 4. Monthly average PM_{10} Concentrations in Metro Manila Airshed Air Quality Monitoring Stations, June – December 2004.

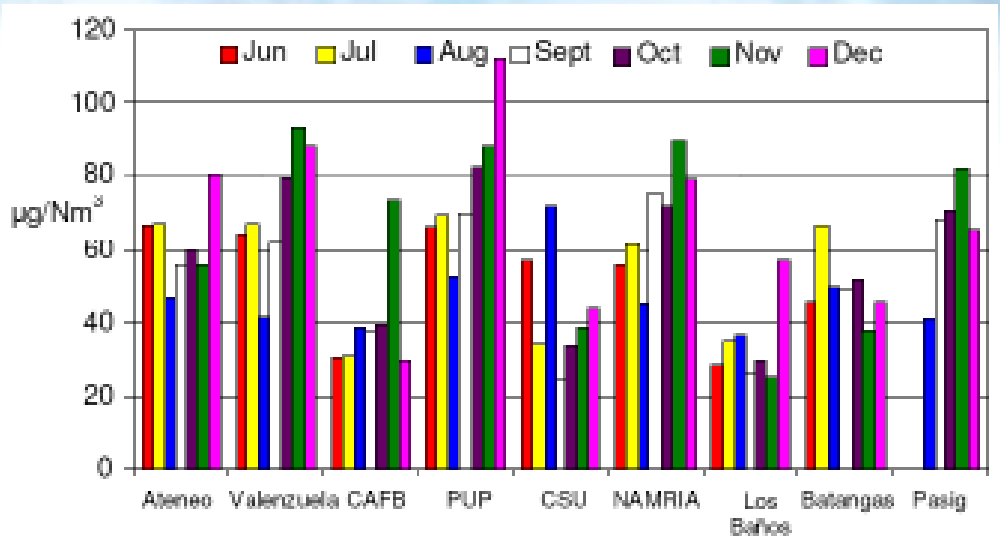


Figure 5. PM_{10} Levels in Metro Manila, 2004

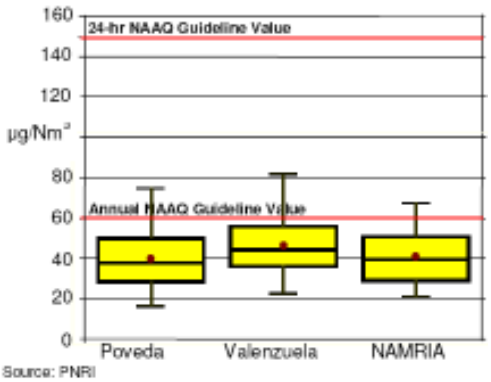


Figure 6. 24-hour PM_{10} Concentrations (August 2000 to February 2004)

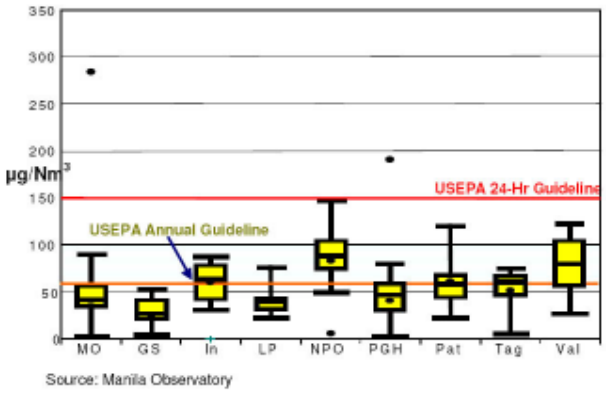
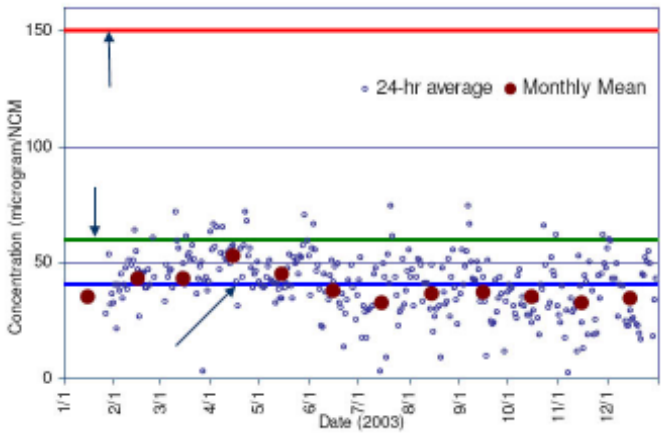


Figure 7. PM_{10} Concentration in Cagayan de Oro City, 2003



$PM_{2.5}$

In 2003, PNRI measurements showed that the annual mean $PM_{2.2}$ concentration at the Ateneo de Manila was 28 µg/Nm³ while at the Poveda Learning Center, it was 18 µg/Nm³. These values were beyond the 15 µg/Nm³ USEPA $PM_{2.5}$ standard for one year averaging time.

Monitoring data of PNRI for $PM_{2.2}$ showed that the annual means for 2004 at its three monitoring stations were beyond the USEPA guideline value (Figure 8). Source apportionment using 2002 elemental data for $PM_{2.2}$ conducted by PNRI showed that the primary source of $PM_{2.2}$ (about 75%) was fuel combustion as shown in Figure 9.

Another study conducted by the Manila Observatory from August 2000 to February 2004 showed that $PM_{2.5}$ concentration was highest at National Printing Office along EDSA in Quezon City where approximately 50% of the samples were above the USEPA 24-hr guideline value. The average concentrations in all the seven stations of the Manila Observatory were beyond the USEPA annual guideline value (Figure 10).

