National State of the Brown Environment Report
(2005 - 2007)

United Nations Development Programme

Environmental Management Bureau
Department of Environment and Natural Resources

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Preface

This publication is a comprehensive technical report of the environmental situation of the country as to air quality, water quality, solid waste, toxic chemicals and hazardous wastes, environmental impact assessment, compliance to multilateral environmental agreements. It covers discussion on best practices, efforts on public awareness and environmental education, challenges, and recommendations towards improvement of each sector's condition. There is also a chapter on environmental administration. It also presents the initiatives of the different stakeholders – various government agencies, the private sector, the civil society, the local government units, and the international development community on their contributions for the betterment of our environment.

The report was written solely by the EMB-DENR staff based on the 'Guidelines for the Preparation of Harmonized Regional and National State of Brown Environment Report' developed in 2007. It is therefore a pilot work. Effort has been made to stick to the guidelines even though several constraints were faced during its writing. First and foremost is the availability of data pertaining to the environment. While it is recognized that such data abound, these are scattered, some outdated, and come in different format. Second, time was limited to produce a report that would faithfully adhere to the outline of the guidelines. To overcome such constraints, the EMB-DENR staff had to undergo capability building through seminar- workshops on the rigors of data analysis and technical report writing. Truly, this report is a product the EMB-DENR staff could be proud of.

The report is a fact book that monitors the environment over the last three years. It is expected to be the single and authoritative reference for those who would seek information on the country's environment. It will be very useful for policy and decision makers, planners, researchers, etc. It will also provide valuable information to the general public.

Comprehensive as it is, being a pilot work however, not all information desired could be contained in the report due to the constraints cited earlier. Several lessons have been learned with regard to keeping of an efficient database that would help in providing valuable data for the writing of future reports. Partnership with other government agencies, the civil society, the LGUs and other stakeholders is necessary for ease in the exchange of data.

It is hoped that this report would contribute to better understanding of our environment. We are always reminded by the old maxim – 'what gets measured gets managed'. Some may argue with this assertion. But as far as the environment is concerned, it is always true.

Acronyms and Abbreviations Used

ADB	-	Asian Development Bank
AFF	-	Agriculture, Fishery, and Forestry
AIM	-	Asian Institute of Management
AusAID	-	Australian Agency for International Development
BALS	-	Bureau of Alternative Learning Systems
BAT	-	Best Available Technologies
BAWASA	-	Barangay Waterworks and Sanitation Association
BEP	-	Best Environmental Practices
BOC	-	Bureau of Customs
BOD	-	Biochemical Oxygen Demand
BOI	-	Board of Investments
BOT	-	Bureau of Treasury
CAA	-	Clean Air Act
CAI-Asia	-	Clean Air Initiatives for Asian Cities
CALABARZON	-	Calamba, Laguna, Batangas, Rizal and Quezon
CAR	-	Cordillera Administrative Region
CAS	-	Chemical Abstract Service
CCO	-	Chemical Control Order
CDF	-	Controlled Disposal Facility
CDM	-	Clean Development Mechanism
CEMS	-	Continuous Emission Monitoring Systems
CEC	-	Certificate of Emission Compliance
CFC	-	Chlorofluorocarbon
CIDA	-	Canadian International Development Agency
CO	-	Carbon Monoxide
C.O.	-	Central Office
COC	-	Certificate of Conformity
COCAP	-	Concerned Citizens Against Pollution
CRAVE	-	Champions for Reduction of Air Pollution from Motor Vehicle Emission
CSEZFP	-	Cagayan Special Economic Zone Free Port
DA	-	Department of Agriculture
DAO	-	DENR Administrative Order
DENR	-	Department of Environment and Natural Resources
DILG	-	Department of Interior and Local Government
DILG-BLGS	-	DILG-Bureau of Local Government and Supervision
DNA	-	Designated National Authority
DND	-	Department of National Defense
DO	-	Dissolved Oxygen
DOE	-	Department of Energy
DOH	-	Department of Health
DOST	-	Department of Science and Technology
DOTC	-	Department of Transportation and Communications
DOTC-RTAS	-	DOTC-Regional Traffic Adjudication Service
DTI	-	Department of Trade and Industry
EANET	-	Acid Deposition Monitoring Network in East Asia
ECAS	-	Environmentally-critical areas
ECC	-	Environmental Compliance Certificate
EIA	-	Environmental Impact Assessment
ELP	-	Eco-Labeling Program
EEID	-	Environmental Education and Information Division
EMB	-	Environmental Management Bureau
EMS	-	Environmental Management Systems
ENR CORE	-	Environment and Natural Resources Capacity and Operations Enhancement

Acronyms and Abbreviations Used

ENROs	-	Environment and Natural Resources Offices
ETV	-	Environmental Technology Verification
FASPO	-	Foreign-assisted and Special Projects Office
FC	-	Fecal Coliform
FMB	-	Forest Management Bureau
FPA	-	Fertilizer and Pesticide Authority
GEF	-	Global Environment Facility
gTEQ/a	-	gram toxic equivalent per area
HANGIN	-	Healthy Air In Good Indoor Environment
IACCC	-	Inter-Agency Committee on Climate Change
IEC	-	Information, Education and Communication
IPFI	-	Infinite Progression Foundation, Inc.
IRR	-	Implementing Rules and Regulations
IT	-	Information Technology
ITDI	-	Industrial Technology Development Institute
JBIC	-	Japan Bank for International Cooperation
LCA	-	Life Cycle Analysis
LCP	-	League of Cities of the Philippines
LINAW	-	Local Initiatives for Affordable Wastewater
LGC	-	Local Government Code
LGPF	-	Leyte Geothermal Power Field
LGUs	-	Local Government Units
LNB	-	Liga ng mga Barangay
LTO	-	Land Transportation Office
LWUA	-	Local Water Utilities Administration
MAC	-	Mobile Air Conditioning
MBEP	-	Manila Bay Environment Project
MC/TC	-	Motorcycles / Tricycles
MEA	-	Multilateral Environmental Agreements
MIMAROPA	-	Mindoro, Marinduque, Romblon and Palawan
mg/L	-	milligrams per liter
MMDA	-	Metro Manila Development Authority
MMT	-	Thousand Metric Tons
MPN	-	Most Probable Number
MRC	-	Modified Rapid Composting
MRF	-	Materials Recovery Facility
MSWMB	-	Municipal Solid Waste Management Board
MVECT	-	Motor Vehicle Emission Control Technician
MVIS	-	Motor Vehicle Inspection System
MW	-	megawatt
MWSI	-	Maynilad Water Services, Inc.
NCR	-	National Capital Region
NCPP	-	National Chlorofluorocarbon Phase-Out Plan
NDCC	-	National Disaster Coordinating Council
NEEAP	-	National Environmental Education Action Plan
NGVPPT	-	Natural Gas Vehicle Program for Public Transport
NMTT	-	Navotas-Malabon-Tullahan-Tinajeros
NEPC	-	National Environmental Protection Council
NOV	-	Notice of Violation
NOx	-	Oxides of Nitrogen
NPC	-	National Power Corporation
NSCB	-	National Statistical Coordination Board
NSWMC	-	National Solid Waste Management Commission
NSO	-	National Statistics Office
NWRC	-	National Water Resources Council

Acronyms and Abbreviations Used

ODS	-	Ozone Depleting Substances
PATLEPAM	-	Philippine Association of Tertiary Level Educational Institutions in Environmental Protection and Management
PASAR	-	Philippine Associated Smelting and Refinery Corporation
PCBs	-	Polychlorinated Biphenyls
PCDD	-	Polychlorinated Dibenzo-P-Dioxins
PCDF	-	Polychlorinated Dibenzofurans
PCL	-	Priority Chemical List
PCAA	-	Philippine Clean Air Act
PCWA	-	Philippine Clean Water Act
PCAMRD	-	Philippine Council for Aquatic and Marine Research and Development
PCARRD	-	Philippine Council for Agriculture, Forestry and Natural Resources Research and Development
PCASTRD	-	Philippine Council for Advanced Science and Technology Research and Development
PCHRD	-	Philippine Council for Health Research and Development
PCIERD	-	Philippine Council for Industry and Energy Research and Development
PCSD	-	Philippine Council for Sustainable Development
PD	-	Presidential Decree
PEISS	-	Philippine Environmental Impact Statement System
PEMSEA	-	Partnership on Environmental Management for the Seas of East Asia
PETCs	-	Private Emission Testing Centers
PEP	-	Philippine Energy Plan
PNSDW	-	Philippine National Standards for Drinking Water
PHILPHOS	-	Philippine Phosphate Fertilizer Corporation
PHIVIDEC	-	Philippine Veterans Industrial Development Corporation
PIC	-	Prior Informed Consent
PICCS	-	Philippine Inventory of Chemicals and Chemical Substances
PM	-	Particulate Matter
PMPIN	-	Pre-Manufacture Pre-Importation Notification Scheme
PNEC	-	Predicted No-effect Concentration
PNOC-EDC	-	Philippine National Oil Company–Energy Development Corporation
PNRI	-	Philippine Nuclear Research Institute
PNS	-	Philippine National Standards
POD	-	Philippine Ozone Desk
PO	-	Permit to Operate
POPs	-	Persistent Organic Pollutants
PUV	-	Public Utility Vehicle
RA	-	Republic Act
RD	-	Regional Director
SAICM	-	Strategic Approach to International Chemicals Management
SARAIGC	-	Sta. Ana Regional Agro-Industrial Growth Center
SEI	-	Science Education Institute
SCATS	-	Sydney Coordinated Adaptive Traffic System
SMC	-	Semirara Mining Corporation
SMR	-	Self-Monitoring Report
SOx	-	Sulfur Oxides
SPM	-	Sagip Pasig Movement
SUVs	-	Sports Utility Vehicles
TDPA	-	Total Degradable Plastic Additives
TDS	-	Total Dissolved Solids
TESDA	-	Technical Education and Skills Development Authority
TOGs	-	Total Organic Gases
TSP	-	Total Suspended Particulates
TSS	-	Total Suspended Solids

Acronyms and Abbreviations Used

µg/Ncu.m.	-	Microgram per normal cubic meter
UNDESD	-	United Nations Decade of Education for Sustainable Development
UNEP	-	United Nations Environment Programme
UNIDO	-	United Nations Industrial Development Organization
UNFCCC	-	United Nations Framework Convention on Climate Change
UP	-	University of the Philippines
USAID	-	United States Agency for International Development
USAID-ECAP	-	USAID-Energy and Clean Air Project
USEPA	-	United States Environmental Protection Agency
UVs	-	Utility Vehicles
VOC	-	Volatile Organic Compounds
WACS	-	Waste Analysis and Characterization Survey
WQSR	-	Water Quality Status Report
WDPEC	-	Wastewater Discharge Permit Exemption Certificate
WB	-	World Bank
WQ	-	Water Quality
XRF	-	X-ray Fluorescence

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Executive Summary

1. Air Quality

Based on the 2006 National Emissions Inventory, majority of the regions in the country point to the transport sector as the major source of air pollution. As shown in **Figure AQ-1**, it was estimated that 65% from mobile sources, 21% of the pollutants came from stationary sources, and the remaining 14% from area sources.

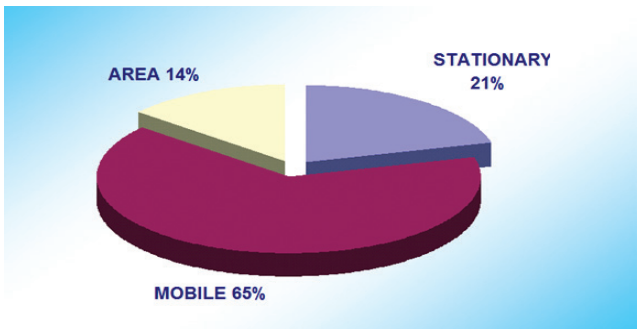


Figure AQ-1 – 2006 National Emissions Inventory According to Criteria Pollutant

Table AQ-1 shows that CO has the biggest pollution load contribution of 50%. CO emission is caused by the increasing population of gasoline-fed vehicles which include cars (13.58%) and MC/TC (47.88%). Other pollutants' contribution are as follows: NO_x – (15%), SO_x – (9%), PM-(11%), VOC-(15%).

Table AQ-1 – 2006 National Emissions Inventory (in tons)

Source	PM	SOx	NOx	CO	VOC	Total	%
Stationary	110,023	598,634	326,219	360,620	67,859	1,463,385	21
Mobile	244,764	14,309	405,033	9,988,616	914,996	4,567,719	65
Area	423,615	1,963	327,261	165,647	63,855	982,340	14
Total	**778,402**	**614,937**	**1,058,514**	**3,514,883**	**1,046,710**	**7,013,444**	**100**
%	11	9	15	50	15	100	

Source: EMB

Ambient Air Quality

Ninety µg/Nm³ is the annual mean TSP guideline value for one year **Figure AQ-2** shows the national total suspended particulate (TSP) monitoring from 2003 to 2007. A significant 33% improvement was observed with concentrations decreasing from 144 to 97 microgram per normal cubic meter (µg/Nm³.) Although trends are decreasing, TSP geometric mean concentrations are still above the 90 averaging time. As such, more efforts are needed to comply with the guideline by 2010 as provided in the General Plan of Action for Air Quality Management.

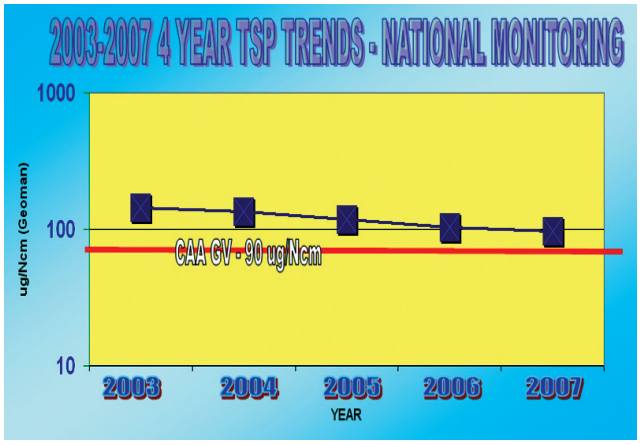


Figure AQ-2 – National Ambient TSP Trend (1 year 24-hour averaging time), 2003-2007

Management of Stationary Sources

The EMB, through its regional offices is in charge of monitoring industrial firms and issuing notices of violations (NOVs) and permit-to-operate (POs). From 2005-2007, a total of 18,697 firms were monitored. Also, a total of 1,676 NOVs and 24,391 POs were issued within the same period.

Management of Mobile Sources

The Land Transportation Office (LTO) enforces compliance with emission standards for motor vehicles, pursuant to pertinent provisions of the Philippine Clean Air Act (PCAA) of 1999 and its Implementing Rules and Regulations (IRR). Under the IRR of the PCAA, all private in-use motor vehicles and vehicles with updated/enhanced engines whose chassis are pre-registered with the LTO will only be allowed renewal of annual registration upon inspection by the LTO or other authorized private motor vehicle inspection centers. The Motor Vehicle Inspection System (MVIS) project involves the construction of motor vehicle inspection centers to cover all types and classifications of motor vehicles all over the country. The MVIS centers shall be equipped with the state-of-the-art equipment and shall be fully computerized.

Management of Area Sources

Area sources are relatively large areas of specific activities that generate signicant amounts of air pollutants. Examples of these area sources of air pollution which need to be managed include: the open burning of solid wastes widely practiced in most urban centers including Metro Manila; the continuing destruction of forests by fire thru kaingin and natural causes; the burning of agricultural biomass after harvest, including rice, corn, and sugarcane stalks; and the aerial spraying of pesticides.

Airsheds

The PCAA of 1999 (RA 8749) and its IRR defines an airshed as "areas with similar climate, weather, meteorology and topography which affect the interchange and diffusion of pollutants in the atmosphere." The whole country has been divided into airsheds. These airsheds are to be managed by multi-sectoral governing boards which are tasked to formulate policies and standards as well as action plans to effectively manage the air quality situation within their respective areas.

Table AQ-2 Policies Issued from 2005-2007

DENR Administrative Order (DAO) Number	Policy Title	Date of Issuance
DENR-DTI-DOTC Joint Administrative Order No. 1 Series of 2007	Amended Guidelines and Procedures for the Monitoring of Accredited and Authorized Private Emission Testing Centers (PETCs) and Land Transportation Office (LTO) Emission Testing Activities	December 2007
DAO 2007-27	Revised Emission Standards for Motor Vehicles Equipped with Compression-Ignition and Spark-Ignition Engines	31 July 2007
DAO 2007-25	Guidelines for DENR Accreditation of Third Party Source Emission Testing Firms	31 July 2007
DAO 2007-22	Guidelines on the Requirements for Continuous Emission Monitoring Systems (CEMS) and other Accepted Protocols thereby Modifying and Clarifying Certain Provisions	31 July 2007

Source: EMB

Regulations and Policies

From 2005-2007, the DENR-EMB issued policies on air quality management as shown in Table AQ-2. These directives were issued to further strengthen the implementation of air quality efforts in the country.

Alternative and Clean Fuels

As a substitute to petroleum, alternative fuels are expected to yield significant energy security and environmental benefits to its consumers. Methanol, denatured ethanol, and other alcohols blended with gasoline, diesel or other fuels are alternative fuels. Those that act as substitutes to petroleum, such as natural gas, liquefied petroleum gas, hydrogen, and coal-derived liquid fuels are also considered as alternative fuels, as are other fuels derived from biological materials and electricity.

The Alternative Fuels Program is one of the five key components of the Arroyo Administration's Energy Independence Agenda, which outlines the roadmap that will lead to the country's attainment of 60% energy self-sufficiency by 2010. The Program has four major subprograms, namely Biodiesel Program, Bioethanol Program, Natural Gas Vehicle Program for Public Transport (NGVPPT), and Autogas Program. Other technologies advocated under the program are hybrid, fuel cell, hydrogen, and electric vehicles.

RA 9367 otherwise known as The Bio-fuels Act of 2006," An Act to Direct the Use of Bio-fuels, Establishing for this Purpose the Biofuels Program, Appropriating Funds therefore, and for other Purposes" was signed into law by the President on January 12, 2007 and became effective on February 6, 2007. Biofuel refers to fuels made from biomass and primarily used for automotive, thermal and power generation, with quality specifications in accordance with the Philippine National Standards (PNS). The "Bio-fuels Policy" is to achieve energy independence and fuel diversification while meeting environmental challenges through the utilization of agricultural-based feed stocks, thus increasing economic activity, especially in the countryside.

As mandated in the Act, bio-diesel blend of 1% by volume is available in all gas/pump stations nationwide since May 2007 (no more 100% conventional diesel). Likewise, E10 10% bio-ethanol blend of volume blended into all gasoline fuel is distributed and sold by all oil companies/dealers in the country. The bio-diesel and E10 manufactured/imported/sold conform to the PNS.

Public Awareness And Education on Air Quality Management

For a couple of years, the EMB-DENR has undertaken various activities focused on public awareness and education on air quality management under the Linis Hangin program of the DENR.

The various activities are in cooperation with different multi-stakeholder partners such as academic institutions, business, local government units, national government agencies, non-government organizations, private sector, and even individuals advocating the fight for clean air.

There were several undertakings of the EMB-DENR in this direction from 2005 to 2007. Among them are:

Bantay Tambutso sa Eskwela – The program aimed at (1) involving academic institutions in promoting clean air and (2) increasing and strengthening the advocacy for clean air, especially in the attainment of emission standard for vehicles within school campuses nationwide.

Bantay Tambutso sa Malls – The said program targets mall and business establishments nationwide with the aim of encouraging public and private sector cooperation by conducting free vehicle emission testing in malls and commercial establishments for FX taxi, jeepneys and other public utility vehicles.

Bantay Sunog Basura –The said program partners with local government units and encourages them to practice a more ecological way of dealing with solid wastes through issuance of local ordinances that ban open burning of wastes in their localities.

Bantay Tsimneya – This is also a program under the Linis Hangin program that targets industries and encourages them to reduce emissions in their smoke stacks.

Best Practices and Lessons Learned

National Capital Region

a. Marikina City

The city government of Marikina is a strong advocate of clean air and non-motorized transport. This was manifested through the Marikina Bikeways Project, which aims to promote low cost and environment-friendly transport.

The bikeways program of Marikina City is a holistic social and advocacy campaign that promotes cycling as an alternative public transport. It is holistic in the sense that it involves not only creating the physical requirements for the adoption of bicycling, but also providing an opportunity to own bicycles, educating the public on the social dimension and safety of riding the bike, and putting in place policies that make this program a sustainable one.

b. Makati's Project Hangin

Healthy Air In Good Indoor Environment (HANGIN) Project was initiated by the City Government of Makati through the Department of Environmental Services in collaboration with the Makati Health Department, Liga ng mga Barangay, Department of Health (DOH), DENR-NCR and the University of the Philippines (UP) College of Public Health. The project officially started on March 12, 2007 through a Memorandum of Agreement that was entered into by the concerned parties.

Cordillera Administrative Region

Efforts of the region are focused more on advocacy for strengthened air quality protection. The advocacy is geared towards increased cooperation and willingness of the people, academe and the youth sector to participate in environmental programs.

Region 1

City of San Fernando, La Union

In 2006, the City of San Fernando enacted its Environment Code. One of its main components is the Tricycle Conversion Program that targeted the conversion of the City's three-wheeler public transport (tricycles) from 2-stroke to 4-stroke engine motorcycles.

Region 2

Region 2 government agencies, private sectors, LGUs, civil society and communities support the mission of improving the air quality and protecting the environment.

The Department of Agriculture (DA) in Quirino Province has intensified its campaign against burning of agricultural wastes/debris. Interpretative signs were installed along the national road to strategic locations which read "Dayami ay huwag sunugin, i-decompose para pataba pagyamanin".

Penalties are imposed on residents caught burning their agricultural wastes. Positive results were recorded. A high level of awareness among the residents was recorded with no incidence of burning.

Region 3

Since 1999, the DOST Region 3, has been promoting technologies that help minimize air pollution. The program aims to assist small and medium-scale enterprises to comply with environmental quality standards through reduction of waste generation. The implementation of cleaner production strategies serves as a preparatory stage for the implementation of Environmental Management System (ISO 14000 standards) within the companies' manufacturing operations.

Region 4-A

The local government of Cavite prepared the Cavite Environment Code under Provincial Ordinance No. 43-S-2008. Among the salient features of the code are articles on forest, mineral and water resources, waste management, marine and coastal resources, air and noise pollution management, ecotourism, environmental impact assessment and land use planning.

Region 4-B

The local government units of Region 4-B support the air quality management programs of the EMB. As part of their procedure in the renewal of business permits of firms and industries operating in their respective jurisdiction, the local government units require copies of Permit to Operate Air Pollution Source and Control Installation issued to them by the EMB Region 4-B to verify if the firms operating are in compliance with the provisions of the PCAA. The local government units are also giving support for the maintenance of the air quality monitoring stations established by EMB Region 4-B.

Region 5

The local government of Legazpi City has passed an ordinance banning smoking in public places and conveyances. Also, Naga City and Iriga City have intensified their campaign against smoke belchers by creating Anti-Smoke Belching Units which will provide assistance to LTO and EMB Region 5 deputized agents in the conduct of random roadside vehicle emission testing. The issuance of ordinances by other LGUs regarding ban on open burning also helps in improving air quality in the region.

Region 6

Iloilo City has undertaken activities against open burning. The city has likewise actively participated in DENR's Green Philippine Highways Program and continues to implement other urban greening activities.

Region 7

Cebu City takes pride of its comprehensive planning for transport and land use. The city has embarked on a variety of initiatives in traffic management. It has already installed a computerized traffic signal system called SCATS (Sydney Coordinated Adaptive Traffic System) in 1993, the first in the country. In recent years, the city government has been active in its anti-smoke belching efforts and the promotion of the Bus Rapid Transit (BRT) as a mass transit system for the city.

Region 8

EMB Region 8 partners with industries having initiatives on environmental education and public awareness programs for air quality management and clean air. An example is the creation of the Leyte Geothermal Airshed in Ormoc City and Kananga, Leyte thru the initiative of the Philippine National Oil Company-Energy Development Corporation (PNOC-EDC). Since the establishment of Geothermal Areas as Airsheds in 2002 and the organization of the Leyte Geothermal Airshed Governing Board in 2005, various programs and activities were undertaken thru the chairmanship of EMB Region 8 and logistic support of PNOC-EDC.

Region 9

Efforts of the region were focused more on awareness campaigns and advocacy for various environmental programs.

Region 10

a. Iligan City

The city of Iligan has been a forerunner in the institution of traffic management at the local government level. Through the help of the Asian Development Bank and AusAID, the construction of the north and south bound terminals for buses and jeepneys, and road widening were made possible. These greatly enhanced the traffic condition of the city and have significantly reduced emissions from inter-city vehicles.

b. Cagayan de Oro City

The local government of Cagayan de Oro City has prepared a comprehensive land use plan that is intended to decongest its Central Business District and identify growth corridors that integrate both land use and transport development.

Region 11

The local government in Davao City has issued policies in support of the Clean Air Act. For 2007, four city ordinances were issued, namely, city ordinances on anti-smoke belching, anti-smoking in public places, no vending of cigarettes within 100 meters from school premises and ban on aerial spraying of pesticides.

Region 12

One of the best practices in the region is the promotion of proper maintenance of motor vehicles. It was observed during roadside inspection of vehicles in 2007 that majority of the vehicles inspected passed the opacity standard. Interviews with vehicle owners revealed that they regularly undertake maintenance check for their vehicles, which according to them, resulted in lower emission.

Caraga

The local government of Caraga has established a strong linkage with other sectors of society to institutionalize the implementation of the ban on open burning as well as an intensified greening program.

Recommendations

The government should re-direct its effort of controlling and/or minimizing emissions coming from mobile sources. Programs and activities of DENR aimed at improving the air quality of Metro Manila shall continue to be of minimal effect unless other government agencies implement their respective mandates vigorously as provided in the PCAA.

To further improve air quality monitoring and assessment, the following are recommended:

• Strengthen industry self-regulation programs;
• Fast track the nationwide implementation of the MVIS;
• Strengthen monitoring of compliance on fuel specifications by oil companies;
• For LGUs to strengthen their programs on prohibition of open burning of wastes;
• Strengthen air-related researches;
• Intensify public awareness and education on air pollution prevention among all stakeholders;
• Strengthen anti-smoke belching operations by LGUs;
• Results of air quality monitoring should be made known to the LGUs concerned particularly those who frequently exceed the guideline valves; and
• Encourage the active participation of civil society in the monitoring of the implementation of the PCAA.

2. Water Quality

The Philippines is lavishly endowed with water resources. However, population growth and continuous urbanization cause tremendous stress to the quality of our waters. Pollution affects fresh, marine, coastal, and even our groundwater resources.

The Philippines, being an archipelagic country has about 20 major river basins, 421 principal rivers (NWRB, 2007) and many other minor water bodies and tributaries that comprise the rich water resources that abound our country.
The Asian Development Bank (ADB) Water Outlook for 2007 cites that the Philippines has plenty of surface water resources available, although droughts and seasonal changes are experienced in some areas and there is low per capita water availability.

The water at the upstream of most rivers remains suitable for sustaining lives and for domestic purposes, while at the downstream portion, water quality is sometimes generally poor and unsuitable for domestic purposes.

The report also cited that water quality is poorest in urban areas, and the main sources of pollution in these water bodies are untreated discharges of industrial and domestic wastewater. Although groundwater resources are generally abundant, over-abstraction and poor environmental management of extractive resource industries have polluted downstream water courses and aquifers, caused siltation, and lowered water tables.

With the various scenarios faced by our water resources in the country, there are mounting challenges that need to be addressed by the government in implementing R.A. 9275, otherwise known as the Philippine Clean Water Act (PCWA) of 2004 and other water-related laws.

Some of these challenges are:

1. Investments and providing funds for the strict enforcement of the various water-related laws;
2. Strengthening institutional mechanisms and sustaining multi-sectoral participation in water quality management;
3. Heightened and intensified Information, education and communication (IEC) campaign on water quality management and other requirements of the PCWA;
4. Strengthening institutional coordination, networking, data sharing and institutional partnerships; and
5. Rehabilitation of degraded water bodies.

Water Body Classification

The EMB-DENR has classified additional 29 water bodies in 2007 bringing to 596 the total of water bodies that have been classified in terms of best usage and water quality to be maintained. To date, there are now 277 classified principal rivers or rivers with drainage areas of not less than 40 sq. km. This accounts to 65.80% of the country's 421 principal rivers identified by the National Water Resources Board (NWRB).

For freshwater bodies,five of these are classified as Class AA, meaning waters which require only disinfection in order to meet the Philippine National Standards for Drinking Water (PNSDW). Two hundred one are classified as Class A or waters which require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the PNSDW. One hundred six are Class B waters or waters that can be used for primary contact recreation such as bathing and swimming.Two hundred nine are classified as Class C or fishery water for the propagation and growth of fish and other aquatic resources. Twenty six are classified Class D category as being allowed for agriculture, irrigation, livestock watering and suited for industrial cooling purposes.

Under the marine waters group, five are classified as Class SA waters suitable for propagation, survival and harvesting of shellfish for commercial purposes and designated as marine parks and reserves. Twenty five are classified as Class SB or waters suitable for bathing, swimming and skin diving. Sixteen are classified as Class SC described as Recreational Water Class II suited for boating and commercial sustenance fishing. Three are Class SD waters rated as Industrial Water Supply Class II for cooling purposes in industrial facilities.

In all, Region 4 has the biggest number of classified water bodies with 88, followed by Region 3 (56), Region 5 (55), Region 6 (54), Regions 2, 7 and 12 (39 each), Region 9 and CAR (37 each), Region 10 (36), Region 8 (31), Region 11 (30), Regions 1 and Caraga (25 each), and NCR (5).

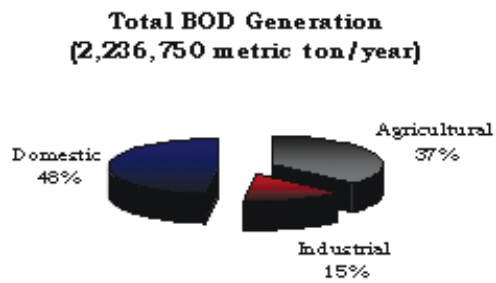
Sources of Water Pollution

Based on **Figure WQ-1**, major sources of Biochemical Oxygen Demand (BOD) eneration in the Philippines are from domestic sources (48%); agriculture (37%); and industry (15%).

The industry sector contributes lowest as most industries have already installed wastewater treatment facilities that enable them to minimize their pollution generation.

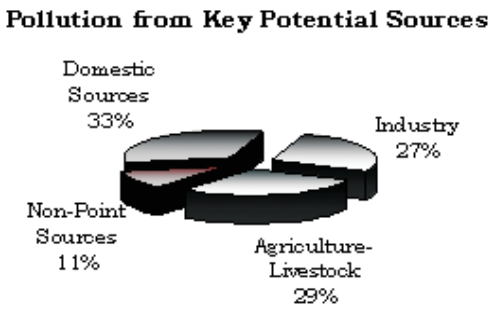
Figure WQ-2 shows that in 2005, identified potential point sources of water pollution came from industries (27%); agriculture and livestock (29%); domestic sources (33%); and non-point sources (11%).

Figure WQ-3 shows that based on figures taken in 2005 for non-point sources, agricultural runoff contributes the biggest with 74%, followed by forest runoff with 23 %, and urban runoff with 3%.



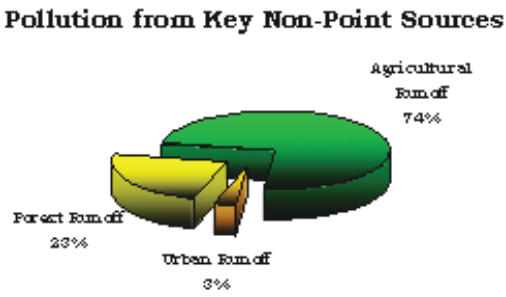
Source: EMB-C.O. NWQSR, 2001-2005

Figure WQ-1. Total BOD Generation in the Philippines, 2001-2005



Source: EMB-C.O. NWQSR, 2001-2005

Figure WQ-2. Pollution from Key Potential Point Sources, 2001-2005



Source: EMB-C.O. NWQSR, 2001-2005

Figure WQ-3. Pollution from Key Non-point Sources, 2001-2005

Almost all the rivers monitored by the EMB for DO and BOD at the National Capital Region for the period 2000-2007 failed the DENR criterion for Class C classification.

Results of the DO and BOD monitoring results for the other priority rivers in the different regions in the country are summarized in **Table WQ-1**.

Table WQ-1. Summary of DO and BOD Results for the 19 Priority Rivers, 2007

Region	Water Body	Class	Average DO (mg/L) 2007	Passed/Failed	Average BOD (mg/L) 2007	Passed/Failed
III	Meycauayan River	C	5.05	**Passed**	56.00	Failed
	Marilao River	A	5.39	**Passed**	21.17	Failed
	Bocaue River	C	5.78	**Passed**	8.83	Failed
IV-A	Imus River	C	5.16	**Passed**	10.13	Failed
	Ylang-ylang River	C	4.47	Failed	29.79	Failed
IV-B	Mogpog River	C	7.49	**Passed**	-	-
	Calapan River	C	3.86	Failed	5.88	**Passed**
V	Anayan River	D	5.92	**Passed**	3.85	**Passed**
	Malaguit River	C	6.56	**Passed**	2.73	**Passed**
	Panique River	C	7.08	**Passed**	1.05	**Passed**
VI	Iloilo River	C	5.36	**Passed**	3.64	**Passed**
VII	Luyang River	C	7.86	**Passed**	2.31	**Passed**
	Sapangdaku River	C	6.84	**Passed**	0.54	**Passed**
X	Cagayan de Oro River	A	8.27	**Passed**	4.00	**Passed**
CAR	Balili River	-	6.17	**Passed**	25.36	Failed
NCR	Marikina River	C	2.20	Failed	25.43	Failed
	San Juan River	C	1.63	Failed	40.42	Failed
	Paranaque River	C	**1.39**	Failed	39.90	Failed
	Pasig River	C	**2.41**	Failed	15.45	Failed

Source : EMB-DENR

Note: According to the DENR AO 34(1990), DENR Water Quality Criteria for DO are as follows, in mg/L: for Class A (5); for Class C (5); for Class D (3). Meanwhile, for BOD , these are, in mg/L: for Class A (5); for Class C (7); for Class D (10).

Ground Waters

As of 2007, extraction of groundwater in urban cities of the country has already exceeded the allowable extraction rate or safe yield reference. Unrestrained utilization of groundwater thru additional allocations of groundwater in these areas would result in further deterioration of water quality, decline in piezometric (measure of pressure and compressability) levels, saline intrusion and possible land subsidence.

Programs on Water Quality Enhancement and Rehabilitation

- *Industrial Eco-watch* - The DENR's Industrial Eco-watch program aims to encourage industries to conduct voluntary self-regulation among establishments for improved environmental performance by encouraging pollution reduction beyond compliance through public recognition and praise, and creating incentives for dischargers and/or producers.

- *Tap watch* - DENR's Tap watch program undertakes regular monitoring of deep wells in poor barangays. It analyzes water samples in accordance with the Philippine National Standards for Drinking Water (PNSDW), including the presence of microbiological organisms.

- *Beach Watch* - The Beach Ecowatch Program is one of the priority programs of the EMB-DENR as part of advocacy for good water quality.

Both the 2006 and 2007 monitoring data on bathing beaches submitted by the EMB regional offices were evaluated and processed. Based on the 2006 report, there were 38 bathing beaches monitored out of the 50 targeted/programmed for 2006. From these 38 beaches, 29 beaches passed, six failed the maximum 200 MPN/100ml fecal coliform (FC) Criterion set for SB Waters, and three had insufficient data.

For 2007, there were 53 bathing beaches monitored out of the 63 targets/programmed for 2007. From these 53 beaches, 44 passed, five failed the allowable 200 MPN/100ml FC Criterion set for SB Waters. The other four beaches had insufficient data.

- *Sagip-ilog Program* - The Sagip-ilog program of the DENR aims to improve the DO and BOD levels of 19 identified priority rivers by 30% by 2010.

Laguna de Bay Watershed Environmental Action Planning (LEAP)

This project of the Laguna Lake Development Authority aims to collectively identify and prioritize projects for watershed protection and development in the country. It also aims to strengthen capacity for participatory watershed management at sub-basin level among local government units.

Civil Society Initiatives

Sagip Pasig Movement

Sagip Pasig Movement (SPM) regularly conducts information campaigns targeting the residents, industries and local government units on environmental issues, particularly, the Pasig River rehabilitation.

Local Government Initiatives

Marikina River Rehabilitation

One of the local government units in the country that has initiated a bold move in rehabilitating its dying river is the City of Marikina. Among the steps taken to rehabilitate the river were the:

- Removal of illegal structures in the riverbanks using the easement from the centerline of the river as legal basis.
- Development of access roads to allow people and equipment to go near the river and undertake cleaning and clearing operations.
- Development of prototypes in two barangays to give local constituents an idea about the kind of transformation that the city would want to pursue and get them to experience the beauty and benefits of such change.
- Construction of concrete jogging lane on both sides of the river for connectivity and to entice people to go down to the river.
- Relocation of informal settlers living along the edge to in-city settlement sites.
- Massive planting of ornamental trees in the riverbanks.
- Strict enforcement of regulations on waste disposal particularly on the surrounding factories and residents.

International Development Community Assistance Programs and Projects

Japan International Cooperation Agency (JICA) - Capacity Development Project on Water Quality Management

The project aims to strengthen the capability of the EMB Central and Regional Offices to implement priority actions mandated to the agency by the PCWA and its implementing rules and regulations.

World Bank

The DENR is one of the government agencies that form part of the implementation of the World Bank-assisted project "Manila Third Sewerage Project" which started in 2007. The said five-year project aims to assist the government in (1) identifying essential adjustments to administrative, institutional, and regulatory practices and existing legislations in order to attract private investments in the Recipient's wastewater sector; (2) increasing the effectiveness of the agencies responsible for water pollution control through improved coordination; and (3) promoting innovative, simple and effective wastewater treatment techniques.

Asian Development Bank (ADB)

The ADB has initiated the following programs on water quality management:

1) The Integrated Coastal Resource Management Project which aims at providing marine management areas and social infrastructures like potable water supply and sanitation in targeted coastal areas; and

2) The Infrastructure for Rural Productivity Enhancement Sector Project which aims at providing potable water systems in rural areas and small townships.

United States Agency for International Development (USAID)

USAID is assisting several Philippine local government units (LGUs) to develop innovative solutions for reducing pollution through the Local Initiatives for Affordable Wastewater Treatment (LINAW) project.

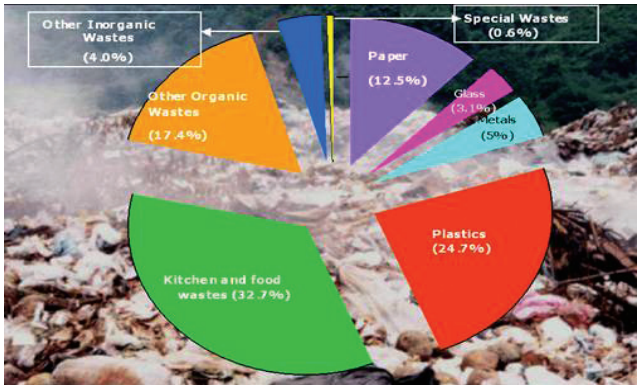
3. Solid Wastes

The solid waste problem is most serious in urban centers, particularly in Metro Manila, because of the high population density, the high consumption rates, and the concentration of packaged goods, some of which are made with raw materials that are toxic and non-biodegradable. Increasingly, the non-durable consumer goods are also becoming disposable items made for one-time use only, compounding what is already a serious problem.

In January 26, 2001, Republic Act No. 9003 or the Ecological Solid Waste Management Act of 2000 was enacted, calling for the institutionalization of a national program that will manage the control, transfer, transport, processing and disposal of solid wastes in the country.

Characteristics of Solid Wastes

In 2003, the ADB-assisted Metro Manila Solid Waste Management Project, conducted a Waste Analysis and Characterization Survey (WACS) in five local government units. Results of the survey (as shown in **Figure SW-1**) revealed that the bulk of the waste being generated comprised of kitchen (32.7%) and other organic substances (17.4%) followed by plastics (24.7%) and paper (12.5%). One key characteristic of solid wastes in the country is the change in volume as well as the properties of wastes being generated. Plastics and paper are two of the most dominant materials that were assessed, mainly due to the high recoverable value of the said materials.



Source: Metro Manila Solid Waste Management Project, ADB, 2003

Figure SW-1. Composition of Disposed Municipal Solid Waste (MSW) in Metro Manila, 2003

Available studies have also shown a steady increase on the fraction of reusable and recyclables because of the emerging techniques and processes to carry out utilization of secondary materials by the manufacturing sector.

Figure SW-2 illustrates, that over the years, the use of plastics has been steadily increasing, indicating a change in the packaging materials for goods.

It also shows that the concentration of paper products in the MSW increased slightly from 14.5% in 1982 to 16.8% in 1997, but decreased to 12.5% in 2003. Kitchen/ food wastes, meanwhile, increased substantially from 1982 to 1997, then decreased in 2003 to levels that were more similar to those in 1982. The differences may be attributed to the differences of the sampling points.

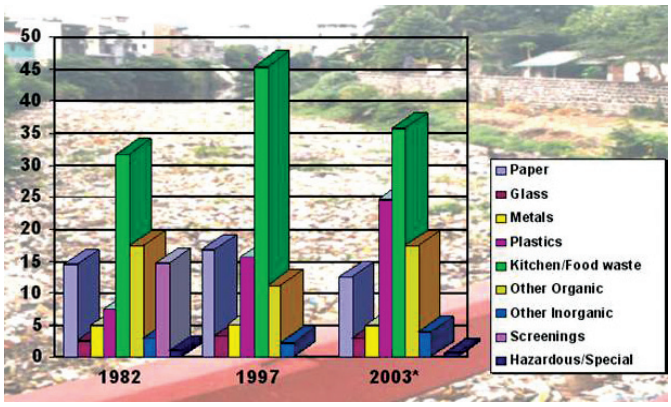


Figure SW-2. Comparison of Results of Composition of Municipal Solid Waste Generated (Composition, % wet weight)

Existing Solid Wastes Facilities

With the heightened campaign toward proper solid waste management, LGUs are expected to have already closed/ rehabilitated their open dumpsites in 2006. While a few LGUs have introduced and implemented engineering measures for the conversion of their open dumpsites into controlled disposal facilities (CDFs), important aspects of an ecological solid waste management such as daily covering of soil, well-designed drainage and runoff control, security fencing, no burning, etc are still to be satisfied.

LGUs have taken seriously RA 9003 in their political agenda. Some were able to identify proposed sanitary landfill sites and subjected these for suitability assessment. **Table SW-1** presents the solid waste management facilities nationwide, from 2005 to 2007.

Table SW-1 Solid Waste Management Facilities, 2005-2007

Indicator	2005	2006	2007
Facilities			
Open Dumpsites	794	692	826
Controlled Disposal Facilities	309	388	359
Proposed Landfills	166	171	211
Sanitary Landfills (SLFs)	4	10	35
SLF Description			*16 ops 19 cons*
Materials Recovery Facilities	1103	1265	2200
Barangays Served by MRFs	*1103*	*1265*	*2473*
Compliance			
Closure and Rehabilitation Plan	-	282	328
Authority to Close	-	188	269

Source: National Solid Waste Management Commission (NSWMC)-Secretariat

Projection of Waste Generation

Table SW-2 shows the estimated waste generation for years 2007 and 2010, with the 2007 data coming from the National Solid Waste Management Commission – Secretariat, and the 2010 estimate from the World Bank Study.