DENR has not established **$PM_{2.5}$** national ambient guideline value and **$PM_{2.5}$** monitoring station.

USEPA Guideline Values for **$PM_{2.5}$**
- **15** µg/Nm³ (1-year)
- **65** µg/Nm³ (24-hour)

Figure 8. Fine Particulate Levels in Metro Manila, 2004

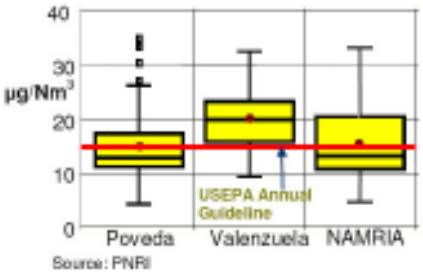


Figure 9. Pollutant Source for PM_{10}

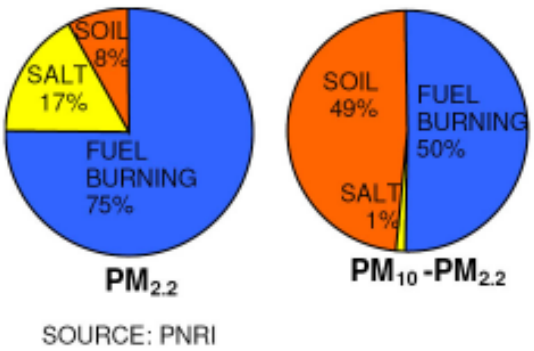
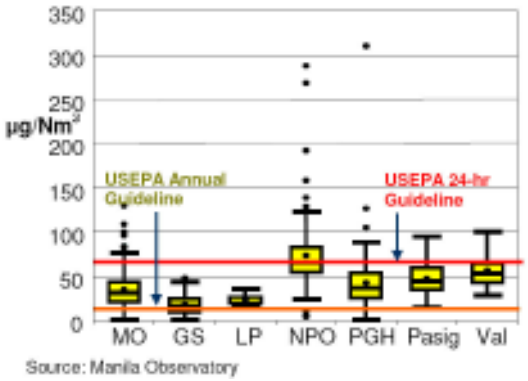


Figure 10. 24-hr $PM_{2.5}$ Concentrations (August 2000 to February 2004)



SULFUR DIOXIDE (SO_2)

From June to December 2004, the 24-hr guideline value for SO_2 was not exceeded in the Metro Manila Airshed based on monitoring data from nine EMB stations.

In 2003, monitoring data from the Manila Observatory also showed that annual mean SO_2 concentrations in Metro Manila were below the NAAQ guideline value (Figure 11).

Power plants and motor vehicles that burn fuels containing sulfur emit **SULFUR DIOXIDE**.

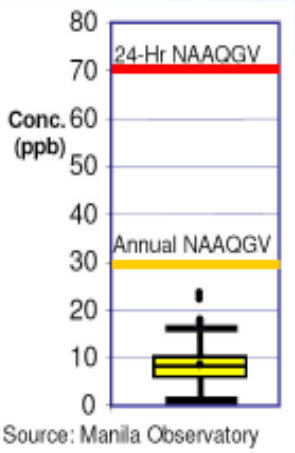
NAAQ Guideline Values for SO_2
- 150 µg/Nm³ = 70 ppb (24-hour)
- 60 µg/Nm³ = 30 ppb (1-year)

The relatively higher SO_2 concentrations can be attributed to higher number of diesel vehicles burning sulfur-containing diesel fuels and industrial facilities that burned high sulfur (3%) fuel oil in these areas.

Davao City. In 2003, the annual mean SO_2 concentrations in three monitoring stations in Davao City ranged from 1.44 to 2.0 μg/Nm³, while in 2004, it ranged from 1.53 to 2.0 μg/Nm³. These concentrations were well below the NAAQ guideline value.

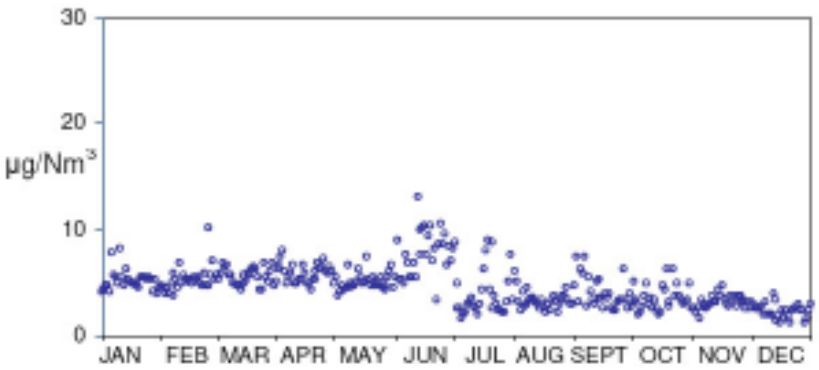
Cagayan de Oro City. In 2003, 24-hr SO_2 average concentration in Cagayan de Oro City was from 1.15 to 13.06 μg/Nm³ with an annual mean of 4.14 μg/Nm³ as shown in Figure 12. These values were well below the NAAQ guideline value. Average monthly SO_2 concentrations were higher during the dry season (February to June) compared to the rest of the year.

Figure 11. SO_2 Concentrations at Ateneo, 2003



Source: Manila Observatory

Figure 12. SO_2 Concentration (24-hour Averaging Time) in Cagayan de Oro City, 2003



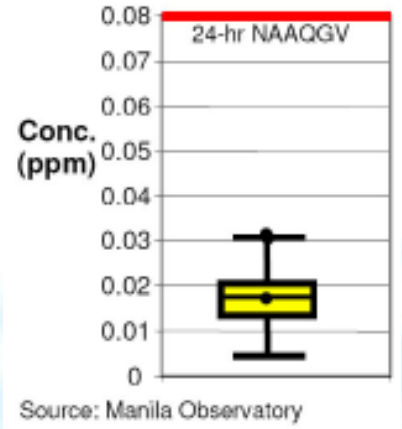
CARBON MONOXIDE is a product of incomplete combustion. Its principal source is gasoline engine.

NAAQ Guideline Values for CO
- 35 μg/Nm³ = 30 ppm (1-hour)
- 10 μg/Nm³ = 9 ppm (8-hour)

NITROGEN DIOXIDE (NO_2)

In 2003, the 24-hour NAAQ guideline value for NO_2 was not exceeded in the Metro Manila Airshed based on monitoring data from the Manila Observatory as shown in Figure 13.

Figure 13. NO_2 Concentrations at Ateneo



Source: Manila Observatory

NITROGEN OXIDES, which include NO and NO_2, are produced when air is subjected to high temperature and high pressure such as in diesel engines.

NAAQ Guideline Values for NO_2
- 150 μg/Nm³ = 80 ppm (24-hour)

OZONE is produced through the reaction of nitrogen oxides (primarily from diesel engines), volatile organic compounds (VOC) (primarily from gasoline engines), and UV rays (from the sun).

NAAQ Guideline Values for ozone
- 140 μg/Nm³ = 70 ppb (1-hour)
- 60 μg/Nm³ = 30 ppb (8-hour)

LEAD (Pb)

Monitoring data from the PNRI showed that in 2003 the annual average concentration of lead in the ambient air is much less than the 1.0 μg/Nm³ NAAQ Guideline Value.

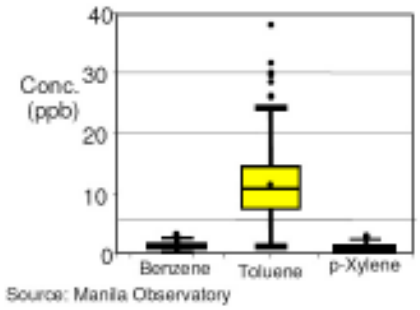
NAAQ Guideline Values for lead
- 1.5 μg/Nm³ (3 months , 24-hour averaging time)
- 1.0 μg/Nm³ (1 year , 24-hour averaging time)

Non-Criteria Pollutants

VOLATILE ORGANIC COMPOUND

Concentrations of benzene, toluene and p-xylene monitored at the Manila Observatory in Quezon City are shown in Figure 14.

Figure 14. Benzene, Toluene and p-Xylene monitored at the Manila Observatory, 2003.



Source: Manila Observatory

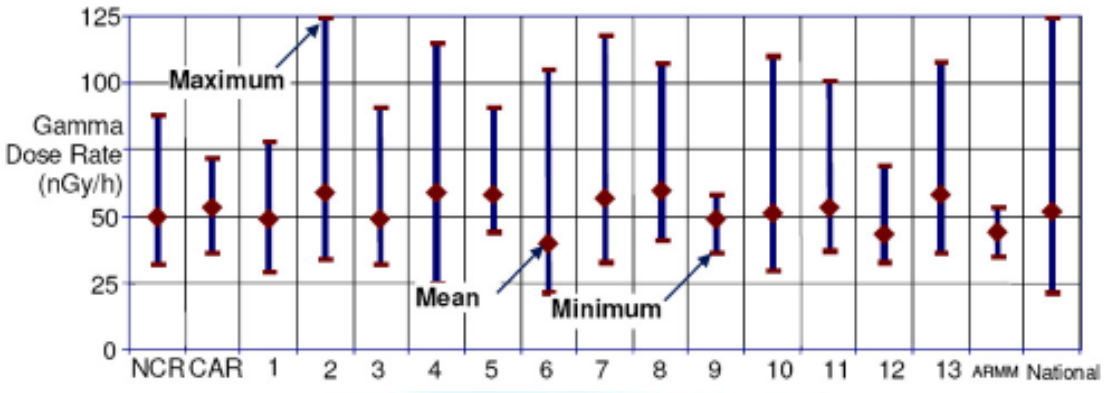
OZONE DEPLETING SUBSTANCES (ODS)

ODS consumption in 2003 totaled 1658 metric tons, which included 1,422 tons of CFCs, 191 tons of HCFCs and 45 tons of methyl bromide.

RADIOACTIVE COMPOUNDS

The PNRI measured ambient gamma radiation in different parts of the country from 1982 to 2004 using portable and car-borne gamma spectrometers. From these measurements, the country-wide mean gamma dose rate was calculated as 52 ± 7 nGy/h with values ranging from 21 – 124 nGy/h. The mean gamma dose rate for the Philippines is within the global background radiation level reported in UNSCEAR 1988 at 55 nGy/h with values ranging from 24 – 85 nGy/h. Large variation in values is observed for areas with high radioactivity levels such as regions 2, 4 and 7 due to high concentration of naturally occurring radionucleids in these sites (Figure 15).

Figure 15. Average Gamma Dose Rates per Region (1982 – 2004).



Sources of Pollution

MOBILE SOURCES

In 2004, the 377 Private Emission Testing Centers (PETCs) nationwide tested a total of 3,064,141 motor vehicles, with 97.85 percent passing the emission test and only 2.15 percent failing the test (Source: LTO MID).