Table SW-2 Waste Generation Estimates, 2007 and 2010 (million tons/years)

Region	Volume (2007)	2007 % of Total	Volume (2010)	2010 % of Total	Rank (2007)
NCR	2.86	23.54	3.14	22.97	1
CAR	0.21	1.73	0.21	1.5	15
I: Ilocos Region	0.57	4.69	0.63	4.61	8
II: Cagayan Valley	0.37	3.05	0.4	2.9	13
III: Central Luzon	1.21	9.96	1.32	9.66	3
IV: Southern Tagalog	1.69	13.91	2.11	15.4	2
V: Bicol Region	0.62	5.10	0.65	4.75	7
VI: Western Visayas	0.9	7.41	1	7.3	5
VII. Central Visayas	0.87	7.16	1.01	7.39	4
VIII. Eastern Visayas	0.49	4.03	0.51	3.7	10
IX. Western Mindanao	0.46	3.79	0.53	3.88	9
X. Northern Mindanao	0.56	4.61	0.47	3.4	11
XI. Southern Mindanao	0.6	4.94	0.97	7.10	6
XII: Central Mindanao	0.45	3.70	0.41	3.0	12
XIII. CARAGA	0.29	2.39	0.31	2.27	14
National	**12.15**	100	**13.67**	100	

Source: NSWMC-Secretariat

The 2007 figures showed the National Capital Region (NCR) having the highest waste generation at 2.86 million tons per year, followed by Southern Tagalog and Central Luzon at 1.69 million tons and 1.21 million tons, respectively, owing to its proximity to the NCR.

Ecological Solid Waste Management (ESWM)

The National Solid Waste Management Commission (NSWMC) was created to oversee the implementation of solid waste management plans and prescribe policies to achieve the objectives of the Act.

The NSWMC, chaired by the Department of Environment and Natural Resources (DENR), is the major agency tasked to implement RA 9003, to oversee the implementation of appropriate solid waste management plans and programs by the local governments and the key stakeholders as mandated by law.

Collection and Transport of Solid Wastes

Collection of solid wastes is the responsibility of the local government units as mandated by the Local Government Code (Republic Act 7160) and reiterated under RA 9003. Municipal solid waste collection is done either by self-administration or through private contractors. On the national scale, typical collection efficiency rates average to about 70% in urban areas and 40% in rural areas.

For Metro Manila, the collection efficiency is pegged at 83% based on the actual amount of wastes disposed. Currently, out of the 17 LGUs in Metro Manila, 11 have contracted collection. The collection service covers between 80%-100% of their respective jurisdiction, with some barangays and subdivisions having their own collection regimens. The most common form of collection is by door to door wherein the collection trucks pass through a designated community route or via curbside collection. Normally, wastes are placed in plastic bags and various types of bins usually provided by the residents themselves.

Recovery and Recycling

The extent of formal recycling through the initiatives of the local government units is very limited when compared to wastes generated. Currently, recycling rate for the whole country is difficult to assess mainly due to unavailability of sufficient data.

To help accelerate the implementation of RA 9003, efforts have been made in terms of pushing for the establishment of community-based materials recovery facilities (MRFs), particularly to complement efforts for waste segregation, collection, recovery, processing. Eight hundred and forty two MRFs, with components ranging from composting and storage facilities have already been established nationwide, most of which are located in the NCR.

Public Awareness and Education on Solid Waste Management

The NSWMC through the DENR, NGOs, the academe and the other stakeholders held seminars and symposia in various institutions and distributed IEC materials like print advertisements, flyers, brochures and posters to various offices, schools, communities and the industry.

The Environmental Education and Information Division (EEID) of the Environmental Management Bureau of the DENR, with its regional counterparts, and in cooperation with the NSWMC Secretariat, spearheads efforts in the promotion of awareness on significant environmental concerns, one of which is ecological solid waste management. Long before the passage of RA 9003 into law, the EEID has been undertaking support activities to create awareness, understanding and concern on this issue.

Integration of solid waste management concepts in the school curriculum has also been coordinated by the EEID with the Department of Education and the Commission on Higher Education, alongside with other institutions like the Miriam College-Environmental Studies Institute. Lectures and seminars for educators in the elementary, secondary and tertiary levels have been conducted to create awareness on the ESWM Act and the issues surrounding its implementation.

Recommendations

The Proposed Rationalization Plan of Government, thru the DENR should address the lack of personnel and funding to operationalize the Regional Ecology Centers. The NSWMC, thru the EMB-DENR, and LGUs should find ways on how to effectively implement and re-invigorate the enforcement of the provisions of RA 9003. The enforcement powers of the DENR should be clearly defined within the ambit of the law.

The role of the LGUs in solid waste management should be made known to the public, that is, "the LGUs shall be primarily responsible for the implementation and enforcement of the provisions of this Act within their respective jurisdictions" (Section 11 of RA 9003). Well-informed citizens would be the DENR's ally in pressuring the LGUs to implement their mandate.

Baseline data (e.g. per social class, locality) on solid waste generation rate, composition/characteristics and related information should be established and published with the consent of stakeholders. Data to be generated being the first and foremost component of a solid waste management system, shall be used as basis for the formulation of plans and programs and should be incorporated in other components of the management system. The collection and transport components in particular should likewise be given equal importance as with other components (e.g. waste processing, disposal).

4. Toxic Chemicals and Hazardous Wastes

Toxic chemicals pose a significant risk to human health and safety. Moreover, they can also be environmental hazards once they are not properly managed. Chemical inputs constitute much of our daily needs and activities as they are found in the food we eat, liquid to drink and products we use. Therefore, the need to manage these toxic chemicals becomes more crucial.

By creating and managing the chemical inventory, and the related reporting requirements, governmental authorities can obtain necessary information about the chemicals that are being manufactured and imported into the country.

Through inventory management and reporting requirements, the EMB can effectively track the flow of manufacturing and distribution of chemicals. This management mechanism can provide the necessary information for quick and effective response if any accident happens. Moreover, the tracking of different toxic chemical substances creates accountability for those who manufacture, transport, use and dispose the toxic chemical substances.

Inventory of Regulated Chemicals

A three-year inventory (2005-2007) of chemicals under different *Chemical Control Orders* (Cyanide, Asbestos, Mercury, Ozone-Depleting Substances and Polychlorinated Biphenyls [PCBs]) shows a decreasing trend in the number of registration certificates issued. Cyanide has the highest total volume registered with about 79,445.38 MT, followed by Asbestos with 4443.71 MT then Mercury with 15.89 MT, Ozone-Depleting Substances with 38.82 MT. Data show almost no inventory of registered PCBs from 2005-2007. In 2007, those non-PCB transformers were registered instead with the Regional Offices.

As to importation of these regulated chemicals, cyanide has the highest volume from 2005-2007 with 17,273.55 MT. The bulk of this importation comes from National Capital Region. On the other hand, Asbestos, having the second highest volume among the CCOs with 11,058 MT, exhibited an increasing trend in importation from 17 MT in 2005 to 5,486 MT in 2006 and 5,555 MT in 2007.

Policies, Programs and Projects

RA 6969, otherwise known as the Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 was enacted to address the increasing generation of hazardous wastes in the country. It has the main goal of ensuring that industrial economic growth is achieved in an environmentally sound manner.

To this end, and in order to ensure further implementation of RA 6969 with efficacy, the DENR-EMB has issued several other Implementing Rules and Regulations under Titles II and III, among which are the following:

- DAO 1997-38: Chemical Control Order for Cyanide and Cyanide compounds
- DAO 1997-39: Chemical Control Order for Mercury and Mercury compounds
- DAO 2000-02: Chemical Control Order for Asbestos
- DAO 2004-01: Chemical Control Order for PCBs
- DAO 2004-08: Revised Chemical Control Order for Ozone Depleting Substances (ODS)
- DAO 2005-05: Toxic Chemical Substances for Issuance of Chemical Control Order
- DMC 2005-003: Prescribing Graduated Administrative fines, Pursuant to Republic Act No. 6969 and DAO 29, Series of 1992
- DAO 2005-27 on Revised Priority Chemical List (PCL)
- DMC 2007-03: Delegation of Authority to EMB Regional Offices of Various Requirements of DAO 2004-01 which include issuance of "PCB Registration Certificates" and "Importation Clearance" for non-PCB Equipment
- DAO 2007-19 on Suspension and/or Deferment of the Deadline for the Storage of all Existing Decommissioned PCBs, PCB Equipment and PCBs Oil/Fluid.
- DAO 2007-23: Prescribing Additional Requirements for the Issuance of the Priority Chemical List Compliance Certificate

Surveys and monitoring of industrial firms and existing facilities are still being conducted as a continuing program for the implementation of the above policies. Concerns about the treatment and disposal of wastes are surfacing. Some generated wastes are stored in the company's storage facilities due to unavailability of local service provider in some regions. There is an apparent difficulty on handling toxic chemicals and hazardous wastes relative to transporting and movement from island to island. Aside from being too costly, it poses high hazards on human health and the environment. Therefore, local investors are invited to initiate development of a treatment and disposal facility for toxic chemicals and hazardous wastes generated in the regions.

5. Environmental Impact Assessment

The Philippine Environmental Impact Statement System (PEISS), with the general policy issued in 1977 thru Presidential Decree (PD) 1151 and the system established in 1978 thru PD 1586, requires all developmental projects which will have significant effects to the environment, to acquire an Environmental Compliance Certificate (ECC) prior to their construction and eventual operation. Proponents of development projects which are categorized as environmentally-critical projects (ECPs) and those located in environmentally-critical areas (ECAs) are required to conduct an Environmental Impact Assessment (EIA) study for review in relation to ECC application.

The PEISS is being implemented by the EMB as a planning tool that aims to ensure the environmental soundness of undertakings by unveiling their potential adverse environmental impacts for prevention and/or mitigation. Among the

key responsibilities of the EMB under the PEISS are the review of EIA submissions as a requisite to ECC applications, ECC compliance monitoring and the review and updating of policies and guidelines.

Through the years of implementing the PEISS which started under the then National Environmental Protection Council (NEPC, now the EMB), there is an increasing annual average ECC issuance as reflected in **Table EI-1.**

The number of ECC issuance has increased remarkably since the processing of ECC applications was devolved to the EMB Regional Offices per DAO 21 Series of 1992. This may be attributed to the increasing awareness of the said requirement as well as improved enforcement.

Iterative process of improving the system has been undertaken through the development, implementation review, and revision of procedural manuals which from 1996 to the present has already reached four versions. Aside from addressing the problems in ECC application processing expediency, the continuous improvement efforts also address the concerns regarding the clarification of which projects are covered or not covered by the ECC requirements. The standardization of requirements and procedures is one of the main features of the latest version of the procedural manual which contains guidance documents and forms.

Table EI-1. Average Annual Environmental Compliance Certificate (ECC) at the different Regimes

EIS Regime	Period of Effectivity	No. of Years	Ave. Annual ECC Issuance
First NEPC IRR	1980-1984	5	103
Second NEPC IRR	1985-1992	8	231
DAO 21, series of 1992	1993-1996	4	1,428
DAO 37, series of 1996	1997-2002	7	2,552
DAO 30, series of 2003	2003-2006	3	4,267

Source: EMB-DENR

After almost three decades since the establishment of the Philippine EIS System, approximately 40,665 ECCs have been issued. Of these, 518 are classified as ECPs and approximately 40,147 as Non-ECPs.

Table EI-2 provides a summary of ECC issuance across different regions with corresponding environmental risk rating. It can be seen that Region IV-A issued the most number of ECCs while Region 3 has the highest percentage of high risk projects.

Table EI-2. Summary of ECC Issuances Nationwide as of 2007

Region	Total ECC issued as of 2007	Risk Category, % Low	Medium	High
CAR	694	97.9	1.6	0.5
NCR	4,910	100.0	0.0	0.0
1	2,931	55.5	44.5	0.0
2	1,842	97.5	2.5	0.0
3	4,416	44.3	33.6	22.1
4A	5,707	52.9	46.1	1.0
4B	1,652	68.3	29.9	1.8
5	1,558	63.5	36.5	0.0
6	3,447	94.9	5.1	0.0
7	3,076	100.0	0.0	0.0
8	1,521	93.5	6.3	0.2
9	1,339	94.8	5.2	0.0
10	2,305	100.0	0.0	0.0
11	2,584	100.0	0.0	0.0
12	1,179	98.0	1.3	0.7
13	986	96.9	3.1	0.0
TOTAL	**40,147**			

Source: EMB-DENR

Considering the volume of ECCs issued, effort must be exerted to classify these projects for better management. A web-based internal database system, which has recently been developed, is a valuable tool in tracking down the status of ECC applications and compliance to ECCs, and for strategizing monitoring activities.

Monitoring protocols have likewise been developed to improve the compliance monitoring system with the end goal of achieving better environmental performance for projects issued with ECCs. One monitoring scheme which may be considered "endemic" to the Philippines is the establishment of the Multi-Partite Monitoring Teams (MMT). Recently, guidance documents had been developed as to the formulation of the MMT Manual of Operations and customized monitoring report forms to further improve on the scheme and the MMT System.

6. Compliance to Multilateral Environmental Agreements

The Philippines is signatory to a number of Multilateral Environmental Agreements, among which are:

Stockholm Convention on Persistent Organic Pollutants (POPs)

As part of its commitment to the Convention, the Philippine government has drafted a National Implementation Plan that outlines its programs to meet its obligations under the Convention. The same plan was likewise drafted to address the specific issues on POPs in the country.

As the focal point for Stockholm Convention on the Elimination of Persistent Organic Pollutants in the Philippines, the EMB-DENR pursues several ongoing programs and regional activities. Among them are:

a. Completed Canadian International Development Agency (CIDA)- funded project on Risk Assessment and Management, and Capacity Building on POPs in the Philippines.

b. GEF-UNIDO assisted Global Programme to Demonstrate Regional Viability and Removal of Barriers that Impede Adoption and Successful Implementation of Available Non-burn Technology for Destroying POPs. The four-year project which started in March 2008 covers the destruction of 1,500 tons of PCBs – containing equipment and wastes that form part of the 6,879 tons of PCB wastes that were identified during an initial inventory process of PCBs in the country.

c. The Integrated POPs Management Project is a GEF and World Bank (WB)-project preparatory grant to manage POPs in the country. This was approved last 21 February 2008.

d. GEF-UNIDO Regional Best Available Technology and Best Environmental Practice Forum for East and Southeast Asia Countries to Promote Strategies to Reduce Elements of unintentional POPs for Industries

Rotterdam Convention on Prior Informed Consent (PIC) Procedure on Certain Hazardous Chemicals and Pesticides in International Trade

The EMB-DENR and the Fertilizer and Pesticide Authority of the Department of Agriculture perform the roles of Designated National Authorities (DNA). Both government agencies are responsible for undertaking administrative functions required by the Convention, including the operation of the PIC and information exchange procedures in the country.

Strategic Approach to International Chemicals Management (SAICM)

The SAICM is an international policy framework to foster the sound management of chemicals. The EMB-DENR is the focal point in the implementation of the SAICM.

In compliance to the national commitments under SAICM, the EMB enforces the provisions of Republic Act 6969 and its Implementing Rules and Regulations which regulate, restrict or prohibit the importation, manufacture, processing, sale, distribution, use, and disposal of chemical substances and mixtures.

Specifically, the EMB is tasked on the following:

1. Implementation of all international agreements on chemicals management (Stockholm Convention, Rotterdam Convention, Montreal Protocol, Basel Convention).

2. Issuance of a Chemical Control Order (CCO) on chemicals found to pose unreasonable risk or hazard to public health and the environment.

3. Conduct of Philippine Inventory of Chemicals and Chemical Substances.

4. Issuance of Pre-Manufacture Pre-Importation Notification Scheme (PMPIN).

Vienna Framework Convention for the Protection of the Ozone Layer, and Montreal Protocol on Substances that Deplete the Ozone Layer

The DENR acts as the national coordinator for their implementation. The Philippine Ozone Desk (POD), based at the EMB, was created to facilitate and coordinate ODS phase-out projects and policies. The POD is currently implementing three major projects, namely: the Institutional Strengthening Project, the National Methyl Bromide Phase-Out Strategy, and the National Chlorofluorocarbon (CFC) Phase-Out Plan. These projects are funded by the Multilateral Fund for the Implementation of the Protocol with the World Bank as the implementing agency.

United Nations Framework Convention on Climate Change (UNFCCC), and the Kyoto Protocol

The UNFCCC sets out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases to avoid "dangerous anthropogenic interference" with the climate system. Continuous efforts are being done on information, awareness-raising and education on climate change among the different sectors such as government and non-government sectors, the academe, local government units, policymakers, finance and business sector, and others. These brought about the production of various IEC materials on climate change consisting of primers, poster-calendars, fact sheets, exhibit materials, handouts and video documentary.

7. Environmental Education

Current Environmental Education Status

The year 2005 saw the onset of the United Nations Decade of Education for Sustainable Development (UNDESD) for 2005-2014. For the Philippines, the EMB-DENR, which likewise chairs the Sub-Committee on Information and Education of the Philippine Council for Sustainable Development, initiated the multi-sectoral crafting of the National Environmental Education Action Plan (NEEAP) for Sustainable Development (SD) for the same decade since 2004.

The NEEAP for SD for 2005-2014 is the country's support commitment to the UNDESD. The NEEAP envisions an environmentally-literate and proactive citizenry imbued with a sense of responsibility to care, protect and enhance environmental quality that is conducive to their well-being and supporting of a nation's economic development and unified in its pursuit of peace, social justice and equity in the use of natural resources.

Initiatives, problems, and commitments in environmental education, from the major education departments like the Department of Education (in its three offices – Bureaus of Elementary Education, Secondary Education, and Alternative Learning Systems), Technical Education and Skills Development Authority, and Commission on Higher Education. Environmental education initiatives of the EMB and the other offices of DENR, National Youth Commission, the DOST and civil society organization were also cited.

A tentative list of universities and colleges with undergraduate and graduate degree program specializing on the environment were also listed down.

8. Environmental Administration

In support of and in carrying out its mandate, EMB is at the helm of implementing several environmental laws that hinge on the basic concept of environmental protection and management of the country's environmental resources, from air to land and water. The following are the laws it coordinates in implementation:

- Presidential Decree 1586 on the Philippine Environmental Impact Statement (EIS) System (1978)
- Republic Act 6969 or the Toxic Substances, Hazardous and Nuclear Wastes Control Act (1990)
- Republic Act 8749 of the Philippine Clean Air Act (1999)
- Republic Act 9003 or the Ecological Solid Waste Management Act (2001)
- Republic Act 9275 of the Philippine Clean Water Act (2004)

Further, these laws which are being implemented with multi-level stakeholders seek to support the overarching/guiding framework of sustainable development under Philippine Agenda 21, the Philippine having been a signatory to the Rio Declaration on Environment and Development, and other succeeding multilateral environmental agreements.

8.1 EMB's Organizational Structure and Personnel Administration

The EMB-DENR, by the very nature of its operation, exercises its functions as a regulatory body and has emerged from a staff to a line bureau. With the passage of the Philippine Clean Air Act of 1999 and the subsequent issuance of DAO No. 17-2002 dated July 24, 2002, EMB's Organizational Structure and major responsibilities were defined further. Moreover, its day-to-day operation is complemented by its Central and Regional-based staff, comprising of 1,074 personnel. Likewise, a corresponding budgetary appropriation is being approved by the Department of Budget and Management for release on an annual basis. The inadequacy of regular/permanent staff is regularly augmented by casual, contractual (PS101) and Object 29 types of hiring.

8.2 Pollution Adjudication Board

The Pollution Adjudication Board (PAB) is a quasi-judicial body created under Section 19 of Executive Order 192 for the adjudication of pollution cases.

- The PAB is organizationally under the supervision of the Office of the Secretary of the Department of Environment and Natural Resources.
- Secretariat support is being provided by the Environmental Management Bureau.

The PAB's Organizational Placement is co-equal w/ RTC under *Sec.7 (d) of PD 984 - Execution of decision ...Any decision or order of the Commission, after the same has become final and executory, shall be enforced and executed in the same manner as decisions of Courts of First Instance, ...*

8.2.1 Jurisdiction of PAB

As a quasi-judicial body, it assumes the powers and functions of the former National Pollution Control Commission with respect to the adjudication of pollution cases under Republic Act 3931 (Pollution Control Law) and Presidential Decree 984 (National Pollution Control Decree of 1976). Its functions were further expanded by the enactment of the Clean Water Act of 2004 (RA 9275) and the Clean Air Act (RA 8749).

8.2.2 Cases Handled from 2006 to 2007

In 2006, the PAB issued 17 Cease and Desist Orders (CDO), 10 of which were from the NCR which accounted for 58.82 percent of the total closure orders issued by the Board. Four were from CALABARZON which accounted for 58.82 percent of the total closure orders. Three of these were violations of both R.A.9275 and R.A. 8749, five are purely air pollution cases while the rest are water pollution cases. Further to this, the PAB has also issued a total of 20 Temporary Lifting Orders (TLOs). In 2007, however, the PAB issued 13 CDOs, five of which were from the NCR which accounted for 38.46

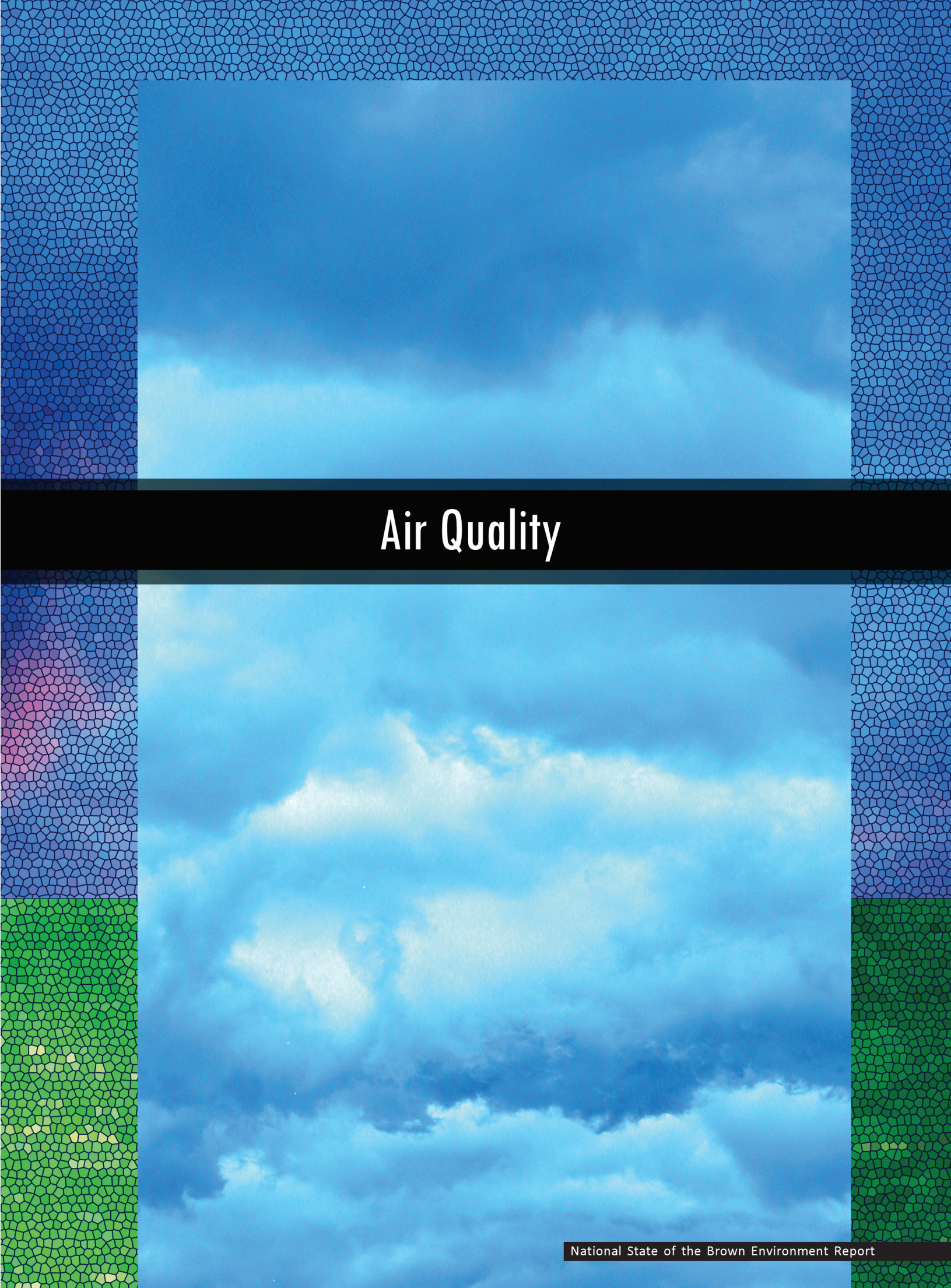
percent of the total closure orders it has issued. On the other hand, a total of two TLOs were issued to 18 different companies in the same year. It has also issued a total of 93 directives in the form of orders for re-sampling, denial of motion, fine imposition, hold in abeyance pending the submission of certain requirements, reiteration of CDO, Show Cause, etc.

So far, 75 cases were resolved in 2007. Among these were issuances of 27 Formal Lifting Orders (FLOs) while the rest were dismissed either for lack of jurisdiction or for having been inactive for more than 10 years, pursuant to PAB Resolution No. 31 Series of 2006.

Further to this, 201 pollution cases were acted upon in 2007, involving 128 companies nationwide. Six percent of said pollution cases were deliberated by the Board that resulted to issuances of CDOs while 11 percent resulted to issuances of TLOs.

Significantly, the Board was able to resolve 37 percent of all cases set for deliberation in 2007.

In order to reinforce, however, adjudication of pollution cases, creation of the Revised PAB Procedural Rules is underway. Likewise, the Fine Ratings System under the R.A. 9275 is also being drafted by the PAB. Similarly, the PAB has devised a subgroup called the PAB Committee of Fines.



Air Quality

1. Air Quality

Clean air is essential for all life on earth. When the air is unhealthy, a host of complications arise that affects both human health and the state of the country's ecological wealth.

1.1 Sources of Air Pollution

1.1.1 Stationary sources

Stationary source is defined by the Clean Air Act (CAA) as "any building or immobile structure, facility or installation which emits or may emit any air pollutant." Stationary source examples include electricity generating plants, processing plants, manufacturing plants, mills, chemical industries, and other industrial plants. Specifically, these include manufacturing of food and related products, tobacco manufacturing, textile mill products, lumber and wood products, paper and allied products, printing and publishing, chemical and allied products, petroleum and coal products, rubber and miscellaneous plastic products, stone, clay, and glass products, primary metal industries, fabricated metal products, machinery except, electrical and electronic equipment, miscellaneous manufacturing industries.

1.1.2 Mobile sources

Mobile sources of air pollution are any vehicle/machine propelled by or through oxidation or reduction reactions including combustion of carbon-based or other fuel, constructed and operated principally for the conveyance of persons or the transportation of property or goods that emit air pollutants as a reaction product. These engines are either gasoline, diesel-powered, compressed natural gas (CNG), liquefied petroleum gas (LPG) or other alternative fuels, each contributing a characteristic set of pollutants into the air. These mobile sources are further categorized into cars, utility vehicles (UVs), trucks, buses, and motorcycles/tricycles (MC/TC). **Table 1-1** shows the annual motor vehicle registration from 2005 to 2007. Note that since 2005, the fastest average annual increase has been with MC/TC (10.77%), most of which have two-stroke engines, followed by sport utility vehicles (SUVs) (10.55) %) and trucks (2.75%). Likewise, cars continue to increase by 2.35% annually on the average.

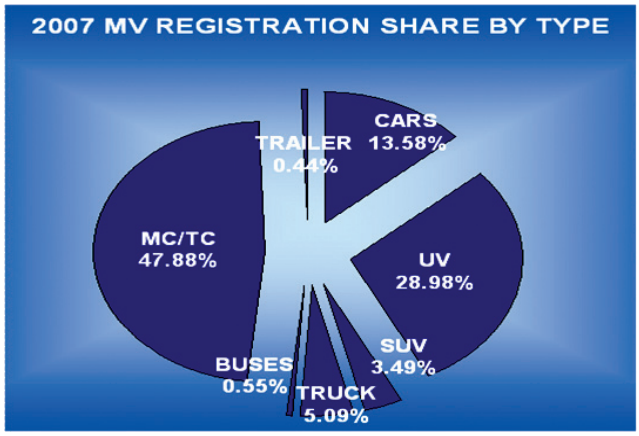
As shown in **Figure 1-1** MC/TC comprised the largest group (47.88 %), followed by UVs (29.98 %), cars (13.58 %), trucks (5.09 %), SUVs (3.49%), buses (0.55 %), and trailers (0.44 %).

Table 1-1. National Annual Motor Vehicle Registration by Vehicle Type, 2005-2007

MV Type	Mode of Registration	2005	2006	2007
CAR	New	41,175	40,763	46,183
	Renewal	747,233	751,610	704,909
	Sub-Total	788,408	792,373	751,092
UV	New	93,959	88,950	91,518
	Renewal	1,593,897	1,529,151	1,511,101
	Sub-Total	1,633,856	1,618,101	1,602,619
SUV	New	21,554	25,491	27,503
	Renewal	136,384	147,303	165,488
	Sub-Total	157,938	172,794	192,991
TRUCK	New	15,245	16,896	18,439
	Renewal	251,670	269,005	262,822
	Sub-Total	266,915	285,901	281,261
BUS	New	1,738	2,008	2,518
	Renewal	29,239	27,136	27,641
	Sub-Total	30,977	29,144	30,159
MC/TC	New	585,482	605,038	671,588
	Renewal	1,572,255	1,804,325	1,975,986
	Sub-Total	2,157,737	2,409,363	2,647,574
TRAILER	New	1,427	2,595	1,789
	Renewal	22,495	21,303	22,567
	Sub-Total	23,922	23,898	24,356
Sub-total	New	760,580	781,741	859,538
	Renewal	4,299,173	4,549,833	4,670,514
Grand Total		**5,059,753**	**5,331,574**	**5,530,052**

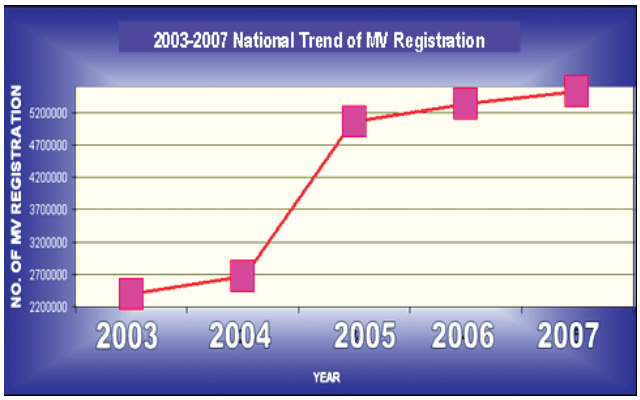
Source: LTO

Figure 1-2 further shows that, in general, the number of motor vehicles has increased by more than 100% from 2003 to 2007.



Source: LTO

Figure 1-1. Percentage Share of National Motor Vehicle Registration by Vehicle Type



Source: LTO

Figure 1-2. Trend of National Motor Vehicle Registration , 2003-2007

Table 1-2 gives the distribution of motor vehicles by region. The NCR has 29% of the total vehicles registered nationwide. Both Regions III and IV-A have about the same share of 13% of the total.

Table 1-2. Regional Annual Total Motor Vehicle Registration, 2005-2007

Regions	Motor Vehicles Registered			% Increase		Average % Increase
	2005	2006	2007	06/05	07/06	
I	268,697	288,066	310,783	7.21	7.89	7.55
II	178,501	79,545	192,491	0.58	7.21	3.90
III	628,086	690,411	733,360	9.92	6.22	8.07
IV-A	641,349	681,994	722,767	6.34	5.98	6.16
IV-B	68,735	71,497	72,860	4.02	1.91	2.96
V	151,755	161,442	168,940	6.38	4.64	5.51
VI	276,458	300,353	305,498	8.64	1.71	5.18
VII	400,384	457,816	436,156	14.34	-4.73	4.81
VIII	105,875	110,961	119,996	4.80	8.14	6.47
IX	148,698	147,036	168,635	-1.12	14.69	6.79
X	137,791	154,698	158,416	12.27	2.40	7.34
XI	189,621	205,217	218,951	8.22	6.69	7.46
XII	164,794	205,618	205,211	24.77	-0.20	12.29
NCR	1,580,753	1,555,174	1,592,036	-1.62	2.37	0.38
CAR	63,921	63,505	64,664	-0.65	1.83	0.59
CARAGA	54,335	58,241	59,288	7.19	1.80	4.49
Total	**5,059,753**	**5,331,574**	**5,530,052**	**5.37**	**3.72**	**4.55**

- Excluding the submitted reports of Malabang D.C. (Reg. XII – Oct. 2007); Patin-ay D.C. (CARAGA – Dec. 2007) and E-Patrol (Reg. VII-Sept.-Dec 2007); Reg. II (Oct. 2007-Dec 2007) Reg. IVA (Sept. – Dec. 2007)

Source: LTO

1.1.3 Area Sources

Area sources are relatively large areas of specific activities that generate significant amounts of air pollutants. These include busy roads and hubs, construction sites, aircraft operations, forest fires or the burning of wastes, residential sites, and similar dispersed sources. Often, these area sources consist of many small-scale mobile or stationary sources, which may emit relatively small amounts of pollutants when taken individually, but whose combined emissions add significantly to the air pollution in the area.

Examples of these area sources of air pollution include:

• The open burning of solid wastes widely practiced in most urban centers including Metro Manila

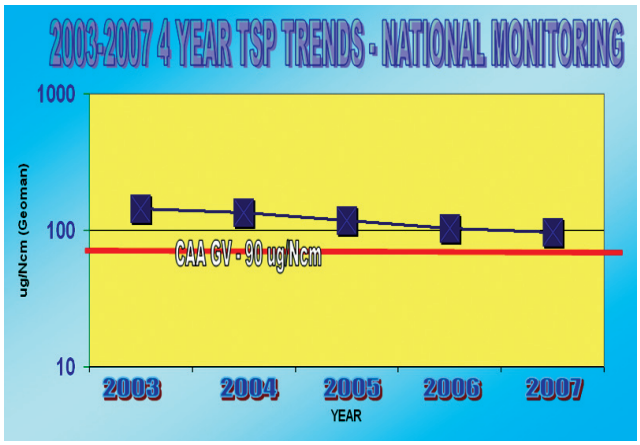
• The continuing destruction of forests by fire thru kaingin and natural causes

• The burning of agricultural biomass after harvest, including rice, corn, and sugarcane stalks

• The aerial spraying of pesticides

1.2 Ambient Air Quality

Figure 1-3 shows the national total suspended particulate (TSP) monitoring from 2003 to 2007. A significant 33% improvement was observed with concentrations decreasing from 144 to 97 microgram per normal (µg/Nm_3.) Although trends are decreasing, TSP geometric mean concentrations are still above the 90 µg/Nm_3 annual mean TSP guideline value for one year averaging time (**Table 1-3**). As such, more efforts are needed to comply with the guideline by 2010 as provided in the General Plan of Action for Air Quality Management. The locations of the ambient air quality monitoring stations in the different regions of the Philippines and the corresponding TSP concentrations (1 year 24-hour averaging time) are shown in **Table 1-4**.



Source: EMB

Figure 1-3. National Ambient TSP Trend (1 year 24-hour averaging time), 2003-2007

Table 1-3. National Ambient Air Quality Guideline Values

Pollutants	Short Term ugcm	Short Term ppm	Averaging Time	Long Term ugcm	Long Term ppm	Averaging Time
Suspended Particulate Matter	230		24 hours	90		1 year
TSP	150		24 hours	60		1 year
PM_{10}						
Sulfur Dioxide	150	0.07	24 hours	80	0.33	1 year
Nitrogen Dioxide	150	0.08	24 hours			
Photochemical	140	0.007	1 hour			
Oxidants	60	0.003	8 hours			
Ozone						
Carbon Monoxide	35 mgNCM	30	1 hour			
	10 mgNCM	9	8 hours			
Lead	1.5		3 months	1.0		1 year

a- Maximum limits represented by ninety-eight percentile (98%) values not to exceed more than once a year.
b- Arithmetic mean
c- SO_2 and suspended particulate matter are sampled once every six days when using the manual methods. A minimum
d- of twelve sampling days per quarter or forty-eight sampling says each year is required for these methods. Daily sampling maybe done in the future once continuous analyzers are procured and become available.
e- Limits for Total Suspended Particulate Matter with mass median diameter less than 25-50 pm.
f- Annual Geometric Mean

Table 1-4 Ambient Air Quality Monitoring Stations in the Philippines (TSP)
(1 Year 24 hour averaging)

National TSP Trending		2003	2004	2005	2006	2007
REGION	STATIONS	CONCENTRATION (ug/Ncm)				
National Capital Region (NCR)	NCR-Makati	198	211	183	153	146
	NCR-Valenzuela	247	206	152	157	146
	NCR-Congressional Ave.	225	275			
	NCR-East Ave.	179	170	129	104	102
	NCR-EDSA NPO Q.C.	157	164	163	138	125
	NCR-Ateneo	83	105	87	72	65
	NCR-Mandaluyong	136	133	124	121	134
	NCR-Manila	180	134	138	111	110
	NCR-Pasig	101	109	106	90	92
	NCR-Las Piñas	37			159	
	NCR-Pasay	178	135	134	159	140
	NCR-EDSA MMDA		226	213		
	NCR-EDSA MRT		236	323	316	257
Cordillera Administrative Region	CAR-Plaza Garden	204	229	170	155	201
Region 1 Lingsat, City of San Fernando, La Union	Laoag City (in front of Heroes Bldg.)	130		141		
	Alaminos City		312	179	153	159
	San Fernando City		183		155	148
Region 2 Cagayan Valley	Tug. Station Brgy. 10 Tuguegarao City	198	59	102	84	98
Region 3 San Fernando	SM Elegant-San Fernando	117				
	Iba Station	101				
	Saluysoy Station	141	190	309	186	116
	Cabanatuan		84	103		
	Bocaue, Bulacan			370	195	
	Meycauayan, Bulacan			309		
	MEL-VI Bldg., OG Road City of San Fernando					
	Intercity Ind'l Subd.					215
Region 4A Mainland Provinces	Wakas					457
	Cavite	79	84	62	59	46
	Batangas	127	144	140	46	49
Region 4B MIMAROPA						
Region 5 Legaspi City	Oriental Mindoro		217	86	110	
	Barriada, Legaspi CitySan	110	72	72	125	84
	Nicolas, Iriga CityPanganiban	110	108	88	95	76
Region 6 Iloilo City	Drive, Diversion Road, Naga City	106	84	83	101	105
	Jaro Police Station Compound	177	182	141	68	67
Region 7 Cebu City	Lapaz Plaza	92	104	81	87	110
	Oportos Residence	72				
	Baricuatros Residence	117		88		
	Canos Residence	93				
	MEPZI (PM_{10})	36				
	Mandaue Foam-H. Cortes St., Mandaue City		56	24.18		
	Valuerich, Sudlon, Mandaue City					
	Wilson Foods, Mandaue City		64	42		
	Banilad, Mandaue City		89			
	N. Gupuit Res., Boundary			88	87	80
	Inuburan & Langtad, Naga, Cebu City				159	137
Region 8 Tacloban City	P&M Bldg.		73	45		
	DENR Cpd., Sto. Niño Extn., Tacloban City					

Table 1-4 Ambient Air Quality Monitoring Stations in the Philippines (TSP)
(1 Year 24 hour averaging)

National TSP Trending		2003	2004	2005	2006	2007
REGION	STATIONS	CONCENTRATION (ug/Ncm)				
Region 9 Zamboanga City	Station 1	237	220	154	155	128
	Station 2	226	209	161	149	105
	Station 3	227	218	170	126	110
Region 11 Davao City	Station 1 (5)	90	56	44	44	87
	Station 2 (6)	42			63	63
	Station 3 (7)	182	64	63	66	36
	Station 4 (8)	249	91	66	66	40
	Station 5 (9)	335	89	66		
	Station 6 (10)	39				
Region 12 Cotabato City	Station 1 in front of Palomolog, South Cotabato	99	135	81	85.5	90.17
	Station 2 in front of Mun. Hall Suralla, Cotabato city	93	91.94	80	85.57	87.31
	Station 3 in front of Mun. Hall, Isulan Sultan Kudarat	95	90.56	78	85.37	86.82
Region 13 Butuan City	New Asia, Butuan City	96	83	81	70	71

Source: EMB

The Philippine Nuclear Research Institute (PNRI) continued to monitor particulate matter in the PM_{10} range using the Gent sampler at three sites in Metro Manila with two stations co-located with those of the Environmental Management Bureau. The monitoring is being done to identify the major sources of air pollution and to estimate the contribution of these sources to air pollution. **Tables 1-5 and 1-6** represent the PM_{10} and $PM_{2.5}$ monitoring from year 2001 to 2007. Data show the minimum and maximum concentration of particulates in ug/Ncu.m.