STATIONARY SOURCES

In 2004, the DENR conducted emission testing of 213 stacks in 103 different facilities in the Metro Manila Airshed (NCR, Region III, and Region IV). Parameters tested varied based on industry and fuel type but included one or more of the following: PM, SO_X, NO_X and CO. Out of the 213 stacks tested, 135 (or 63%) failed to meet the CAA limit for at least one parameter. About one out of two stacks tested failed to meet the emission standard for sulfur dioxide. On the other hand, about one out of three stacks tested failed the standard for PM. Facilities that did not meet the emissions limit were required by the EMB Regional Office to submit compliance plan describing how their facilities can comply with the CAA emissions standard. Stack testing was conducted by the DENR, together with the experts, as part of the Outsource Sampling Project under the MMAQISDP.

AREA SOURCES

The Ecological Solid Waste Management Act of 2000 (Republic Act No. 9003) prohibits open burning of wastes. Enforcement of this provision of the Act ensures elimination of emissions from waste burning, including the release of dioxins and furans. The DOST has identified uncontrolled combustion as the highest source of dioxins and furans in the Philippines.

Health Impacts of Air Pollution

The Department of Health published in June 2004 a report on *Public Health Monitoring: A Study under the Metro Manila Air Quality Improvement Sector Development Program*, which reported the following findings:

- Fine particulate matter ($PM_{2.5}$) and ozone are pollutants of serious health concern in Metro Manila;
- Motor vehicles are the major sources of particulate pollution in Metro Manila;
- Considerable morbidity and mortality due to respiratory and cardiovascular diseases could have been prevented with better air quality in Metro Manila in 2002;
- For every 10 $\mu g/m^3$ increase in PM_{10}, incidence rates for respiratory and natural mortality increase by 2.6% and 3.9%, respectively;
- Indoor PM_{10} increases as outdoor PM_{10} increases with cigarette smoking as significant contributor to indoor PM_{10} levels;
- Better cooking fuel quality reduces occurrence of hospital admissions. Household using LPG as fuel for cooking has the lowest hospital admissions of 19.3% compared with those using wood (27.3%) and kerosene (25.3%).
- Child Health:
  - Incidence of respiratory symptoms and diseases increases as level of exposure to particulate matter pollution increases;
  - Asthma incidence rate is 14.9 per 1,000 population in high PM_{10} exposure area, 11.5 in medium exposure area and 8.2 in low exposure area.
  - Significant risk factors for respiratory symptoms are age, indoor NO_2 level, cooking fuel and educational attainment of mothers;
  - There is a significant improvement in blood lead levels among children in Metro Manila. In 2003, only 34.6% of study children exceeded the US Center for Disease Control guideline value of 10 $\mu g/dl$, an improvement from the 90.3% value in 2000.
- Adult Health:
  - The type of household cooking fuel and number of smokers in the household are significant predictors of respiratory symptoms among adults;
  - Fine particulate pollution contributes to events of respiratory symptoms and diseases

The same study estimated the deaths in Metro Manila attributable to PM_{10} level above 50 $\mu g/m^3$ were from 230 to 390 persons.

Government, NGO, Private Sector, and International Development Community Responses

AIRSHED DESIGNATION

The DENR has designated a total of 15 airsheds in the country including the four geothermal airsheds and their respective governing boards to better manage air quality in the country. Geothermal airsheds cover areas where there is existing geothermal energy development and power plant. The designated airsheds and their area covered are listed in Table 6.

Table 6. DENR-Designated Airsheds

Airshed	Coverage
Metro Manila (DAO 2002-05)	17 cities and municipalities of Metro Manila, Region 3 (excluding Nueva Ecija) and Region 4-A (excluding Quezon province)
Metro Cebu (DAO 2002-21)	Cities of Cebu, Talisay, Mandaue and Lapu-Lapu and municipalities of Naga, Minglanilla, Cordova, Consolacion, Liloan and Compostela.
Davao City	Davao City
BLIST (DAO 2003-04) (BLIST)	Baguio City and municipalities of La Trinidad, Itogon, Sablan and Tuba
Agusan del Norte (DAO 2003-16)	Butuan City, Buenavista, Cabadbaran, Carmen, Jabonga, Kitcharo, Las Nieves, Magallanes, Nasipit, Santiago, Tubay and Remedios T. Romualdez
Naga City (DAO 2003-33)	Abella, Balatan, Bagumbayan Norte, Lerma, Liboton, Bagumbayan Sur, Pacol, Sta Cruz, Concepcion Pequeña, Sabang, San Isidro, Dayangdang, Dinaga, Triangulo, Del Rosario, Tabuco, Cararayan, Panicuason, Tinago, Igualdad, Peñafrancia, Calauag, San Felipe and San Francisco.
Cagayan de Oro City (MC No. 17 and DAO 2003 –04)	Cagayan de Oro City and municipalities of Jasaan, Villanueva, Tagoloan, Opol and El Salvador.
Zamboanga City (DAO 2003-47)	Zamboanga City
Northeastern Pangasinan (DAO 2004-07)	Binmaley, San Fabian, Lingayen, San Jacinto, Calasiao, Mangaldan, Binalonan, Malasiqui, Laoac, Mapandan, Pozorrubio, San Carlos City, Sison, Sta. Barbara, Urdaneta City, Dagupan City, San Manuel and Manaoag.
Metro Tuguegarao (DAO 2004-05)	Peñablanca, Iguig, Enrile, Solana, Tuguegarao City, Tuao and Amulong (PIESTTA)
South Cotabato (DAO 2004-22)	Cities of General Santos and Koronadal and the municipalities of Polomolok, Tupi, Tampakan, Tantangan, Banga, Surallah, Noralla, Sto. Niño, T'boli and Lake Sebu
Leyte Geothermal (DAO 2004-12)*	City of Ormoc and municipality of Kananga in the province of Leyte
Southern Negros Geothermal (DAO 2004-14)*	Municipality of Valencia in the province of Negros Oriental
Bacon-Manito Geothermal (DAO 2004-11)*	City of Sorsogon in the Province of Sorsogon; Municipality of Manitoin the province of Albay
North Cotabato Geothermal (DAO 2004-13)*	City of Kidapawan in the province of North Cotabato

* The geothermal airsheds cover part of the indicated city or municipality. Coordinates and boundaries are provided in the respective administrative orders.

EMISSION STANDARDS

Hydrocarbon (HC) emissions from motorcycles and tricycles. The standard for HC emissions from in-use motorcycles and tricycles was set in DAO No. 2003 – 25 issued on July 18, 2003. Maximum HC emissions from motorcycles and tricycles are set at 7,800 ppm for those operating in urban centers and 10,000 ppm for those operating in rural areas or outside of the urban centers. Urban centers include cities, provincial capital cities/municipalities and metro areas such as Metro Manila, Metro Cebu, and Metro Iloilo.

Revision of emissions standards for in-use motor vehicles equipped with spark-ignition (gasoline-fed) engines. DAO 2003 – 51 (*Revised Emission Standards for In-Use Motor Vehicles Equipped with Spark-Ignition or Compression-Ignition Engines except Motorcycles*) issued on October 29, 2003 revised the emissions standards for in-use motor vehicles to harmonize them with the standards for new motor vehicles and correct them to realistic levels. With the revised standards, gasoline-fed engine vehicles initially registered on or before December 31, 2002 are allowed CO emissions of up to 4.5 % by volume and HC emissions of up to 800 ppm, while emissions for those registered after January 1, 2003 are 3.5 % CO and 600 ppm HC. The summary of the changes in emissions standards is shown in Table 7.

Table 7. Comparison of Old and Revised Emissions Standards for In-Use Gasoline-Fed Engines.

Revised (DAO 2003-51)			Old (DAO 2000-81)		
Date of 1st Registration	CO (% volume)	HC (ppm as hexane)	Date of 1st Registration	CO (% volume)	HC (ppm as hexane)
			On or before 12/31/1997	4.5	800
On or before 12/31/2002	4.5	800	01/01/1997 – 12/31/2002	3.5	600
On or after 01/01/2003	3.5	600	On or after 01/01/2003	0.5	100

Contrary to popular belief, DAO 2003-51 did not revise the Clean Air Act but simply harmonized the emissions standards for in-use motor vehicles with the emission standards for new motor vehicles.

Revision of smoke opacity standard for in-use diesel vehicles. DAO 2003-51 also set the emissions standard for diesel vehicles at a uniform value of 2.5 m-1 light absorption coefficient (K value). The new standard, unlike the old standard, did not make any differentiation on engine type and date of registration. Comparison of the old and revised standards is shown in Table 8.

Table 8. Comparison of Old and Revised Smoke Opacity Standard for In-Use Diesel Vehicles.

Revised (DAO 2003-51)			Old (DAO 2000-81)		
Date of 1st Registration	Naturally Aspirated	Turbo Changed	Date of 1st Registration	Naturally Aspirated	Turbo Changed
Any date	2.5	2.5	On or before 12/31/2002	2.5	3.5
			On or after 01/01/2003	1.2	2.2

MOTOR VEHICLE EMISSION TESTING

The requirement of passing an emission test before registration was implemented starting January 1, 2003. Emission tests of private vehicles were conducted in PETCs authorized by the DOTC and duly accredited by the DTI. Public utility vehicles were given the option to have their vehicles tested in the LTO's Motor Vehicle Inspection System (MVIS) at a reduced rate.

As of December 31, 2004, there were 377 DOTC-authorized/DTI-accredited PETCs with 475 stationary lanes and 25 mobile units. However, there were some areas where there were no operating PETCs such as: the islands of Batanes, Marinduque, Bantayan, Basilan, Jolo, Tawi-tawi and Camiguin; the cities of Palayan, Silay, Calbayog and Marawi; and the provinces of Aurora, Maguindanao, and Lanao del Sur.

Table 9. DOTC-Suspended PETCs.

Action	2004	2003	Total
Warning	3	0	3
Temporary Suspension	69	16	85
Cancellation	8	0	8
Total	80	16	96

Source: DOTC

The PETCs were closely monitored by the DENR, the DOTC, and DTI through a tripartite monitoring team created under the Joint DENR-DOTC-DTI Administrative Order No. 2003-01. Monitoring seeks to ensure the integrity and effectiveness of PETC operations. Table 9 shows that in 2003 and 2004, as a result of this vigilant monitoring of concerned agencies, 96 PETCs were given temporary suspensions resulting to cancellation of authorization of eight PETCs and issuance of warning to three. The suspension of the other 85 PETCs was lifted after correction of violations and compliance with deficiencies.

ANTI-SMOKE BELCHING

In 2004 and 2003 a total of 16,250 and 21,141 diesel-fed vehicles, respectively were apprehended for smoke belching. The reduction in the number of apprehensions from 2003 to 2004 was primarily because of the stoppage of operation of MMDA and DOTC, which in 2003 accounted for more than half of the total apprehensions.

In September 2003, the DENR with other government agencies, members of the civil society and NGOs launched the Smoke-free EDSA Campaign, which aimed to reduce the level of TSP along EDSA by 20 percent at the end of 2003.