Table 1-5. PM_{10} Annual Mean Levels and Concentration Ranges at the PNRI Metro Manila Sampling Sites. 2001 - 2007

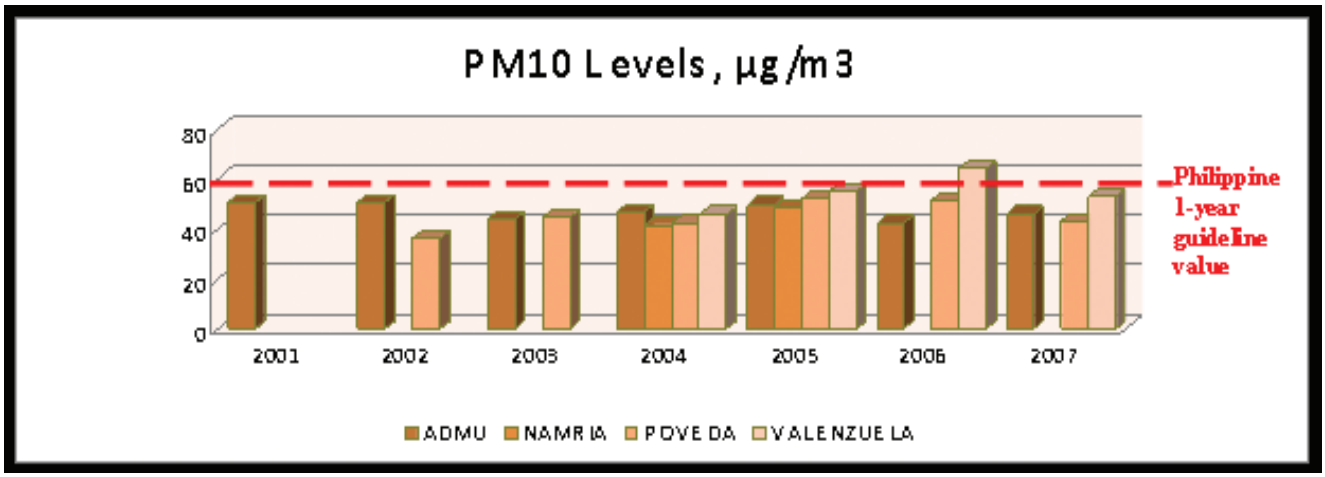
Year	Concentration in ug/cu.m. (range)			
	ADMU	NAMRIA	POVEDA	VALENZUELA
2001	50.4 (23.3-78.9)			
2002	50.3 (21.7-95.0)		36.4 (52-72.3)	
2003	44.0 (17.3-80.3)		44.8 (16.7-92.8)	
2004	47.0 (16.9-82.2)	41.5 (21.0-67.6)	42.6 (16.3-75.0)	45.7 (22.8-81.8)
2005	49.5 (18.5-179.0)	48.3 (19.0-78.4)	52.2 (24.8-89.4)	58.5 (19.7-104.3)
2006	42.5 (13.0-84.1)		51.6 (18.9-61.8)	64.0 (20.9-157.3)
2007	45.7 (22.2-84.0)		43.3 (19.2-85.5)	52.8 (18.0-113.0)

Source: PNRI

Table 1-6. $PM_{2.5}$ Annual Mean Levels and Concentration Ranges at the PNRI Metro Manila Sampling Sites, 2001 - 2007

Year	Concentration in ug/cu.m. (range)			
	ADMU	NAMRIA	POVEDA	VALENZUELA
2001	27.9 (10.1-49.1)			
2002	27.7 (13.0-50.5)		15.8 (1.1-32.1)	
2003	26.0 (2.8-49.8)		18.5 (3.2-39.0)	
2004	28.0 (11.8-51.4)	15.8 (4.8-33.2)	15.0 (4.3-35.0)	20.1 (9.4-32.6)
2005	30.0 (9.9-113.0)	22.0 (7.8-48.0)	19.6 (9.0-44.0)	25.0 (10.0-63.3)
2006	25.8 (8.2-42.1)		21.7 (8.27-25.3)	29.2 (9.2-68.8)
2007	25.9 (10.6-43.3)		16.8 (2.3-48.0)	19.8 (8.9-39.6)

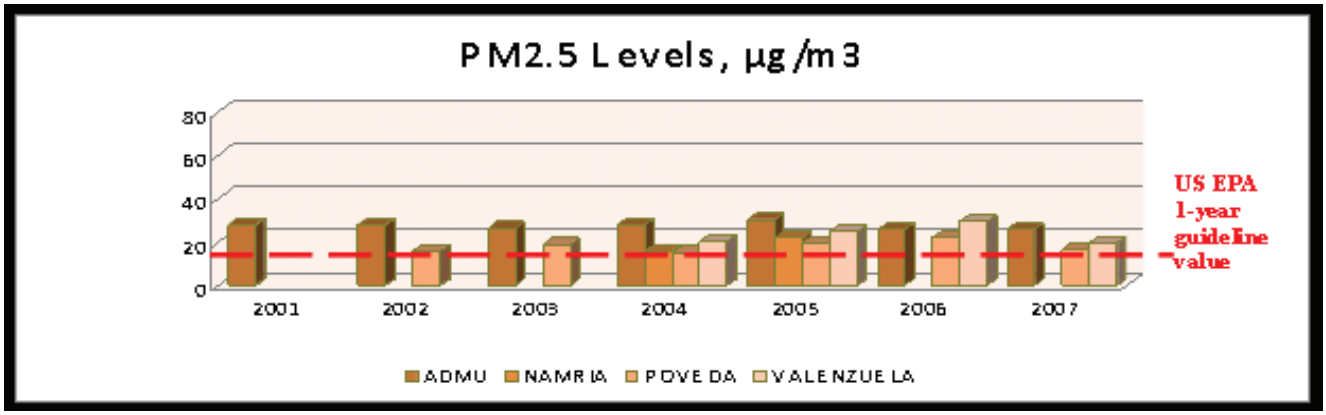
Source: PNRI



Source: PNRI

Figure 1-4. PM_{10} Annual Mean Levels at the PNRI Metro Manila Sampling Sites, 2001-2007

Furthermore, PM_{10} annual mean levels in all the PNRI Metro Manila sampling sites are in compliance with the Annual Ambient Air Quality long term guideline value of 60 µg/m^3 except for Valenzuela in 2006 and are in general showing decreasing trends in 2007 compared to 2006.



Source: PNRI

Figure 1-5. $PM_{2.5}$ Annual Mean Levels at the PNRI Metro Manila Sampling Sites,2001-2007

Also, $PM_{2.5}$ annual mean levels in all the PNRI Metro Manila sampling sites, although showing a general decreasing trend in 2007 compared with 2006, have consistently been in exceedance of the US EPA long term guideline value of 15 µg/m^3 indicating a need to address fine particulate pollution.

1.3 Air Quality Management

1.3.1 Emissions Inventory

Emissions Inventory is an estimation of the sources, extent, and future trends of air pollutants in a given area. Although inventories are merely approximations, results serve as basis in the prioritization of air quality regulations. The conduct of emissions inventory is required by the CAA of 1999 or RA 8749 once every three years. Emissions inventories use information submitted by companies as part of their self monitoring and permitting requirements. The previous emissions inventory was conducted in 1990 and was updated in 2001, and continuously three years thereafter. The Philippine emissions inventory covers criteria pollutants which include PM, sulfur oxide, nitrogen oxide, carbon monoxide, volatile organic compounds, and total organic gases from mobile sources.

Emissions inventory in the Philippines utilizes emission factors. These are numerical values relating the quantity of pollutants released from a source to some activity associated with those emissions. It is an excellent tool in conducting emission inventories used in quantifying and identifying the extent of air pollution emitted by a certain source. In general, available emission factors developed in other countries may not be applicable elsewhere. However, while the Philippines has not developed its own emission factors, inventories are calculated using USEPA AP-42 Emission Factor Compilation.

Based on the 2006 National Emissions Inventory, majority of the regions in the country point to the transport sector as the major source of air pollution. As shown in Figure 1-6, it was estimated that 21% of the pollutants came from stationary sources, 65% from mobile sources, and the remaining 14% from area sources.

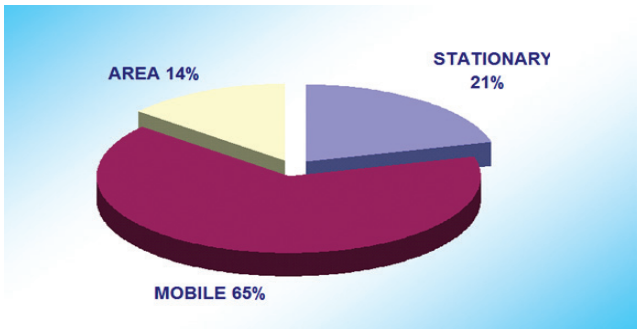


Figure 1-6. 2006 National Emissions Inventory According to Source of Air Pollution

Table 1-7 shows that CO has the biggest pollution load contribution of 50%. CO emission is relatively caused by the increasing population of gasoline-fed vehicles which include MC/TC (47.88%) and cars (13.58%). Other pollutants contribution are as follows: NO_x – (15%), PM-(11%), VOC-(15%), SO_x – (9%) (see **Figure 1-7**).

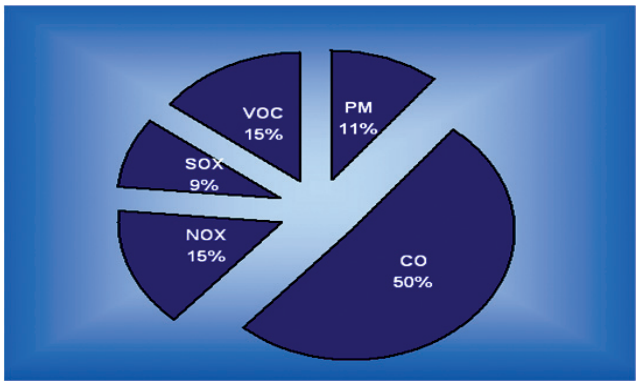


Figure 1-7. 2006 National Compilation of Emissions Inventory According to Criteria Pollutants

Table 1-7. 2006 National Emissions Inventory (in tons)

Source	PM	SOx	NOx	CO	VOC	Total	%
Stationary	110,023	598,634	326,219	360,620	67,859	1,463,385	21
Mobile	244,764	14,309	405,033	9,988,616	914,996	4,567,719	65
Area	423,615	1,963	327,261	165,647	63,855	982,340	14
Total	**778,402**	**614,937**	**1,058,514**	**3,514,883**	**1,046,710**	**7,013,444**	**100**
%	11	9	15	50	15	100	

1.3.2 Management of Stationary Sources

The EMB, through its regional offices, is in-charge of monitoring industrial firms. For complying industries, permit to operate (PO) are issued with a maximum of five years. For companies found to violate environmental laws, notices of violations (NOVs) are issued and for non-complying companies a Cease and Desist Order (CDO) will be issued by the Pollution Adjudication Board (PAB).

From 2005-2007, a total of 18,697 firms were monitored. Also, a total of 1,676 NOVs and 24,391 POs were issued within the three-year period. The breakdown of NOVs and POs for all regions is shown in **Table 1-8**. Compared to the other regions, the NCR has the most number of NOVs issued annually. Region 4-A, where most of the industries are located, has the highest number of POs.

EMB technical personnel doing stack sampling work

Establishments that emit air pollutants are required to submit to EMB a self monitoring report (SMR) that demonstrates their compliance with environmental regulations, including the CAA. The SMR, which is submitted on a quarterly basis, contains among others, concentration and flow rate of air pollutants emitted by the establishment. The EMB, through its regional offices, validates compliance of establishments with CAA through stack sampling.

Major industrial facilities such as power plants and cement plants are required to install continuous emissions monitoring systems.

Table 1-8. Notice of Violations (NOV) and Permit to Operate (PO) Issued, 2005-2007

Region	2005		2006		2007	
	NOV	PO	NOV	PO	NOV	PO
NCR	216	1,795	209	907	218	727
CAR	-	264	10	168	11	132
1	23	510	-	475	40	353
2	37	330	40	458	-	308
3	52	673	36	584	46	644
4a	-	2,438	5	1,281	11	1,727
4b	-	379	20	321	48	285
5	41	416	71	655	70	800
6	148	608	33	541	16	458
7	20	687	50	698	31	662
8	-	217	5	224	6	280
9	3	139	-	145	-	180
10	16	535	10	233	1	334
11	46	364	30	400	21	223
12	8	184	8	80	9	93
13	1	120	5	171	5	185
Total		**9,659**	**532**	**7,341**	**533**	**7,391**

Source: EMB

Accreditation of Third Party Source Emission Testing Firm

Accreditation of Source Emission Testing Firm aims to provide assurance to stakeholders, regulators and the public of the reliability of source emission test results; and to ensure that accredited firms are fully capable of conducting source emission tests in accordance with the Implementing Rules and Regulations (IRR) of RA 8749 DENR Administrative Order (DAO) 2000-81. There are six accredited firms that provide source emission testing services to demonstrate compliance with the CAA IRR standards. The firms have undergone performance test that include oral and written examination and on-site demonstration.

The CEMS consists of a probe installed in a smoke stack (photo at left) which is connected to an analyzer (photo at right) to continuously measure the concentration of air pollutants.

Continuous Emission Monitoring Systems

Continuous Emission Monitoring Systems (CEMS) "means the total equipment required under the Clean Air Act's Implementing Rules and Regulations or as directed by the EMB, used to sample and condition (if applicable), analyze, and provide a permanent record of emissions or process parameters. Such record shall be the basis of the firm's compliance with the emission standards. Further, it may be an approved monitoring system for continuously measuring the emission of a pollutant from an affected source or facility and as such, may be used in computing annual emission fees."

Stationary sources with actual emissions per year of 750 tons per regulated pollutant are required to install CEMS for purposes of monitoring and reporting of compliance to emission standards.

1.3.3 Management of Mobile Sources

The LTO enforces compliance with emission standards for motor vehicles pursuant to pertinent provisions of the CAA of 1999 and its Implementing Rules and Regulations.

Motor Vehicle Inspection System (MVIS) Project

Under the IRR of the CAA, all private in-use motor vehicles and vehicles with updated/enhanced engines whose chassis are pre-registered with the LTO will only be allowed renewal of annual registration upon inspection by the LTO or other authorized private motor vehicle inspection center.

The MVIS project involves the construction of motor vehicle inspection centers to cover all types and classifications of motor vehicles all over the country. The centers shall be situated in areas with high motor vehicle density such as the National Capital Region (NCR), Metro Davao, and Metro Cebu, and in urban areas with satellite city/townships as clusters. The MVIS centers shall be equipped with the state-of-the-art equipment and shall be fully computerized. The IRR of the Clean Air Act directed the LTO to establish MVIS in Metro Manila by 2003 and nationwide implementation shall follow in 12 to 18 months thereafter. Upgrading and rehabilitation shall be given priority in the existing six LTO MVIS (NCR-North and South, Regions III, IV-A, VII and XI).

Private Emission Testing Center (PETC) Program

A PETC is a privately – owned facility for determining the level of opacity and testing the gaseous content of motor vehicle emissions. Its job is to determine if the vehicle emissions conform to the standards set by the DENR under the CAA.

The Department of Trade and Industry (DTI) and the Department of Transportation and Communications (DOTC) issued a Joint Administrative Order (JAO) setting the guidelines for the accreditation of PETCs for motor vehicles. There are currently 575 PETCs nationwide.

Certified technicians perform emission tests on vehicles

Compliance with emission standards of all motor vehicles has been started in January 2003 in a nationwide scope through the operationalization of PETCs. The DOTC through the LTO authorizes PETCs that have been previously accredited with the DTI. The DENR, on the other hand, is responsible for regulating the specifications of the emission testing equipment by PETCs.

Renewal of vehicle registration as well as retrieval of confiscated licensed plates due to smoke belching requires the presentation of Certificate of Emission Compliance (CEC) to LTO. Activities involved in this program are the interconnectivity between the LTO and the PETCs for real time monitoring and validation of data prior to motor registration; and strict monitoring of PETC operations via decentralized setup with the LTO regional offices directly responsible for PETCs operating within their respective areas of responsibility.

The Technical Education and Skills Development Authority (TESDA) is in charge of implementing the assessment and certification program for the Motor Vehicle Emission Control

Technician (MVECT). All certificates relating to the national trade skills testing and certification system shall be issued by the authority through the TESDA Secretariat. In addition, the Secretary of Labor and Employment shall determine the occupational trades for mandatory certification.

Private industry groups and trade associations are accredited to conduct approved trade tests, and the local government units to promote such trade testing activities in accordance with the guidelines to be set by the Authority. Accreditation of technicians that is provided by MVECT is a requirement of the PETC program. With the issuance of the DENR-DTI-DOTC Joint Administrative Order No. 1 series of 2007 or the Amended Guidelines and Procedures for the Monitoring of Accredited and Authorized Private Emission Testing Centers (PETC) and LTO emission testing activities, the compliance with the provisions of the Philippine Clean Air Act is monitored ensured.

Roadside Smoke Emission Apprehension and Testing

Vehicles observed to be emitting excessive smoke while operating in any public highway may be subjected to an emission test by properly-equipped law enforcers and other deputized agents from the DOTC-LTO, Metro Manila Development Authority (MMDA), and local government units in strategic points in Metro Manila.

Table 1-9 shows the total number of apprehensions of smoke belching vehicles and the total number of fines collected by the LTO for the period 2005-2007. For 2005, a total of 15,858 apprehensions were made by the LTO with collected fines amounting to Php26.7 million. Meanwhile, for 2006, a total of 15,276 vehicles were apprehended with corresponding fines amounting to Php34.1 million. For 2007, apprehensions reached a total of 11,556 with fines amounting to Php23.3 million.

Table 1-9. Anti-Smoke Belching Apprehensions, 2005-2007

Regions	Apprehensions		
	2005	2006	2007
I	18	4	11
II	65	8	867
III	7	469	499
IV-A	199	704	285
IV-B	2		
V		64	189
VI	67	127	118
VII	966	331	754
VIII	294	284	228
IX	10	103	8
X	27	14	58
XI	2	7	3
XII			
NCR			
C.A.R.	1,279	1,051	32
CARAGA			
C.O.	12,922	12,110	8,504
Total	**15,858**	**15,276**	**11,556**

Source: LTO

Under the "Bantay Tambutso" program, the DENR-EMB-NCR intensified its anti-smoke belching campaign through roadside apprehension along the stretch of EDSA and other high traffic density areas in Metro Manila. Some of the anti-smoke belching activities conducted were held in the cities of Caloocan, Quezon, Mandaluyong, Makati, Pasay, Mandaluyong and Muntinlupa.

As of December 2007, the DENR-EMB-NCR Anti-Smoke Belching Unit (ASBU) Team, inspected a total of 15,238 vehciles and apprehended a total of 12,497 vehicles for failing the emission standards. This was made possible through the combined efforts of the DENR ASBU Team, local government units and non-government organizations.

Emission Control for Motor Vehicles

Emission Limits for Type Approval and In-use Emission Standards

The adoption of EURO 2 type approval standards for new motor vehicles was signed in 2007 to take effect in 2008, pursuant to DENR Administrative Order 2007-27. In-use

vehicles shall comply with stringent emission standards for vehicles registered after 31 December 2007.

Certificate of Conformity

A COC is issued by the DENR, through the EMB, to a motor vehicle manufacturer, assembler, or importer certifying that a motor vehicle type complies with the numerical emission standards stipulated in DAO 2000-81 and DAO 2007-27, using the relevant Economic Council for Europe (ECE) test procedures or their equivalent as approved by the DENR. No new motor vehicle is allowed initial registration unless a valid COC is issued by the Department through the Bureau.

Table 1-10 shows the total number of COC issued for passenger vehicles, light commercial vehicles, heavy duty vehicles and motorcycles for the period 2005-2007. In 2005, a total of 96 COCs were issued for passenger vehicles and light commercial vehicles, nine COCs for heavy duty vehicles and 38 COCs for motorcycles. In 2006, a total of 125 COC were issued for passenger vehicles and light commercial vehicles, 31 COC for heavy duty vehicles and 23 COCs for motorcycles. Finally, in 2007, a remarkable increase in the number of COCs issued was recorded, with a total of 343 COC for passenger vehicles and light commercial vehicles, 81 COCs for heavy duty vehicles and 171 COC for motorcycles. This is largely attributed to the computerization of LTO's registration process.

Table 1- 10. Certificate of Conformity (COC) Issued, 2005-2007

Class/Type of Motor Vehicles	No. of COCs Issued
Passenger Vehicles/Light Commercial Vehicles (M1, N1)	564
Heavy Duty Vehicles	121
Motorcycles	232

Source: EMB

Table 1-11. Policies Issued from 2005-2007

DENR Administrative Order (DAO) Number	Policy Title	Date of Issuance
DENR-DTI-DOTC Joint Administrative Order No. 1 Series of 2007	Amended Guidelines and Procedures for the Monitoring of Accredited and Authorized Private Emission Testing Centers (PETC) and Land Transportation Office (LTO) Emission Testing Activities	December 2007
DAO 2007-27	Revised Emission Standards for Motor Vehicles Equipped with Compression-Ignition and Spark-Ignition Engines	31 July 2007
DAO 2007-25	Guidelines for DENR Accreditation of Third Party Source Emission Testing Firms	31 July 2007
DAO 2007-22	Guidelines on the Requirements for Continuous Emission Monitoring Systems (CEMS) and other Accepted Protocols thereby Modifying and Clarifying Certain Provisions	31 July 2007

Source: EMB

1.3.4 Regulations and Policies

From 2005-2007, the DENR-EMB issued policies on air quality management as shown in Table 1-11. These directives were issued to further strengthen the implementation of air quality efforts in the country.

1.3.5 Clean Fuels and Fuel Quality

As mandated, the Department of Energy (DOE) and the Department of Environment and Natural Resources (DENR) co-chair the Technical Committee on Petroleum Products and Additives (TCPPA) which sets specifications of all types of fuel and fuel-related products to improve fuel composition for increased efficiency and reduced emissions. Aside from DOE and DENR, the TCPPA is composed of representatives of DTI-Bureau of Product Standards (BPS), the Department of Science and Technology (DOST), the fuel and automotive industries, academe and the consumers. Specifications of all types of fuel are adopted by the BPS as Philippine National Standards (PNS).

Likewise, the DOE, specifically the Oil Industry Management Bureau, is mandated to monitor the compliance of the oil companies/dealers nationwide.

RA 9367, otherwise known as The Bio-fuels Act of 2006 "An Act to Direct the Use of Bio-fuels, Establishing for this Purpose the Biofuels Program, Appropriating Funds therefor, and for other Purposes" was signed into law by the President on January 12, 2007 and became effective on February 6, 2007. The "Bio-fuels Policy" aims to achieve energy independence and fuel diversification while meeting environmental challenges through the utilization of agricultural-based feed stocks thus increasing economic activity, especially in country side. A National Biofuel Board was established as an advisory body to DOE. Biofuel refers to fuels made from biomass and primarily used for automotive, thermal and power generation, with quality specifications in accordance with the Philippine National Standards (PNS).

As mandated in the Act, bio-diesel blend of 1% (B1) by volume is available in all gas/pump stations nationwide since May 2007 (no more 100% conventional diesel). Likewise, 10% bio-ethanol blend of (E10) by volume into all gasoline fuel is distributed and sold by all oil companies/ dealers in the country. The bio-diesel and E10 manufactured/imported/sold conform to the Philippine National Standards.

Table 1-12 shows the fuel properties critical under CAA and closely monitoried by the DOE. The level of compliance of oil industry players nationwide with the benzene and aromatics standard for gasoline was 100%, while that for sulfur in automotive diesel oil was 97%.

Table 1-12. Philippine Fuel Standard, 2005

Fuel	Parameter	Level
Gasoline	aromatics	35% by vol. (maximum)
	benzene	2 % by vol. (maximum)
	AKI	87.5 (minimum)
Automotive Diesel	Reid Vapor Pressure	9 psi (maximum)
	sulfur	0.05% by wt. (maximum)
Industrial Diesel	Cetane index	48 (minimum)
	sulfur	0.30% by wt. (maximum)

Source: CAA

Coal Consumption and Importation

Coal is a black or brownish black, solid combustible rock used mainly in the generation of electricity and manufacture of cement. Currently, coal-fired thermal power plants remain as the number one producer of electricity and account for a total of 3,967 MW or 25% of the country's total installed powered generating capacity.

Coal deposits are scattered all over the Philippines but the largest deposit is located in Semirara Island, Antique. The country's largest coal producer is Semirara Mining Corporation (SMC), which contributes about 92% of the local coal production. Coal mines are also located in Cebu, Zamboanga Sibuguey, Albay, Surigao and Negros Provinces.

Based on the 2006 Update of the Philippine Energy Plan (PEP), coal production in 2004 surpassed the 2003 level by 34 percent from 2.0 MMMT in 2003 to 2.7 MMMT in 2004. Improved coal production of big mining companies such as the Semirara Mining Corporation (SMC) as well as good weather conditions contributed to this positive development. SMC produced a total of 10.09 MMBFOE of coal from its Panian Pit on Semirara Island, Antique, increasing by 1.39 MMBFOE from its 2004 production level.

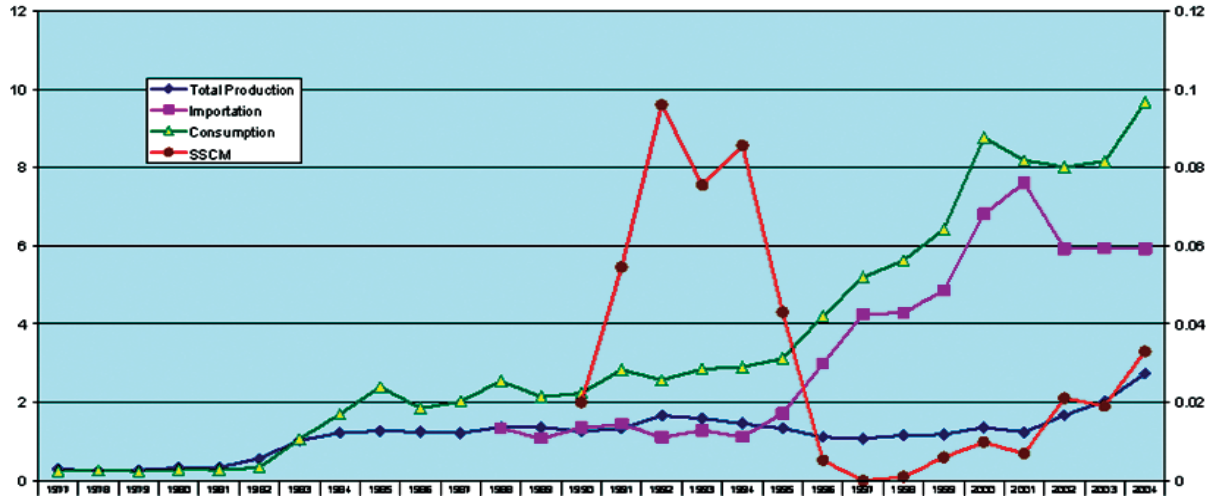


Figure 1-8. Historical coal sector performance (in million metric tons, Run-of-Mine)

The local coal consumption for 2006 as of December 12 was 9.5 MMT, 73% of which was for power generation, 22.5 % for cement production, and 3.75% for other industrial operations. In 2005, local coal production reached 3.1 MMMT, an increase of 26% from the 2004 level. Domestic coal production is estimated to yield an 11.7% increase in the next 10 years from 3.1 MMMT in 2005 to 6.6 MMMT in 2014 @10,000 BTU/lb. Coal production in 2006 as of December 12 stands at 2.3 MMT run-of-min, 2.5% of which came from small-scale coal mining operations. With the cement industry, power generating plants and process industry as major coal users, coal consumption for the year 2005 reached 33.76 MMBFOE or 1.45 percent lower than the 2004 consumption of 34.45 MMBFOE. Coal consumption of the industrial sector reached 7.3 MMBFOE in 2005, 8.75 percent lower than the 2004 level of 8 MMBFOE. This is primarily due to the decreased consumption of some of the local cement factories and coal-fired power plants.

The country's coal requirements are sourced from domestic production and importations. For 2005, total importation reached 7.0 MMMT, 49% of which came from Indonesia, 32% from China, 10% from Australia and 7% from Vietnam (**Figure 1-9**).

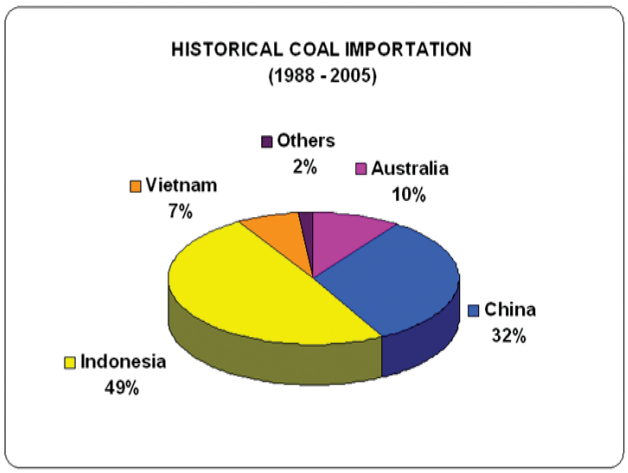


Figure 1-9. Historical Coal Importation

Clean Coal Technologies

The combustion of coal and other fossil fuels emits oxides of Sulfur (SOX) and Nitrogen (NOx) as well as Carbon dioxide (CO_2) to the atmosphere. However, these are minimized or eliminated through the use of clean coal technologies such as fluidized bed combustion, flue gas de-sulfurization and electrostatic precipitation.

To address environmental concerns, the DOE encourages the operation of coal power plants that utilize clean coal technologies. Efforts to educate the public are likewise intensified to better inform them of such clean coal technologies.

Alternative Fuels Program

Alternative fuels are fuels that are not composed substantially of petroleum and thus, are alternatives to petroleum. As a substitute to this "traditional" fuel, it is expected to yield significant energy security and environmental benefits to its consumers. Methanol, denatured ethanol, and other alcohols blended with gasoline, diesel or other fuels are alternative fuels. Those that act as substitutes to petroleum, such as natural gas, liquefied petroleum gas, hydrogen, and coal-derived liquid fuels are also considered as alternative fuels, as are fuels derived from biological materials and electricity.

The Alternative Fuels Program is one of the five key components of the Arroyo Administration's Energy Independence Agenda, which outlines the roadmap that will lead to the country's attainment of 60% energy self-sufficiency by 2010.

The Program has four major subprograms, namely Biodiesel Program, Bioethanol Program, Natural Gas Vehicle Program for Public Transport (NGVPPT), and Autogas Program. Other technologies advocated under the program are hybrid, fuel cell, hydrogen, and electric vehicles. As of 2007, twenty two (22) commercial buses have been utilized under the NGVPPT.

The Department of Energy (DOE) is implementing a long-term Alternative Fuels Program to reduce the country's dependence on imported oil and provide cheaper and more environment-friendly alternatives to fossil fuels. Through the said program, the DOE intends to tap the country's domestic produce as viable sources of energy. The goal is to develop indigenous and renewable energy fuels for long term energy security, which will be a pillar for our country's sustainable growth.

1.3.6 Airsheds

An airshed is a part of the atmosphere that behaves in a coherent way with respect to the dispersion of atmospheric emissions. The Philippine Clean Air Act of 1999 (RA 8749) and its Implementing Rules and Regulations defines an airshed as "areas with similar climate, weather, meteorology and topography which affect the interchange and diffusion of pollutants in the atmosphere." **Table 1-13** provides the list of designated airsheds nationwide.

From 2005 to 2007, two airsheds were additionally designated. These are the Metropolitan Iloilo Airshed (Region 6) designated in 2005 which covers the areas of Oton, Pavia, Leganes, San Miguel and Iloilo City, and the Baco-Naujan-Calapan (Region 4-B) Airshed designated in 2006 which covers the municipalities of Baco and Naujan as well as the entire Calapan City.

Airsheds are to be managed by multi-sectoral governing boards which are tasked to formulate policies and standards as well as action plans to effectively manage the air quality situation within their respective areas.

Table 1-13. Designated Airsheds Nationwide

Name of Airshed	Region	MC No. and date signed	Coverage
Metro Manila Airshed	NCR, 3 and 4A	DAO No.2002-05 dated January 23, 2002	17 cities and municipalities in Metro Manila. Part of Region 3 (Bataan, Bulacan and Pampanga) and part of Region IV (Cavite, Laguna, Rizal and part of Quezon Province)
BLIST Airshed	CAR	MC No. 2002-03 dated February 12, 2003	City of Baguio and Municipalities of La Trinidad, Itogon, Tuba and Sabang
Northeastern Pangasinan	1	DAO No. 07 Series of 2004 dated March 23, 2004	Binmaley, San Fabian, Lingayen, Laoac, San Jacinto, Calasiao, Mangaldan, Manaoag, Binalonan, Malasiqui, Mapandan, Pozorrubio, San Carlos City, Sison, Sta. Barbara, Urdaneta City, Dagupan City, San Manuel
Metro Tuguegarao (PIESTTA) Airshed	2	DAO No. 05 Series of 2004 dated March 23, 2004	Peñablanca, Iguig, Enrile, Solana, Tuguegarao City, Tuao, Amulong
Baco-Naujain-Calapan Airshed	4B	DAO No. 02 Series of 2006 dated January 16, 2006 published January 19, 2006	Baco, Naujan municipalities and Calapan City
Naga City Airshed	5	DAO No. 2003-33 dated July 14, 2003	Abella, Balatas, 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
Bacon-Manito Geothermal Airshed	5	DAO No. 11 Series of 2004 dated May 18, 2004	Ranges: **Latitude** $12^0$59"58.0897-$13^0$4"37.2524 **Long:** $123^0$51"41.1827-$123^0$59"32.0355
Metropolitan Iloilo Airshed	6	DAO No. 2005-11 dated June 10, 2005	Oton, Pavia, Leganes, San Miguel, Iloilo City
Southern Negros Geothermal Airshed	7	DAO No. 14 Series of 2004 dated May 18, 2004	Ranges: **Latitude** $9^0$15'38.2244 to $9^0$20'5.4437 **Long**: $23^0$7'18.0068 to-$123^0$12'45.2140"
Metro Cebu Airshed	7	DAO No. 2002-21 dated October 7, 2002	Cities of Mandaue, Cebu, Lapu-lapu and Talisay Municipalities of Naga, Manglanilla, Cordova, Liloan, Compostela and Consolacion
Leyte Geothermal Airshed	8	DAO No. 12 Series of 2004 dated May 18, 2004	Range: **Latitude** $11^0$5'14.1879" to $11^0$12'17.1161" **Long.** $123^0$36'20,000 to $124^0$41'9.6469
Zamboanga Airshed	9	DAO No. 47 Series of 2003 dated September 2003	A. City Proper (Zone I, II, II, IV) B. North-West Coast Area (Ayala, Canclar, Recodo, Baliwasan, Capisan, San Ramon, Baluno, Cawit, Caragasan, San Roque, Cabatangan, Sinunuc, Calarian, La Paz, Sta. Maria, Camino Nuevo, Maasin, Sto. Niño, Pitogo, Tulungatung, Malagutay, Talisayan, Pamucutan, Upper Pasonanca (Dulian), Pasonanca C. East Coast Area (Arena Blanco, Lumayan, Sangali, Boclan, Lumbangan, Sta. catalina, Cabaluay, Cacao Lunzuran, Talaboan, Mampang, Talon-Talon, Culianan, Manicahan, Talon-Talon Loop, Divisoria, Mariki, Taluksangay, Guisao, Mercedes, Tetuan, Guiwan, Pasobolon, Tugbunga, Kasanyangan, Putik, Tumaga, Lamisahan, Rio Hondo, Victoria, Lampacan, Salaan, Zambowood Lanzones
Cagayan de Oro	10	DAO No. 45 Series of 2003 dated September 12, 2003	Cagayan de Oro City and Municipalities of Jasaan, Villanueva, Tagoloan, Opol and El Salvador
North Cotabato Geothermal Airshed	11	DAO No. 13 Series of 2004 dated May 18, 2004	Ranges: **Latitude** $6^0$59'9.3947 to $7^0$240.3374 **Long:** $125^0$12'13.3856 to -$125^0$15'19.7223"

Table 1-13. Designated Airsheds Nationwide

Name of Airshed	Region	MC No. and date signed	Coverage
South Cotabato Airshed	12	DAO No. 2004-22 dated August 3, 2004	Gen. Santos City, Koronadal City, Tupi, Polomolok, Tampakan, Tantangan, Banga, Surallah, Norala, Sto. Niño, T'boli, Lake Sebu
Agusan del Norte Airshed	Caraga	DAO No. 2003-16 dated June 6, 2003	Butuan City, Buenavista, Cabadbaran, Carmen, Jabonga, Kitcharao, Las Nieves, Magallanes, Nasipit, Santiago, Tubay, and Remedios T. Romualdez
Metro Manila Airshed – revising the Initial Area Coverage of Metro Manila Airshed	NCR, R4-A, R3	DAO No. 07, Series of 2007	Bulacan, 16 Municipalities & 1 City: Pampanga-one-Eco Zone, 1 city & 20 municipalities; Bataan – 10 municipalities; Cavite-21 municipalities & 1 City; Laguna-4 municipalities & a City; Rizal-14 municipalities and a City; NCR- 17 cities

1.3.7 Air Quality Management Fund

The Air Quality Management Fund (AQMF) was established as a special account in the National Treasury to be administered by the DENR to finance containment, removal, and clean-up operations of the Government in air pollution cases; guarantee restoration of ecosystems and rehabilitate areas affected by the acts of CAA violators; and support research, enforcement, monitoring activities and capabilities of the relevant agencies pursuant to Section 14 of the Philippine Clean Air Act of 1999. The AQMF can also be used by the Airshed Governing Boards. The AQMF was assigned Fund Code 155 by the National Bureau of Treasury (BTr) in April 2004.

Sources of the Fund include the following: 1) air emission charges from industrial and mobile sources; 2) fines and penalties for non-compliance with environmental standards; 3) grants, donations and endowments from both private sector and donor organizations; 4) fees collected from the processing of permits; and 5) fines and penalties for violation of the other provisions of the Act and its Implementing Rules and Regulations. So far, only the Environmental Management Bureau of the Department of Environment and Natural Resources (EMB-DENR) and the Land Transportation and Office of the Department of Transportation and Communications (LTO-DOTC) have been remitting to the Fund. The latter's collection of fines largely comes from the Anti-Smoke Belching operations.

In addition to the DENR-DBM Joint Memorandum Circular (JMC) No. 2004-01 dated November 8, 2004 on the operational guidelines of the AQMF, the "Criteria in the Selection and Implementation of Qualified or Eligible Project and Activities to be Supported pursuant to Rule XVI, Section 4 of DAO 2000-81 or the Implementing Rules and Regulations of the CAA" was established on 15 July 2005 in the DENR Memorandum Circular No. 2005-010 dated on July 15, 2005. Likewise, a Special Review Committee (SRC) composed of EMB officials was created pursuant to DENR Special Order No. 867 on 15 December 2004 to review, evaluate, and recommend such eligible and qualified projects/activities using the criteria set forth under MC 2005-10.

The first request for fund release was made in July 2005 but no release was effected as of December 31, 2007.

Table 1-14 shows the total amount of Php 184,994,118.00 deposited to the BTr under the AQMF as of December 2007. Of this amount, Php 60,103,314.00 has been certified bythe BTr.

Table 1-14. LTO and EMB Deposited Collections for the Air Quality Management Fund

Regional Office	LTO		EMB	
	DEPOSITS	BTr CERTIFIED	DEPOSITS	BTr CERTIFIED
CO	94,556,370.00	17,797,095.00	57,350.00	-
NCR	25,326,500.00	-	18,355,499.00	10,248,986.00
Region 1	37,000.00	3,000.00	5,941,662.00	5,527,387.00
Region 2	941,000.00	9,000.00	522,770.00	44,010.00
Region 3	802,680.00	9,680.00	4,495,664.50	2,953,527.50
Region 4-A	1,519,115.00	65,115.00	9,655,577.50	9,566,352.50
Region 4-B	2,000.00	-	248,232.50	-
Region 5	117,095.00	12,000.00	940,376.50	383,687.50
Region 6	-	-	602,249.53	129,864.25
Region 7	2,523,059.00	51,925.00	8,258,638.79	8,258,638.79
Region 8	1,260,935.00	10,000.00	889,898.00	626,143.50
Region 9	143,225.00	8,000.00	532,881.10	407,415.10
Region 10	115,900.00	9,900.00	169,862.50	-
Region 11	14,000.00	2,000.00	1,446,718.20	1,073,294.20
Region 12	-	-	1,095,400.00	1,095,400.00
CAR	2,402,285.50	-	926,555.00	926,555.00
CARAGA	209,281.00	-	884,338.00	884,338.00
TOTAL	**129,970,445.50**	**17,977,715.00**	**55,023,673.12**	**42,125,599.34**
Total Deposited Total Btr	**PhP 184,994,118.26**			
	PhP 60,103,314.34			

Source: EMB

1.3.8 Civil Society Initiatives

Bantay Kalinisan Task Force, Inc.

The Bantay Kalinisan Task Force, Inc., an organization of concerned volunteers, was conceptualized and initiated by the DENR EMB-Cordillera Administrative Region (CAR) during the middle part of CY 2005. Using the precept of volunteerism, the group conducts on-the-spot vehicle emission testing and roadside apprehensions during surprised but planned "operations" at identified major roads and entry points to the City of Baguio.

In its operation on August 1, 2005 until September 8, 2005, the group reported 632 apprehensions of smoke belching vehicles; 475 (76.37%) of which were already settled with a total fines of PhP 493,000.00 collected by DOTC-Regional Traffic Adjudication Services (RTAS); fines still to be collected amounted to PhP 157,000.00. For year 2006, there were 942 vehicles flagged down and tested 709 (75.27%) of which failed the standard emission level. The simultaneous roadside apprehensions conducted by five teams of the Task Force did not only help improve the air quality in the City but have caused warning too to the transport group, and even owners of private motor vehicles, that indeed, violators are apprehended and penalized.

Concerned Citizens Against Polllution (COCAP)

COCAP, a non-government organization, has initiated public awareness projects with various transport organizations in Metro Manila. These projects include information campaigns on the shift from two-stroke to four-stroke engines, health and economic benefits of clean engines, and of using bio 2T on two-stroke engines.

In addition, COCAP has likewise conducted workshops on coconut methyl ester (CME) production from used cooking oil and 2T oil production using CME. These workshops were coupled with actual monitoring of emissions on test vehicles to illustrate the effectiveness of using CME.

MIRIAM P.E.A.C.E (Public Education and Awareness Campaign for Environment)

Technology Options for 2-Stroke Powered Tricycles is a quasi participatory research conducted last 2006 by Mirian P.E.A.C.E. It studied the effectiveness of four current technologies namely: a) Alternative fuel (Ethanol 10), b) Bio 2T oil (CME-blended), c) Air Bleed Technology (Cyclos) and d) Retrofit Technology (Direct Injection). The project is made

up of three components namely Market Scan and Information Dissemination, Technology Verification and Social Benefit-Cost Analysis. It was sponsored by Peace and Equity Foundation (PEF) and undertaken mainly by academic institutions, headed by the Environmental Studies Institute (ESI) of Miriam College in collaboration with National Center for Transport Studies (UP-NCTS), Technological University of the Philippines (TUP), Don Bosco Technical College (DBTC) and the SKY Group (Suzuki, Kawasaki and Yamaha). In conclusion, the study showed that the four technologies –Direct Injection, Air Bleed, Bio 2T and E10 - brought about improvement on specific parameters in varying degrees, with Direct Injection technology topping positive changes in all parameters. However, it is recommended that a large scale pilot testing should be undertaken to ensure that technical problems resulting to long-term use are addressed and costing can be refined. The Social Benefit-Cost Analyses also showed remarkable benefits to the general public as well as to the tricycle operators.

Another project undertaken is Air Care: A Community-Based Air Quality Management Program. It aimed to improve local ambient air by involving academe in air quality monitoring, the tricycle sector in regular preventive maintenance practices and community leaders in clean air policies/ projects. Several collaterals have been produced through the project: Manual for Schools, posters and video on Preventive Maintenance, etc. The project was implemented in the Katipunan, UP, Balara corridor of Quezon City.

1.3.9 International Development Community Assistance Programs/Projects

Metro Manila Air Quality Improvement Sector Development Program (MMAQISDP)

The MMAQISDP is an Asian Development Bank (ADB) loan-financed program implemented by various national government agencies headed by the DENR. Its general objective is to promote policy reforms to improve air quality through the abatement of mobile and stationary sources of air pollution. It focuses on the Metro Manila air shed, the location of the main concentrations of air pollution, but policies developed have nationwide implications and/ or may be replicated in other airsheds.

The MMAQISDP was completed on December 2007. An initial assessment of its activities' environmental impact was conducted in 2006 which yielded the following results:

1. 87% reduction in ambient lead concentration from 1999 to 2000 as a result of the gradial phase-out of lead in gasoline beginning 1994;
2. 10% reduction in TSP from 1999 to 2005 and no reduction in PM10 from 1999 to 2003; and
3. 87% reduction in total mass of SOx emitted by mobile sources was achieved due primarily to reduction in sulphur content of automotive diesel fuel.

Program was able to reap the following benefits in improving air quality management in the Metro Manila air shed: (1) a delineated Metro Manila Airshed and a working Governing Board; (2) issuance and implementation of policies on emission standards for both mobile and stationary sources of pollution, emission testing, incentives for industries, fuel standards and clean fuels; and (3) capacity building for the EMB in the following areas: ambient air quality monitoring, stack testing and monitoring, enforcement of Clean Air Act, permitting, and public awareness.

Vehicle Emission Reduction Programs

The United States Agency for International Development (USAID) in its response to the worsening air quality brought about by excessive pollution for motor vehicle emissions in Metro Manila, entered into a cooperative agreement with Infinite Progression Foundation, Inc. (IPFI) for a two-year project that aims to promote public awareness and actions to reduce vehicle emissions in Metro Manila by addressing the problem of poorly maintained public utility vehicles plying the roads of Metro Manila with uncalibrated fuel injection pumps.