FUELS STANDARD

The DOE created a Technical Committee on Petroleum Products and Additives, which was tasked to formulate and review standard specifications for petroleum products taking into consideration international developments in fuel quality, vehicle technology and emissions standards.

Fuel standards. The DOE completed the following standards that are now part of the Philippine National Standards (PNS) for petroleum products: (1) PNS/DOE Quality Standard (QS) 004:2004 (Diesel oils complying to CAA); (2) PNS/DOE QS 003:2004 (Two-stroke (2T) lubricating oil); and (3) PNS 2020:2003 (100% Coco-Methyl Esters (CME) for blending with diesel). The DOE has also developed and endorsed to the Bureau of Product Standards the quality standard for LPG as motor vehicle fuel (PNS/DOE QS 005:2004) and has started review of standards for unleaded gasoline, bunker fuel oil and ethanol as motor vehicle fuel.

Fuel additive registration. The DOE issued permanent registrations to five fuel additives in 2003, while four were issued in 2004. Permanent registration is granted to fuel additives after screening their chemical components and ensuring that these chemicals do not contribute harmful emissions.

ALTERNATIVE FUELS

The use and promotion of alternative clean fuels such as compressed natural gas (CNG), liquefied petroleum gas (LPG), ethanol and CME as diesel additive have made significant headway.

CME. Beginning July 2004, government vehicles were required to use diesel fuel blended with 1% CME by the Malacañang Memorandum Circular No. 55 (*Directing all Departments, Bureaus, Offices, Agencies and Instrumentalities of the Government to Use 1% by Volume "Coco Methyl Ester" in their fuel requirements for the Diesel Vehicles*).

At the forefront of the campaign to use CME is the National Clean Diesel Task Force under the Presidential Adviser on Agricultural Modernization and the Philippine Coconut Authority (PCA). Biodiesel refueling pump stations have been setup inside the PCA central office in Quezon City. The PNS for CME was established in 2004.

CNG. The Natural Gas Vehicle (NGV) Program for Public Transport was launched in late 2002. A mother-daughter fueling system will be set up in Batangas and Metro Manila to promote the use of CNG by 100 public buses.

The Development Bank of the Philippines (DBP) approved the loan application of several companies for acquisition of CNG buses. Incentives and privileges include income tax holiday for qualified NGV industry and related activities under the BOI 2003 Investment Priority Plan. In addition, only one percent rate of duty is levied on imported NGVs, NGV engines and other related equipment, facilities, parts and components as certified by DOE.

LPG. Initiatives on the use of LPG as automotive fuel are private sector-led. An example is the Emerson Taxi Company in Cebu which has a fleet of 50 taxicabs fueled by LPG and supported by Shell Gas LPG, which installed refueling facility for the company.

Ethanol. The DOE undertook assessment of the local ethanol industry that focused on capacity, processes and ethanol quality as part of the DOE's thrust in introducing ethanol as blending component for gasoline.

AIR QUALITY MANAGEMENT FUND

The DENR and the Department of Budget and Management issued the*Implementing Guidelines on the Operationalization of Air Quality Management Fund* (AQMF) through Joint Circular No. 1, series of 2004. This issuance defines the mechanism for accessing the AQMF that was established under the CAA to enable financing regular programs and activities dedicated to air quality improvement.

PUBLIC AWARENESS

The Public Affairs Office (PAO) of the DENR and the Environmental Education and Information Division (EEID) of the EMB accomplished the following as part of their public awareness mandate, under the MMAQISDP:

♦ Inventory and assessment of Information, Education and Communications (IEC) plans of DENR and other air-related institutions, and of 46 IEC materials on clean air;

♦ Development and conduct of training courses as follows, for DENR/EMB information officers and representatives from various clean air institutions: (i) Web Writing; (ii) Handling Media in Times of Crisis; (iii) Technical Writing and Popularization of Technical Reports; and (iv) Process Documentation;

♦ Conduct of fora on the following: (i) Anti-Smoke Belching Campaign Action Plan and Communication Strategies for LGU Enforcement Teams; (ii) Clean Air for Public Transport Companies; and (iii) EDSA Bus Operators' Forum on Environment-friendly and Cost-Effective Vehicle Handling and Maintenance;

♦ Conduct of Forum on Local Governance for Clean Air where nine LGUs shared success stories on LGU-initiated projects related to clean air (Please see sub section on LGU initiatives);

♦ Launching activities for the Smoke-Free EDSA Campaign held on September 27, 2003, which was attended by 600 participants, and the *Linis Hangin* Program intensified in November 2004, with components on *Bantay Tambutso*, *Bantay Tsimineya* and *Bantay Sunog Basura*. These three program components seek to address the three major sources of air pollution, namely motor vehicles, industries and area sources.

♦ Bike Ride for Clean Air held on November 8, 2003, participated in by over 1000 participants.

The PAO and EEID also developed and distributed the following information and promotional materials:

- ♦ Smoke Free EDSA Campaign brochures, streamers, T-shirts, and visors;
- ♦ Linis Hangin Program streamers, brochures, flyers, posters, and stickers;
- ♦ Clean Air Month Streamers;
- ♦ Posters on Clean Air Act Milestones;
- ♦ Brochures on Clean Air Act Milestones and Towards Cleaner Air;
- ♦ Two television and three radio plugs on clean air, co-produced with GMA 7; and
- ♦ Musical television on clean air.

CAPACITY BUILDING

The EMB is working with a team of international and Filipino experts to strengthen its institutional capabilities to enforce the provisions of the Clean Air Act for stationary sources of pollution. Policies and procedures for permitting, inspection and monitoring are being revised as part of this project under the ADB loan-funded MMAQISDP.

POPS ELIMINATION PROGRAM

The Philippine Senate through Senate Resolution No. 106 ratified the Stockholm Convention on POPs on February 2, 2004. The resolution was submitted to the Stockholm Convention Secretariat on February 27, 2004 and became legally binding on May 27, 2004.

The Convention requires the use of Best Available Technologies and Best Environmental Practices for the destruction of polychlorinated biphenyls (PCBs) and POPs. An initial inventory conducted by the EMB estimated that the amount of PCBs in the country is more or less two million kilograms.

DAO 2004-01 (Chemical Control Order for PCBs) was issued in February 16, 2004 guaranteeing the reduction and elimination of unintentional production of dioxins and furans due to improper treatment/disposal of PCBs in the country.

LGU INITITATIVES

From two-stroke to four-stroke tricycles. To encourage shift from twostroke to four-stroke tricycles, the city government of San Fernando in La Union provided loan package to tricycle operators for the purchase of new four-stroke tricycles. The interest-free loan was payable in one year with a two-month grace period. On the first year of implementation of the project, all of the 25-30 year old two-stroke tricycles in the city were replaced with new four-stroke tricycles.

From incineration to non-burn technology. The province of Cavite installed a 10 metric ton per day autoclave unit at the Emilio Aguinaldo Memorial Hospital for the disposal of health care wastes generated by the hospital and nearby medical establishments. Autoclaving, a non-burn technology, replaced conventional incineration banned under the CAA.

From motorized to non-motorized transport. Marikina constructed 1.36 kilometers of dedicated bikeways on existing roads using local funding and a US$ 50,000 grant from World Bank. An additional US$1.3 million grant from World Bank has already been secured for the construction of the additional 43.92 kilometers of bikeways. The bikeways are meant to provide an environment-friendly alternative transport mode to city residents.

Smoke Free Makati. Makati City issued an ordinance in 2003 banning smoking in all public areas. Violators are fined P1,000 for the first offense, P2,000 for the second offense and P3,000 or imprisonment for the third offense. Easy-to-read brochures, comics and flyers were distributed by the City Government to familiarize the public with the various aspects of the ordinance.

COMPLIANCE ASSISTANCE TO INDUSTRIES

Tax Incentives. Assistance was extended by DENR to industries with the issuance of DAO 2004-53 (*Guidelines to Implement the Tax Incentive Provision of the Philippine Clean Air Act of*

1999). The guidelines apply to installation of pollution control devices or retrofitting of existing facilities with mechanisms that reduce emissions. Under the DAO, industrial firms can avail of the following tax incentives provided by the National Internal Revenue Code of 1997:

¨ Accelerated depreciation
¨ Deductibility of research and development expenditures
¨ Tax credits
¨ Exemption from Real Property Tax
¨ Tax incentives for qualified enterprises operating within Special Economic Zone and Freeport Zones

Permitting. In addition, the DENR also rationalized procedures to systematize air pollution permitting requirement (i.e., DENR deleted the Authority to Construct requirement prior to installation of air pollution source equipment) as provided for in DAO 2004-26.

Loan. The Land Bank of the Philippines granted loans amounting to ¥721.636 million to four companies involved in transportation, manufacturing and power generation as part of the US$ 25 million (¥ 3,057 million) ADB-Air Pollution Control Facility loan. The ADB loan facility, which aimed to finance investments in air pollution control devices and technology to improve air quality, was closed on December 29, 2003 because of low availment.

CIVIL SOCIETY INITIATIVES

Bantay Usok Project. In 2003 – 2004, Bantay Kalikasan was actively involved in roadside apprehension of smoke belchers, in free emission testing and in Text Usok. Bantay Kalikasan, the only NGO with an LTO-deputized anti-smoke belching unit, was able to apprehend a total of 13,123 vehicles in 2003 – 2004. It also provided free emission test for 15,034 vehicles for the same period. Its Text Usok project, which was launched in 2002 with the LTO, MMDA and DOTC, has received more than 369,889 reports via Short Message Service (text), telephone and its website.

INTERNATIONAL DEVELOPMENT COMMUNITY ASSISTANCE

The United States Agency for International Development (USAID) provided assistance to the Philippine Government through the following activities:

1. Conduct of the Integrated Environmental Strategies study that identified policy interventions necessary to reduce PM_{10} in Metro Manila such as the implementation of the MVIS, conversion of two-stroke motorcycles to fourstroke and construction of more rail systems;

2. Technical assistance to DOTC, DENR and DTI in developing mechanism to monitor PETC operations; and

3. Fund assistance for the implementation of "Root Cause Approach to Control Vehicle Emissions" Project. Through this project 34 seminar/workshop/fora were conducted and participated in by 1,347 public utility vehicle operators and drivers, 200 students, 100 professionals and 47 NGO leaders and law enforcers. Pilot studies to demonstrate the economic benefits of preventive maintenance system involving four jeepneys and one bus were conducted.

Recommendations

Ambient air quality monitoring data in 2003 and 2004 show that ambient concentration of particulate matter (TSP, PM_{10} and $PM_{2.5}$) exceeded the NAAQ Guideline Values, both for short-term and long-term exposure in Metro Manila and major urban centers. The high levels of TSP and PM_{10} in major urban cities in the country can be attributed to resuspended dust and vehicle emissions. The hourly ozone concentrations also exceeded the NAAQ Guideline Values depending on the time of the day (specifically between from 1:00 to 4:00 PM).