The strategies to implement the preventive maintenance system include: 1) comprehensive training and technical consultancy assistance on proper vehicle maintenance and injection calibration; 2) coalition building of PUV operators and drivers as leaders in advocating for preventive maintenance practices; 3) establishment of reputable calibration centers; and 4) program for monitoring and documentation for skills upgrading and technology transfer. The target beneficiaries are jeepney and bus drivers/ operators and the general public in Metro Manila.

The project, through USAID assistance, organized the Champion for Reduction of Air Pollution from Motor Vehicle Emission (CRAVE), a coalition of 30-50 core group leaders from public utility transport sector that aims to continue the project's Preventive Maintenance advocacy work. It has conducted a number of seminars and trainings on preventive maintenance system to about 900 jeepney/bus drivers and operators in Metro Manila.

USAID-Energy and Clean Air Project (ECAP)

The USAID-ECAP is a four-year project which started last October 2004 and ended on September 2008. The project provided technical assistance to government agencies and selected civil society partners that are working on power sector reforms and cleaner air. ECAP operates in four project sites, namely: Metro Manila, Baguio, Cebu and Davao by partnering with key academic institutions as ECAP's project offices. Some of its initiatives include strengthening local governance for clean air; strengthening motor vehicle inspection and maintenance; enabling public utility transport sector compliance with emission standards in the Clean Air Act; and sustaining constituencies for clean air and power sector reforms.

Acid Deposition Monitoring Network in East Asia (EANET)

The Philippines is one of the ten countries that first established the EANET in 1998. Acid deposition activities in the Philippines during the regular phase of the EANET could be categorized into the following: (1) implementation of the National Monitoring Plan through the conduct of acid deposition monitoring in the following media: wet deposition, dry deposition, soil, vegetation, and inland aquatic; (2) participation in inter-laboratory comparison exercises for wet deposition, soil and inland aquatic environment; and (3) conduct of public awareness activities.

The National Monitoring Plan covers the generation of relevant data, operation and maintenance of field and laboratory facilities and equipment, and conduct of quality assurance/quality control activities. For wet and dry deposition monitoring, weekly monitoring was conducted in the Metro Manila and Los Baños stations. For soil monitoring, soil samples were collected and analyzed for pH (H_2O), pH (KCl), exchangeable base cations (Ca, Mg, K, Na), and exchangeable acid cations (Al, H). For vegetation monitoring, investigations were made on trees in the sampling plots and understorey vegetation in terms of species. For inland aquatic monitoring, quarterly monitoring was conducted in Mojicap Lake for the period 2001-2003.

1.3.10. Research and Development

Characterization and Source Identification of Ambient Air PM_{10} in Metro Manila by Nuclear and Related Analytical Techniques

The Philippine Nuclear Research Institute (PNRI) has continued research to generate information on the sources of particulate pollution and their contribution through the use of nuclear and related analytical techniques. Data for PM_{10} and $PM_{2.5}$ **(Figures 1-4 and 1-5, Tables 1-5 and 1-6** shown in Section 3 on Ambient Air Quality), black carbon and elemental concentrations such as that of Pb are also generated.

Air pollutants at receptor sites, anthropogenic and/or natural origin, may be in different mixed-up forms. With the use of nuclear and related analytical techniques such as the X-ray Fluorescence Spectrometry (XRF) to generate multi-element data for receptor modeling, the research aimed to address the following questions:

WHAT are the sources of air pollutants?
HOW MUCH is the contribution of each?
WHERE? From which direction/s are these coming from?

Phase-out of the use of leaded gasoline has been very effective in reducing Pb levels in ambient air as shown in the decreasing trend of Pb levels at the ADMU sampling station **(Figure 1-10**). Continuous monitoring is helpful in documenting the impact of government policies such as that seen in ADMU where the reduction of Pb levels coincided with the phase-out of leaded-gasoline.

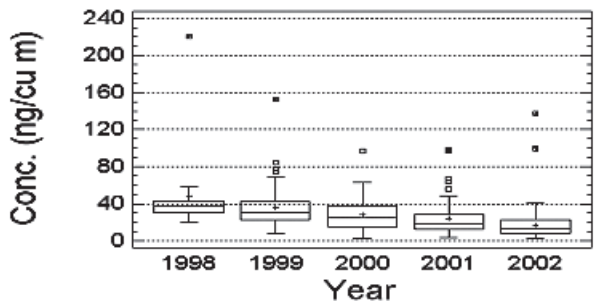


Figure 1-10. Pb levels at the ADMU sampling station, 1998-2002

Figure 1-10 shows decreasing Pb levels in the fine fraction coinciding with the introduction of unleaded gasoline and the eventual phase-out of the use of leaded-gasoline.

Of particular great concern especially in the residents of the area is the Pb levels in Valenzuela City since Pb levels in this part of Metro Manila are generally very much higher compared with Pb levels in the other sampling sites **(Figure 1-11**). The high Pb condition can only come from sources other than leaded gasoline. This condition is reflected in the source apportionment studies with Pb sources showing up in both the coarse ($PM_{10-2.5}$) and the fine fractions ($PM_{2.5}$) **(Figure 1-13)** as compared with that of ADMU (**Figure 1-12)**.

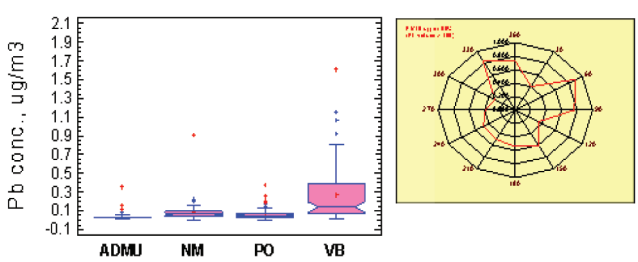


Figure 1-11. Comparison of PM_{10} Pb levels in Valenzuela City and other Metro Manila Sampling Sites, 2005

PM_{10} Pb levels in Valenzuela City are significantly higher than those in the other PNRI sampling stations in Metro Manila. Data analysis using the Conditional Probability Function (CPF) indicates large source contributions coming from about NNW-N, ENE-E and SSE-W of the sampling station.

Figure 1-12. Source Apportionment Studies in Valenzuela

Pb source pollutants in Valenzuela (2005 preliminary results) show up in both the coarse (left figure) and fine fractions (right figure).

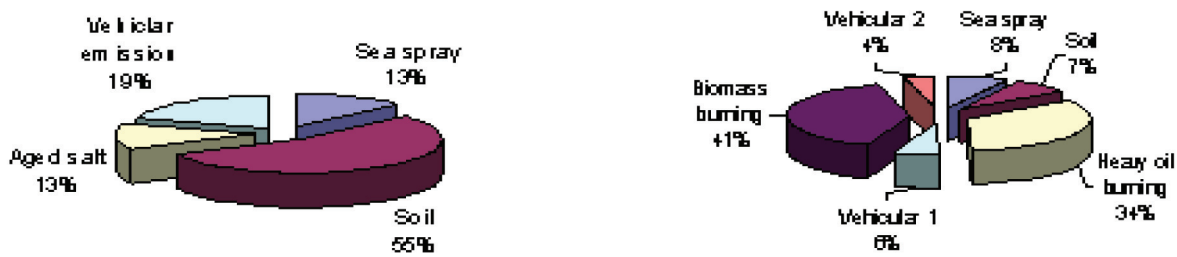


Figure 1- 13. Principal Sources of Particulate Pollution in the Coarse (left figure) and the Fine (right figure) Fractions from ADMU, Metro Manila

Of particular great concern especially in the residents of the area is the Pb levels in Valenzuela City since Pb levels in this part of Metro Manila are generally very much higher compared with Pb levels in the other sampling sites **(Figure 1-10)**. The high Pb condition can only come from other sources other than leaded gasoline. This condition is reflected in the source apportionment studies with Pb sources showing up in both the coarse ($PM_{10-2.5}$) and the fine fractions ($PM_{2.5}$) **(Figure 1-12)** as compared with that of ADMU (**Figure 1-13**).

Figure 1-11 shows comparison of PM_{10} Pb levels in Valenzuela City and other Metro Manila Sampling Sites in 2005.

PM_{10} Pb levels in Valenzuela City are significantly higher than those in the other PNRI sampling stations in Metro Manila. Data analysis using the Conditional Probability Function (CPF) indicates large source contributions coming from about NNW-N, ENE-E and SSE-W of the sampling station.

Figure 1-12 refers to Sources Apportionment Studies in Valenzuela.

Pb source pollutants in Valenzuela (2005 preliminary results) show up in both the coarse (left figure) and fine fractions (right figure).

Figure 1-13 show principal sources of particulate pollution in the coarse (left figure) and the fine (right figure) fractions from ADMU, Metro Manila.

The project resulted in a better understanding of the sources of particulate pollution in Metro Manila, in addition to generating basic data for air quality management.

Results show that continuous monitoring is helpful in documenting impact of government policies such as that seen in the ADMU data showing reduction of Pb levels in the fine fraction coinciding with the phase-out of leaded-gasoline. Results in Valenzuela City indicate the need to do a more comprehensive evaluation of the area to determine the sources of Pb and formulate measures to bring down its ambient levels.

Dry Deposition Monitoring in Metro Manila and Los Baños, Laguna (Acid Deposition Monitoring Network in East Asia)

The Philippines is a participatory country to the Acid Deposition Monitoring Network in East Asia (EANET). Since 2001, the EMB being the country's National Center for the EANET is conducting dry deposition monitoring to study the concentration levels of SO_2, HNO_3, HCl, and NH_3 in gases in Metro Manila and Los Baños, Laguna.

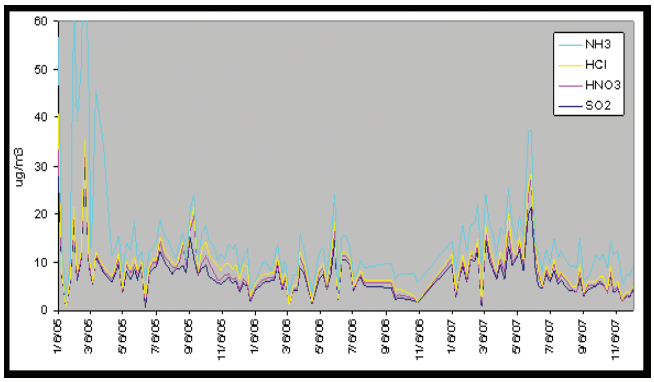
Dry deposition samples are collected using the filter pack method on a weekly basis. Samples are analyzed by ion chromatography method for SO_4^{2-}, NO_3^-, and Cl^- while NH_3 is measured using the colorimetry method. HNO_3, HCl, and NH_4^+ are calculated from their respective ion concentrations. **Table 1-15** shows the annual mean levels of the gas species in the two stations during the period 2005 – 2007.

Table 1-15. Annual Mean Levels of SO_2, HNO_3, HCl and NH_3 in Metro Manila and Los Baños, 2005-2007

Station	Year	Concentration in *ug/m³*			
		SO_2	HNO_3	HCl	NH_3
Metro Manila	2005	8.40	1.23	1.44	7.94
	2006	5.77	0.710	0.808	2.74
	2007	7.28	1.02	1.05	4.63
	Overall Mean	7.15	0.987	1.10	5.10
Los Baños	2005	0.663	0.162	0.489	2.92
	2006	0.683	0.163	0.427	1.43
	2007	1.34	0.462	1.40	2.14
	Overall Mean	0.895	0.262	0.772	2.16

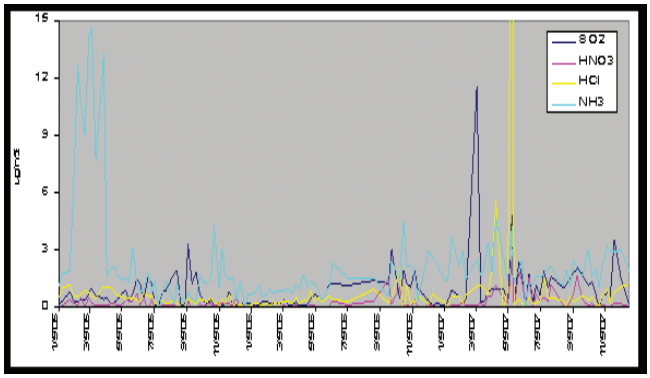
During the 2005-2007 monitoring activities, all the measured gas species in the urban site (represented by Metro Manila) had higher concentration levels than those in the rural site (represented by Los Baños). SO_2 had the highest concentration level in the urban site while NH_3 had the highest concentration level in the rural site. In both sites, HNO_3 had the least concentration level followed by HCl. Comparing the overall mean values, Metro Manila's SO_2 concentration level was almost eight times more than that the concentration level in Los Baños. HNO_3 concentration level in Metro Manila was almost four times the Los Baños level, while NH_3 and HCl were twice the concentration levels in Los Baños.

Figures 1-14 and **1-15** show the time series concentration of gases in Metro Manila and Los Baños. A clear trend is yet to be determined for the gas concentration levels in both stations.



Source: EMB

Figure 1-14. Time Series Concentration of Gases in Metro Manila, 2005-2007



Source: EMB

Figure 1-15. Time Series Concentration of Gases in Los Baños, 2005-2007

1.3.11 Public Awareness and Education on Air Quality Management

For a couple of years, the EMB-DENR has undertaken various activities focused on public awareness and education on air quality management under the Linis Hangin program of the DENR.

The various activities were in cooperation with different multi-stakeholder partners such as academic institutions, business, local government units, national government agencies, non-government organization, private sector, and even individuals advocating the fight for clean air.

The campaign is done on a year-round basis but highlighted mostly every November of each year as this is declared as the National Clean Air Month by virtue of Presidential Proclamation No. 1109 issued in 1997. The declaration aimed at involving the public on initiatives for cleaner air.

There were several undertakings of the EMB-DENR in this direction from 2005 to 2007. Among them are:

Bantay Tambutso sa Eskwela – This program was formally launched in November 2005 under the Linis Hangin Program. The program aimed at (1) involving academic institutions in promoting clean air and (2) increasing and strengthening the advocacy for clean air, especially in the attainment of emission standard for vehicles within school campuses nationwide.

There had been a move also under the program to encourage schools nationwide to adopt the program yearly by writing heads of the schools nationwide through partnership with the Department of Education, Catholic Educational Association of the Philippines, Philippine Association of Tertiary Level Eductional Institutions in Environmental Protection and Management, Commission on Higher Education and Technical Education and Skills Development Authority.

To date, about 100 universities and colleges nationwide vowed to support the program, and close to 50 universities and colleges nationwide had already participated in the one-day nationwide banning of entry of smoke-belching vehicles within their campus premises in a particular day in November.

Bantay Tambutso sa Malls – One of the programs under the Linis Hangin is the Bantay Tambutso sa Malls. This program is geared towards intensifying the government's anti-smoke belching campaign in order to reduce total suspended particulate emissions and safeguard the health of the public consistent with the mandates of the Philippine Clean Air Act of 1999.

The said program targets mall and business establishments nationwide with the aim of encouraging public and private sector cooperation by conducting free vehicle emission testing in malls and commercial establishments for FX taxi, jeepneys and other public utility vehicles

To date, there are several big business establishments that have supported the program such as the SM Supermalls and other prominent commercial establishments nationwide.

Bantay Sunog Basura – This is also under the Linis Hangin Program which aims to address the open burning of wastes nationwide.

The said program partners with local government units and encourages them to practice a more ecological way of dealing with solid wastes through issuance of local ordinances that ban open burning of wastes in their localities.

Bantay Tsimneya – This is also a program under the Linis Hangin program that targets industries and encourages them to reduce emissions in their smoke stacks.

Under the program, EMB Regional Offices conduct visual monitoring and testing of smoke stack emissions of industries using the Opacity Testing Methodology. This program also allows the EMB to check the efficiency of the air pollution control installations of these industries vis-à-vis their compliance to the regulations set under the Philippine Clean Air Act.

The Environmental Education and Information Division (EEID) of the EMB, with its EMB Regional Environmental Education and Information Sections support the heightened information and education campaign for the popularization of the Clean Air Act.

Since the passage of the Act in 1999, the EMB has produced quite a number of information materials to increase awareness on the salient features of the Act. The EMB Central and Regional Offices have conducted several seminars, fora, and trainings for their stakeholders such as the industries, transport operators, drivers, local government units, the academic sector, among others.

1.4. Best Practices and Lessons Learned

National Capital Region

Marikina City

The city government of Marikina is a strong advocate of clean air and non-motorized transport. This was manifested through the Marikina Bikeways Project, which aims to promote low cost and environment-friendly transport.

The bikeways program of Marikina City is a holistic social and advocacy campaign that promotes cycling as an alternative public transport. It is holistic in the sense that it involves not only creating the physical requirements for the adoption of bicycling, but also providing an opportunity to own bicycles, educating the public on the social dimension and safety of riding the bike, and putting in place policies that make this program a sustainable one.

Marikina City has constructed 32 km of bikeways (out of the 50-km target) which connects residential areas to major transport terminals, markets, schools, commercial and industrial establishments.

The Bikeways program is funded by the World Bank with a grant of USD 1.1 million. Aside from construction of bikeways, the program also offers activities focusing on safe

cycling education, bicycle loan and lending program, bicycle ownership survey, Marikina cycling festival, cyclists organization, bicycle clinic, and creating ordinance mandating the use of bicycle lanes.

Makati's Project Hangin

Healthy Air In Good Indoor Environment (HANGIN) Project was initiated by the City Government of Makati through the Department of Environmental Services in collaboration with Makati Health Department, Liga ng mga Barangay, Department of Health (DOH), DENR-NCR and the University of the Philippines (UP) College of Public Health. The project officially started on March 12, 2007 through a Memorandum of Agreement that was entered into by the concerned parties.

The project is an offshoot of the study conducted by the DOH in collaboration with the ADB and the World Health Organization Eastern Pacific Region entitled "Public Health Monitoring: a Study under the Metro Manila Ambient Air Quality Improvement Sector Development Program", which aims at filling the gaps that limit the identification of relationship between severity of air pollution and health effects of exposed communities in Metro Manila.

Five monitoring stations were identified/established within the locality of Makati. Sources of particulate matter monitored are from the motor vehicles and area sources as the sampling stations were situated on the road side. However, due to limited resources, only one sampling equipment could be utilized and this is being transferred to another station after a week of sampling in a particular site.

Cordillera Administrative Region

Efforts of the region are focused more on advocacy for strengthened air quality protection. The advocacy is geared towards increased cooperation and willingness of the people, academe and the youth sector to participate in environmental programs.

Region 1

City of San Fernando, La Union

In 2006, the City of San Fernando enacted its Environment Code. One of its main components is the Tricycle Conversion Program that targeted the conversion of the City's three-wheeler public transport (tricycles) from two-stroke to four-stroke engine motorcycles.

Region 2

Region 2 government agencies, private sector, LGUs, civil society and communities support the mission of improving air quality and protecting the environment as shown in their advocacy.

The Department of Agriculture (DA) in Quirino Province has intensified its campaign against burning of agricultural waste/debris.

Interpretative signs were installed along the national road to strategic locations which read "*Dayami ay huwag sunugin, i-decompose para pataba pagyamanin*".

Penalties were imposed on residents caught burning their agricultural wastes. Positive results were recorded. A high level of awareness among the residents was recorded with no incidence of burning.

Region 3

The DOST Region 3, has, since 1999, been promoting technologies that help minimize air pollution. The program aims to assist Small and Medium-Scale Enterprises to comply with environmental quality standards through reduction of waste generation. The implementation of cleaner production strategies serves as a preparatory stage for the implementation of Environmental Management System (ISO 14000 standards) within the companies' manufacturing operations.

Region 4-A

The local government of Cavite prepared the Cavite Environment Code under Provincial Ordinance No. 43-S-2008. Among the salient features of the code are articles on forest, mineral and water resources, waste management, marine and coastal resources, air and noise pollution management, ecotourism, environmental impact assessment and land use planning.

Region 4-B

The local government units of Region 4-B support the air quality management programs of the EMB. As part of their procedure in the renewal of business permits of firms and industries operating in their respective jurisdiction, the local government units require copies of *Permit to Operate Air Pollution Source and Control Installation* issued to them by the EMB Region 4-B to verify if the firms operating are in compliance with the provisions of the CAA. The local government units are also giving support for the maintenance of the air quality monitoring stations established by EMB Region 4-B. The establishment of the new monitoring station in Baco, Oriental Mindoro was made possible with the signing of the Memorandum of Agreement by the Municipal Government of Baco.

Region 5

The local government of Legazpi City has passed an ordinance banning smoking in public places and conveyances. Also, Naga City and Iriga City have intensified their campaign against smoke belchers by creating Anti-

Smoke Belching Units which will provide assistance to LTO and EMB Region 5 deputized agents in the conduct of random roadside vehicle emission testing. The issuance of ordinances by other LGUs regarding ban on open burning also helps in improving air quality in the region.

Region 6

Iloilo City has undertaken activities against open burning. The city has likewise actively participated in the DENR's Green Philippine Highways Program and continues to implement other urban greening activities.

Region 7

Cebu City takes pride of its comprehensive planning for transport and land use. The city has embarked on a variety of initiatives in traffic management. It has already installed a computerized traffic signal system called SCATS (Sydney Coordinated Adaptive Traffic System) in 1993, the first in the country. In recent years, the city government has been active in its anti-smoke belching efforts and the promotion of the Bus Rapid Transit (BRT) as a mass transit system for the city.

Region 8

EMB Region 8 tied up with industries having initiatives on environmental education and public awareness programs for Air Quality Management and Clear Air. An example is the creation of the Leyte Geothermal Airshed in Ormoc City and Kananga, Leyte thru the initiative of the PNOC-EDC. Since the establishment of Geothermal Areas as Airsheds in 2002, and the organization of the Leyte Geothermal Airshed Governing Board in 2005, various programs and activities were undertaken thru the chairmanship of EMB Region 8 and logistical support of PNOC-EDC.

Region 9

Efforts of the region were focused more on awareness campaigns and advocacy for various environmental programs.

Region 10

Iligan City

The city of Iligan has been a forerunner in the institution of traffic management at the local government level. Through the help of the Asian Development Bank and AusAID, the construction of the north and south bound terminals for buses, and jeepneys, and road widening were made possible. These greatly enhanced the traffic condition of the city and have significantly reduced emissions from inter-city vehicles.

Cagayan de Oro City

The local government of Cagayan de Oro City has prepared a comprehensive land use plan that is intended to decongest its Central Business District (CBD) and identify growth corridors that integrate both land use and transport development.

Region 11

The local government in Davao City has issued policies in support of the Clean Air Act. For 2007, four city ordinances were issued, namely, city ordinances on anti-smoke belching, anti-smoking in public places, and no vending of cigarettes within 100 meters from school premises.

Region 12

One of the best practices in the region is the promotion of proper maintenance of motor vehicles. It was observed during roadside inspection of vehicles in 2007 that majority of the vehicles inspected passed the opacity standard. Interviews with vehicle owners revealed that they regularly undertake maintenance check for their vehicles, which according to them, resulted in lower emission.

Caraga

The local government of Caraga has established a strong linkage with other sectors of society to institutionalize the implementation of the ban on open burning as well as an intensified greening program.

1.5 Challenges

The contribution of the transport sector to the worsening air pollution requires immediate attention inasmuch as mobile sources account for the bigger percentage of the pollutants present in the air particularly in Metro Manila, not to mention its effects to the health of the city dwellers. It is also a reality that there is a direct correlation between the worsening traffic situation and increasing emission of pollutants. Unsustainable urbanization leads to growing traffic congestion necessitating costly transport planning and management.

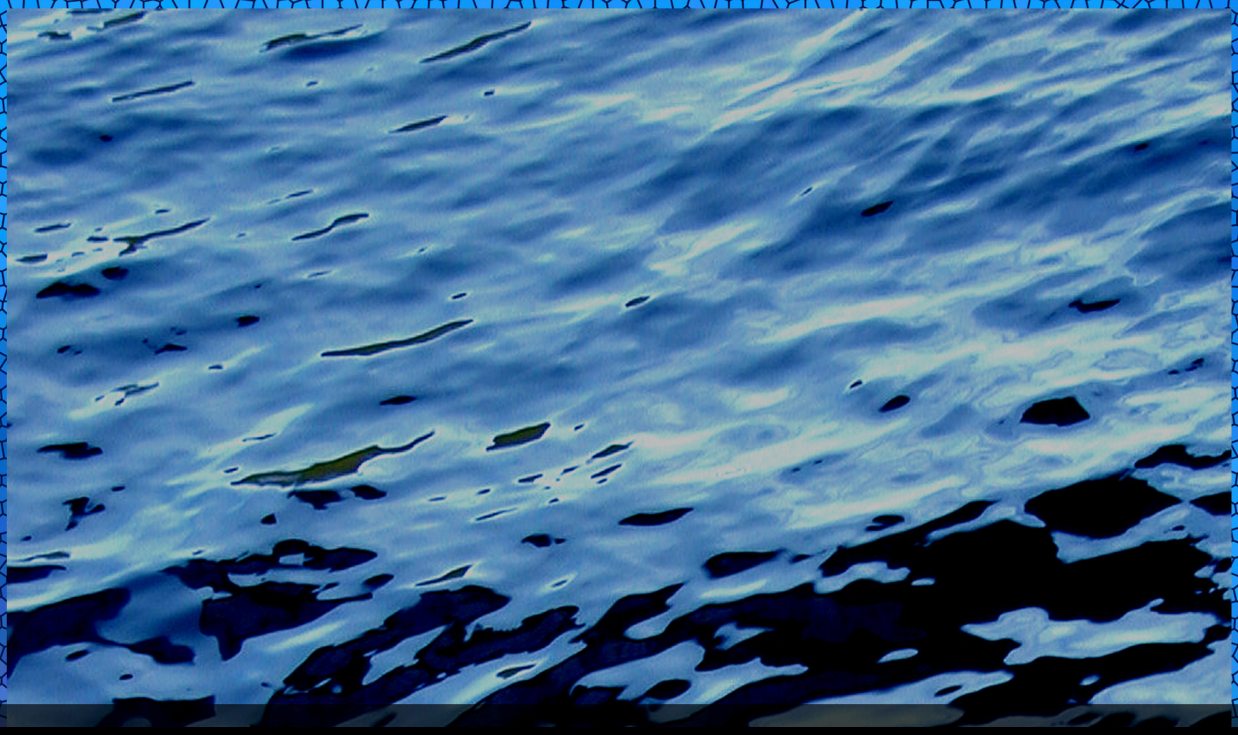
The aspect of air quality monitoring and assessment still needs improvement as most of the monitoring stations are traffic-exposed. The practice of computing the annual average TSP level of all monitoring stations needs to be reassessed as it is being construed as the air quality of any given region.

1.6 Recommendations

The government should re-direct its effort of controlling and/or minimizing emissions coming from mobile sources. Programs and activities of DENR aimed at improving the air quality of Metro Manila shall continue to be of minimal effect unless other government agencies implement their respective mandates vigorously as provided in the CAA.

To further improve air quality monitoring and assessment, the following are recommended:

- Strengthen industry self-regulation programs;
- Fast track the nationwide implementation of the MVIS;
- Strengthen monitoring of compliance on fuel specifications by oil companies;
- For LGUs to strengthen its programs in prohibition of open burning of wastes;
- Strengthen air-related researches;
- Intensify public awareness and education on air pollution prevention among all stakeholders;
- Strengthen anti-smoke belching operations by LGUs;
- Results of air quality monitoring should be made known to the LGUs concerned particularly those which frequently exceed the guideline values; and
- Encourage the active participation of civil society in the monitoring of the implementation of the Clean Air Act.



Water Quality

2. Water Quality

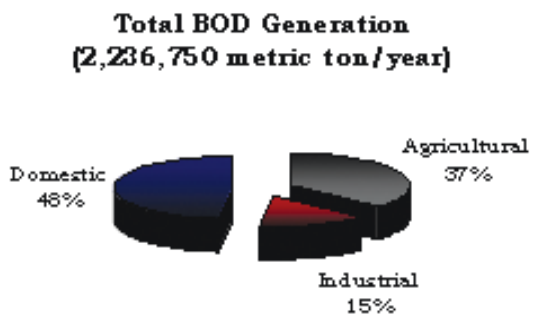
According to the 2006 Philippine Situationer Report, there is an impending water crisis in the country, despite the fact that abundant water resources are available nationwide.

The report said that enhancing urban water governance capability in the Philippines is one approach that can be utilized in adopting a holistic integrated urban resources management strategy, particularly in the water supply sector within the context of the Philippine water crisis and related issues.

In order to address the several mounting problems in our water bodies, the government continues to monitor and enhance the capability of water-related agencies to help them restore our water bodies.

2.1 Sources of Water Pollution

Based on **Figure 2-1,** major sources of BOD generation in the Philippines are from domestic sources (48%); agriculture (37%); and industry (15%).



Source : EMB-DENR. NWQSR, 2001-2005.

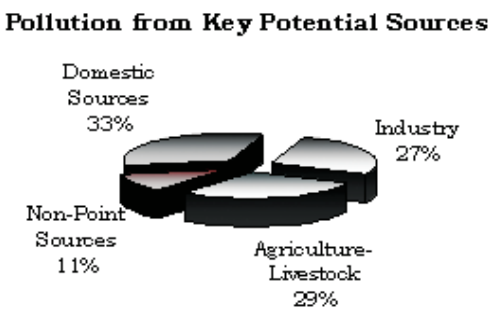
Figure 2-1. Total BOD Generation in the Philippines, 2001-2005

The industry sector contributes lowest as most industries have already installed wastewater treatment facilities that enable them to minimize their pollution generation.

- Sources of water pollution are either from point and non-point sources. Point sources of pollution come from precise locations or identifiable sources like industrial discharges, municipal wastewater effluents, manufacturing/ processing operations, septic systems and raw sewage.

- On the other hand, non-point sources are diverse sources and origins like agricultural runoff, oil, grease and toxic chemicals runoff, leachate from municipal solid waste, oil spills and illegal dumping. Pollution occurs when water running over the land surface and through the ground collects natural or human-made pollutants and deposits to the water bodies.

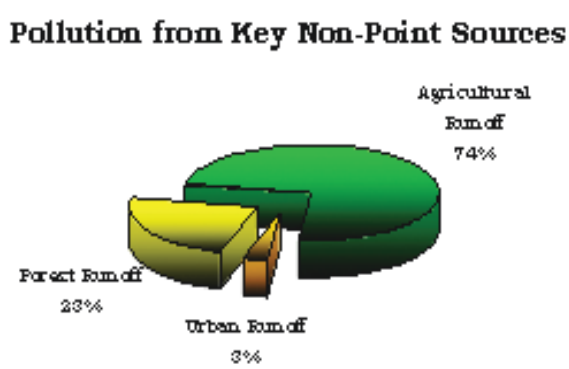
Figure 2-2 shows that from 2001-2005, identified potential point sources of pollution came from industries (27%); agriculture and livestock (29%); domestic sources (33%); and non-point sources (11%).



Source : EMB-DENR. NWQSR, 2001-2005.

Figure 2-2. Pollution from Key Potential Point Sources, 2001-2005

Figure 2-3 shows that based on figures from 2001-2005 for non-point sources, agricultural runoff contributes the biggest with 74%, followed by forest runoff with 23 %, and urban runoff with 3%.



Source : EMB-DENR. NWQSR, 2001-2005.

Figure 2-3. Pollution from Key Non-point Sources, 2001-2005

2.2 Water Body Classification

The EMB-DENR has classified additional 29 water bodies in 2007 bringing to 596 the total water bodies that have been classified in terms of best usage and water quality to be maintained. To date, there are now 277 classified principal rivers or rivers with drainage areas of not less than 40 sq. km. This accounts to 65.80% of the country's 421 principal rivers identified by the National Water Resources Board (NWRB).

For freshwater bodies, five of these are classified as Class AA, meaning waters which require only disinfection in order to meet the Philippine National Standards for Drinking Water (PNSDW). Two hundred one (201) are classified as Class A or waters which require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the PNSDW. One hundred six (106) are Class B waters or waters that can be used for primary recreation such as bathing and swimming. Two hundred nine (209) are classified as Class C or fishery water for the propagation and growth of fish and other aquatic resources. Twenty six (26) are classified as Class D category as being allowed for agriculture, irrigation, livestock watering and suited for industrial cooling purposes.

Under the marine waters group, five are classified as Class SA waters suitable for propagation, survival and harvesting of shellfish for commercial purposes and designated as marine parks and reserves. Twenty five (25) are classified as Class SB or waters suitable for bathing, swimming and skin diving. Sixteen (16) are classified as Class SC described as Recreational Water Class II suited for boating and commercial sustenance fishing. Three are Class SD waters classified as Industrial Water Supply Class II for cooling purposes in industrial facilities.

Tables 2-1 and 2-2 show the current classification for fresh surface waters and for coastal and marine waters according to DENR Administrative Order No. 34, series (1990) and DENR Administrative Order No. 23 (1997).

Table 2-1. Current Classification of Water Bodies for Fresh Surface Water according to Beneficial Use

Classification	Beneficial Use
Class AA Public Water Supply Class I	This class is intended primarily for waters having watersheds which are uninhabited and otherwise protected and which require only approved disinfection in order to meet the Philippine National Standards for Drinking Water (PNSDW)
Class A Public Water Supply Class II	For sources of water supply that will require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the PNSDW
Class B Recreational Water Class I	For primary contact recreation such as bathing, swimming, skin diving, etc. (particularly those designated for tourism purposes)
Class C	Fishery Water for the propagation and growth of fish and other aquatic resourcesRecreational Water Class II (boatings, etc.)Industrial Water Supply Class I (for manufacturing processes after treatment)
Class D	For agriculture, irrigation, livestock watering, etc.Industrial Water Supply Class II (e.g. cooling, etc.)Other inland waters, by their quality, belong to this classification

Source: DENR Administrative Order 34, series of 1990

Table 2-2. Current Classification of Water Bodies for Coastal and Marine Waters according to Beneficial Use

Classification	Beneficial Use
Class SA	1. Waters suitable for the propagation, survival and harvesting of shellfish for commercial purposes; 2. National marine parks and reserves established under existing laws and/or declared as such by appropriate government agency/ies; and 3. Coral reefs parks and reserves designated by law and concerned authorities.
Class SB	1. Tourist zones and marine reserves primarily used for recreational activities such as bathing, swimming, skin diving, etc., established under existing laws and/or declared as such by the appropriate government agency; 2. Recreational Water Class I (Areas regularly used by the public for bathing, swimming, skin diving, etc); and 3. Fishery Water Class I (Spawning areas for Chanos chanos or "Bangus" and similar species).
Class SC	1. Recreational Water Class II (e.g. boating, etc.); 2. Fishery Water Class II (commercial and sustenance fishing); and 3. Marshy and/or mangrove areas declared as fish and wildlife sanctuaries.
Class SD	1. Industrial Water Supply Class II (e.g. cooling etc.); and 2. Other coastal and marine waters, by their quality, belong to this classification.

Source: DENR Administrative Order 23, series of 1997

Table 2-3 shows the number and percentage of principal rivers that were classified as of 2007, while **Table 2-4** shows the statistics of classified water bodies as of 2007.

Table 2-3. Principal Rivers Classified as of 2007

Region	Total Number of Principal Rivers	Number of Classified Principal Rivers	Number of Principal Rivers to be classified	Percent Classified
1	14	14	0	100.00
2	31	26	5	83.87
3	18	16	2	88.89
4a	40	21	19	52.50
4b	56	23	33	41.07
5	30	29	1	96.67
6	35	31	4	88.57
7	19	19	0	100.00
8	34	15	19	44.12
9	29	13	16	41.83
10	14	12	2	85.71
11	22	18	4	81.82
12*	32	12	20	37.50
CARAGA	33	15	18	45.45
CAR	12	11	1	91.67
NCR	2	2	0	100.00
Total	**421**	**277**	**144**	**65.80**

Source: EMB-CO

** Nine were turned over to Autonomous Region of Muslim Mindanao for classification*

Table 2- 4. Statistics of Classified Water Bodies as of 2007

Region	AA	A	B	C	D	SA	SB	SC	SD	Total
1		10	4	10			1			25
2		3	8	23	5					39
3		17	7	27	1		2	2		56
4a		3	10	28				1		42
4b		7	1	29	3	3	1	2		46
5		24	13	14	2		1	1		55
6		20	7	19			8			54
7	1	23	3	2	1	1	5	3		39
8				25				3	3	31
9		23	14							37
10		35						1		36
11	2	7	8	7	3		3			30
12		9	10	9	4		4	3		39
NCR		1		4						5
CAR	2	9	20	6						37
Caraga		10	1	6	7	1				25
Total	**5**	**201**	**106**	**209**	**26**	**5**	**25**	**16**	**3**	**596**

Source: EMB-CO

In all, Region 4 has the biggest number of classified water bodies with 88 followed by Region 3 (56), Region 5 (55), Region 6 (54), Regions 2, 7 and 12 (39 each), Region 9 and CAR (37 each) Region 10 (36), Region 8 (31), Region 11(30), Regions 1 and Caraga (25 each) and NCR (5).

2.3. Water Quality Assessments

Inland water quality is assessed based on Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), oil and grease, nutrients, Total and Fecal Coliform, and in some cases, heavy metals. Marine waters are assessed based on the levels of DO, oil and grease, pH, Total and Fecal Coliform,and in some cases, heavy metals. The monitoring activities include in-situ (on-site) measurements and grab water sampling following the EMB Water Quality Monitoring Manual. The assessment of the condition of water bodies is based on DENR AO 34 (1990) and DENR AO 23 (1997).

Groundwater is assessed based on the presence of Total and Fecal Coliform and Salinity based on the standard set under the PNSDW of 2007.

2.3.1 Inland Waters

2. 3.1.1 Fresh Surface Waters

Fresh surface water includes rivers, streams and lakes. Surface water pollution comes from domestic or household sources, industrial and agricultural wastes that greatly affect human health and the environment.

Among our surface waters, rivers have been the most important water body to many human activities such as fishing, irrigation, transportation, bathing, and recreation and even for waste disposal.

a. Priority Rivers Monitored

There are 19 priority rivers initially identified by the EMB for its Sagip Ilog Program to comply with the water quality criteria set under DENR Administrative Order (DAO) 34, series of 1990. These are the following:

- National Capital Region – Marikina River, San Juan River, Paranaque River and Pasig River
- Cordillera Administrative Region – Balili River
- Region 3 – Meycauayan River, Marilao River, Bocaue River
- Region 4A – Imus River, Ylang-ylang River
- Region 4B – Mogpog River, Calapan River
- Region 5 – Anayan River, Malaguit River, Panique River
- Region 6 – Iloilo River
- Region 7 – Luyang River, Sapangdaku River
- Region 10 – Cagayan de Oro River

b. Water Quality Monitoring

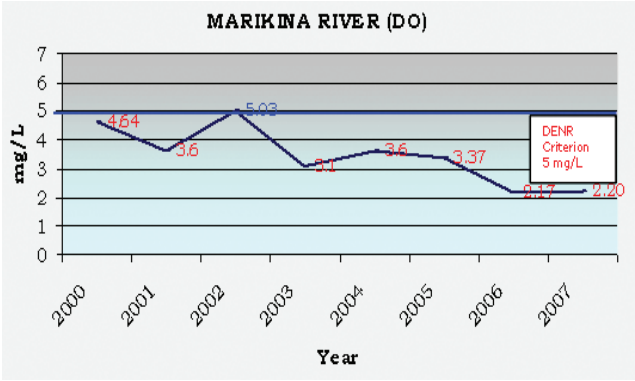
This section presents the monitoring activities being conducted in the 19 Priority Rivers identified under the Sagip-Ilog program, and other related water quality monitoring activities being done by the EMB.

Monitoring activities of the quality of each water body are being undertaken to characterize waters, identify trends over time, identify emerging problems, determine whether pollution control programs are effective and prioritize pollution prevention efforts.

Sampling of the water bodies in the different regions in the country often varies. However, the sampling frequency based on the existing Water Quality Monitoring Manual should be done regularly. Currently, sampling frequencies in the different EMB Regional Offices are limited to one sample per station every month or quarterly at the most.

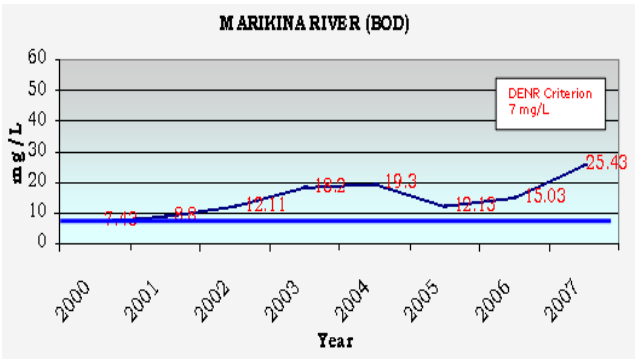
For water bodies that have been classified, water quality monitoring and assessment are being conducted regularly to check whether the said water body maintains the status, for which it was classified for its best usage.

Presently, the EMB National Capital Region monitors four priority rivers, namely: Marikina River, Paranaque River, Pasig River and San Juan River. **Figures 2-4 to 2-11** below show the DO and BOD trends of the said rivers from 2000-2007.



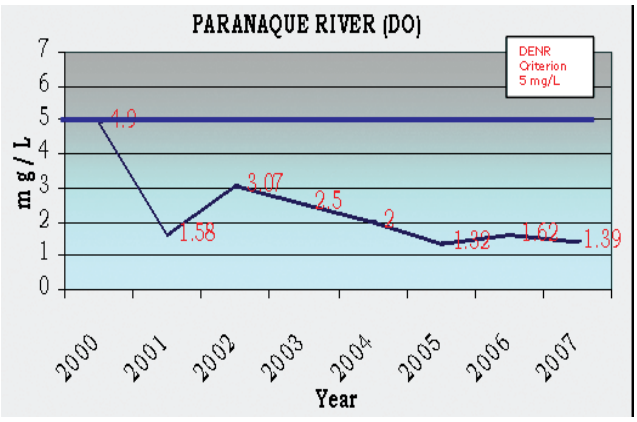
Source: EMB-DENR

Figure 2-4. Average Dissolved Oxygen of Marikina River, 2000-2007



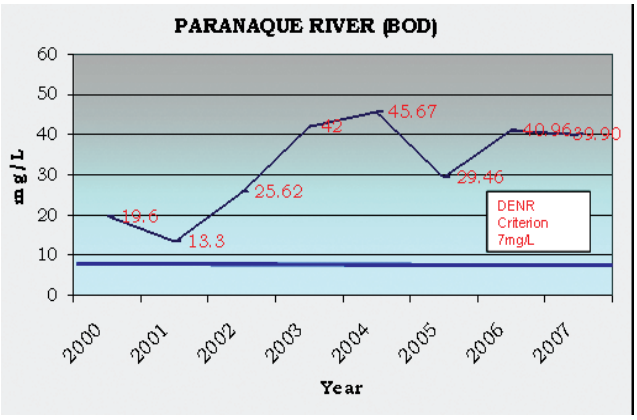
Source: EMB-DENR

Figure 2-5. Average Biochemical Oxygen Demand of Marikina River, 2000-2007



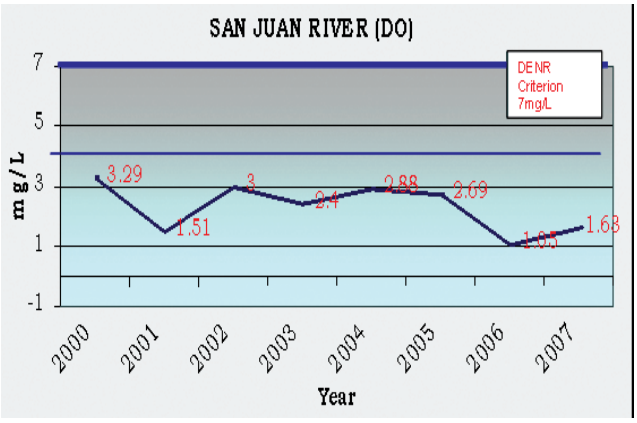
Source: EMB-DENR

Figure 2-6. Average Dissolved Oxygen of Paranaque River, 2000-2007



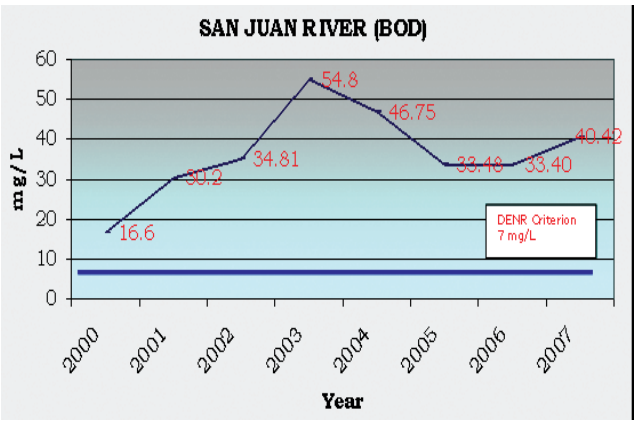
Source: EMB-DENR

Figure 2-7. Average Biochemical Oxygen Demand of Paranaque River, 2000-2007



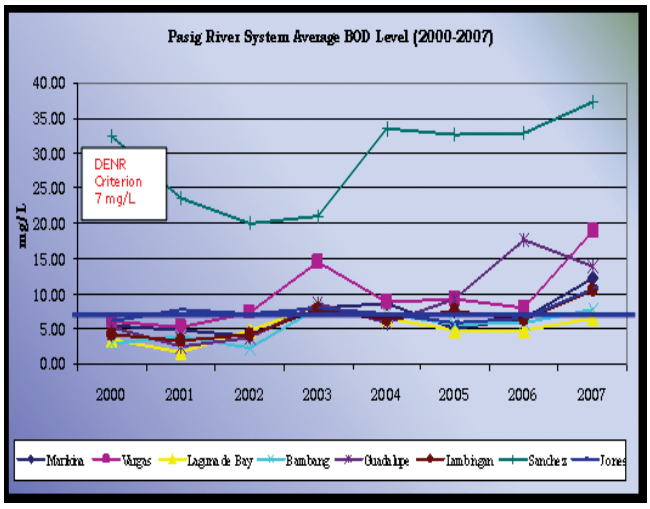
Source: EMB-CO

Figure 2-8. Average Dissolved Oxygen of San Juan River, 2000-2007



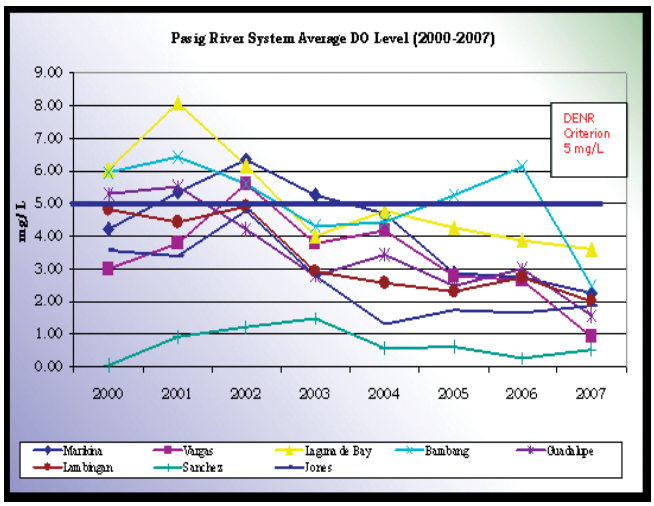
Source: EMB-DENR

Figure 2-9. Average Biochemical Oxygen Demand of San Juan River, 2000-2007



Source: EMB-DENR

Figure 2-10.Average Biochemical Oxygen Demand of Pasig River, 2000-2007



Source: EMB-DENR

Figure 2-11. Average Dissolved Oxygen of Pasig River, 2000-2007

Tables 2-5 and 2-6 below summarizes the Dissolved Oxygen and Biochemical Oxygen Demand results of Pasig River from 2000 to 2007.

Table 2-5. Summary of Dissolved Oxygen (DO) Results of Pasig River, 2000-2007

	2000	2001	2002	2003	2004	2005	2006	2007
Marikina	4.20	***5.36***	***6.34***	***5.26***	4.71	2.85	2.74	2.27
Vargas	3.00	3.77	***5.60***	3.77	4.18	2.77	2.64	0.93
Laguna de Bay	***6.05***	***8.10***	***6.17***	3.99	4.79	4.24	3.89	3.63
Bambang	***5.97***	***6.43***	***5.60***	4.32	4.45	***5.24***	***6.13***	2.49
Guadalupe	***5.30***	***5.51***	4.20	2.80	3.43	2.49	3.00	1.56
Lambingan	4.84	4.42	4.93	2.90	2.57	2.31	2.76	1.99
Sanchez	0.04	0.91	1.20	1.49	0.55	0.62	0.28	0.53
Jones	3.56	3.37	4.79	2.77	1.29	1.76	1.64	1.86

Source: EMB-CO

Table 2-6. Summary of Biochemical Oxygen Demand (BOD) Results of Pasig River, 2000-2007

	2000	2001	2002	2003	2004	2005	2006	2007
Marikina	***5.43***	***4.83***	***4.00***	8.00	8.56	***5.00***	***6.58***	12.29
Vargas	***6.14***	***5.29***	7.40	14.57	8.78	9.25	7.92	19.00
Laguna de Bay	***3.50***	***1.60***	***4.80***	8.17	6.56	***4.83***	***4.91***	***6.43***
Bambang	***2.93***	***3.92***	***2.40***	7.92	7.11	***5.66***	***5.83***	7.79
Guadalupe	***5.17***	***2.63***	***3.80***	8.67	***6.00***	9.25	17.70	14.00
Lambingan	***4.14***	***3.45***	***4.11***	7.83	***6.33***	7.54	6.33	10.43
Sanchez	32.33	23.60	20.00	21.00	33.56	32.67	32.83	37.29
Jones	***6.21***	7.75	7.10	7.92	7.22	***5.98***	***6.63***	10.71

Source: EMB-CO

Almost all the rivers monitored by the EMB for DO and BOD at the National Capital Region for the period 2000-2007 failed the DENR criterion for Class C waters.

Only Laguna de Bay, Marikina (except 2000), Bambang, and Guadalupe (except 2002) stations of the Pasig River conformed with the DO criterion for Class C waters from 2000-2002. Deterioration of water quality in terms of DO started in 2003 with almost all stations already below the criterion from 2004 to 2007 except for Bambang in 2005 and 2006. For BOD along the Pasig River, Sanchez station did not conform with the criterion from 2000-2007 and exhibited the highest BOD concentration almost three to five times the concentration of the other stations monitored for the same period.

Results of the DO-BOD monitoring for the other priority rivers in the different regions in the country are summarized in **Table 2-7**. Out of 19 priority rivers, eight and 13 rivers conformed with the DENR water quality criteria set for DO and BOD, respectively.

Table 2-7. Summary of DO and BOD Results for the 19 Priority Rivers, 2007

Region	Water Body	Class	Average DO (mg/L) 2007	Passed/Failed	Average BOD (mg/L) 2007	Passed/Failed
III	Meycauayan River	C	5.05	**Passed**	56.00	Failed
	Marilao River	A	5.39	**Passed**	21.17	Failed
	Bocaue River	C	5.78	**Passed**	8.83	Failed
IV-A	Imus River	C	5.16	**Passed**	10.13	Failed
	Ylang-ylang River	C	4.47	Failed	29.79	Failed
IV-B	Mogpog River	C	7.49	**Passed**	-	-
	Calapan River	C	3.86	Failed	5.88	**Passed**
V	Anayan River	D	5.92	**Passed**	3.85	**Passed**
	Malaguit River	C	6.56	**Passed**	2.73	**Passed**
	Panique River	C	7.08	**Passed**	1.05	**Passed**

Table 2-7. Summary of DO and BOD Results for the 19 Priority Rivers, 2007

Region	Water Body	Class	Average DO (mg/L) 2007	Passed/Failed	Average BOD (mg/L) 2007	Passed/Failed
VI	Iloilo River	C	5.36	**Passed**	3.64	**Passed**
VII	Luyang River	C	7.86	**Passed**	2.31	**Passed**
	Sapangdaku River	C	6.84	**Passed**	0.54	**Passed**
X	Cagayan de Oro River	A	8.27	**Passed**	4.00	**Passed**
CAR	Balili River	-	6.17	**Passed**	25.36	Failed
NCR	Marikina River	C	2.20	Failed	25.43	Failed
	San Juan River	C	1.63	Failed	40.42	Failed
	Paranaque River	C	**1.39**	Failed	39.90	Failed
	Pasig River	C	**2.41**	Failed	15.45	Failed

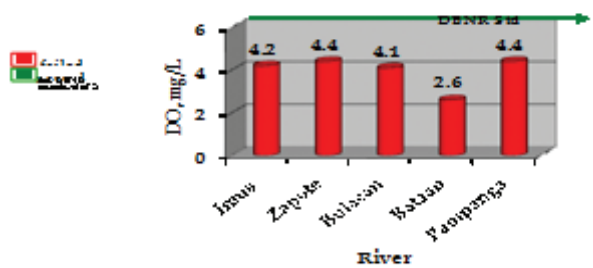
Source : EMB-DENR

Note: According to the DENR AO 34(1990), DENR Water Quality Criteria for DO are as follows, in mg/L: for Class A (5); for Class C (5); for Class D (3). Meanwhile, for BOD , these are, in mg/L: for Class A (5); for Class C (7); for Class D (10).

River Mouth Monitoring in Manila Bay Environs

Water quality monitoring in selected river mouth discharging into the Manila Bay was also conducted by the pilot phase of the Integrated Environmental Monitoring Program (IEMP) under the Manila Bay Environmental Management Project (MBEMP) and Partnership on Environmental Management for the Seas of East Asia (PEMSEA) Project in 2004-2005.

Hydrographic surveys done over 24-hour period during the dry and wet seasons, and monthly monitoring were conducted in the following rivers: Pampanga River, Bulacan, Meycauayan River,Zapote River, Imus River, Bataan River (dry season) and Talisay River. During the sampling period, February to May 2005 (dry season), DO values in these rivers failed to meet the minimum of 5mg/l requirement for class C waters **Figure 2-12**.



Source: PEMSEA and MBEMP IEMP-TWG, 2006

Figure 2-12. DO Concentration on Selected Rivers

The freshwater discharge from these rivers was estimated by a combination of methods: direct flow measurement, use of salinity as tracer in salt and freshwater budget computation, and comparing salinity distributions with two-dimensional river hydrodynamic models. Time series measurements in all five stations in all rivers were used to calculate the net freshwater discharge. Using the discharged data, flow measurements and BOD data values, the total BOD loading from these five rivers were estimated (PEMSEA-MBEMP IEMP- TWG).

Table 2-8. BOD Loading at Selected River Mouths

River	Freshwater Discharge(m3/s)	Using BOD at Mouth BOD (g/m3)	BOD Loading (kg/day)	Using BOD at Upstream Station BOD (g/m3)	BOD Loading (kg/day)
Pampanga	62.1	1	5364	3	16093
Bulacan	2.2	10	1968	6	1181
Zapote	1.3	136	15205	6.4	7155
Imus	7.6	11	7269	8	15859
Orion	.2	3	460	8	105

Source: PEMSEA and MBEMP IEMP-TWG, 2006

2.3.2 Groundwater

Groundwater is found in natural rock formations called aquifers, a vital natural resource with many uses. Most communities rely on groundwater as a source of drinking water. However, mismanagement, over-use and excessive abstraction of our groundwater have caused major problems to human users and the environment.

The most evident problem seen in our groundwater is the lowering of the water table beyond the reach of existing wells. A lowered water table may cause subsidence and saltwater intrusion.

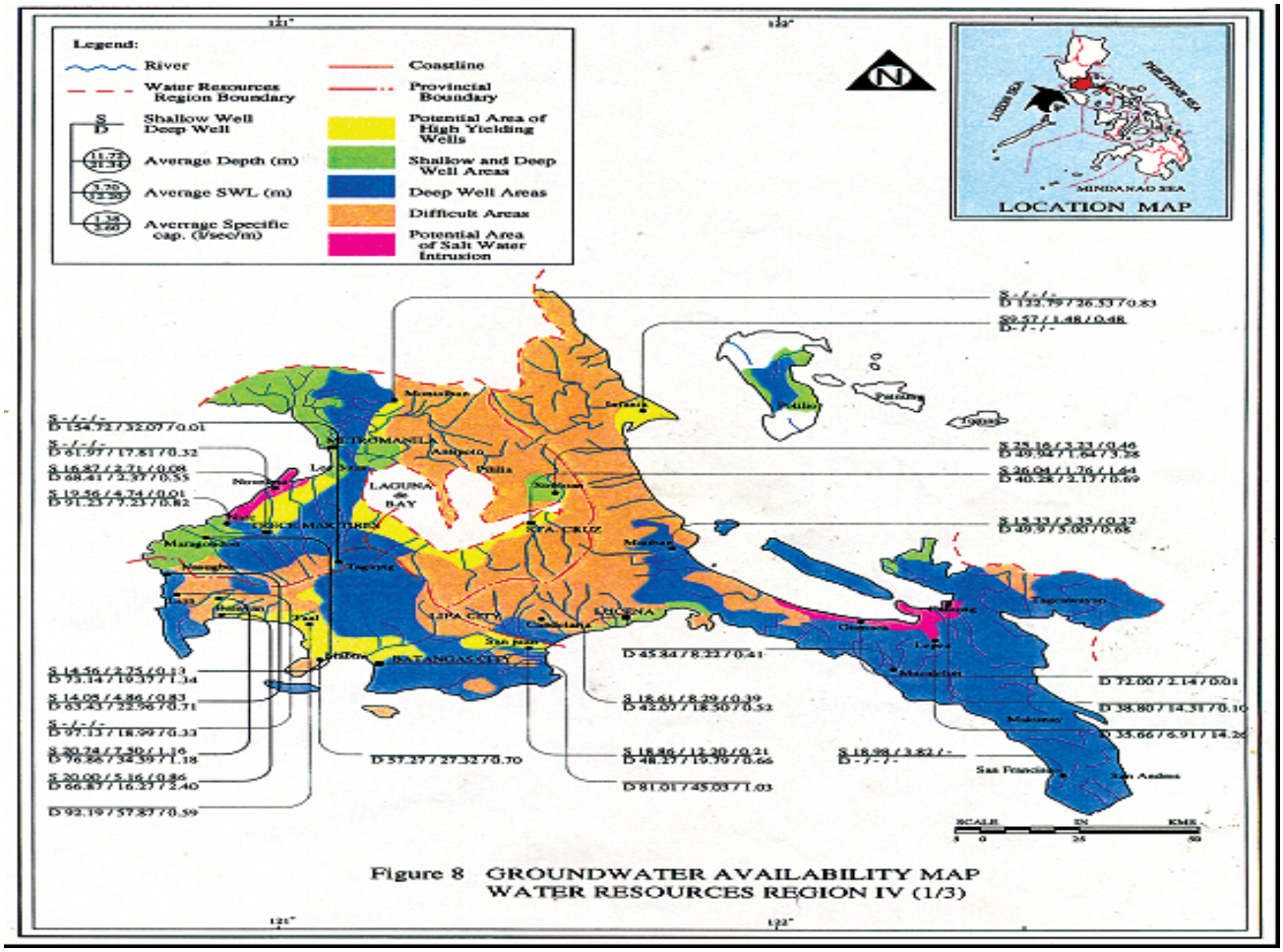
Many other significant groundwater contaminants such as leaks from underground gasoline tanks, dumpsite leachates, leaks in the sewage systems and application of too much fertilizers or pesticides on our agricultural fields also pose threat to our groundwater.

Location of aquifers

The Philippines is delineated in accordance with two different categories, namely boundaries of the Water Resources Regions (WRR) and the administrative regions. For the former case, it is divided into 12 WRRs by the NWRB in consideration of hydrological boundaries for the purpose of comprehensive planning of water resources development.

An estimated 260,000 MCM of water is contained within the pores and fractures of the unconsolidated and hard rock aquifers. Groundwater recharge is estimated at 33,000 MCM. The total groundwater development potential of the country's WRR is considered equal to their groundwater recharge. The groundwater recharge is defined as the inflow flux to a groundwater basin.

The WRR IV-A as shown in **Figure 2-13** covers the southern central part of Luzon Island of the provinces of Rizal, Cavite, Batangas, Laguna and Quezon. The region is divided into five categories, namely: the potential area of high yielding wells, shallow and deep well areas, the deep well areas, the difficult areas, and the potential area of salt water intrusion.



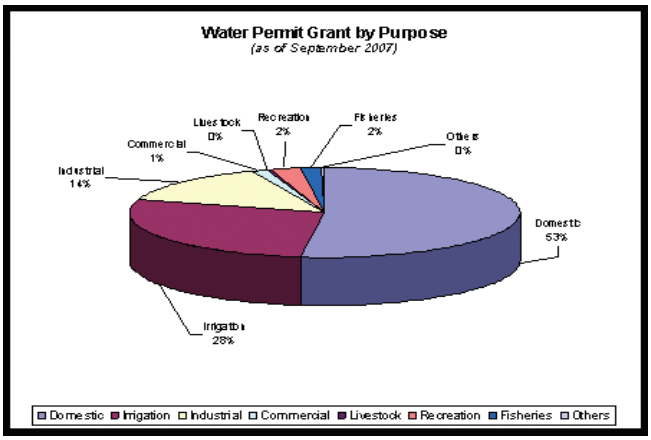
Source: NWRB

Figure 2-13. Groundwater Availability Map

Abstraction rates, availability and uses

Groundwater abstraction refers to water taken from the ground and is considered sustainable as long as it does not exceed the natural renewable flow of aquifers. At certain times, groundwater resource may decline to such extent that the total demand (domestic, agriculture, industry) can only be met by exceeding sustainable rates of abstraction in terms of quantity, and possibly, of quality.

As of September 2007, well inventory of NWRB groundwater database shows over 9,800 well permittees. These wells have an allocated flow of about 3,274.137 MCM.



Source: NWRB

Figure 2-14. Water Permit Grant by Purpose, September 2007

A previous NWRB study has estimated that the allocated withdrawal from registered wells represents only 40% of the actual groundwater withdrawal. About 60% remains unregistered.

Figure 2-13 shows the total volume of groundwater permit grants by purpose.

Groundwater Quality Assessment

As of 2007, extraction of groundwater in urban cities of the country has already exceeded the allowable extraction rate or safe yield. Unrestrained utilization of groundwater thru additional allocations of groundwater in these areas would result in further deterioration of water quality, decline in piezometric (measure of pressure and compressability) levels, saline intrusion and possible land subsidence.

For the protection of groundwater quality and to prevent further deterioration of water quality of groundwater as well as surface waters, there should be provisions for improvement of wastewater treatment, sewage treatment for highly utilized areas and septic treatment for less urbanized districts. Public awareness of sanitation practices through relentless campaign should be conducted, particularly in the less urbanized areas.

Table 2-9 shows regional assessment of groundwater sources.

Table 2-9. Regional Assessment of Groundwater Source

Region	Safe Yield (MCM)	Mining Yield (MCM)	Ground Water Appropriated as of 9/30/07 (MCM)*	Available Water (MCM)
	(1)	(2)	(3)	(4) = (1) - (3)
I	2355.739	4112.294	277.87	2077.869
II	5094.073	10876.883	55.81	5038.263
III	8411.534	13907.944	537	7874.534
IV	2761.45	8999.05	684.33	2077.12
V	2688.886	5578.844	150.34	2538.546
VI	2789.895	6152.201	274.89	2515.005
VII	751.787	2560.092	308.52	443.267
VIII	2324.518	4348.121	62.22	2262.298
IX	986.391	3663.681	28.74	957.651
X	3696.47	9539.798	201.78	3494.69
XI	2479.234	4682.433	183.38	2295.854
XII	2078.096	5165.313	320.55	1757.546
NCR	189.111	324.408	188.67	0.441

Source: NWRB

2.3.3 Marine Waters

Marine waters include coastal, offshore and estuarine waters. Our marine waters are increasingly threatened by bacterial contaminants from land runoff including urban areas and intensive farming operations, sewage spills and overflows, indirect discharge and untreated effluents from industries and establishments like hotels. Any effluent discharged into the environment will eventually find its way into a water body through the river.

2.3.3.1 Manila Bay Monitoring

The Manila Bay is the country's major hub and international gateway to its political, economic and social center. It is a natural heritage and the venue of many historical events that helped shaped the Filipino culture and values. The Bay, with its semi-enclosed estuary facing the South China Sea, represents a vital national asset, providing a source of food, livelihood, employment, recreation, to an estimated 23 million Filipinos and a major source of economic benefit for the country.

Along with its surrounding provinces, the Bay contributes a very significant share of the country's Gross Domestic Product and accounts for almost one third of the country's agricultural and fisheries production. It supports fisheries and aquaculture as among the major sources of livelihood as well as development activities in manufacturing, shipping and ports, agriculture, mining and commerce.

An economic valuation study (PEMSEA/MBEMP 2005) of the uses of Manila Bay's resources (i.e., fisheries; aquaculture; tourism; and shipping), as well as the benefits derived from key habitats (i.e., mangroves, mudflats; and coral reefs), showed a total value of more than P 8 billion per year. The amount represents a partial assessment of the total economic value of this Bay. The actual aggregate economic value is, by all accounts, much large **(Figure 2-15)**.

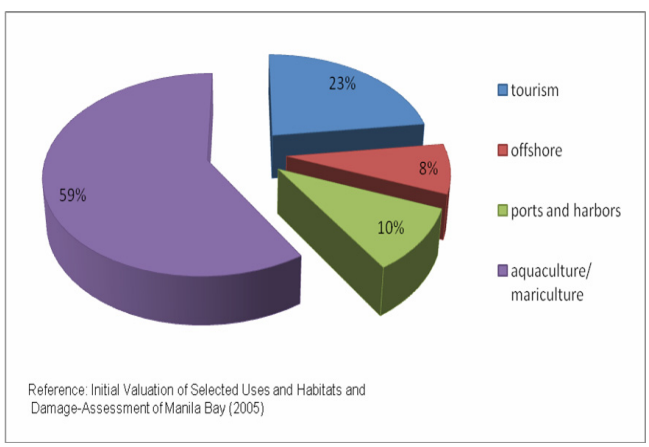


Figure 2-15. Summary of Use Values for Manila Bay

The sustainability of the Bay and its diverse ecosystem is, however, continually threatened by a variety of watershed, lowland and sea-based human activities, which contribute to the decline in its environmental quality.

Overexploitation of resources, illegal and destructive methods of harvest, habitat destruction, pollution discharge from land and sea-based sources, sedimentation, uncontrolled development and conflicting use of limited available resources cause untold pressures on the bay.

The quality of the bay is furthermore significantly affected by the bodies of water that discharge into it. Most of the pollution is due to land-based human activities, including the discharge of domestic, industrial and agricultural wastes, land runoff and atmospheric deposition.

Manila Bay which is about 1,800 sq.km. and with 190 km coastline is intersected by six major rivers, draining in 24 catchment basins are the major sources of pollution in the bay.

The two main contributory areas are the Pasig and Pampanga river basins. The Pasig River connects Manila Bay with Laguna de Bay, the largest freshwater lake in Southeast Asia. Almost 21% of the organic load of the bay comes from Pasig River, with 70% of the load derived from households.

The poor quality of the rivers can be attributed to the inadequacy of the sewerage systems in the metropolitan area, and untreated wastewater discharge from domestic, agricultural, commercial and industrial sources in the watershed areas that ultimately drain into the bay.

Domestic wastewater discharge is the highest contributor to Manila Bay's organic pollution. Only 18% of the wastewater generated in Metro Manila households is collected by localized separate sewerage systems. Nearly all of this is discharged through an outfall into Manila Bay. Most residential wastewater (82% percent, or around 7.5 million people) is discharged into public drainage system, either directly or through one million septic tanks. These septic tanks are not desludged and the effluents that directly go into the water bodies are essentially untreated, causing heavy pollution everywhere in Metro Manila and particularly in high population density area (Philippine Environment Monitor, 2003).

Water Quality

Integrated environmental monitoring was conducted in Manila Bay to determine its water quality.

Bacteriological Monitoring

Monthly coliform measurements from 14 stations in Manila Bay, which is generally used for swimming or bathing were undertaken by the EMB. Water samples were collected at the eastern and western parts of Manila Bay for total and fecal coliform count.

Tables 2-10 and **2-11** show the monthly geometric mean of Total and Fecal coliform count, respectively in samples collected for the period 2005 to 2007. Data derived from the monitoring show that out of the 14 stations monitored only three stations passed the total coliform criteria set for primary contact recreation. in 2005, one in 2006, and two in 2007. For fecal coliform measurements in the same stations, it showed that only one station passed the criteria of 200 MPN/100 ml for SB waters throughout the observation period. It is noticeable that only stations located in the western part of the bay passed the criteria.

Source : PEMSEA-MBEMP

Bacteriological Monitoring Stations

Table 2-10 Geometric Mean of Total Coliform Counts (MPN/100 ml) in Manila Bay, 2005- 2007

STATION	2005	2006	2007
1. Navotas Fishport	43682	43694	20068
2. Luneta Park	74086	62586	40551
3. Bacoor – Cavite	4426	1733	4878
4. Noveleta, Cavite 1	1834	9249	1055
5. Noveleta, Cavite 2	1593	2243	1174
6. Rosario, Cavite	17731		4914
7. Tanza, Cavite 1	28232	18400	9075
8. Tanza, Cavite 2	1863	3949	2635
9. Naic, Cavite 1	6184	2932	7510
10. Naic, Cavite 2	7621	2234	5778
11. Mariveles, Bataan 1	*490	*795	*517
12. Mariveles, Bataan 2	*737	3631	*634
13. Limay, Bataan 1	4106	23315	6268
14. Limay, Bataan 2	*674	11805	2865
DENR WQ CRITERION	***1000***	***1000***	***1000***

Table 2-11.Geometric Mean of Fecal Coliform Counts (MPN/100 ml) in Manila Bay, 2005-2007

STATION	2005	2006	2007
1. Navotas Fishport	8053	23952	11219
2. Luneta Park	20912	41746	14571
3. Bacoor – Cavite	1710	1130	3277
4. Noveleta, Cavite 1	998	6124	8122
5. Noveleta, Cavite 2	553	1348	541
6. Rosario, Cavite	5323	7330	2982
7. Tanza, Cavite 1	9439	13972	3720
8. Tanza, Cavite 2	291	3212	1584
9. Naic, Cavite 1	2446	2477	4907
10. Naic, Cavite 2	2388	2234	4004
11. Mariveles, Bataan 1	241	289	155
12. Mariveles, Bataan 2	669	3691	234
13. Limay, Bataan 1	1864	8182	5291
14. Limay, Bataan 2	214	5529	1501
DENR WQ CRITERION	***200***	***200***	***200***

Bay-wide Monitoring

Bay-wide monitoring covering nine stations from different sections of the bay (**Figure 2-16**), was also conducted under the MBEMP-IEMP. Physico-chemical parameters such as DO, pH, oil and grease and nutrients were monitored. **Table 2-12** shows the results of measurements of the above-mentioned parameters.

Samples from nine stations generated data on DO, pH, Salinity, Temperature, Transparency, Chlorophyll, Nutrient, Plankton and Oil and Grease for the water column **(Table 2-12).**

Source: PEMSEA-MBEMP IEMP/MB Atlas

Figure 2-16. Map showing the Manila Bay-wide Monitoring Stations

Table 2- 12. Results of Manila Bay-wide Monitoring

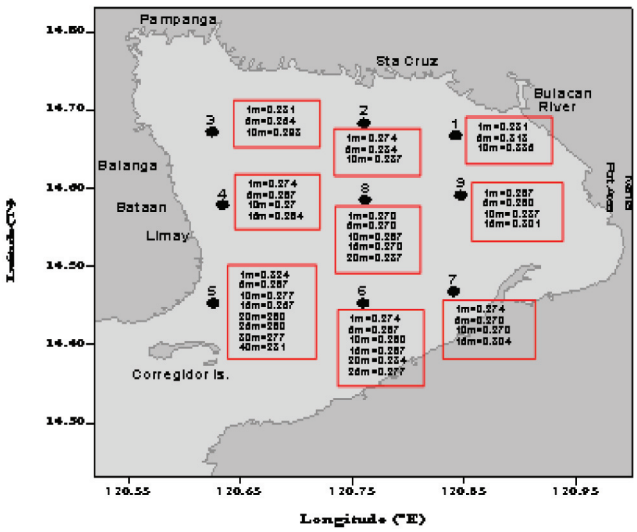
Parameters	Concentration Range	Criteria	Remarks
DO	0.05 – 6.6mg/L	5mg/L	Bottom Surface passed/failed
pH	7.03 – 8.06	6.0 – 8.5	**Passed**
Oil and grease	Nil – 3 mg/L	5 mg/L	**Passed**
Ammonia	Nil - .064 mg/L	0.07 mg/L	**Passed**
Nitrate	Nil - .107 mg/L	0.06 mg/L	Failed
Orthophosphate	.002 - .032 mg/L	0.015 mg/L	Failed

Dissolved Oxygen

There was a decreasing trend from top to bottom of chlorophyll and oxygen at the nine stations in the bay. Vertical profiles of DO at various stations were measured. The oxygen profiles showed a decreasing concentration from the surface to the bottom. The concentration ranged from 0.05 to 6.6 mg/l. Only DO concentrations at the surface passed the environmental criteria of 5 mg/l for Class SC waters (DAO 34, 1990). The near bottom and bottom DO concentrations were generally below 5 mg/, showing evidence of hypoxia. Values approaching anoxia were observed near the substrate in stations 2 and 5. The deterioration of water quality could have been due to the increased organic materials and nutrients into the bay and the presence of stratified water *(PEMSEA and MBEMP-IEMP TWG report).*

Nutrients

A depletion of nitrite-N (NO_2- N), nitrate-N (NO_3 -N) and phosphate -P (PO_4 -P) at the surface and an increase in concentration at the bottom were observed at the nine stations (**Figure 2-17**). The nitrate -N and nitrite -N levels on the surface and on the mid-depth in all stations of Manila Bay had RQs less than one (using the ASEAN water quality criteria value of 0.06 mg/L for NO_3 -N and 0.055 mg/L for NO_2-N). The high concentration of NO_2-N, NO_3-N and PO_4-P near the bottom was likely influenced by nutrient flux from sediments *(PEMSEA and MBEMP- IEMP TWG report).*



Source: PEMSEA and MBEMP/IEMP-TWG, 2006

Figure 2-17. Total Phosphate–P Concentrations (mg/L) at Different Depths in the Nine Sampling Stations Sediment Quality

Trace Elements in Sediments

Sediments are usually a useful medium for monitoring pollutants in aquatic systems due to their ability to accumulate contaminants while maintaining reasonable uniform composition (Larsen and Jensen, 1989 ; Chapman, et al., 1992). Most eroded materials are trapped in reservoirs, lakes, and flood plains or much of it is deposited in deltas, bays and estuaries (Gehm and Bregman, 1976). Sediment samples were collected from nine stations within the Bay and analyzed in the tube–excited x-ray fluorescence (XRF) systems using secondary targets, silver (Ag) and iron (Fe), and in a radioisotope-excited XRF using an Americium-241 (241 Am) as excitation source.

The XRF with Ag secondary target was used to quantify the elements, manganese (Mn) and lead (Pb), while the iron Fe target was used to quantify the elements sodium (N_a) and chromium (Cr). To determine the presence of heavy elements like cadmium (Cd) and mercury (Hg), the radioisotope XRF was used, employing the 241 Am as excitation sources.

Results of analysis showed Cr levels were higher in stations 1,2 and 3 (50-71 parts per million or ppm). Copper (Cu) levels ranged from 56 to 90 ppm. Zinc (Zn) levels varied from 75 to 124 ppm, with stations 1, 2 and 6 exhibiting > 100ppm level. Pb level ranged from 13-18 ppm.

Stations 1, 2 and 3 (northern part of the Bay, coastal areas of Bulacan, and Pampanga, respectively) exceeded the predicted no-effect concentration (PNEC) or threshold value for Cr (based on the low limit of HKISQV). For Cu, all sites generally exceeded the PNEC, while the levels of Pb in all sites were acceptable. Nickel (Ni) concentrations were below the criteria values. **Table 2-13** gives a summary of the results for these elements, together with the PNEC values adopted by the MB-RRA for each of elements.

Sediments from stations 6 and 7 (eastern side of the bay, Cavite coastal areas) had slightly different elemental composition profiles, particularly with the elements calcium (Ca) and chlorine (Cl), than the rest of the samples. This indicated that the sediments from this part of the Bay may have a different source.

Table 2- 13. Summary of Concentrations (mg/kg) of Selected Trace Elements in Sediments

Sample Code	Chromium (Cr)	Copper (Cu)	Zinc (Zn)	Lead (Pb)	Nickel (Ni)
1	139.0	65.9	124.0	13.0	16.0
2	127.0	56.7	102	14.1	16.8
3	107.0	69.6	85.7	15.7	17.4
4	67.6	73.9	74.6	8.69	17.1
5	52.2	84.7	84.5	18.2	18.7
6	58.4	75.5	104.3	14.34	9.92
7	49.9	90.3	86.1	13.1	12
8	71.5	71.2	122.0	26.6	10.2
9	71.4	77.2	80.4	20.4	18.0
Average	82.7± 27.8	73.7±7.1	96.0±15.2	16.0±4.1	15.1±3.0

Source: PEMSEA and MBEMP IEMP-TWG, 2006.

Initiatives to Revive Manila Bay

Major initiatives considered as essential components to develop Manila Bay and deter its further deterioration have been identified by the Technical Working Group (TWG) organized under the umbrella of the MBEMP.

The TWG is composed of representatives from relevant national government agencies, concerned LGUs, academic and scientific institutions, national government organizations. The TWG brings forward the unified efforts of stakeholders to flesh up and make concrete the high vision of bridging the bay to a healthy condition and reviving once again the significant resources attached to this idyllic body of water. The major initiatives are as follows:

- Operationalize an integrated watershed and coastal area management regime for Manila Bay, Pasig River and Laguna de Bay connected to each other and holding significant levels of population, economic activities and industrialization. These bodies of water clearly demand coordination and integration in terms of management. The quality of one will certainly reflect and impact the two others. Standards for water quality, land use and water use, for instance, must be correlated.

- Establish appropriate water quality criteria/standards for Manila Bay that will support the bay's living resources, as well as the desired functional uses of the bay's coastal and marine waters. This activity is the first step in establishing a basin-wide program for restoring water quality in the bay. The following milestone outputs are included: (a) formulation of

total allowable discharge loads; and (b) allocation of allowable discharge loadings to contributing rivers, major point and non-point, discharge categories, as appropriate.

- Implement sewage collection and treatment projects in selected urbanized areas in Manila Bay, using innovative partnership arrangements involving water distribution concessionaires, LGUs, private sector and financing institutions. This project would focus on the development, construction, operation and management of affordable sewerage systems for clusters of communities in the Manila Bay area.

- Integrate in number one initiative (above) the Pampanga River Basin, thus, contributing to the holistic management of the entire bay and its watersheds. While undoubtedly supporting the domestic, agricultural and industrial demands in Central Luzon, the river systems in Pampanga and Bulacan have contributed in a major way to the present water quality in the area.

- Implement the recommendations in the defined risk assessment for research and development studies on human health, such as biomarker study, demographic survey, exposure assessment of critical populations, and the like. Fish and shellfish resources in the bay which supplement the protein needs of the coastal communities have been found to be contaminated with coliform, heavy metals and pesticides – thus posing high risk to human health.

- Implement an inter-agency and multi-sectoral integrated environmental monitoring program.

- Implement the operational plan for the Manila Bay Coastal Strategy, thus coming up with action plans in three areas of urgent concerns: (a) protection of waters in the bay and its tributaries, thus ensuring safe usage of resources therein; (b) sustainable development of habitats, natural areas and historic/cultural sites; (c) promotion of partnerships to support implementation of good environmental governance in the bay.

2.4. Water Quality Management

The Philippine Clean Water Act of 2004 requires the government to implement anti-degradation measures to preserve the quality of our water bodies, proper water quality management programs and measures for preservation and conservation of water bodies.

2.4.1 Legislations and Policies

The following are the different legislations and policies that govern water and sanitation in the country.

Table 2-14. Salient Provisions of National Laws on Water and Sanitation in the Country

National Policy	Salient Features
Presidential Decree (P.D.) 198 of 1973 [Provincial Water Utilities Act]	P.D. 198 created the now Local Water Utilities Administration (LWUA) and the local water districts (LWD). It established LWUA as the government resource provider and the LWDs as the local water service providers. It also gives authority to LWUA as a specialized lending institution for, and provides technical and training assistance to the LWDs.
Presidential Decree (P.D.) 424 of 1974 [National Water Resources Council (NWRC) Charter]	P.D. 424 created the National Water Resources Council (NWRC), which is now the National Water Resources Board (NWRB), to coordinate the planning of some 30 water resources agencies of the Government.
Presidential Decree (P.D.) 856 of 1975 [Sanitation Code of the Philippines]	P.D. 856 codifies and enforces the various sanitation policies of the government, including the standards for water supply, food processing and servicing, sanitary facilities, sewerage and sewage management, markets and abattoirs, industrial hygiene, and funeral parlors.
Presidential Decree (P.D.) 979 of 1976 [Providing for the Revision of PD 600 Governing Marine Pollution]	P.D. 979 declares a national policy to prevent and control the pollution of seas created by the dumping of wastes and other matter which poses hazards to human health, harm living resources and marine life, damage amenities, and/or interfere with the legitimate uses of the sea within the terrestrial jurisdiction of the Philippines.
Presidential Decree (P.D.) 1067 of 1976 [Water Code of the Philippines]	P.D. 1067 provides the framework for implementing the provisions of the Constitution on water resources development and management with regard to water quality. This includes the rules governing the rights and obligations of water users as well as the administrative structure to enforce the provisions of the Water Code. The code adopts prior appropriation doctrine of "first in time, first in right" for water allocation in the country.

Table 2-14. Salient Provisions of National Laws on Water and Sanitation in the Country

National Policy	Salient Features
Presidential Decre (P.D.) 1586 of 1978 [Environmental Impact Statement System]	P.D. 1586 provides the establishment and institutionalization of a system whereby the exigencies of socio-economic undertakings can be reconciled with the requirements of environmental quality. It also caused for the declaration of certain projects, undertakings or areas in the country as environmentally-critical. For this purpose, the proper land and water use patterns for the areas of said critical projects shall be prepared.
Executive Order (E.O.) 192 of 1987 Department of Environment and Natural Resources (DENR)	E.O. 192 provides for the reorganization of the DENR as the lead agency in, among other insitutions in promulgating the (1) rules and regulations for the control of water, air and land pollution and (2) ambient and effluent standards for water and air quality.
The Philippine Constitution of 1987	The Philippine Constitution provided the basic principles of water resources development and management, which stipulate that all waters of the Philippines belong to the State.
Republic Act No.7160 [Local Government Code Of 1991]	R.A. 7160 defines the functions and powers of local government units (LGUs), i.e., provinces, cities, municipalities and barangays in environmental protection. R.A. 7160 mandates LGUs to undertake watershed-related activities, initially confined to community-based forest management (CBFM), social forestry and watershed projects. Since then, a number of environmental functions of various national government agencies have already been devolved to the LGUs.
Environmental Code of 1997	The Code prescribes, among other things, the management guidelines aimed to protect and improve the quality of the water resources through (a) classification of surface waters, (b) establishment of water quality standards, (c) protection and improvement of the quality of water resources, and (d) responsibilities for surveillance and mitigation of pollution incidents.
Republic Act No.9275 [Philippine Clean Water Act of 2004]	R.A. 9275 provides for a comprehensive water quality management program. It also provides the framework for sustainable development to achieve a policy of economic growth in a manner consistent with the protection, preservation and revival of the quality of fresh, brackish and marine waters. The passage of R.A. 9275 is also the first attempt to consolidate different fragmented laws of the Philippines on water resources management and sanitation.

2.4.2 Compliance and Enforcement

Compliance to the implementation of the Philippine Clean Water Act of 2004 includes the following: a) monitoring, inspection and survey of firms and establishments within the jurisdiction of its various offices; b) effluent monitoring and sampling; and c) ambient water quality monitoring of water bodies.

The EMB Regional Offices have intensified monitoring, inspection and survey of firms and establishments along and within the catchment areas of our water bodies. This is coupled with the conduct of inspection and monitoring of wastewater samples to determine industrial and commercial establishments' compliance with the DENR Effluent Standards.

At the DENR, Wastewater Discharge Permits are being issued to regulate the wastewater discharges from commercial and industrial establishments. These permits, whether new or renewal, are issued after thorough assessment and evaluation of their applications and upon compliance with the provisions cited under the Act.

Notices of Violations are being issued to industries and establishments caught discharging wastewater on water bodies without proper permits from the DENR and other concerned authorities and/or exceeding the DENR effluent standards.

2.4.3 Investments in Sanitation, Sewerage, and Wastewater Treatment

The passage of the Philippine Clean Water Act mandated the putting up of sewage treatment plants and provision of sanitation facilities in each locality. Thus, several cities and even the national government are expediting measures to comply with the mandate of the Act.

Presently, less than 4% of the population in Metro Manila is connected to the sewer. Households from high income families (e.g. Ayala Alabang) had built their own sewage treatment facilities in their village.

Most households in Metro Manila use toilets with flush connected to septic tanks. Around 40% of households now have on-site latrines and presently, it is estimated that there are more than 1 million septic tanks in Manila (ADB, 2007).

Except for the two big water concessionaires, Manila Water Company, Inc. (MWCI) and Maynilad Water Services, Inc. (MWSI), there are very few investments in sewerage and sanitation. These concessionaires have both installed or are planning to install a number of sewage treatment plants and facilities in their respective service areas.

In Baguio City, the City Environment and Parks Management Office was created in 2004 to manage the city's sewage and wastewater system. Currently, the said office is proposing a Php 7 million project to conduct inventory on wastewater facilities and sewer connections in the entire city.

Raw septage collected by vacuum tankers from domestic sources is processed in a treatment facility to separate the solids from the wastewater. Collected septage is brought to Dagat-dagatan Septage Treatment Plant for processing.

MWSI, through the Fertilizers and Pesticide Authority and accredited researchers of the Sugar Regulatory Administration, developed a sanitation scheme of septage and biosolids disposal on sugarcane farms in Central Luzon. Biosolids are the solids/sludges removed from raw septage after processing it in a septage treatment plant.

Laboratory analysis of MWSI, biosolids has shown potential in supplying the nutrient and water requirements of sugarcane and other fruit-bearing trees, and improving soil fertility without polluting the environment.

Former MWSS Administrator Lorenzo Jamora leads the ceremonial lowering of the time capsule signaling the groundbreaking for the construction of Taguig's first-ever sewage treatment facility.