Based on the above information, efforts in improving air quality in major urban centers should be focused on reducing emission of air pollutants from motor vehicles. The following interventions on implementation (recommendations 1-5) and on policy (6-8) are recommended:

1. Assess and strengthen the performance of the PETCs.

2. Strengthen roadside anti-smoke belching operations.

3. Promote clean technologies for motor vehicles including cleaner fuels and preventive maintenance.

4. Develop and implement the National Motor Vehicle Inspection and Maintenance Program as mandated by the CAA.

5. Strengthen the capacity of LGUs in developing local policies and programs on air quality, specifically on anti-smoke belching.

6. Establish $PM_{2.5}$ NAAQ Guideline Value.

7. Review in-use and type approval emissions standards for motor vehicles especially for PM, HC and NOx.

8. Review fuel standards.

Emission test before registration and roadside anti-smoke belching if properly and efficiently implemented can effectively reduce emissions from motor vehicles. Implementation of PETC monitoring, as specified in the DENRDOTC-DTI JAO No. 1, should be intensified to ensure proper testing of motor vehicles. On the other hand, mobilizing the LGUs can strengthen roadside anti-smoke belching.

With the intensification of efforts to ensure compliance of motor vehicles to emissions standard, efforts must also be directed in providing assistance to vehicle owners. The government should provide vehicle owners with options that would enable them to comply with emission standards. This can be done by making available to them cleaner fuels (CME, CNG, etc.) and technologies such as preventive maintenance. As part of assistance to vehicle owners, the DTI should implement a program of accreditation of repair shops capable of repairing vehicles that do not comply with emission standards.

The review of standards and guidelines must be conducted with the view of harmonizing these standards. Specifically, the sulfur content of fuel oil must be set to a value which will enable industrial and power plants to comply with emission standard.

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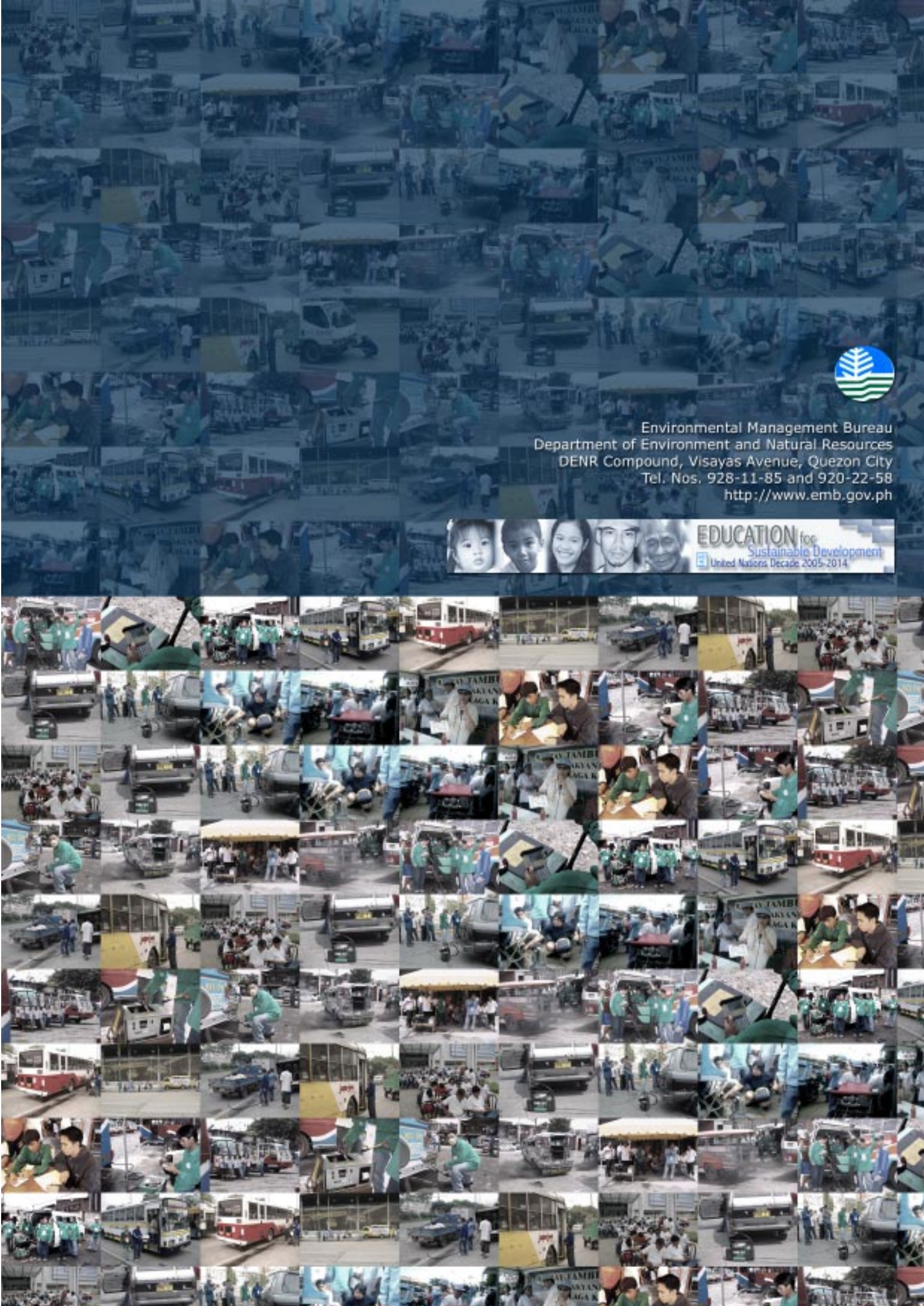

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