2.4.4 Initiatives in Research and Development

Characterization of Rainwater (Wet Deposition Monitoring) for the Acid Deposition Monitoring Network in East Asia (EANET)

The EMB, being the Philippines' National Center for the EANET is maintaining three acid deposition (AD) monitoring stations located in (1) Metro Manila (urban site); (2) Los Baños, Laguna (rural site); and (3) Mt. Sto Tomas, Benguet (remote site). One of the objectives of the EANET is to study the trends of precipitation chemistry to characterize the concerned region's wet deposition.

The 2005 to 2007 annual trends in the precipitation chemistry were studied using the measurement variations of wet deposition (rainwater) samples sourced from the Metro Manila and Los Baños AD monitoring stations. pH and EC measurements and ionic concentrations of rainwater samples were used as bases to characterize wet deposition. The generated data were evaluated using a time series analysis wherein the tri-annual average values of the considered parameters were compared.

Rainwater samples were collected using wet-only samplers installed at both monitoring sites. During the 2005 to 2007 monitoring activities, a total of 111 and 122 rainwater samples were sourced from Metro Manila and Los Baños monitoring stations, respectively.

The tri-annual average value of pH was 5.69 in Metro Manila and 5.73 in Los Baños (pH annual average values ranged from 5.42 to 5.84). On the other hand, the tri-annual average value of EC was 2.34 m*S*/m in the urban site and 1.47 m*S*/m in the rural site.

The tri-annual average of sulfate concentration (14.3 *u*moles/L) in Metro Manila was two times higher than the tri-annual average of sulfate concentration in Los Baños. Likewise, the tri-annual average of nitrate level in Metro Manila (23.2 *u*moles/L) was twice higher than the tri-annual average of nitrate level in Los Baños (11.7 *u*moles/L). In contrast, the tri-annual average of chloride level was higher in Los Baños (37.0 *u*moles/L) than the tri-annual average of chloride level in Metro Manila (28.3 *u*moles/L).

For the measured cations, ammonium ion had the highest concentration level in Metro Manila followed by sodium, calcium, potassium and magnesium ions. In Los Baños, sodium ion had the highest concentration level; ammonium, calcium, magnesium, and potassium ions followed in descending order. Except for sodium, concentration levels of corresponding ions in Metro Manila were higher than those in Los Baños.

Metro Manila has the higher average ammonium and potassium concentration levels, twofold higher than the concentration levels in Los Baños. On the other hand, the tri-annual average concentration level of calcium in Metro Manila (21.6 *u*moles/L) was almost threefold higher than the concentration level in Los Baños (7.56 *u*moles/L). Similarly, the tri-annual average concentration level of potassium in Metro Manila was almost threefold higher than the average potassium concentration level in Los Baños. **Table 2-15** shows the 2005-2007 annual mean levels of pH, EC, cations and anions in Metro Manila and Los Baños.

Table 2- 15. Annual Mean Levels of pH, EC, Cations and Anions in Metro Manila and Los Baños, 2005-2007

Station	Year	pH (range)	EC (mS/m)	SO_4^{2-} (μmol/l)	NO_3^- (μmol/l)	Cl^- (μmol/l)	NH_4^+ (μmol/l)	Na^+ (μmol/l)	K^+ (μmol/l)	Ca^{2+} (μmol/l)	Mg^{2+} (μmol/l)
Metro Manila	2005	5.42	2.11	31.7	26.7	20.2	43.1	20.6	4.60	18.9	4.19
	2006	5.84	2.44	27.3	18.7	30.8	45.9	31.0	20.0	24.3	7.42
	2007	5.82	2.46	33.1	24.2	34.0	60.3	27.7	11.9	21.4	7.56
	Average	5.69	2.34	30.7	23.2	28.3	49.8	26.4	12.2	21.6	6.39
Los Baños	2005	5.59	1.66	16.8	15.0	34.1	34.5	31.5	3.77	6.99	4.75
	2006	5.82	1.38	12.4	9.45	32.4	18.6	33.6	2.93	7.13	4.19
	2007	5.77	1.38	13.8	10.8	44.5	26.9	31.6	7.77	8.56	6.19
	Average	5.73	1.47	14.3	11.7	37.0	26.7	32.2	4.82	7.56	5.04

2.4.5 Programs on Water Quality Enhancement and Rehabilitation

Industrial Eco-watch

The DENR's Industrial Eco-watch program aims to encourage industries to conduct voluntary self-regulation among establishments, for improved environmental performance by encouraging pollution reduction beyond compliance through public recognition and praise, and creation of incentives for dischargers and/or producers. The ratings are based on DENR AO 51 (1998) and DENR AO 26 (2003).

It uses the following six-color codes to rate the performance of various industries:

- ✓ Black (Very Bad)
- ✓ Red (Bad)
- ✓ Blue (Good)
- ✓ Green (Very Good)
- ✓ Silver (Excellent)
- ✓ Gold (Outstanding)

Currently, priority sectors identified for the national implementation of Industrial Eco-watch include only the following: sugar central and refinery, beverage, pulp and paper, and cement plants. Other industry sectors for selected regions include meat and fish processing, soy sauce and condiments manufacturing, food processing and dressing mall/commercial establishments, and beer and soft drinks manufacturing.

Tap watch

DENR's Tap watch program undertakes regular monitoring of deep wells in poor barangays. It analyzes water samples in accordance with the PNSDW, including the presence of microbiological organisms.

The program aims to disseminate information derived from such investigations to the local offices of the Department of Health, appropriate local government units where the samples were collected, and local water districts in the area for appropriate action.

Beach Watch

The Beach Ecowatch Program is one of the priority programs of the EMB-DENR for 2004 as part of its advocacy for good water quality. The program aims to:

1) Establish baseline data and provide the latest/updated information on the present quality of the bathing beaches; and
2) Inform the resort/facility owners to institute some measures to prevent deterioration and to improve the quality of their respective bathing beaches and the environs.

Under the program, bathing beaches that are regularly visited either by local or foreign tourists are monitored regularly in order to assess if their water quality is suited for bathing, swimming, skin diving, or other primary contact recreation. The water quality of beaches under the Beach Ecowatch Program is required to comply with criteria for Class "SB" coastal and marine waters.

The monitoring is designed and implemented in accordance with the provisions under the DENR Administrative Order No. 34 (1990) and DENR AO 23 (1997), which include the following:

1. on-site measurements of physical parameters such as pH, temperature and salinity including field observations;
2. sample collection for Total Coliform and Fecal Coliform (FC) analysis;
3. sample preservations;
4. laboratory analysis; and
5. data assessment

Assessment of water quality is based on the geometric mean of measured FC values for five consecutive sampling events and compared it to 200 MPN/100mL FC water quality criterion set for class SB waters. Fecal Coliform indicates significant content of pathogens from feces of warm-blooded animals which pose risk on human health.

Both the 2006 and 2007 monitoring reports/data on bathing beaches submitted by the EMB Regional Offices were evaluated and processed. Based on the 2006 report, there were 38 bathing beaches monitored out of the 50 targeted/ programmed in 2006. From these 38 beaches, 29 beaches passed, six failed the maximum 200 MPN/100ml FC Criterion set for SB Waters, and three had insufficient data.

For 2007, there were 53 bathing beaches monitored, out of the 63 targets programmed in 2007. From these 53 beaches, 44 passed, five failed the allowable of 200 MPN/ 100ml FC Criterion set for SB Waters. The other four beaches had insufficient data.

Sagip-ilog Program

The Sagip-ilog program of the DENR aims to improve the DO and BOD levels of 19 identified priority rivers by 30% by 2010. In support to the program, the following activities are being undertaken:

- ✓ Mapping out and inspection of industries and commercial establishments
- ✓ Issuance of wastewater discharge permits to different companies to enhance monitoring activities
- ✓ Intensification of monitoring activities
- ✓ Issuance of Notices of Violations
- ✓ Issuance of Cease and Desist Orders

Laguna de Bay Watershed Environmental Action Planning

This project of the Laguna Lake Development Authority aims to collectively identify and prioritize projects for watershed protection and development in the country. It also aims to strengthen capacity for participatory watershed management at sub-basin level among local government units.

2.4.6 Civil Society Initiatives

Sagip Pasig Movement

Sagip Pasig Movement (SPM) regularly conducts information campaigns targeting the residents, industries and local government units on environmental issues, particularly, the Pasig River rehabilitation. SPM also works with NGOs and environmental agencies in legislative lobbying and environmental monitoring. Furthermore, SPM affiliates with schools and school organizations to tap volunteers for its programs and activities.

Among its more unique programs is the ***"Lason sa Ilog Pasig Awards"***, a mock award given every April 22 (International Earth Day) to the top ten industries which have been found to be polluting the river. This has gotten positive feedback. For the past five years that the SPM has done this, majority of the past awardees have installed wastewater treatment facilities because of the pressure created by the awards.

SPM presents the Lason Awardees

SPM volunteers conduct regular educational tour of Pasig River

The SPM is also piloting the ***Bantay-Ilog Program***, which trains and mobilizes riverside communities as vanguards of specific areas of the river. The Program trains community leaders in first-level monitoring of industries in their specific areas. These watchdogs are deputized as DENROs (Deputized Environment and Natural Resources Officers) to help the DENR in their monitoring functions

2.4.7 Local Government Initiatives

Marikina River Rehabilitation

One of the local government units in the country that has initiated a bold move in rehabilitating its dying river is the City of Marikina. The rehabilitation began in 1993.

Among the steps taken to rehabilitate the Marikina River were the following:

- Removal of illegal structures in the riverbanks using the 96 meter easement from the centerline of the river as legal basis.

- Development of access roads to allow people and equipment to go near the river and undertake cleaning and clearing operations.

- Development of prototypes in two barangays to give local constituents an idea about the kind of transformation that

Former Marikina Mayor Fernando inspects the river

Tree planting along Marikina River

Old Marikina River

New Marikina River

the city would want to pursue and get them to experience the beauty and benefits of such changes.

- Construction of concrete jogging lane on both sides of the river for purposes of connectivity and to entice people to go down to the river.

- Relocation of informal settlers living along the edge to in-city settlement sites.

- Massive planting of ornamental trees in the riverbank.

- Strict enforcement of regulations on waste disposal, particularly on the surrounding factories and residents.

The important lessons learned by the City of Marikina in the rehabilitation of its river are (1) saving a river is no minor task but not impossible; (2) saving a river is not expensive; (3) river can rehabilitation program can unite the people; and (4) the quality of the river reflects people's discipline and care for the environment.

2.4.8 International Development Community Assistance Programs and Projects

Japan International Cooperation Agency (JICA)

The Capacity Development Project on Water Quality Management is a five-year JICA-assisted project at the EMB which commenced in 2006. The project goal is the development of national capacity of the EMB to implement an integrated water quality management system within the context of the Philippine Clean Water Act (PCWA).

The project aims to strengthen the capability of the EMB Central and Regional Offices to implement priority actions mandated to the agency by the PCWA and its implementing rules and regulations.

The project is structured into four main activity groups as follows:

1. Formulating an integrated water quality policy framework and providing procedural guidelines for implementation of EMB's role within such framework;
2. Strengthening the EMB Central Office's capability to lead and support the EMB Regional Offices;
3. Assisting the EMB Regional Offices in establishing and sustaining Water Quality Management Areas in their institutions; and
4. Supporting the EMB Regional Offices in Water Quality Management, particularly in enforcing the discharge permitting and wastewater charge system as well as in compliance monitoring.

World Bank

The DENR is one of the government agencies that form part of the implementation of the World Bank-assisted project on the "Manila Third Sewerage Project" which started in

2007. The said five-year project aims to assist the government in (1) identifying essential adjustments to administrative, institutional, and regulatory practices and existing legislations in order to attract private investments in the government's wastewater sector; (2) increasing the effectiveness of the agencies responsible for water pollution control through improved coordination; and (3) promoting innovative, simple and effective wastewater treatment techniques.

The project has seven components as follows:

- partnership strengthening,
- planning and policy development;
- innovative financing,
- use of market-based incentives,
- rate rebasing,
- joint sewage and septage treatment, and
- project management.

Components 1 to 4 aim at identification of impediments to cooperation among sector agencies and to non-conventional investments in sewerage and sanitation. Components 5 and 6 aim to assist Metropolitan Waterworks and Sewerage System (MWSS) in pursuing higher investments in sewerage and sanitation by its concessionaires and in piloting suitable technology for septage disposal. Component 7 provides technical assistance to help in project management, monitoring, evaluation and dissemination.

Asian Development Bank

The Asian Development Bank has initiated the following programs on water quality management:

(1) Integrated Coastal Resource Management Project aims at providing marine management areas and social infrastructures like potable water supply and sanitation in targeted coastal areas; and
(2) Infrastructure for Rural Productivity Enhancement Sector Project aims at providing potable water systems in rural areas and small townships.

Local Initiatives for Affordable Wastewater Treatment (LINAW) Project

USAID is assisting several Philippine local government units (LGUs) to develop innovative solutions for reducing pollution through the LINAW) project.

During Phase 1 of the project, which ran from 2003 to 2005, LINAW worked with the cities of Dumaguete, Iloilo, Muntinlupa and Naga to develop decentralized wastewater systems that use low-cost technologies to reduce water pollution and comply with the requirements of the PCWA.

LINAW assisted these four participating LGUs by engaging in a participatory process to identify pilot project priorities, explore appropriate technologies and financing solutions (e.g., loans, public-private partnerships, user fees), support project design, facilitate public awareness raising campaigns and improve and/or develop relevant policies.

Under Phase 2 (2005-2007), LINAW is:

- providing additional technical assistance to the four cities to complete project development and construction;

- replicating the successful Phase 1 approach in three additional cities: Calbayog City , Malaybalay, Bukidnon, and San Fernando, La Union; and,

- sharing information materials with concerned LGUs throughout the country through the League of Cities of the Philippines, outreach workshops and collaboration with USAID's ECO-Asia Program; and institutionalizing training programs for local engineers to design, operate and maintain low-cost treatment systems.

2.4.9 Public Awareness and Education on Water Quality Management

The EMB-DENR has initiated some activities focused on public awareness and education on water quality management after the passage of the PCWA.

When the 'Implementing Rules and Regulations of the Philippine Clean Water Act of 2004 were formulated in 2005, activities to help raise people's awareness on the country's continuing program for clean water were initiated by the EMB nationwide, in cooperation with different multi-stakeholder partners such as academic institutions, business, local government units, national government agencies, non-government organizations, private sector partners and advocates of water quality management.

Among the activities conducted were:

International Coastal Clean-up –Observed every September of each year, this event promotes massive voluntary action to support and complement clean-up and greening activities of the government. This initiative is embodied in Presidential Proclamation 470 declaring every third Saturday of September as International Coastal Clean-up Day.

Partners from the local government units, academic institutions, non-government organizations, business sectors and other private institutions join the government in this yearly endeavor which aims to protect, conserve, and manage the coastal and marine resources in the country. Part of the activities also helped in the restoration of coral reefs and planting of mangroves in selected areas.

The said clean-up has been done in various water bodies of the country.

Fluvial Parade – This activity was done as part of the Earth Day 2007 celebration. In the said event, each banca used for the program was decorated with recyclable materials and streamers all advocating for the rehabilitation of Pasig River and the environment as a whole.

Environmental Cruise- This activity was done by EMB/DENR Region 6 during the Environment Month celebration in 2007.

Clean Bicol River Program – Initiated by EMB Region 5, the program is intended to encourage concerted efforts and actions to ensure environmental sustainability, particularly in the rehabilitation and management of major urban rivers in Region 5. Bayanihan style was employed in cleaning the river until the rivers identified finally conformed with DENR standards on water quality management.

The urban rivers like Sagumayon in Albay, Balos River in Camarines Sur, Daet River in Camarines Norte, Gogon in Catanduanes, Tugos in Masbate and Salog in Sorsogon were recipients of the rehabilitation project.

Linis Estero – This project is part of the program every September Clean-up Month in support of both the solid waste management and clean water programs of the EMB.

The program aims to minimize wastes from plastics and packaging materials that usually end up in our drainage systems. The various esteros are likewise cleared up of other forms of debris as they are aimed to be brought back to life as a source of clean water in the area.

IEC Campaigns on Clean Water –.The Environmental Education and Information Division (EEID) of the EMB, with its EMB Regional Environmental Education and Information Sections support the heightened information and education campaign for the popularization of the PCWA.

Since the passage of the Act in 2004, the EEID has produced a number of publications to increase awareness on water quality management. The EMB Central and Regional Offices have conducted several seminars, fora, and trainings among their stakeholders such as the industries, academic sector, business and local government units.

Other activities conducted at the EMB Central and Regional Offices involve public hearings to present classification and laboratory results conducted on rivers, groundwater and beaches to local government units and residents in the areas.

Year-round international and nationally significant events such as World Water Day (March 22), International Earth Day (April 22), World Environment Day (June 5), Philippine Environment Month (June), National Clean-up Month (September), International Coastal Clean-up Weekend (third weekend of September) are also venues for heightened social mobilization and multi-stakeholder programs and activities highlighting water issues and concerns.

2.5. Best Practices and Lessons Learned

There are several good practice initiatives in water quality management in every region in the country. This section discusses some of these best practices and lessons learned in some of the regions nationwide.

Continuous monitoring on the status of rivers through collection of samples for laboratory analyses is one of the methods employed to best judge the proper usage of water resources in some of the industries mentioned below.

EMB Region 4-A, cited the Absolut Water Distillery in Lian, Batangas that uses the Reed System in their waste water treatment system. This system entails the use of the nodes or nodules of bamboo roots to cleanse the wastewater.

EMB in Region 11 has cited San Miguel Corporation, an industry in their locality that practices "waste to energy conversion" by treating the waste water generated from its plant to produce methane gas which is now utilized as fuel in its boiler.

EMB Region 12 mentioned the use of vetiver grass as erosion control measure being adopted by the National Irrigation Administration, under the Water Resources Development Project.

Vetiver grass (*Vetiveria zizaniodes*) is an erosion control method used for erosion-prone areas. The program was implemented in Silway-Buayan, Pasada, and Banga River Irrigation Systems, where the use of vetiver grass was found to be effective in controlling erosion and in addressing sedimentation problems in catchment areas, canal embankments and also in critical slopes in Region 12.

In terms of water quality, it has contributed in reducing sediments and total suspended solids in water. Insofar as acceptability and willingness of farmers to replicate the same measure is concerned, about 41 percent were not convinced due to the following reasons:

- Maintenance problems;
- It serves as dwelling place for rats and snakes;
- It can be easily damaged by grazing animals;
- It causes canal obstructions; and
- Scarcity of planting materials.

Although some of the farmers are not willing to replicate the same measure in their area due to the aforementioned reasons, the overall acceptability of 59 percent is still high.

Another good practice option in Region 12 is the program on "Empowerment of Barangay Waterworks and Sanitation

Association" or (BAWASA) as embodied under Resolution No. 2005-5-058 issued by the Sarangani Province to address sanitation issues.

The establishment of BAWASA is anchored on Republic Act 6716, which empowers water beneficiaries the right to manage, operate, and maintain water facilities. Part of the responsibilities of the BAWASA is the proper disposal of domestic wastewater to decrease water pollution in rivers and creeks. Each BAWASA is trained by the Provincial Water Supply Sewerage and Sanitation Sector Unit in all aspects for community development in water project operation. To ensure, however, sustainability of the program, a Water and Sanitation Committee Municipal Technical Working Group was organized by the Local Chief Executive concerned through E.O. 29 , series of 2005.

2.6. Challenges and Recommendations

Nationwide, many of our rivers are polluted due to the wastes that are directly disposed in our bodies of water. Hence, there is a need to accelerate the provision of sewerage in the country. Otherwise, the country's water bodies, particularly in urban areas, will continue to be polluted and degraded.

In places outside Metro Manila, the Department of Public Works and Highways has delegated the Local Water Utilities Authority and the Local Government Units in the preparation of the National Sewerage and Septage Management Program

However until such time, there are still mounting challenges that need to be addressed in managing our waters. Among them are:

- Investments and providing funds for the strict enforcement of the various water-related laws;
- Strengthening institutional mechanisms and sustaining multi-sectoral participation in water quality management;
- Heightened and intensified IEC on water quality management and other requirements of the PCWA;
- Strengthening institutional coordination, networking, data sharing and institutional partnerships; and
- Rehabilitation of degraded water bodies.

The sources of water pollution can cause devastating damage to lives and properties, moreover, to the environment, if they are not properly abated or controlled. Thus, the challenge lies on our hands.

Solid Wastes

3. Solid Wastes

The production of manufactured and processed goods based on modern materials has created a major problem for modern society: hills, if not mountains, of wastes that are not easily broken down by natural processes of decay and decomposition. Instead, they generate and build up harmful gases and liquids and voluminous solid wastes. They are not only eyesores on the landscape but are major threats to human health and ecological balance. Their disposal also becomes a source of social conflict, because few communities, if given the choice, are willing to host dumpsites, landfill sites and other waste handling or disposal facilities.

In the Philippines, the solid waste problem is most serious in urban centers, particularly in Metro Manila, because of the high population density, the high consumption rates, and the concentration of packaged goods, some of which are made with raw materials that are toxic and non-biodegradable. Increasingly, the non-durable consumer goods are also becoming disposable items made for one-time use only compounding what is already a serious problem.

Solid wastes can come in direct or indirect contact with human beings at several stages in the waste cycle. The groups at risks are therefore broad and numerous. These include: the population of unserved areas, especially pre-school children; garbage collectors; workers in facilities that produce infectious and toxic materials; people living close to waste disposal facilities, and population whose water supplies have been polluted due to waste dumping or leakage from landfill sites. Additionally, industrial dumping of hazardous wastes that has become mixed together with household solid wastes can expose populations to chemical and radioactive hazards.

Several environmental laws have been enacted in the country and one of these is Republic Act (RA) 9003 or the Ecological Solid Waste Management Act of 2000. The same law provides for the legal framework for the country's systematic, comprehensive and ecological solid waste management program that shall ensure protection of public health and the environment. It underscores, among other things, the need to create the necessary institutional mechanisms and incentives, as well as imposes penalties for acts in violation of any of its provisions.

3.1 Sources and Characteristics of Solid Wastes

Baseline information on sources, quantities and nature of wastes is one of the basic requirements in the development of an effective waste management system, more so now with rapid urbanization and economic development which influence waste generation, collection and disposal pose to be a problem. Projected increases in quantities of each waste stream should likewise be undertaken to be able to plan for future provision of facilities. It is also important to determine the composition of solid wastes so that they may be handled properly according to their component.

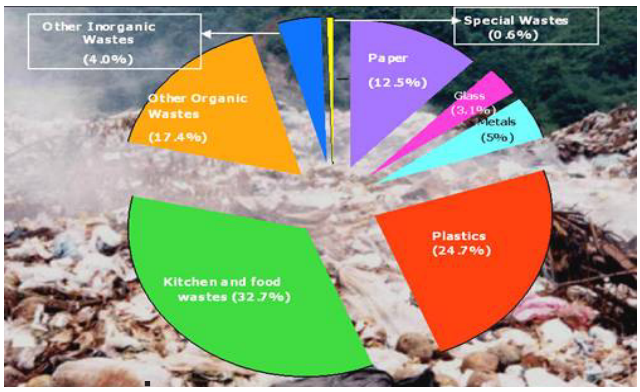
Solid Waste Characterization is used to determine the kinds of wastes generated within a certain city or municipality. This is to monitor the progress of solid waste management program, and, to determine the method of segregation necessary for the wastes predominant in the area. The different sources of wastes include, among others: commercial, residential, industrial and institutional.

Per DENR Administrative Order 2001-34 wastes are further described as,: 1) Readily biodegradable – garbage, paper, wood, leaves, trees; 2) Readily combustible – textile, plastics, rubber, leather; and 3) Mostly inert – metals, glass, dirt, ceramics, ash and stones.

A Waste Characterization Study conducted in 1982 revealed that out of the total solid wastes generated in the residential areas, 53.2% are biodegradable wastes that include food and kitchen and yard wastes. Paper and cardboard wastes account for 12.9 % while plastics account for 6.93 percent of the total wastes generated at residential areas.

Results of another waste characterization study undertaken in 1992 showed that more than half of the wastes generated in the residential areas are biodegradable wastes. The study also estimated the sources of wastes that comprised MSW as: 48% from residential sources; 26% from informal settlers; and, 26% from commercial and industrial sources.

In 2003, the Asian Development Bank-assisted Metro Manila Solid Waste Management Project, conducted a Waste Analysis and Characterization Survey (WACS) in five local government units. Results of the survey (as shown in **Figure 3-1**) revealed that the bulk of the wastes being generated comprised of kitchen (32.7%) and other organic substances (17.4%) followed by plastics (24.7%) and paper (12.5%).



Source: Metro Manila Solid Waste Management Project, ADB, 2003

Figure 3-1. Composition of Disposed Municipal Solid Wastes in Metro Manila*, 2003

One key characteristic of solid wastes in the country is the change in volume as well as the properties of wastes being generated. Plastics and papers are two of the most dominant materials that were assessed, mainly due to the high recoverable value of the said materials.

Available studies have also shown a steady increase on the fraction of reusable and recyclables because of the emerging techniques and processes to carry out utilization of secondary materials by the manufacturing sector.

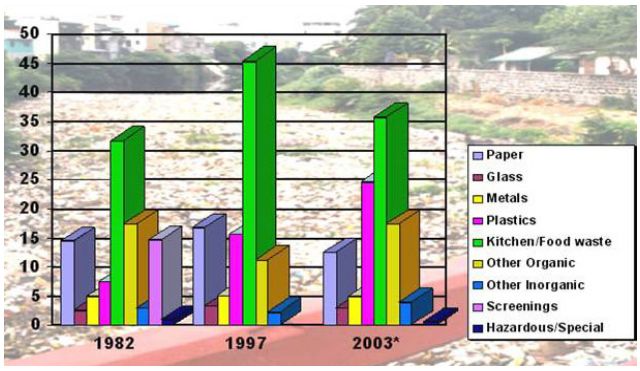
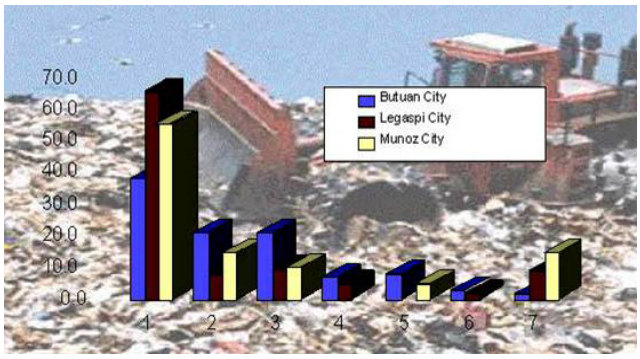


Figure 3-2. Comparison of Results of Composition of Municipal Solid Wastes Generated (Composition, % wet weight)

Figure 3-2 illustrates, that over the years, the use of plastics has been steadily increasing, indicating a change in the packaging materials for goods.

It also shows that the concentration of paper products in the MSW increased slightly from 14.5% in 1982 to 16.8% in 1997, but decreased to 12.5% in 2003. Kitchen/food - wastes, meanwhile, increased substantially from 1982 to 1997, then decreased in 2003 to levels that were more similar to those in 1982. The differences may be attributed to the differences of the sampling points.



Source: JBIC Study, 2003

1 – Organic Wastes
2 – Plastics
3 – Paper
4 – Glass
5 – Tin cans and metals
6 – Rubber
7 - Others

Figure 3-3. Composition of Solid Wastes in Selected Cities, 2003

A similar study on the composition of solid wastes in the cities of Butuan, Legaspi and Munoz was implemented under assistance from the Japan Bank for International Cooperation (JBIC) and it revealed the same results that organic wastes, which constitute kitchen, yard and field wastes, are produced more than any other waste materials.

3.2. Existing Solid Wastes Facilities

With the heightened campaign toward proper solid waste management, LGUs are expected to have already closed and rehabilitated their open dumpsites in 2006. While a few LGUs have introduced and implemented engineering measures for the conversion of their open dumpsites into controlled disposal facility (CDF), important aspects of an ecological solid waste management, such as daily covering of soil, well-designed drainage and run-off control, security fencing, no burning, etc are still to be satisfied.

In general, LGUs are still operating their open dumpsites, which is a violation of RA 9003. Some continuously operate their open dumpsites, notwithstanding that these are usually located along river banks which are considered as inappropriate locations for a disposal facility.

Local government units are having a hard time complying with the closure of their open dumpsites, despite the time-bounded compliance to the requirements. This is because the LGUs are constrained by several factors, most importantly, funds and grants. Several municipalities do not even have solid waste disposal sites.

LGUs, however, have taken seriously RA 9003 in their political agenda. Some were able to identify proposed sanitary landfill sites and subjected these for suitability assessment. **Table 3-1** presents the solid waste management facilities nationwide, from 2005 to 2007.

Table 3-1. Solid Waste Management Facilities, 2005-2007

Indicator	2005	2006	2007
Facilities			
Open Dumpsites	794	692	826
Controlled Disposal Facilities	309	388	359
Proposed Landfills	166	171	211
Sanitary Landfills (SLFs)	4	10	35
SLF Description			*16 ops 19 cons*
Materials Recovery Facilities	1103	1265	2200
Barangays Served by MRFs	*1103*	*1265*	*2473*
Compliance			
Closure and Rehabilitation Plan	-	282	328
Authority to Close	-	188	269

Source: National Solid Waste Management Commission (NSWMC)-Secretariat

In Davao, there are 349 Materials Recovery Facilities (MRFs) in the four provinces. Compostela Valley (ComVal), the largest province in terms of land area has 122 MRFs (34.95%) while Davao Oriental, the farthest province from Davao City has the least, with 46 MRFs (13.18%).

Categorized sanitary landfills are already established by some LGUs noting the 33 present in the region, of which ComVal has the most number (11). Composting is also commonly practiced in Davao del Sur, with ten composting facilities at present.

3.3 Projection of Waste Generation

The volume of waste generation is affected by different factors. Generally, the greater a country's economic prosperity and the larger its urban population, the greater the amount of solid wastes generated.

In 2001, A World Bank study presented an estimation of waste generation by a 0.71 kg waste production rate per capita daily. The study also presumed that urban areas have a 0.50 kg waste production rate per capita daily, as compared with the 0.30 kg in rural areas. It was also assumed that the urban population would increase their waste production rate by 1% per year due to rising income levels (based on GHK/MRM International Report).

Table 3-2 shows the estimated waste generation for years 2007 and 2010, with the 2007 data coming from the National Solid Waste Management Commission-Secretariat, and the 2010 estimate from the World Bank Study.

Table 3-2. Waste Generation Estimates, 2007 and 2010 (million tons/year)

Region	Volume (2007)	2007 % of Total	Volume (2010)	2010 % of Total	Rank (2007)
NCR	2.86	23.54	3.14	22.97	1
CAR	0.21	1.73	0.21	1.5	15
I: Ilocos Region	0.57	4.69	0.63	4.61	8
II: Cagayan Valley	0.37	3.05	0.4	2.9	13
III: Central Luzon	1.21	9.96	1.32	9.66	3
IV: Southern Tagalog	1.69	13.91	2.11	15.4	2
V: Bicol Region	0.62	5.10	0.65	4.75	7
VI: Western Visayas	0.9	7.41	1	7.3	5
VII. Central Visayas	0.87	7.16	1.01	7.39	4
VIII. Eastern Visayas	0.49	4.03	0.51	3.7	10
IX. Western Mindanao	0.46	3.79	0.53	3.88	9
X. Northern Mindanao	0.56	4.61	0.47	3.4	11
XI. Southern Mindanao	0.6	4.94	0.97	7.10	6
XII: Central Mindanao	0.45	3.70	0.41	3.0	12
XIII. CARAGA	0.29	2.39	0.31	2.27	14
National	**12.15**	100	**13.67**	100	

Source: NSWMC-Secretariat

The 2007 figures showed that the National Capital Region (NCR) has the highest waste generation at 2.86 million tons per year, followed by Southern Tagalog and Central Luzon at 1.69 million tons and 1.21 million tons, respectively.

In the case of MIMAROPA, the per capita generation of solid wastes was computed based on population (*data from National Statistics Office*) and the rate of wastes per capita generation (*based on Asian Development Bank Study*).

The said study indicates that the range of per capita waste generation is significantly based on the given income class of certain municipalities, pursuant to the data from the National Statistics Office.

It is worthy to note that two regions exceeded the 2010 projections made by World Bank. These regions are Northern Mindanao and Central Mindanao (See **Figure 3-4**)

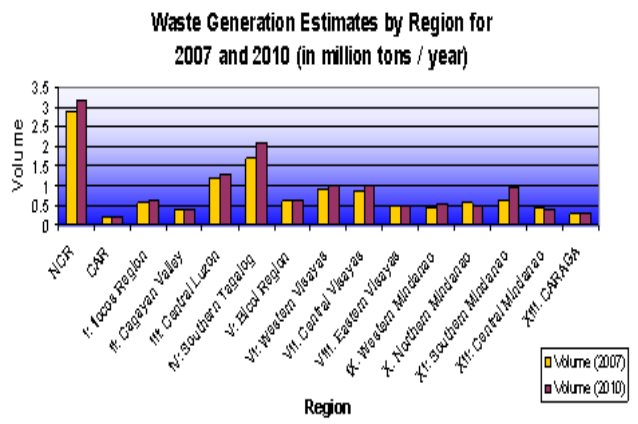


Figure 3-4. Waste Generation Estimates by Region for 2007 and 2010 (in million tons/year)

3.4 Ecological Solid Waste Management

The NSWMC was created to oversee the implementation of solid waste management plans and prescribes policies to achieve the objectives of the Act.

The Commission has 17 members: 14 from the government sector and three from the private sector. (***Figure 3-5*** shows the organizational structure of the NSWMC).

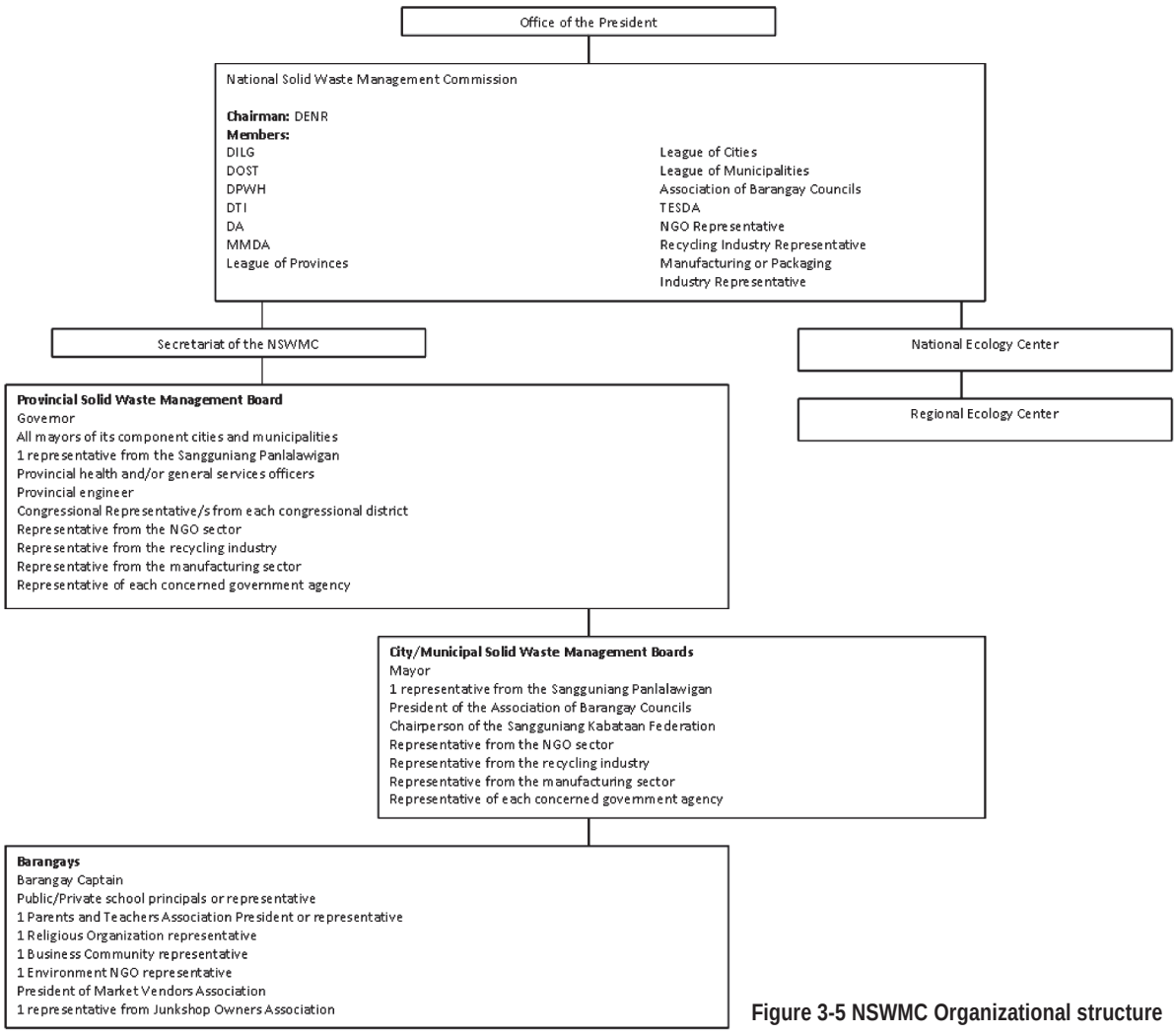


Figure 3-5 NSWMC Organizational structure

3.4.1 Legislations and Policies

The implementation of plans and programs on ecological solid waste management is an inherent function of the local government units pursuant to the Local Government Code of the Philippines (Republic Act No. 7160).

Republic Act 9003. Ecological Solid Waste Management Act of 2000.

Executive Order No. 192, Series of 1987. Implementing Rules and Regulations of the Philippine Ecological Solid Waste Management Act of 2000.

DENR Memorandum Circular No. 06. Adoption of IEE Checklist and IEE Report on the ECC Processing of Categorized Final Disposal Facility (Sanitary Landfill)

DENR-DILG Joint Memorandum Circular 06-02. Amendment to Joint Memorandum Circular 06-01 Nationwide Search for Model Barangays

DENR Administrative Order 06-09. General Guidelines on the Closure and Rehabilitation of Waste Disposal Facilities.

DENR Administrative Order 06-10. Guidelines on the Categorized Final Disposal Facilities

DENR-DILG Joint Memorandum Circular 06-01. Nationwide Search for Model Barangays for Ecowaste Management System 2006-2007

DENR-DOST Joint Memorandum Circular 06-01. Adopting Environmental Technology Verification Protocol

NSWMCS Resolution #8. Guidelines on the Formulation and Approval of the 10 year SWM Plan.

NSWMCS Resolution #9. Creation of a Technical Working Committee (TWC) for the Phasing Out of Non-Acceptable Products and Packaging Materials

Local ordinances and Resolutions relative to the implementation of solid waste management were also drafted and signed by concerned Local Government Units.

3.4.2 Programs and Projects (including investments)

The following are solid waste management programs being implemented by the members of the Commission, which are composed of government agencies, the private sector, LGUs, civil society, and communities:

Department of Trade and Industry

The Department of Trade and Industry (DTI) is mandated under RA 9003 to formulate a Recycling Program, to study project standards for recyclable and recycled materials, the existing markets for the processing and purchasing of recyclable materials, and the potential steps necessary to expand these markets.

Through the Bureau of Product Standards (BPS), the DTI is mandated to establish an Eco-labeling Program, where a coding system for packaging materials and products to facilitate waste recycling and re-use is to be formulated and implemented.

It is also the responsibility of the DTI, through the Board of Investments (BOI) to issue approvals on Tax and Duty Exemption on Imported Capital Equipment and Vehicles for the importation of machineries, equipment, vehicle and spare parts used for collection of solid wastes.

Recycling Program

The DTI-BOI has been implementing the Japan International Cooperation Agency-assisted Study on the Recycling Industry Development in the Philippines, since 24 July 2006. This aims to formulate a Master Action Plan for the development of the recycling industry in the country in accordance with RA 9003. The Master Action Plan is set to be tested in Metro Manila and Metro Cebu.

A Fact Book on recycling and an inventory of existing markets for recyclables is set to be published, and a symposium and exhibit of recyclers were conducted in November 2007.

Eco-labeling: Product Coding/Eco-labeling Program (ELP)

The Eco-Labeling Program is being chaired by the DTI-BPS and administered by the Clean and Green Program.

Since the launching of the Green Choice Philippines (GCP) in 2003, eight Product Criteria have already been developed, in addition to the product criteria for detergent and tissue paper developed in 2002.

These are:

- Product Criteria for Household Batteries (2003)
- Product Criteria for Plastic Packaging (PP- 2003)
- Product Criteria for Engine Oil (2003)
- Product Criteria for Fire Extinguishers (2004)
- Product Criteria for Air Conditioning Units (2004)

- Product Criteria for Crayons (2004)
- Product Criteria for Printing and Writing Paper (2004)
- Product Criteria for Cement (2006)

Pride and Surf detergents have been authorized to use the GCP logo, in March 2003, and June 2004, respectively.

Non-Environmentally Acceptable Products (NEAP) and Packaging

The DTI is the designated Chair of the Technical Working Committee (TWC) that would formulate the criteria/ guidelines for the phasing out of non-environmentally acceptable products (NEAP) and packaging. At present, the TWC has already drafted the guidelines for the creation of the Technical Working Group, and has agreed on the guidelines/criteria for determining NEAP and packaging.

Incentive scheme for RA 9003 projects and activities

The guidelines for registration of projects under RA 9003 have been adopted (published in September 7, 2006). Projects concerning RA 9003 had been proposed in the 2007 Investments Priority Plan (IPP).

Department of Science and Technology

The Department of Science and Technology (DOST) is mandated under RA 9003 to promote the development of an industrial clean technology/production program, to initiate studies on the alternative usage of non-recyclable and non-reusable materials; and to develop and apply methods of waste collection and disposal, including energy recovery from solid wastes.

It is also the responsibility of the DOST to push the utilization of organic materials as sources of fertilizer and biofuels; and to develop and discover new uses for recovered resources.

Environmental Technology Verification (ETV) Program

The DOST is in charge of the verification and evaluation of local and foreign environmental technologies. Of the 17 environmental technologies that applied for ETV, seven were already issued with ETV Statements. These are the Environmental Recycling System (ERS) by Protech Machinery; Smartwashers by Lead Marketing; Happy soil (baling) by Lacto Asia; Controlled Steam Generation by Cleansave Waste Corporation; Novozyme by Allen Specialty Producers; Induplex Perlite I.G. by Pacific Non-metallic, Inc.; and JAS Coat by JEC Aqua Staff Co., Ltd.

Technology Development and Transfer Program

The ITDI-DOST has developed and commercialized technologies that are being utilized in the management of solid wastes. Among these are the Bioreactor Composting (aerobic composting of organic materials); the Biogas digester (anaerobic composting of biodegradable solid waste materials); and the Styro-oven (melting of polystyrene and plastic materials which makes use of coconut oil into useful products such as tiles, panel boards, table tops, synthetic, lumber, school desks and chairs).
Other technologies being pushed are the processing of Milo laminates (molding of laminates into panel boards, table tops and chairs); glass recycling into decorative materials (including wine and softdrinks bottles); and the evaluation and testing of clay as sanitary landfill liner.

Styro-oven

There were several bioreactors for composting that were already fabricated and transferred to the local governments of La Trinidad, Benguet; Vigan City, Ilocos Norte; Camalaniugan, Cagayan; Tuguegarao, Cagayan; Quezon City; Sta. Cruz, Laguna; Boracay Island, Malay, Aklan; Pagadian City, Zamboanga del Sur; Ozamis City, Misamis Occidental; Davao City; South Cotabato; Muntinlupa City; and in Smokey Mountain, Tondo, Manila.

The styro-oven technology is also being adopted by Sta. Cruz, Laguna; Boracay, Malay, Aklan; San Fernando, Pampanga; Lipa, Batangas; Silay City, Negros Occidental; Victoria, Negros Occidental; Talisay, Negros Occidental; Bago, Negros Occidental; Sagay, Negros Occidental; Manapla, Negros Occidental; Miag-ao, Iloilo; Miriam College, Quezon City; Davao City; Cebu City; Lapu-lapu, Cebu City; San Teodoro, Mabini, Batangas; Sta. Rosa, Nueva Ecija; and Baliuag, Bulacan.

Information, Education and Communication (IEC) Program

Seminars and symposia on solid waste management are also being conducted by the DOST, for the LGUs and the private sector, among them.

To date, the DOST has conducted seminar-workshops on solid waste management; alternative technologies; and proper handling and transport of wastes for haulers/

collectors in several municipalities including Taguig, Pasay City, Davao, and Surigao City.

DOST Solid Waste Management Program

The DOST also leads by example as it established a Committee that will oversee the management of the entire solid wastes generated by the DOST Science Community. This Committee is in charge with the set-up of color-coded and properly labeled segregation and recycling containers, and the installation of composting units at the DOST compound; and the conduct of awareness seminars on solid waste management among employees.

Department of Agriculture – Bureau of Soils and Water Management

The Department of Agriculture (DA) is mandated under RA 9003 to lead in the improvement of composting technology and the identification of existing markets and demand for compost.

The DA is likewise mandated to encourage the composting of agricultural wastes, and other compostable materials including, but not limited to garden waste; assist the compost producers to ensure that the compost products conform to the standards; and to set the standards for organic fertilizers from compost.

For its part, the DA has established a Regional Techno-Demo on the Agri-Kalikasan Program with sub-components Modified Rapid Composting (MRC), "Tipid Abono" Fertilization Program, Porta Bio-gas, and the Basket composting-cum-mushroom production.

The MRC is the on-farm decomposition of farm waste/ products to be converted as organic fertilizer (i.e. rice straw, corn stubbles, animal manure, fruits, etc.) through the use of Trichoderma fungus, thereby reducing dependency to commercial organic fertilizer to half. The "Tipid Abono" Fertilization Program, on the other hand, is focused on the promotion and demonstration of organic-based farming in combination with minimum amounts of inorganic fertilizer formulated for specific soil and agro-climatic conditions.

Porta Bio-gas is mainly the utilization of rice straw/farm stubble for methane gas emission sequestration to combat global warming (farmers' choice), and, Basket Composting-cum-Mushroom Production is focused on identifying potential sites (farmers' choice) as a form of support services to small entrepreneurs.

Provinces targeted for the Agri-Kalikasan Program are Kalinga (Cordillera Administrative Region); Pangasinan, Ilocos Norte (Region I); Cagayan, Isabela, Nueva Viscaya, Quirino (Region II); Bulacan, Nueva Ecija, Pampanga, Tarlac, Aurora (Region III); Quezon (Region IV-A); Occidental Mindoro, Oriental Mindoro (Region IV-B); Albay, Camarines Sur (Region V); Capiz, Iloilo, Negros Occidental (Region VI); Bohol (Region VII); Leyte, Southern Leyte (Region VIII); Zamboanga del Sur, Zamboanga Sibugay (Region IX); Bukidnon, Lanao del Norte (Region X); Davao Sur, Davao del Norte, Compostela Valley (Region XI); North Cotabato, Sultan Kudarat, South Cotabato (Region XII); Agusan del Norte, Agusan del Sur (Region XIII); and Maguindanao, Lanao del Sur (ARMM).

For the "Tipid-Abono" Fertilizer Program, targeted provinces include, for Group 1: Ilocos Sur, Ilocos Norte, La Union, Pangasinan, Isabela, Tarlac, Pampanga, and Albay; for Groups 2 and 3: Quirino, Nueva Viscaya, Nueva Ecija, Bulacan, Bataan, Zambales, Pampanga, Laguna, Quezon, Occidental Mindoro, Oriental Mindoro, Catanduanes, Camarines Sur, Camarines Norte, Masbate, Sorsogon, Aklan, Antique, Capiz, Iloilo, Negros Occidental, Bohol, Negros Oriental, Leyte, Western Samar, Misamis Oriental, Misamis Occidental, Bukidnon, Davao, South Cotabato, Lanao del Norte, North Cotabato, Sultan Kudarat, and Abra; for Group 4: Maguindanao, Lanao del Sur, Marinduque, Zamboanga del Norte, and Surigao del Norte; for Group 5: Agusan del Sur, Agusan del Norte, Surigao del Sur, Cavite, Palawan, Romblon, Ifugao, Kalinga, and Apayao.

For Group 6, targeted provinces are San Manuel, Urdaneta, Pangasinan; Villaverde, Solano, Bagabag, North Viscaya; Camiling Tarlac, Arayat, Magalang Pampanga, San Ildefonso, Bulacan, Hermosa, Bataan; Gapan, Nueva Ecija; Sta. Cruz, Laguna; Banga Aklan, Sibalom Antique, Barotac Nuevo, Cabatuan, Pototan in Iloilo; Palo, Leyte, Basey in Samar; Polanco, Zamboanga del Norte, Tukuran Zamboanga del Sur, Gingoog City, Butuan City, Agusan Norte, Prosperidad, Agusan Sur; Sinsuat, Magindanao, Tabuk, Kalinga.; and for Group 7: Curimao, Ilocos Norte, Sta. Catalina, Sta. Maria, Ilocos Sur; Binmaley, Lingayen; and Sual in Pangasinan; Sasmoan, Macabebe, and Masantol in Pampanga.

A National Expert Team has also been organized for the creation of a National Organic Agricultural Program which would include the promotion, practice, and marketing of organic fertilizer based on the advocacy of creating awareness and consciousness in the utilization of the produce of the MRF, in proper coordination with the LGUs.

A technical research paper, "Agricultural and Solid Waste Management System in the Philippines and Strategies for Producing Organic Fertilizer and/or Soil Conditioners", was published for distribution to LGUs.

Department of Health (DOH)

The Department of Health (DOH) is mandated under RA 9003 to spearhead the study of the adverse health effects of solid wastes to people, including the unintentional release of by-products of combustion (such as dioxins and furans), including methods to eliminate such effects.

For this, the DOH has developed a manual on hospital waste management and the "Proper Handling of Solid Wastes", an information material on the handling and disposal of soft plastic wastes.

The DOH has also provided technical assistance to its Regional Sanitation Offices and the LGUs, and conducted orientation and advocacy campaign activities regarding the health effects of improper handling and management of solid wastes.

Department of Interior and Local Government (DILG)

The Department of Interior and Local Government (DILG), with the Commission, DENR, National Economic Development Authority (NEDA), and the various leagues of local governments, is mandated under RA 9003 to develop a coordinative mechanism that will ensure that LGUs are significantly guided in the preparation of the Local Government Solid Waste Management Plan (LGSWMP).

The DILG is also mandated to ensure active education and public information, including the allocation of a portion of its funds on waste management of every local government unit, down to the barangay level. Through the Philippine National Police, the Department of National Defense and the Philippine Coast Guard, the DILG also helps enforce compliance to the provisions set forth under RA 9003.

For this, the Bureau of Local Government Development - DILG conducted an assessment of the operation of Local Solid Waste Management Boards/Committees, and also came up with the policy paper, "Measuring Progress of a Functional Solid Waste Management Board". The Bureau also participated in the National Search for Model Barangays for Eco-Waste Management System; and coordinated with the NSWMC-DENR for the listing of LGUs with the Ten-Year Solid Waste Management Plan, and the Disposal Facilities/ Sanitary Landfills and MRFs.

Solid Waste Management Best Practices were also documented and compiled by DILG including the Bolinao Sanitary Landfill of the Municipality of Bolinao, Pangasinan (Region 1); Barangay Pinagkaisahan Ecology Center: A Model SWM Project of Brgy. Pinagkaisahan, Quezon City (NCR); SWM Project of Solsona, Ilocos Norte; Ecological Solid Waste Management Program of Bulan, Sorsogon; Materials Recovery Facility of San Mateo, Isabela; Integrated Solid Waste Management Program of Barangay Dos, Pamplona, Las Piñas; and the Wow to Big Project: The Bani Experience of Bani, Pangasinan.

The League of Cities of the Philippines (LCP)

The League of Cities of the Philippines (LCP), for its part, has undertaken the following programs and activities in relation to solid waste management, including the Training Workshop and LGU Sharing Forum on "Financing Sustainable Environmental Projects"; the "Training of Trainors' on Solid Waste Management" under the Consolidating Philippine Local Government Associations (COPLOGA) Project; and the "Capacitating the League of Cities of the Philippines Component" of the Good Practices on Local Governance: Facility for Adaptation and Replication – Local Environmental Planning and Management (GO-FAR/LEPM) Project. It has also conducted its own survey on the status of and capacity building needs for RA 9003 implementation by its member-cities.

Under the GO-FAR/LEPM, the LCP has developed the Advocacy Strategy Framework on LEPM/SWM; the Task Force Capacity Building Program; and the LCP Core Group Advocacy Plan. The LCP has also identified the roles and responsibilities of the Task Force; organized a Capacity Building Training/Workshop; developed advocacy materials, tools, processes and strategies; published the LCP Official Newsletter; and compiled Proceedings of the GO-FAR/LEPM Capacity Building of Cities.

A session on Environmental Management was also held during the 1st LCP National Convention which provided a venue for cities to discuss initiatives and emerging trends in implementing urban environmental programs. In addition, a policy dialogue was held to study the issues surrounding solid waste management, among others. The forum also provided a venue for the city mayors to interact with the NSWMC Secretariat's Office of Executive Director and to discuss possible areas for partnership.

The LCP has also provided assistance to cities, including Dagupan, Manila (Department of Public Services, and the Association of Metro Manila Environment Officers), Sorsogon, Cebu, Cagayan de Oro, and Sta. Rosa, on solid waste management in the form of technical advice, in-house training or formulation of local legislations on waste management.

To check compliance of cities with RA 9003, the LCP conducted a survey among 120 cities. Of this number, only 54 cities responded which accounts to 45% of the total targeted respondents. Results of the survey revealed the following:

• One hundred percent of the respondents already have their own Solid Waste Management Board that meets regularly (monthly, semi-annually, quarterly, or as the need arises).

• More than half (54%) of the respondents have their SWM Plan drafted, 35% have submitted the same to the NSWMC, while only 11% have their SWM plans approved.

• Eighty-seven percent of the respondents attested to having their own MRF, but with varying percentage of barangays being serviced (from as low as 3% to 100%).

• Eighty-one percent confirmed that they have their own composting facilities.

• Twenty-six percent of the respondents have their respective categorized sanitary landfill. For others that have yet to establish their SLF, most of them dispose their wastes in a controlled dumpsite within the city. Metro Manila cities dispose their wastes in a sanitary landfill of another LGU.

The Liga ng mga Barangay (LNB)

The Liga ng mga Barangay (LNB) acts as representative in Local Sanggunians of provincial, municipal or highly urbanized level in charge to encourage the adoption of local resolutions/ordinances on solid waste management to be implemented in local settings; to review the budget prepared by their respective barangays (allocations for environment concerns); and to consolidate plans and programs coming from their respective barangays.

The LNB provides assistance and basic information on solid waste management to barangays through the production of information materials, the holding of conventions and meetings, and the conduct of Lakbay Aral for Punong Barangays where an overview on solid waste management is being discussed by the LNB, with a highlight on its significance to community development. Barangays Infanta, Pangasinan; Dolores, Quezon; Lupon, Davao Oriental; Infanta, Pangasinan; Nagcarlan, Laguna; Sto. Domingo, Nueva Ecija; Zamboanga Sibugay; Alegria, Cebu; Upi, Maguindanao; Roxas, Palawan; Sindangan, Zamboanga del Norte; and, Banga, Aklan were among the participants in the event.

The LNB also actively participated in meetings/workshops and seminars on Solid Waste Management, including the Search for Model Barangays Validation Team, Recycling Industry Development in the Philippines, and the Galing Pook General Assembly. The LNB also has a regular radio program that discusses topics on Solid Waste Management over radio station DWDD.

Further, the LNB is also a recipient of an International project with SALA IDA – Sweden, "Consolidating Philippine Local Government Associations (COPLOGA)". Under the project, LNB co-designs with stakeholders, a training module on Solid Waste Management for pilot LGUs in Negros Occidental and Rizal Province.

With its goal of strengthening programs on its service area of Water and Environmental Protection and Management, the LNB continues to network with other government and non-governmental organizations, not only to promote environment-related issues, but also to establish an effective and relevant solid waste management program.

Technical Education and Skills Development Authority (TESDA)

The Technical Education and Skills Development Authority (TESDA), in coordination with the DENR, Department of Education (DepEd), the Commission on Higher Education (CHED), and other concerned government agencies, is mandated under RA 9003 to aggressively incorporate ecological waste management in the school systems at all levels.

The education program aims to focus on the involvement of the administrators, teachers, and the students, in the school and community waste management actions, as well as the strengthening of the waste management content in the curricula. Emphasis is also on, but not limited to, the ill-effects of solid wastes relative to human health and the environment, waste minimization and pollution prevention, waste segregation (biodegradable and non-biodegradable) and storage, waste reduction at source, waste recycling/reuse, composting, different methods of waste management and economic benefits derived thereat, and other community-based solutions to the solid waste problem.

The provisions of the prohibited acts under RA 9003, including sanctions and the right of citizens to file suits, are also emphasized on the program.

TESDA has initiated the implementation of an ecological solid waste management system in all its regional and provincial offices, including the TESDA technical and vocational education and training institutions. A "Waste Management Seminar" was conducted for all employees, and a TESDA Central Office Eco-Waste Center was also constructed which now serves as a segregation house and a venue for recycling, redeeming, reusing and composting of waste materials.

A Solid Waste Management Work Plan was also prepared by TESDA to provide details of the processes, and methods to be used in implementing and advocating a waste management program.

At the regional/provincial level, particularly in the TESDA training institutions, waste management has been part and parcel of the policy of the centers. Among the programs and procedures being implemented are recycling of used

welding equipment, recycling of used/consumed printer toner/cartridges, and the establishment of a facility service management to resell surplus and excess materials.

The Private Sector

The Recycling Industry Sector Representative

Development of a Recycling Market:

The DTI-BOI with JICA worked on a report , which will serve as a baseline for the publication of the study on existing market for recyclables mandated under RA 9003.

The Recycling Industry Representative is also actively working with the industry association to expand and develop the infrastructure for retrieval of recyclable materials in the Philippines.

Development of Recycling Guidelines and Action Plan on Recycling

The Recycling Industry is working with JICA and the DTI-BOI on the development of guidelines and action plan on recycling mandated under RA 9003.

Meetings with industry stakeholders are being convened for the development of the recycling plan under the JICA program focusing on Metro Manila, Metro Cebu, and Metro Davao. The private sector is likewise coordinating with JICA and the DTI-BOI for waste categorization, and is also focused on the development of pilot projects for the program with emphasis on the development of communication and database, sites and methodology selection, in close coordination with the JICA experts.

The Recycling Industry Sector Representative also participated in the JICA-sponsored scholarship program at Kitakyushu, Japan last March 4-31, 2007, part of the training and building up capacity on "designing and constructing a recycling based society", and is likewise an active participant on all fora on regional recycling promotion and developments and how they can be applied in the Philippines.

Prohibition on the Use of Non-Environmentally Acceptable Packaging

The Recycling Industry sector representative holds meetings with BOI and NSWMC to design the criteria by which a product is deemed non-environment friendly.

A Technical Working Group (TWG) among industrial sectors has been created to evaluate the different kinds of packaging currently existing in the market, and its compliance to the Act. Actions are also being taken so as not to displace business and other existing international treaties (like with World Trade Organization), other inter-trade arrangements, and/or with countries with industrial development program/s.

Practical Technologies on Waste Plastic Recycling

Negotiations and signing of the Philippine Plastics Industry Association and the Industrial Technology & Development Institute (ITDI) of the Department of Science and Technology for the development of practical technologies on waste plastic recycling is also being monitored by the Recycling Industry sector.

A product of this partnership is the third generation Melting Oven for Processing Post-Consumer Plastic Sando Bags. Plastic sando bags can now be melted in a preheated used cooking oil and molded into functional products such as tabletops, flower pots, catwalk/paving blocks.

Catwalk blocks made from plastic.

This technology won First Prize for Outstanding Creative Research in the National Inventors' Week 2006 in November held at the Philippine Trade Training Center, Manila.

Another innovation is the utilization of Waste Plastic Bags in Asphalt Paving Mixes. This involves mixing of 5-8% waste plastic bags with commercial asphalt (AC 60/70) before combining with aggregates to produce asphalt paving mixes for road pavements. The developed asphalt mixes showed improved strength, stability and fatigue resistance.

Other technologies are still in the research stage and will be reported to the Commission as soon as developed for commercialization.

Recycling in the Supply Chain

To push for the promotion of recycling in the supply chain, the Recycling Industry sector representative has dialogued with the manufacturing and packaging industry, called for support and participation for recycling programs, the design and manufacture of products from recyclables, in-house segregation and recycling, and use of the Plastics Coding System.

Life Cycle Analysis

A Life Cycle Analysis (LCA) for packaging materials will be undertaken by the Philippine LCA Clearing House under the Center for Sustainable Development and Research of De La Salle University

The Recycling Industry sector representative proposed that the DOST should provide funds to the LCA for packaging materials as part of its research and development mandate, in connection with the determination of Non-Environmentally Acceptable Products (NEAP) under RA 9003, and in consideration of the Philippine LCA Clearing House that works in collaboration with the DOST.

Industry Awareness: The Plastic Bag Problem

Making the industry aware of the plastic bag problem in solid wastes, and finding a way to reduce the volume going to the dumpsite through recycling and reuse is one of the significant moves by the Recycling Industry sector.

At present, the sector representative is working closely with the plastic industry to promote the recycling guidelines developed by the JICA, in its ongoing Study of the Recycling Industry Development in the Philippines.

Meetings in barangays normally serve as a venue for the promotion of the guidelines in recycling, where barangay garbage collectors and volunteers are being instructed to encourage concerned households to sell their plastic reyclables along with their plastic bags.

The priority is to have the plastic bags end up with the recyclers. The Philippine Plastics Industry Association, Inc. will inform scrap dealers who do not buy plactics, that they can sell their plastic bags to other dealers that have a network with recyclers in Valenzuela City.

For plastic bags that are highly contaminated, the same shall be processed using the Melting Oven mounted to a Mobile Recycling Truck to be fabricated by the plastic industry as part of the agreement with JICA for the six-month project that commenced in June 2006.

The Business Groups

The business groups like the Philippine Business for the Environment, the Ayala Foundation and its group of companies, San Miguel Corporation, Nestle Philippines, Unilever, Philippines have also initiated projects on ecological solid waste management. The Philippine Business for the Environment, together with the Ayala Foundation, Earth Day Network Philippines have organized the recyclers to a one-day Recyclables Collection Event (RCE) which they conduct annually every Earth Day Celebration in different venues like the Ayala Center, Rockwell Center, etc. Later on, the Secretary of the DENR adopted it and launched it at Davao City, Cebu City, La Trinidad, Benguet and in Quezon City. These RCEs later on were replicated into regular waste markets which are regularly held at the Goldcrest in Ayala Center, Alabang Town Center, The Fort, Trinoma, and at the SM Supermalls nationwide.

The Ayala Group of Companies, thru the Ayala Foundation has also incorporated solid waste management as part of its corporate social responsibility. Its malls and buildings have been implementing segregation at source and have established its own Materials Recovery Facility and collection system. The Avida Land housing projects conducted contests among homeowners and their clubhouse on best practices on solid waste management, among others. They have also adopted communities and taught them proper waste management.

ESWM in Commercial areas

Four malls in Metro Manila have signified to observe the implementation of the ESWM as indicated in a Memorandum of Agreement with DENR to participate and support in properly managing and disposing recyclable materials; establish drop-off centers within the vicinity of the establishment; and, develop and operationalize information education campaign about waste recovery.

Ayala Center Materials Recovery Facility

These malls include: Ever Gotesco Corporate Center; Ayala Center Association; Rockwell Center Association, Inc. (Power Plant Mall); Alabang Commercial Corporation. The NSWMC and Rustan's Coffee Corporation also agreed to facilitate recovery of coffee grinds for the effective management of their wastes generated and for further use as a compostable material.

3.4.3 Civil Society Initiatives

The Non-Government Organizations (NGOs)

Mother Earth Foundation, one of the NGO representatives to the Commission since 2001 has assisted a number of sectors: 2,784 barangays, 118 other NGOs, 93 religious organizations, 136 government

agencies, 178 subdivisions/villages/housing associations, 135 schools, 79 private sectors, and 103 cities and municipalities, on the implementation of ecological solid waste management.

From 2001 to 2006, Mother Earth has already conducted a total of 1,017 Workshops on ESWM, a total of 120,529 participants.

Mother Earth also initiated and assisted in the establishment of a total number of 709 Materials Recovery Facilities in the country.

Along with the provision of assistance on the implementation of proper ESWM system, Mother Earth also initiated the filing of cases against non-complying LGUs, particularly in Caloocan City. A total of 47 barangays were sued. Among these, 26 have undertaken actions to correct the violation and comply with the provisions of RA 9003. Three cases were submitted to the Municipal Trial Court Branch 53, on-going hearing of 17 cases and one case for approval of Resolution.

3.4.4 Local Government Initiatives

Forty-eight local government units nationwide were identified by the DENR and EMB Regional Offices that were assessed to have initiated several programs towards the implementation of the RA 9003.

Four major components were identified that these LGUs should meet, for them to be able to have an LGU-wide implementation of Ecological Solid Waste Management: Segregation at source, segregated collection, establishment of MRFs and a proper disposal facility.

Proper segregation of wastes

Currently, of the total 2,408 barangays that are included in the said program, 48% or 1,176 barangays are practicing segregation at source and thirty-three (33%) percent are practicing segregated collection. Materials recovery facilities were established servicing a total of 805 barangays. Some of these MRFs include a composting facility either in the household, market, schools or a centralized barangay composting facility.

Forty-five percent or 21 LGUs out of the total LGUs included in the program have already converted their open dumpsites into controlled dumps. Twenty-seven LGUs are in the process of converting their open dumpsites into controlled dumps.

The program on LGU-wide implementation of ecological waste management is not representative of the whole country. However, it does put into the picture the initiatives done by some LGUs.

Collection and Transport of Solid Wastes

Collection of solid waste is the responsibility of the local government units as mandated by the Local Government Code (RA 7160) and reiterated under RA 9003. Municipal solid waste collection is done either by self-administration or through private contractors. The manner and frequency of collection and choice of equipment (both for collection and transport) depends on the size of the roads, density of population to be covered and affordability. In neighborhoods with narrow roads, household wastes are being dumped into communal receptacles placed strategically on larger roads, which are then removed/ collected by trucks.

On a national scale, typical collection efficiency rates average to about 70% in urban areas and 40% in rural areas. Based on the survey conducted by the Office of the Secretariat of the NSWMC in 2003, 27 local government units achieved a hundred percent collection efficiency. These are: Banayoyo, Ilocos Sur; Jabonga, Agusan del Norte; Ivana, Batanes; Uyugan, Batanes; Tuguegarao, Cagayan Valley; Sta. Maria, Isabela; Balagtas, Bulacan;Marilao, Bulacan; Cabuyao, Laguna; Angono, Rizal; Taytay, Rizal; San Pedro, Laguna; Sta. Rosa, Laguna; and, Binan, Laguna.

For Metro Manila, the collection efficiency is pegged at 83% based on the actual amount of wastes disposed.

Several years ago, 86% of the LGUs in Metro Manila allowed private contractors to manage the collection and waste transport services while 13% have their respective fleet of collection trucks that administer these services. The Metro Manila Development Authority collects only 1% of the disposed wastes. At that time, the community viewed solid wastes as mere nuisance and would employ limited or minimal segregation of traditional items normally bought by junk dealers or practices no segregation at all.

Currently, out of the 17 LGUs in Metro Manila, 11 have contracted collection. The collection service covers between 80%-100% of their respective jurisdiction, with some barangays and subdivisions having their own collection regimens. The most common form of collection is thru door to door wherein the collection trucks pass through a designated community route or via curbside collection. Normally, wastes are placed in plastic bags and various types of bins usually provided by the residents themselves.

Recovery and Recycling

The extent of formal recycling through the initiatives of the local government units is very limited when compared to the volume of wastes generated. Currently, recycling rate for the whole country is difficult to assess, mainly due to unavailability of sufficient data.

For Metro Manila, however, 13 percent of solid wastes was recycled in 2000 with the concerted efforts of several sectors in promoting waste segregation at source, composting and recycling. *Estimates showed that trade in waste materials had increased in volume by 39%, and in value by 47 percent in 2000 compared to 1998 (see* ***Table 3-3)***

Table 3-3. Waste Recovery in Metro Manila

Year	Material Purchased	Value (million Pesos)
1998	69,400	95.2
1999	95,600	124.5
2000	101,850	132.5

Source: World Bank Monitor 2001

Although the country has yet to reach its goals and vision for ecological solid waste management, many observed that a paradigm shift has taken over the critical sectors of the society. This particularly holds true for some households where acceptance of the value of waste minimization and avoidance has taken over the traditional practice of throwing garbage on a single receptacle. Least to say, there is an increased involvement and participation from various groups to realize that there are indeed greater benefits with the extension of the lifecycle of the materials in use today.

In the implementation of RA 9003, efforts are being exerted in the establishment of community-based MRFs that is viewed to complement the efforts for segregation, collection, recovery and processing. A total of 842 MRFs with components ranging from composting and storage facilities have already been established nationwide, most of which can be found at the NCR. Reports from the various sectors, however, revealed that there appears to be more composting and recycling facilities in operation. Many of them, however seem to have deteriorated into mere open dumps for various institutional, technical, financial and enforcement issues.

Solid Waste Disposal Facilities

Under the current solid waste management policy, disposal should come after resource recovery has been exhausted. If most of the recyclables and compostables are diverted from the disposal facility, then the technical and funding requirements in the establishment of a disposal facility would be reduced.

It should be noted that Section 37 of RA 9003 provides for the guidelines on the closure and rehabilitation of open dumpsites and controlled dump facilities. All LGUs had 36 months to convert open dumpsites to controlled dump facilities, otherwise they only had until February 6, 2006 to have the same closed and phased out. This is in consonance with DENR Administrative Order No. 09, Series of 2006 which supports further the NSWMC Resolution NO. 5 covering the Guidelines on the Closure and Rehabilitation of Open and Controlled Disposal Facilities which was approved on December 15, 2005.

Nationwide, the prevalent practice of solid waste disposal is still through open dumping, although some cities and municipalities have already started their program for the closure and rehabilitation of the dumpsites. Based on the current national profile, 726 open dumpsites exist nationwide, the bulk of which can be found in the Central Visayas and CALABARZON Region. Meanwhile, 215 LGUs are operating controlled disposal facilities, in addition to the 133 areas proposed for CDF development. Most of the controlled dump facilities can be found also in CALABARZON Region. These efforts are being collectively assumed by the LGUs, concerned government agencies and the private sector. There are two sanitary landfills currently existing in the country. These can be found in Capas, Tarlac and in Barangay Inayawan, Cebu. Further, there are about 220 proposed sanitary landfills to be established nationwide.

Metro Manila's wastes are being disposed in six disposal facilities: Rodriguez, in the Province of Rizal, Payatas in Quezon City, Lingunan in Valenzuela, Tanza in Navotas, and in Pulang Lupa in Las Pinas and Baseco area in Manila. A transfer station in Pier 18 is currently being operated to transfer wastes and the same to be disposed of eventually in Tanza, Navotas.

The Nationwide Search for Model Barangays for Eco-Waste Management System

The Search, launched on October 2003, is a follow-through activity of the National Conference on Ecological Solid Waste Management held at the Philippine International Convention Center in Manila on April 14 and 15, 2003. The government with a number of civil society groups spearheaded both activities, with the DENR as Chair to the NSWMC, as the principal organizer along with the DILG.

The Search was geared towards compliance with the provisions of Republic Act 9003, where it specifically aims to achieve the following objectives:

1. Assist barangays to comply with RA 9003;
2. Assist the communities and monitor the progress of segregation scheme initiatives and installation of ecology centers for composting and MRFs for recycling at the barangays;
3. Recognize, reward, support and help ensure sustainability of Barangay ESWM program; and
4. Generate data for benchmarking RA 9003 compliance.

The barangays were classified according to the following clusters of cities/municipalities where they belong: Highly Urbanized Cities (HUCs), Independent Component Cities (ICCs), Component Cities, 1st to 3rd class municipalities and 4th to 6th class municipalities. The Search was not a contest, but it utilized a grading system reflecting individual barangay's achievements according to their ability and creativity to comply with RA 9003.

The search was participated in by about 500 barangays of which 181 barangays qualified for the nationwide final evaluation.

3.4.5 Research and Development

In the course of the implementation of RA 9003, there is a need to promote national research and development programs for improved solid waste management and resource conservation techniques, more effective institutional arrangements and indigenous and improved methods of waste reduction, collection, separation and recovery.

In response to these, there were several government agencies and private sector initiated researches that seek to ascertain its applicability and appropriateness to the local setting in the country, in line with the provisions of this Act.

Composting of Solid Wastes

In anticipation of the massive application of the technologies for composting solid wastes as embodied in the solid waste treatment option of RA 9003, the ITDI has undertaken the following research and development projects to meet the requirements of said Act in relation to the composting technologies that can possibly be adopted:

I. Accelerated Composting Technology (Bioreactor)

This technology involves the aerobic degradation of solid wastes, mostly organic fractions, inside the fabricated reactor to a level suitable for organic fertilizer. The major advantages of Aerobic Composting with the use of Bioreactor are: no leachate discharge; comparatively insignificant odor emission; fast rate composting process; no worm proliferation; less electrical consumption; and low requirement for inoculants.

Happy Soil Composter

II. Anaerobic Composting (Biogas Technology)

Anaerobic composting is another research and development priority of ITDI-DOST. The anaerobic conversion of organic wastes from agriculture, livestock, domestic and other human activities into energy and bio-fertilizer is a process that does not utilize oxygen. Biogas is a mixture of gases produced by methanogenic bacteria during the decomposition of biodegradable materials under anaerobic conditions. It is composed of 50-70% methane, 30-40% carbon dioxide and low amounts of other gases like hydrogen, nitrogen, hydrogen sulfide, and water vapor.

The biogas generated could be used for cooking, heating, lighting, running generators and for refrigeration system. The liquid effluent could be applied as bio-fertilizer for vegetable cultivation and aqua-culture.

III. Vermicomposting

Vermicomposting is a low cost, low technology, but scientifically-based technology with assistance from the DOST-Philippine Council for Agriculture and Marine Resources Development (DOST-PCAMRD) and the Department of Agrarian Reform (DAR). It is the production of compost with the use of worms. In a single process, two products are created: vermicast, a pure worm excreta, and worm biomass. Vermicompost is vermicast with other components from the worm bed such as compost, microbes, earthworms, etc.

The compost worms are African night crawlers where they eat solid wastes and live in the upper three to four inches of soil. They are flat bellied, reddish in color and grow to about a gram only and can be cultured in captivity.

Vermicomposting products are feeds (fresh worms, vermin meal) and vermitea (a water extract of compost that is brewed, or in other words, the organisms extracted from the compost, the bacteria, fungi, protozoa and nematodes were given a chance to increase in number and activity using soluble food resources and nutrients present in the water, fertilizer and soil amendment.

Research for Non-biodegradable Materials

I. Exploratory Study on Laminates

The ITDI-DOST has entered into a collaborative research and development project with Nestle Philippines, Inc. on the processing/recycling of scrap of plastic aluminum laminates generated at the Nestle's manufacturing plants. The study is aimed at exploring the use for laminates as lightweight construction materials such as panel boards for ceiling or wall furniture components and injection molded/decorative products.

II. Packaging Film from Carrageenan

This study was initiated to develop a new technology that would eventually replace the use of plastics. A water-soluble, edible film was produced from carrageenan for packaging of spices used in instant noodles, casing for sausages and ham, including wrapper for candies, frozen meat, vegetables and fruits.

The use of carrageenan film as packaging for spices in instant noodles gives ease to the consumers, since this can be mixed with the noodles prior to adding boiling water. It minimizes the volume of kitchen garbage that would be generated from the extra packaging.

The development of packaging film from carrageenan is an innovative technology that will help boost the industry and may eventually solve the problem of pollution. It may also reduce the importation of polyethylene and other polymers that cost the country millions of dollars in dollar reserves. The production of packaging film from carrageenan is also considered a major breakthrough in the carrageenan industry.

III. Environmental Plastics, Inc. (EPI)

The Industry has conducted a research on biodegradable plastics for the past 30 years, however, the concept remained to be not commercially feasible until such time that EPI has developed Total Degradable Plastic Additives (TDPA).

What EPI did was to develop a practical and viable technology, which allows available commodity polymers to biodegrade. That means TDPA can be added to the most common "commodity plastics", polyethylene, polypropylene and polystyrene enabling the manufacture of 100% biodegradable plastics using conventional machineries and conditions.

TDPA when added to common plastics will cause the plastics to photothermally and chemically degrade as littering landfills and aerobic compost facilities. Those plastics will progressively degrade to lower molecular weights, discolor, become brittle, fragment until they are digested by micro-organisms back to the basic elements of carbon dioxide, water and biomass which are the natural products of the bio-cycle. There are no harmful residues.

Through the use of the proper amounts of TDPA, the lifespan of plastic products can now be controlled. Instead of littering on landfills and clogging waterways for decades, said products can start to degrade or break down in as short as 55 days.

A large proportion of the potentially biodegradable wastes deposited in landfills and discarded papers are enclosed in plastics, usually polyethylene (PE) bags: trash bags, carrier bags and the like. The only two elements in PE are carbon and hydrogen, so this means that PE that has undergone oxidative degradation is biodegradable.

IV. Rubber

Since the program currently implemented by the local tire manufacturers covers only their dealers, tires discarded by big bus companies and those vulcanizing shops, mostly trucks, buses and jeepneys tires remain stockpiled in these entities. Retreaders have accumulated different sizes of unusable tires. A proposal was expressed in several cities and municipalities within and outside Metro Manila to pass a resolution imposing a fine of Php 50.00 per tire on person/ business entity found stockpiling unusable tire without plan of recycling the items. Currently, the volume of tires disposed through the system is about 10%.

At present, tires are being used as alternative fuel in cement kilns of some Union Cement Plants.

V. Tin Cans

For more than 50 years, the steel industry has an annual recycling rate of over 50%. The production of new steel requires at least 25% "old high grade steel" or "scrap steel". Because steel can be used to package consumer products made from high grade steel, they are an excellent source of scrap for new steel production. More than 5.90% of all steel cans were recovered for recycling in 1995 in the United States.

Like most food cans, paint cans, including aerosol spray paint cans are made of high grade steel, and should be part of every community recycling program. Cans with painted labels, that have even a slight residue of dried paint are acceptable for recycling, because melting steel requires temperature of about 3,000 degrees Fahrenheit. This heat

consumes residual materials, such as small amounts of dried leftovers paint in can and labels, during the steel making process. Both private and government sectors work together to promote the recyclability of used tin cans and tin can scraps.

The Tin Can Manufacturers Association of the Philippines Incorporated (TCMAPI) is developing a process in which the used tin cans from the dumpsites are mixed with plate scraps, then crushed prior to sending abroad or to local smelters.

VI. Tetrapak

Tetra Pak began in the early 1950's as one of the first packaging companies for liquid milk. Since then, it has become one of the world's largest suppliers of packaging systems for milk, fruit juices, and drinks, and many other products.

Tetra Pak Carton is a preferred choice for packaging because of the following:

· Liquid foods in aseptic cartons require no refrigeration and saves energy;
· The shape of the cartons takes up less space during distribution: lower emissions and savings in energy;
· Energy cartons are transported in flattened form, requiring fewer trucks:
· Cartons are 75% paper, a natural and renewable resource;
· Tetra Pak Cartons are recycled into panel boards or paper

Features of "Composite Boards" recycled from Tetra Pak Cartons:

· Made from 100% recycled Tetra Pak cartons
· Excellent water resistance
· Can be formed into curves and other shapes
· Has a unique surface texture
· Excellent insulation and sound proofing qualities
· 100% termite and borer resistant and powder-free
· Can be sawn, molded, cut, glued, screwed or nailed like other boards.

VII. Charcoal Briquettes

In 1999, the DENR thru its Ecosystems Research and Development Bureau together with the Forest Products Research and Development Institute under the DOST "popularized" the utilization of forest wastes (and later urban abandoned cellulosic biomass) as fuel in the form of charcoal briquettes, especially in Community-Based Forest Management areas in the Philippines to reduce cutting of trees for fuelwood, charcoal making and to increase the income of concerned beneficiaries.

These high quality charcoal briquettes can possibly replace or substitute coal as fuel in cement and coal-fired power plants. Charcoal briquettes could be produced from loose biomass by using suitable binders, and have high heating value and negligible sulfur content. Materials include agroforestry wastes (twigs, prunings from coffee and other tree crops, plantation thinning, grasses, etc.), municipal solid cellulosic wastes, charcoal fines, sawdusts, rice hull and shells of coconut, pili nuts, peanuts and others. These materials are then sorted, chopped, dried, and then these will be ground and shredded and mixed with binders to form briquettes. Finally, the briquettes are then dried, packaged and marketed.

Charcoal Briquetting Process

3.4.6 International Development Community Assistance Programs and Projects

Pilot Study for the Formulation of SWM Plan for selected LGUs is funded by the JIBC. It has assisted in the organization and operationalization of the City/Municipal Solid Waste Management Boards in the three cities: Muñoz City, Nueva Ecija; Legaspi City, Albay; and Butuan City, Agusan del Norte. Likewise, it has assisted in the development of a waste recycling program to serve as model for other LGUs, including IEC activities; and likewise assisted in the formulation of the Ecological Solid Waste Management Plan. The project was completed in 2003.

Philippine Ecological Governance Project is funded by the USAID. The project aimed to improve LGU capabilities to carry out good eco-governance; improve DENR and other national agencies' support to LGU initiatives on eco-governance; and, likewise improve DENR and LGU capabilities to derive institutional support from regional/ local service providers for eco-governance undertakings.

Forty-six local government units nationwide were given technical assistance in the formation/re-constitution of the Solid Waste Management Board; formulation of the ten-year solid waste management plans, which include among others, waste analysis and characterization survey and options analysis.

Through the project, several IEC materials were conceptualized and distributed to the various stakeholders of waste management.

Public and Private Sectors' Convergence for Solid Waste Co-Governance in Urban Poor Communities [PPPUE-SWM] Project. The UNDP-assisted project aimed to promote and enhance the policy and operational environment necessary for the viable and sustainable operation of the first-ever cluster-type MRF in the country with public and private sector partnership.

The project sites were : Cluster-barangays of Palingon, Lingga and Sampiruhan in Calamba City, Laguna.

The first phase of the project commenced on August 2002 and ended on March 2004, with the following accomplishments:

1. Construction of the first-ever fully functional cluster-barangay MRF with public-private sector partnership in the country.
2. Establishment of a public-private partnership model on solid waste management.
3. Development of Guidelines on clustering to Replicate the Project Gain.

The second phase of the Project started on April 2004 and ended in September 2004, with the following accomplishments:

1. Production of Photo Exhibits of the Project Highlights and of the Ecological Solid Waste Management Act of 2000;
2. Reproduction of the feasibility study and 4,950 leaflets of the guide on setting-up a cluster-barangay MRF; and
3. The conduct of three barangay conferences to facilitate the replication of the PPPUE-SWM Project experience in strategic locations in the country.

Training of 12 women in PaLiSam on livelihood from SWM to sustain stakeholders' participation. The Project also facilitated the compliance of the three barangays in setting up their SWM Committee and the city government of Calamba in creating its SWM Board. A proforma ordinance on SWM in accordance with the provisions prescribed by the Implementing Rules and Regulations of the Act was also formulated. The project facilitated the Multi-Sectoral Consultation on the NSWM Framework in the three major regions of the country.

Metro Manila Solid Waste Management Project is funded by the ADB. It aimed at improving Metro Manila Solid and Medical Waste Management for increased environmental quality and public health and safety.

The project provided planning, design, training and other assistance to develop and strengthen an integrated SWM system in selected LGUs in Metro Manila. The project has terminated in 2003.

Basic Study on the Selection of High Priority Cities/ Municipalities for the Establishment of a Suitable Solid Waste Management System for the National Solid Waste Management Commission is funded by JICA. On the pre-selected 32 LGUs, the study had investigated and evaluated the existing SWM system of the model cities/municipalities; investigated and evaluated the existing socio-economic environment of the model cities/municipalities. It also developed an evaluation criteria that will be used to prioritize the model cities/municipalities; and ranked the model cities/ municipalities based on the establishment of evaluation criteria. The project has terminated last 2004.

3.4.7 Public Awareness and Education on Solid Waste Management

The NSWMC through the DENR, NGOs, the academe and other concerned stakeholders held seminars and symposia in various institutions and distributed IEC materials like print advertisements, flyers, brochures and posters to different offices, schools, communities and the industry.

The DENR, being the chair of the Commission provides technical capability-building assistance to LGUs to develop and implement an effective solid waste management program, aside from holding seminars/symposia and undertaking various IEC campaigns.

In 1997, the DENR funded a regional training program of the Department of Education (DepEd) on zero waste management.

The Environmental Education and Information Division (EEID) of the EMB of the DENR, with its regional counterparts, and in cooperation with the NSWMC Secretariat, spearheads efforts in the promotion of awareness on significant environmental concerns, one of which is the ecological solid waste management. Long before the signing into law of the ESWM Act, the EEID has been undertaking activities to create awareness, understanding and concern on this issue.

Up to the present, the NSWMC Secretariat's office, the EEID, in collaboration with the other concerned partners still continue development and production of print and audio-visual materials on ESWM. Among the audio-visual materials produced were radio and television plugs, and documentaries. Printed materials, meanwhile came in the form of primers, fact sheets, brochures, posters and instructional calendars.

Special events, aside from supplementing the afore-cited activities were also undertaken to highlight international and local environmental events and to gauge the citizens'

Bawas Balot, Bawas Basura sa Palengke Campaign

understanding and perception of the issue on solid waste management. These included competitions such as on- the-spot art contests, cleanest barangay and recyclables collection events. Actual clean-up activities were also done in wet markets, major thoroughfares and waterways. To create impact, these events were done simultaneously in cooperation with the Environmental Education and Information Sections of the EMB Regional Offices.

Also participated in and initiated were exhibitions relating to solid waste management that were held in commercial centers, exhibition and trade centers, universities and hotels, among others.

Integration of solid waste management concepts in the school curriculum has also been coordinated by the EEID with the Department of Education and the Commission on Higher Education, alongside with institutions such as the Miriam College -Environmental Studies Institute. Lectures and seminars for educators in the elementary, secondary and tertiary levels had been conducted to create awareness on the ESWM Act and other evolving issues.

3.5 Challenges

Several initiatives have already been implemented by various organizations. There are those who have started out with the fundamentals of an integrated waste management system through sheer determination and have reaped a certain degree of success. And there are also those who are still faced with challenges and/or problems that need to be addressed in the long run.

3.5.1 Budgets and Expenditures

Direct comparison on the budgetary allocation as against expenditures of LGUs is rather difficult to determine, considering the various offices handling the function of solid waste management. Therefore, it would really be difficult to fully account their actual expenditures.

The SWM sector for municipal wastes is currently characterized by public sector financing and service provision with limited private involvement focusing on collection and transfer of solid wastes. Investment decisions are predominantly technology and supply driven.

3.5.2 SWM Expenditures

For 2001, Metro Manila LGUs' expenses for SWM varied from 5 percent to 24 percent or an average of 13 percent of their total expenditures. A bigger percentage however, of the SWM expenses were to compensate payment for hauling contractors.

3.5.3 Sources of Funds and Cost Recovery

Local government units acquire funds for SWM through the following:

- General budgetary appropriations that include locally-generated taxes, fees and charges. Internal Revenue Allotment (IRA) and other fund sources to which the LGUs are entitled, to;

- External sources which include Countryside Development Fund (CDF); credit finance instruments; local and foreign-funded loans and grants, and private sector participation;

- Cost recovery of SWM-related activities such as collection of garbage fees and imposition of fines for violations committed;

The LGUs are mandated by the Local Government Code (LGC) to collect fees for services rendered to its respective constituents. One of these is the collection of waste management fees from the business establishments, where the charges are incorporated in the annual application for business permit. The rates vary per type and capacity of the business establishment, which are embodied in the LGUs Local Revenue Code or the Local Tax Ordinance. For instance, food chains, such as Jollibee and McDonalds pay P17.00 per day for garbage collection services when the City collects at least a truckload of solid wastes every day from this type of business establishments.

Local government units are allowed by the LGC to adjust its fees every five years. It should be noted that most of these LGUs have not updated their garbage fees as allowed by law. Based from available information at the NCR and several LGUs in the other regions, at least several LGUs have their Tax Ordinances passed way back 1992 and another two in 1993.

Garbage fees collected by LGUs from business and commercial establishments go to their respective general funds. For 2001, garbage fees vary from a minimal 0.4 percent to 3.2 percent of the total income in Metro Manila.

Some LGUs in Metro Manila and even in other parts of the country are not recovering the full cost of garbage collection service. Since it is only the business sector that is paying

garbage fees, the rate of recovery of SWM expenses is very low. The bigger part of the expenses is thus subsidized by the LGUs and indicated in their respective allocated budget or General Appropriation for the year.

3.5.4 Willingness to Pay

Collection of waste management fees from the residential sector appears to be situational. While it is being done in some isolated barangays and in some cities and municipalities, LGU survey reveals that the willingness of households to pay for SWM is quite low. Political interventions are sometimes hindering LGUs in imposing users fees. Many LGU constituents have the perception that the LGUs are supposed to extend all services, hence introducing fees and charges are next to impossible.

For first class subdivisions and villages, garbage fees are incorporated in the associations' annual dues, particularly in areas where the associations take charge of the garbage collection, whereas in some middle class residential areas, people are actually paying small-time haulers (using carts) to collect their garbage. These areas are oftentimes inaccessible to the LGUs' garbage trucks due to narrow roads or being in the coastal areas. The average garbage fee is about Php 40.00 to Php 50.00 per household per month.

According to a study conducted for Metro Manila, 39% of the respondents revealed that affordability to pay the garbage fees is the main reason why most of them are not willing to pay.

3.5.5 Health

Solid wastes can come into direct or indirect contact with human beings at several stages in the waste cycle. The groups at risks are therefore broad and numerous and include: the population of unserved areas, especially pre-school children; garbage collectors; workers in facilities that produce infectious and toxic materials; people living close to waste disposal facilities, and population whose water supplies have been polluted due to waste dumping or leakage from landfill sites. Additionally, industrial dumping of hazardous wastes that have become mixed together with household solid wastes can expose populations to chemical and radioactive hazards.

The health risks of uncollected solid wastes are obviously most severe for those actually living in unserved areas. Notably, pre-school children are at risk of injury, intoxication or infection, since they are likely to be exposed to uncollected wastes in streets or at dumpsites. Uncollected domestic wastes in particular, pose serious health risks, since they ferment, creating conditions favorable to the survival and growth of microbial pathogens, and especially if they become intermixed with human excreta due to poor sanitation. Organic wastes also provide feeding stock and a natural environment for insects, rodents and other animals which are potential carriers of enteric pathogens.

But even if solid wastes are collected, the same may cause health risks to a large number of people if disposed improperly. Groundwater used for drinking purposes for instance, can become chemically or microbiologically polluted if wastes are disposed of in or near water sources. Direct dumping of untreated solid wastes in rivers, lakes and seas can also result in the accumulation of toxic substances in the food chain due to intake by plants and animals. Infectious diseases spread by poorly managed solid wastes.

Waste treatment and disposal sites themselves have the potential to create health hazards for neighboring populations. Open dumpsites are a source of fire, dust, smoke, noise and disease vectors such as insects, rodents, and stray animals. Ideally, waste treatment and disposal sites should be controlled and located at an adequate distance from human settlements, and the boundaries of landfill sites confined and sealed so that drinking water sources are protected from infiltration of leachate and/or runoffs.

Recycling, too, although in principle is a good approach to solid waste management, carries health risks if proper precautions are not taken. Scavengers and their families are also at risk because they often build their homes close to, if not on dumpsites. As such, they are being exposed to a wide variety of waste health hazards. They are also frequently subjected to social and economic abuses from waste recycling traders. Health surveys show that their health status is very poor and their life expectancy is far below the national average.

3.5.6 Administration and Management

Based on the Solid Waste Management Profile Survey conducted by the NSWMC-Secretariat, politics plays a major role in the implementation of solid waste management. Political will is essential to the overall success of the solid waste management program of the constituent barangays.

Apparently, the negative attitude of some LGUs, towards the implementation of RA 9003, including their level of commitment and varying set of priorities pose to be a big problem in the operationalization of a comprehensive solid waste management program. Likewise, the seeming lack of political will on the part of some LGUs to create an effective solid waste management board or committee, and to prepare and/or issue ordinances and resolutions to support the same law serve as hindering factors in the full implementation of RA 9003.

The existence of an efficient committee to oversee the implementation of a solid waste management system is essential to the success of a solid waste management program.

In some areas, proper SWM is not implemented simply because it is not a priority of some local officials. On the

other, not all LGUs have complied with the creation of a solid waste management board to formulate the SWM Plan and ensure the implementation of an effective ecological solid waste management system. Likewise, not all barangays have created a functional Solid Waste Management Committee in accordance with the law. This is despite the Memorandum by the DILG and the extensive IEC campaigns and programs being undertaken by the DENR and participating environmental organizations to expedite the creation of these bodies. Hence, there should be constant monitoring of the boards and committees formed to ensure sustainability of the implemented plans and programs on waste management. Similarly, a point person on the part of the LGUs should also be appointed to monitor the program.

To answer this challenge, adequate and proper incentives should be provided to enable the implementers, especially the LGUs and national government agencies concerned, including the private sector to aggressively implement and enforce the law. While incentives will be provided for the implementers, legal actions should also be taken against those who would be violating the law. An appropriate civil, criminal and/or administrative action should be filed in the proper courts/bodies against those who would be violating and/or likewise fail to comply with the provisions of the law.

3.5.7 Economic and Financial

Further, even as the national government subsidizes some expenditures of SWM, only a few local government units collect fees for garbage disposed by households. As such, the limited financial revenue and fund sources of LGUs to be utilized for solid waste management have hindered the provision of adequate services for waste management. Expenditures have been limited to household collection, transportation to disposal facilities and minimal operational expenditures to some disposal facilities. The national government on the other hand, does not provide any cost-sharing grants to LGUs to address issues on solid waste management.

It is therefore important for the government to increase the budget for solid waste management and to supplement that funding by encouraging the involvement of the private sector through the establishment of a functional regulatory system, ensuing financial transparency in the sector and introducing user's fees.

3.5.8 Technical

As mandated by the Act, each local government unit has to formulate a ten-year plan. However, based on the communications lodged with the Office of the Secretariat of the NSWMC by several LGUs, it was impressed that the formulation of a ten-year plan on solid waste management is quite a complicated task for some LGUs. Therefore, the capacity of the LGUs to formulate and implement these plans should be reinforced by the national government in coordination with other concerned agencies.

3.6 Recommendations

The proposed rationalization plan of the DENR should address the lack of personnel and funding to operationalize the Regional Ecology Centers. The NSMWC, DENR and the LGUs should find ways on how to effectively implement and enforce the provisions of RA 9003. The enforcement powers of the DENR should be clearly defined within the ambit of the law.

The role of the LGUs in solid waste management should be made known to the public, that is, "the LGUs shall be primarily responsible for the implementation and enforcement of the provisions of this Act within their respective jurisdictions" (Section 11 of RA 9003). Well informed citizens would be the DENR's ally in pressuring the LGUs to implement its mandate.

Baseline data (e.g. per social class, locality) on solid waste generation rate, composition/characteristics and related information should be established and published with the consent of various stakeholders. Data to be generated being the first and foremost component of a solid waste management system, shall be used as basis for the formulation of plans and programs and likewise should be incorporated in other components of the management system. The collection and transport components in particular should likewise be given equal importance as with other components (e.g. waste processing, disposal).

Toxic Chemicals and Hazardous Wastes

4. Toxic Chemicals and Hazardous Wastes

4.1 Toxic Chemicals and Hazardous Waste Management

Toxic chemicals pose a significant risk to human health and safety. Moreover, they can also be environmental hazards once they are not properly managed. For these reasons, almost every nation in the world is regulating the manufacture, distribution, usage, transport and storage of various types of chemicals.

Chemical inputs constitute much of our daily needs and activities as they are found in the food we eat, liquid to drink and products we use. Therefore, as the world progresses, the need to manage these toxic chemicals becomes more crucial.

A number of national and international collaborative efforts to improve chemical management are either in place or on-going. Existing chemicals are defined differently under each country's chemical control laws. In the United States, existing chemicals are defined as those chemicals listed in the Inventory of Toxic Substances Control Act (TSCA). Current European Union legislation defines existing chemicals as those listed in the European Inventory of Existing Commercial Chemical Substances (EINECCS).

In the Philippines, however, Republic Act 6969 (RA 6969), otherwise known as the "Toxic Substances and Hazardous and Nuclear Wastes Control Act" provides for the legal framework for the country's program to regulate and manage industrial chemicals in use throughout the country. Under RA 6969, part of the responsibilities of the DENR through the EMB is to compile and maintain an inventory of all chemicals and chemical substances that are being used, sold, distributed, imported, processed and manufactured in the country. This national inventory is called the Philippine Inventory of Chemicals and Chemical Substances (PICCS) which is set for updating every year. The first PICCS developed by the DENR-EMB was released in 2000. These chemical substances in the inventory were nominated by the industries from 1993-1995. The most recent PICCS with 46,000 chemicals was released in 2009. Each chemical name is assigned a uniquely identifying number called the Chemical Abstract Registry Number (CAS RN). In this CAS Registry Index, names are assigned to chemicals in accordance with the International Union of Pure and Applied Chemistry (IUPAC) nomenclature.

Essentially, as a national inventory, PICCS serves to provide the government, the industry and the general public, the names of all chemicals and chemical substances that are currently imported, used and manufactured in industrial processes throughout the country. It also serves as a guide for manufacturers, importers, distributors, and users of chemicals in the conduct of their business on the following points:

a) Manufacturers, importers, distributors, and users of chemicals and chemical substances which are already included in the PICCS no longer need to secure clearance from the DENR, provided that their chemicals or chemical substances are not listed in the Priority Chemicals List or PCL, and are not subject to Chemical Control Order or CCO.

b) Chemicals and chemical substances not included in the PICCS cannot be manufactured, imported, distributed or used unless they have undergone the Pre-Manufacture and Pre-Importation Notification (PMPIN) process.

Through inventory management and reporting (Annual Report and Self-Monitoring Report) requirements, the EMB can effectively track the flow of manufacturing and distribution of chemicals. This management mechanism can provide the necessary information for quick and effective response if any accident happens. Moreover, the tracking of different toxic chemical substances creates accountability for those who manufacture, transport, use and dispose toxic chemical substances.

In light of the country's growing industrialization, however, the possibility of an increased volume and number of chemical substances being manufactured and imported into the country is not remote. Likewise, the need to regulate and/or restrict the use, transport and/or shipment, and distribution of these chemicals should be taken into account. It is in this context that the following regulations and/or mechanisms were put in place:

Pre-Manufacture Pre-Importation Notification (PMPIN)

New chemical substances not listed on the Philippine Inventory of Chemicals and Chemical Substances (PICCS) are being registered to the PMPIN. The PMPIN seeks to be a notification scheme of new chemical substances before they are imported to the country. The PMPIN also ensures that new chemicals that would pose an unreasonable risk to health or environment either be denied to be imported into/manufactured in the country or be placed under control and restrictions to limit potential releases.

The Pre-Manufacture and Pre-Importation Notification (PMPIN) was instituted to provide adequate control mechanisms for new chemical substances to be imported, distributed and used in the country. The PMPIN also ensures that new chemicals that would pose an unreasonable risk to health or environment either be denied to be imported into/manufactured in the country or be placed under control and restrictions to limit potential releases. As such, new chemical substances not listed on the PICCS are required to be notified through the PMPIN process.

Small Quantity Importation (SQI)

Small Quantity Importation (SQI) is the amount of "new chemical substances" as defined in RA 6969 which shall not exceed 1000kg/year as pure chemical substances or component in percentage of a product, mixture or compound. An SQI clearance is secured from the concerned EMB Regional Offices exempting the proponents/applicants to secure or comply with the PMPIN process.

Priority Chemical List (PCL)

The Philippine PCL is a list of existing and new chemicals that DENR has determined to potentially pose unreasonable risks to public health and the environment. The primary criteria for the selection of PCL are persistence, bioaccumulation potential and toxicity and hazards potential. Meanwhile, secondary criteria are exposure potential and the quantity of chemical manufactured and used. There are currently 48 chemicals included in the PCL under DAO 2005-27. These chemicals are required to be registered and issued with PCL Compliance Certificate for importers, distributors, users and manufacturers.

Regulated Chemicals under Chemical Control Order (CCO)

A Chemical Control Order (CCO) is a DENR Administrative Order that seeks to prohibit, limit or regulate the importation, manufacture, distribution, use of a chemical and regulates the treatment, storage and disposal of its wastes.

The regulated chemicals under CCO are those chemical substances that were determined to pose unreasonable risks to public health and environment. The following chemicals are classified under CCOs that require the concerned industry and related sectors to secure CCO Registration Certificates and Importation Clearances.

Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls are widely used as fire retardant and insulator in the manufacture of transformers and capacitors which are very common in the operation of electric companies. PCBs are used in transformers and capacitors (see **Figure 4-1**) because of their ability to withstand exceptionally high temperatures. The United States Environmental Protection Agency banned their use

Figure 4-1. Transformers and capacitors as the major sources of PCBs

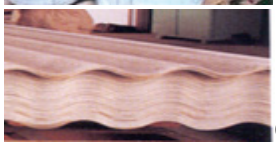
due to their classification as a human carcinogen, persistence in the environment, bioaccumulation and bioconcentration effects.

Asbestos

Asbestos is a naturally-occurring fibrous form of varieties of mineral silicates belonging to the rock-forming minerals and has been used in a wide variety of products and uses including friction materials, construction materials, mechanical packing and gaskets (see **Figure 4-2**).

a. break lining

b. construction materials



c. roofing

Figure 4-2. Asbestos-containing Materials and Products

Asbestos, however, cannot be used in toys, pipes and boiler laggings, untreated textiles, flooring felts and covering and corrugated commercial and specialty papers.

Exposure to airborne friable asbestos may result in a potential health risk because persons breathing the air may breathe in asbestos fibers. Continued exposure can increase the amount of fibers that remain in the lungs. Fibers embedded in lung tissues over time may cause serious lung diseases including: asbestosis, lung cancer, or mesothelioma. Smoking increases the risk of developing illness from asbestos exposure.

Cyanide and Cyanide Compounds

Cyanide is extremely toxic to humans. Chronic (long-term) inhalation exposure of humans to cyanide results to adverse effects primarily in the central nervous system. Other effects in humans include cardiovascular and respiratory problems, an enlarged thyroid gland, and irritation to the eyes and skin. Ingestion of cyanide compounds can be fatal.

Cyanides are commonly used in the electroplating industry, mining and metallurgical industry, steel manufacturing, plastic production and in jewelry-making industry. Cyanide is strictly prohibited to be used in the fishing sector. Likewise, cyanide- bearing waste is not to be discharged into the environment.

Mercury and Mercury Compounds

Mercury is the only common metal existing as liquid at ordinary temperatures. This metal has a silver-white mirror like appearance. Mercury is commonly used in mining and metallurgical industry, electrical apparatus (e.g. batteries, lighting) pharmaceuticals, paint manufacturing, pulp paper manufacturing, dental amalgam and pesticides (see **Figure 4-3**).

Exposure to mercury could lead to harmful effects on humans (severity depends on the level of exposure). High exposure of mercury through inhalation can cause severe lung, gastrointestinal and nervous system damages.

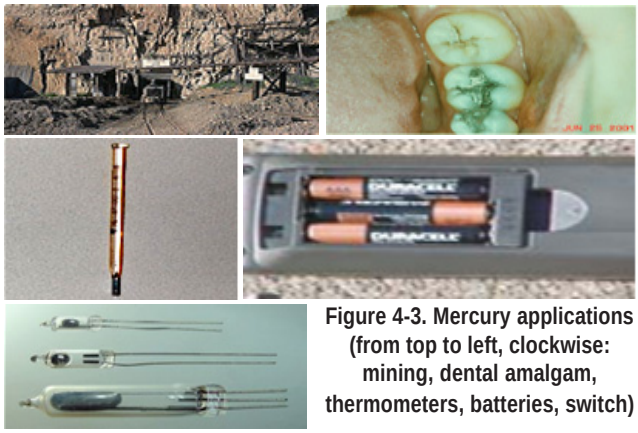


Figure 4-3. Mercury applications (from top to left, clockwise: mining, dental amalgam, thermometers, batteries, switch)

Ozone-DepletingSubstances

Ozone-Depleting Substances (ODS) are substances which when released in the atmosphere, destroy the ozone molecules and eventually the ozone layer. Included as ODS are: Chlorofluorocarbons, Halons, Methylenechloride and Trichloroethane. ODS uses are shown in **Figure 4-4**. The degradation of the ozone layer is a major cause of global warming which brings about different changes in the environment.

Figure 4-4. Products which may contain ODS: Fire Extinguishers may contain Halons, and cooling equipment such as air conditioners and refrigerators may contain CFCs.

Inventory of Regulated Chemicals

The registration of various firms, pursuant to DAO 29, series of 1990; DAO 39, series of 1997; DAO 38, series of 1995; and DAO 01, series of 2004 is continuously implemented.

The initial implementation of the various aforementioned administrative orders gained more registration, especially for priority industries. Presently, surveys are being conducted to evaluate firms whether or not users of toxic chemicals regulated under CCO or generators of hazardous wastes are compliant. **Table 4-1** shows the inventory of regulated chemicals and number of clearances issued and the three-year inventory (2005-2007) of chemicals under Chemical Control Orders for Cyanide, Asbestos, Mercury, ODS, and PCBs-free. There was a decreasing trend in the number of registration certificates issued.

Cyanide has the highest total volume registered (i.e. sum of all regions from years (2005-2007) with about 79,445.38 MT, followed by Asbestos with 4,443.71 MT then Mercury with 15.8900453 MT. ODS with 38.816 MT and finally PCB with data showing almost nil inventory of registered PCBs from 2005-2007. In 2007, non-PCB transformers were registered instead with the EMB Regional Offices.

Table 4-1. Inventory of Regulated Chemicals Under CCO and Number of Clearances Issued

REGION	Regulated Chemicals under Chemical Control Order (CCO) Registration Certificate Issued																							
	CYANIDE						ASBESTOS						MERCURY						ODS					
	No.			Volume			No.			Volume			No.			Volume			No.			Volume		
	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007
NCR	5	5	9	-	-	-	4	-	3	-	-	0.02 MT; 93.7 cu.m.	6	4	4	-	-	-	38	17	2	38 MT	-	-
CAR	-	2	-	-	581.3 MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	4	1	-	-	17 MT	-	3	4	3	-	855 MT	720 MT	3	-	-	-	-	-	-	-	-	-	-	-
4a	17	29	12	-	745.8 MT	149.4 MT	2	10	3	-	-	-	6	10	2	-	0.006303 MT	1.2 MT	-	-	-	-	-	-
4b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	4	52	-	365.4 MT	149.4 MT	2	10	3	-	-	-	6	10	2	-	0.016303 MT	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	2	-	-	48.1 MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	15	7	24	2364.4 MT	74305.5 MT;770 bottles; 130L	1	-	2	80 MT	-	0.02 MT; 115 cu.ft.	-	1	2	-	0.0018 MT	0.000045 MT	-	-	-	-	-	-	-
8	-	2-	2-	-	-	1.2MT	4	1	2	378.2 MT	-	22 sheets	1	2	3	0.0042 MT	-	0.00297 MT	-	-	5	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	1	1	-	2.4 MT	2.4 MT	-	-	-	-	-	-	-	-	-	3	-	-	0.8 MT
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	2	-	-	6MT	-	-	-	-	-	-	-	-	2	-	-	0.2 MT	-	-	-	-	-	-
13	-	4	-	-	276MT	-	-	-	-	-	-	-	-	1	-	-	10 MT	-	-	-	-	-	-	-
Total	45	102	49				18	17	15				19	18	13				38	17	10			

Source:EMB-DENR

Table 4-2. Inventory of Import Clearances Issued on Regulated Chemicals under Chemical Control Orders

REGION	Regulated Chemicals under Chemical Control Order (CCO) Importation Clearance Issued																							
	CYANIDE						ASBESTOS						MERCURY						ODS					
	No.			Volume			No.			Volume			No.			Volume			No.			Volume		
	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007
NCR	8	4	13	1377.4 MT	982 MT	5211.8 MT	10	8	15	10	3005 MT	4565 MT	5	4	3	5 MT	6.9 MT	12.0 777 MT	129	95	-	129 MT	1986 MT	-
CAR	3	-	3	1087 MT	-	689.2 MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2	-	2	20.774 MT	-	19.3 MT	4	-	4	4	-	870 MT	-	-	-	-	-	-	-	-	-	-	-	-
4a	56	62	40	1194.52 MT	2601.79MT	1125.4 MT	2	-	-	2	-	-	-	1	1	-	500 M	.015 875 MT & 250 mL	-	-	-	-	-	-
4b	-	-	-	690MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2	-	1	80MT	-	670MT	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	2	-	3	-	-	120MT	-	1	1	-	40 MT	120 MT	-	1	-	-	80	-	-	-	-	-	-	-
7	-	26	43	-	164.3 MT	130,026.4 MT;160;35.5 L; 5680 bottles; 10can; 310.3 MT; 400L	-	1	-	-	80 MT	-	-	1	-	-	20	11	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	1	1	-	1	2360 MT	-	-	-	-	-	-	-	-	-	-	-	-	-
11	3	-	-	560MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	250 MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	76	93	105				17	12	20				5	7	5				129	95	0			

Source:EMB-DENR

Table 4-2 shows the number of importation clearances issued for Cyanide, Asbestos, Mercury and ODS. EMB NCR tops the number of importation clearances issued with 294 from 2005-2007. This was followed by EMB Region 4a with 162. These figures are due to the fact that these regions are the locations where most manufacturing firms and industrial parks are concentrated.

Cyanide has the highest total volume of importations from 2005-2007 with 17,273.55 MT. The bulk of these importations came from the National Capital Region. On the other hand, Asbestos, having the second highest volume of importations among the CCOs with 11,058 MT, exhibited an increasing trend in importation from 17 MT in 2005 to 5,486 MT in 2006 and 5,555 MT in 2007.

The NCR registered the highest for the CCO of Asbestos. The large increase in the volume of Asbestos issued with importation clearances from 2005 to 2007 was contributed mainly by NCR, Regions 3 and 6.

Table 4-3 shows the issuance statistics of PMPIN and Chemicals for Small Quantity. NCR has the highest registration on chemicals for small quantity importation with 596 permits issued from 2005-2007. The permits issued in NCR increased significantly from 59 in 2005 to 259 in 2007. This increase is brought about by the collaboration and strict implementation and enforcement of the Bureau of Customs (BOC) at the port of entry.

Table 4-3. Inventory of New Chemicals under PMPIN and SQI, and Number of Permits Issued

REGION	Permits Issued								
	PMPIN Compl. Certificate			SQI Clearance					
	No.			No.			Volume		
	2005	2006	2007	2005	2006	2007	2005	2006	2007
NCR	121	156	109	59	82	259	-	-	5219.86MT
CAR	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-	1	1	1	-	1MT	1MT
4a	-	-	-	13	23	22	-	-	<1 MT each
4b	6	-	-	-	8	-	-	-	-
5	1	-	-	-	-	-	-	8MT	-
6	-	-	-	-	-	-	-	-	-
7	1	-	-	93	170	107	-	91.6 MT	50.3 MT; 43.722.8; 2MT; 250L
8	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	1MT
13	-	-	-	-	-	-	-	-	-
Total	129	156	109	166	284	390			

Source: EMB-DENR

4.2 Policies, Programs and Projects

RA 6969 was enacted to address the increasing generation of hazardous wastes in the country. It has the main goal of ensuring that industrial economic growth is achieved in an environmentally sound manner.

In order to set forth however, regulations in terms of managing toxic chemicals and hazardous wastes, there were subsequent initiatives taken by the EMB.

In 1992, the Implementing Rules and Regulations of RA 6969, DENR Administrative Order No. 29 (DAO 92-29) was issued. This sets the guidelines, procedures and standards for the implementation of chemical management (Title II) and hazardous waste management (Title III) in the country.

DAO 92-29 was amended by virtue of DAO 36, Series of 2004, entitled "Revising DAO 92-29 to Further Strengthen the Implementation of RA 6969 and Prescribing the Use of Procedural Manual" on Hazardous Wastes Management. DAO 04-36 provides the list of different categories of hazardous wastes regulated under RA 6969. Further, it requires hazardous waste generators, treatment, storage and disposal (TSD) facilities and transporters to register with the EMB or obtain the necessary transport or treatment permits.

Hazardous waste generators are also required to submit a quarterly report. On the other hand, transporters are required to secure permit to transport prior to any transport activity and submit a manifest to EMB after each transport. TSD facilities are required to secure an Environmental Compliance Certificate (ECC) prior to any recycling, treatment, storage and disposal activity.

It should be noted that hazardous wastes can cause short-term acute hazards, such as toxicity by ingestion, inhalation or skin absorption, corrosivity or other skin or eye contact hazards or the risk of fire explosion. Likewise, they have long-term environmental hazards, including chronic toxicity upon repeated exposure, carcinogenicity (which may in some cases result from acute exposure, but with a long latent period), resistance to detoxification process such as biodegradation, the potential to pollute underground or surface waters, or aesthetically objectionable properties such as offensive odors. As such, hazardous wastes should be handled and managed with extra care.

As defined by law, hazardous wastes are substances that are without any safe, commercial, industrial, agricultural or economic usage and are being shipped, transported or brought from the country of origin for dumping or disposal into or in transit through any part of the territory of the Philippines, These are also by-products, side-products, process residues, spent reaction media, contaminated plant or equipment or other substances from manufacturing operations and as consumer discards of manufactured products which present unreasonable risk and/or injury to health and safety, to the people or to the environment. Generally, hazardous wastes exhibit one or more of the following characteristics, such as: ignitability, corrosivity, reactivity and toxicity.

Hazardous waste management which is governed by RA 6969 is a methodological approach to ensure that hazardous wastes are properly handled from the point of generation, to storage, treatment or recycling down to their final disposal.

Available data and information on hazardous waste management in the country are found in **Tables 4-4 and 4-5**. These had been obtained by the EMB Regional Offices which handle monitoring of hazardous waste generators and likewise issue Permits to Transport for the eventual disposal of said wastes.

Table 4.4. Toxic Substances and Hazardous Wastes, 2007

	Number	Regional Distribution															
		R-1	R-2	R-3	R-4A	R-4B	R-5	R-6	R-7	R-8	R-9	R-10	R-11	R-12	Caraga	CAR	NCR
Hazardous Waste Generators (HWG) registered			136	106		210			481	31	141		16	70	24	107	2,043
Transport Permits Issued			1	845					153	2			33	2			769
HWGs monitored			26	8		70			40	36	40		119	35	46	18	
Notice of Violations (NOVs) issued				5		9				1			15	4	1		
Registered HW Transporters			1	39		1			10	1			15	1			
Transporters monitored				23						2			11				
NOVs issued													4		1		
Registered TSD Facilities				16					4	1			5	1			
TSD Facilities monitored				12					4	4			11	1	1		
NOVs issued				9					1								

Source: EMB-DENR

Table 4-5. Inventory of Hazardous Wastes, 2007

	Regional Distribution										
	R-2	R-3	R-4B	R-7	R-8	R-9	R-11	R-12	Caraga	CAR	NCR
Wastes with cyanide	-	-		150 cu m, 662 kg, 2,583 li	18,131.68 MT, 164 pcs, 241 drums, 5,836 bags	922.04	21,521	1.1 gal	15.40024	12,561.2 MT; 80 cu m	4.329
Acid wastes	-	24.44		3,308 cu m, 901 kg, 467,925 li, 1,327 pcs, 12 tons		46.45	1.265		320.60647	800 li; 0.288 ton	824.501
Alkali wastes	-	27.81		62,596 cu m, 36,390 kg, 42,750 li		81.84	258.72		567.59173		330.662
Wastes with inorganic chemicals	-	5,373.04	3.92	19,406 kg, 57,080 li, 12,881 pcs, 41 tons		250 pcs	27.97	8,041 pcs	10.25962	10,580 pcs; 0.0190 ton	6,046.296
Reactive Chemical Wastes	-	16.26		4 cu m, 121,649 kg, 57,012 li, 107 pcs		1.19	769.79	755 drm	0.01505		6,123.328
Inks/dyes/ pigments/paint/latex/ adhesives/organic sludge	-	-							12.0717	1,411 kg; 1,000 li	320.701
Waste organic solvent	3,555	229.84		106,625 kg, 45,083 li, 475 pcs, 3 tons		0.99		101.3 gal		7.866 tons	405.311
Putrescible/ organic wastes	8,074	588.70		44,420 kg, 61,946 li, 820 pcs, 1 ton		0.04	23,316.63	4,472.5 gal	260.133	18,820 li	6,619.761
Oil	-	66.41	877.76	14 cu m, 55,922 kg, 100,176,259 li, 7,369 pcs, 1 ton	198 L	492.98	1,948.58	140,000 L	20.40279	168,744.4 li; 1,555 MT	2,670.414
Containers	-	19.17		1 cu m, 1,066 kg, 57,168 li, 11,712 pcs, 1 ton		54.32	696.42	9,950 pcs		1,054 kg	265.564
Immobilized wastes	-	17.70		290 kg, 1,000,000 li, 6,412 pcs, 794 tons						1.05 ton	61.256
Organic chemicals	693	-		14,863 kg, 6,412 li		0.01			0.1123		150.065
Miscellaneous wastes -pathogenic or infectious wastes -friable asbestos wastes -pharmaceuticals and drugs -pesticides -persistent organic pollutants -pesticides	-	2.12	1.06	39,553 kg, 794 li, 216 pcs		9.97	1,021.36	5,000 kg	86.83986 1.72581	0.206 ton	5,341.012

Source: EMB-DENR

DAO 94-28 entitled "Interim Guidelines for the Importation of Recyclable Materials Containing Hazardous Substances" sets the general policy consistent with the requirements and procedures of the Basel Convention on the Control and Transboundary Movements of Hazardous Wastes and Their Disposal. The Philippines is a Contracting Party to the Convention, thus, it adopts the decisions made by the Conference of Parties.

DAO 94-28 requires all importers of recyclable hazardous wastes to register with EMB. Importation Clearances for materials containing hazardous substances are issued by the EMB Central Office. These substances include used oil, scrap metals, scrap plastics, electronic assemblies and scraps for recovery, recycling, and reprocessing purposes.

In the absence of proper treatment or disposal facilities, for some extremely hazardous wastes, i.e. polyether polyol, polyisocyanate, and polychlorinated biphenyls (PCBs) are exported to Europe, Japan and Singapore. The EMB issues Export Clearance prior to any shipment of wastes following the requirements and procedures of the Basel Convention.

In furtherance, however, of implementing RA 6969 with efficacy, the DENR-EMB has issued several other Implementing Rules and Regulations under Title II (Chemical Management), among which are the following:

- DAO 1997-38: Chemical Control Order for Cyanide and Cyanide compounds
- DAO 1997-39: Chemical Control Orders for Mercury and Mercury compounds
- DAO 2000-02: Chemical Control Orders for Asbestos
- DAO 2004-01: Chemical Control Orders for PCBs
- DAO 2004-08: Revised Chemical Control Orders for ODS
- DAO 2005-05: Toxic Chemical Substances for Issuance of Chemical Control Order
- DMC 2005 -003: Prescribing Graduated Administrative Fines Pursuant to Republic Act No. 6969 and DAO 29, Series of 1992
- DAO 2005-27 on Revised Priority Chemical List
- DMC 2007-03: Delegation of Authority to EMB Regional Offices of Various Requirements of DAO 2004-01 which include issuance of "PCB Registration Certificates" and "Importation Clearance" for non-PCB Equipment
- DAO 2007-19 on Suspension and/or Deferment of the Deadline for the Storage of all Existing Decommissioned PCBs, PCB Equipment and PCBs Oil/Fluid
- DAO 2007-23: Prescribing Additional Requirements for the Issuance of the Priority Chemical List Compliance Certificate

At present, one of the EMB proposed projects includes the Integrated Persistent Organic Pollutants (IPOPs) Management Project under the WB-GEF grant funding mechanism. The IPOPs Management Project seeks to assist the Philippines meet its obligations under the Stockholm Convention in reducing and phasing out POPs from the environment in an integrated way. This Project has five components namely: 1) Strengthening The Regulating Framework and Capacity Building for POPs Management and Monitoring; 2) Reduction of Releases of Unintentionally Produced POPs; 3) Environmentally-sound Management of PCBs; 4) Identification, Prioritization and Pilot Remediation of POPs Contaminated Sites; and 5) Project Management.

With regard to policies, the EMB Chemical Management Section has lined up several policy formulation projects as part of the chemical safety programs and in improving and strengthening the management of toxic chemical substances. Among the policies for revision or formulation are: DAO for the CCO for Lead, Memorandum Circular for DAO 2007-23 (Guidelines for PCL), Code of Practice for Asbestos, Revised DAO for the CCO for Cyanide, National Inventory of Mercury, and the DAO for Rules and Regulations of Safety Data Sheets and labeling requirements under DAO 29, series of 1992.

On the other hand, initiatives on hazardous waste management include amending DAO 04-36 to update the classification of hazardous wastes and introduce the on-line permitting system.

The EMB acts as the coordinating office for the GEF/UNIDO/DENR Project entitled "Demonstration of the Viability and Removal of Barriers that Impede Adoption and Successful Implementation of Available Non-Combustion Technologies for Destroying POPs.". The four-year project aims to introduce and apply a non-combustion technology to destroy significant obsolete PCB wastes and will help remove barriers towards the further adoption and effective implementation of the selected technology.

Surveys and monitoring of industrial firms and its existing facilities are still being conducted as a continuing program for the implementation of the above policies. Concerns about the treatment and disposal of wastes are surfacing. Some of the generated wastes are still stored in the companies' storage facilities due to unavailability of local service provider in some regions. There is an apparent difficulty on handling hazardous wastes relative to transporting and movement from island to island. Aside from being too costly, it poses high hazards to human health and the environment. Therefore, local investors are invited to initiate development of a treatment and disposal facility for hazardous wastes generated in the region.

4.3. Challenges

Generally, the challenge remains to be the limited number of staff and deficient financial allocation to implement the programs and activities of the Chemical Management and Hazardous Wastes Management Sections of the EMB Central Office, which in turn leads to other constraints.

Many firms and industries in the regions are still unaware that they have been using toxic substances which require of them good storage facilities and handling equipment, and/or have been generating hazardous wastes during operation. Moreso, the public is still unsuspecting of the dangers of hazardous household wastes.

One of the roadblocks that the EMB Chemical Management Section is encountering is in the processing, storage and use of the data it gathers because of the lack of personnel dedicated to developing, maintaining and operating a computerized database system. However, this does not mean that major goals of the Section are not met. This only indicates that with the bulk of papers being handled by the Section, processing, storage and data retrieval can still be greatly improved.

It is particularly difficult to monitor the movement of illegally transported as well as unlabelled hazardous wastes in the region due to lack of personnel and machineries to be utilized. Likewise, there are no harmonized efforts among concerned entities like the local police, the LGUs, tollway patrols, economic zone authorities and other groups in monitoring and apprehending illegally transported and unlabelled hazardous wastes.

In cases of apprehension and confiscation, there are no clear provisions or guidelines under the law where to contain and place the seized items and who has jurisdiction over such materials as well as which agency of government is responsible for the construction of the required storage facilities.

There is a huge challenge to promote and disseminate information on all rules and regulations relating to chemicals and hazardous waste management for better compliance of industries, safety of the people and protection of the environment.

4.4. Recommendations

- The monitoring of transport of toxic chemicals through illegal trade must be harmonized with the National Single Window System established by the Bureau of Customs.

- There is a need to establish standardized holding facilities within DENR to address the problem on confiscated chemicals.

- There is a need to unify efforts of the local police, the LGUs, tollway patrols, economic zone authorities and other concerned groups in terms of monitoring and apprehending illegally transported and unlabelled hazardous wastes.

- There should be strict monitoring of the movement of hazardous wastes from the point of generation to the ultimate disposal location.

- There should be periodic monitoring of proper labelling of toxic chemicals and hazardous wastes.

- There must be intensive IEC campaigns on RA 6969 regionwide. The production and distribution of flyers, leaflets or brochures and other modes of information on significant RA 6969 topics and relevant information on toxic chemicals management and proper hazardous wastes handling and disposal must be prioritized and pursued. Public awareness programs must be focused on schools and communities that are exposed daily to toxic chemicals and hazardous wastes and/or are dealing with similar substances and materials.

Environmental Impact Assessment

National State of the Brown Environment Report

5. Environmental Impact Assessment

State of Philippine Environmental Impact Statement System (PEISS) Implementation

The Philippine Environmental Impact Statement System (PEISS), with the general policy issued in 1977 thru Presidential Decree (PD) 1151 and the system established in 1978 thru PD 1586, requires all developmental projects which will have significant effects on the environment to acquire an Environmental Compliance Certificate (ECC) prior to their construction and eventual operation.

Proponents of development projects which are categorized as environmentally-critical projects (ECPs) and those located in environmentally-critical areas (ECAs) are required to conduct an Environmental Impact Assessment (EIA) study for review in relation to ECC application.

The PEISS system is being implemented by the EMB as a planning tool that aims to ensure the environmental soundness of undertakings by unveiling their potential adverse environmental impacts for prevention and/or mitigation.

Among the key responsibilities of the EMB under the PEISS are the review of EIA submissions as a requisite to ECC applications, ECC compliance monitoring and the review and updating of policies and guidelines.

Since ECC is a requirement for development projects classified as ECP and/or located in ECAs prior to implementation, delays and difficulties in the processing of ECC applications are often associated with problems in attracting economic investments. After three decades of implementing the Philippine EIS System, various studies have been commissioned to find ways to improve the system. A lot of procedural improvements have been introduced. From 1996 to present, three DENR Administrative Orders (DAO 37, series of 1996, DAO 005 series of 2000 and DAO 30, series of 2003) as well as a Malacanang Administrative Order (Administrative Order 42, series of 2002) have been issued and four procedural manuals have been developed. Such undertakings have a common agenda of improving the implementation of the system especially with regard to the clarification of the scope, streamlining of procedures and standardization, and simplification of requirements.

MMT Validation in Hydrometallurgical Processing Plant Project

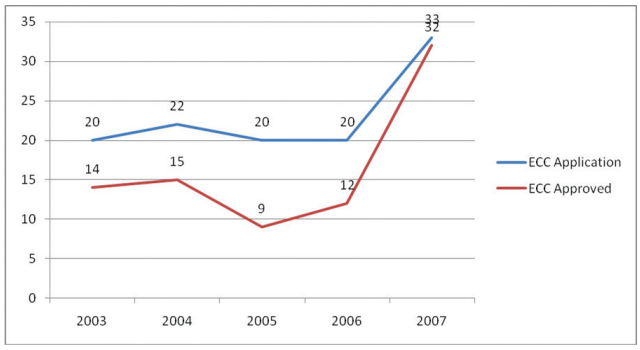
Through the years of implementing the Philippine EIS System which started under the National Environmental Protection Council (NEPC), there is an increasing annual average ECC issuance as reflected in **Table 5-1**.

Table 5-1. Average Annual Environmental Compliance Certificate (ECC) at the Different Regimes

EIS Regime	Period of Effectivity	No. of Years	Ave. Annual ECC Issuance
First NEPC IRR	1980-1984	5	103
Second NEPC IRR	1985-1992	8	231
DAO 21, series of 1992	1993-1996	4	1,428
DAO 37, series of 1996	1997-2002	7	2,552
DAO 30, series of 2003	2003-2006	3	4,267

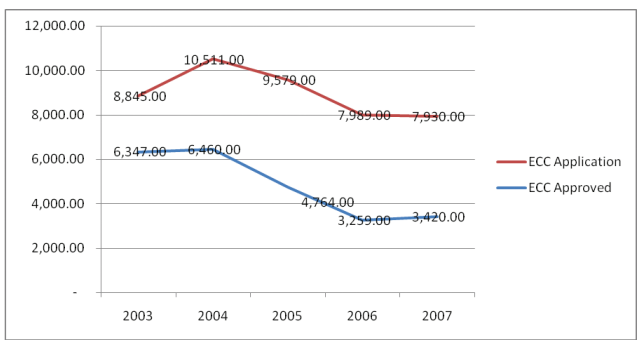
Source: EMB-DENR

Issuance of ECCs has increased remarkably since the processing of ECC applications was devolved to the EMB Regional Offices per DAO 21, series of 1992. This may be attributed to the increasing awareness of the said requirement as well as improved enforcement. **Figures 5-1 and 5-2** show the trends in the total number of ECC applications and issuance in the past five years for the EMB Central and Regional Offices, respectively.



Source: EMB-DENR

Figure 5-1. Total ECC Applications and Issuance at the Central Office (ECPs)

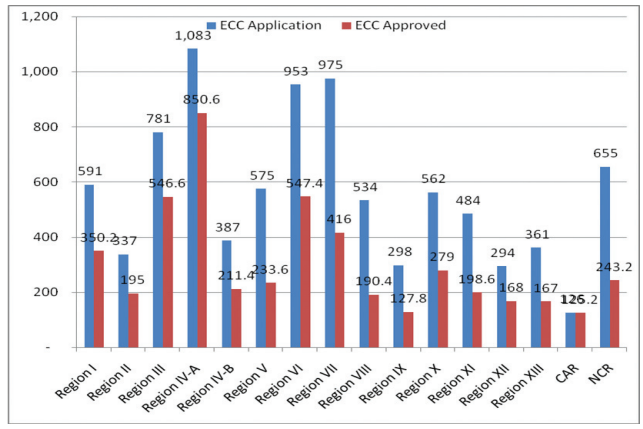


Source: EMB-DENR

Figure 5-2. Total ECC Applications and Issuance at the ROs (non-ECPs)

It can be seen from the two figures that since most of the applications and issuances are processed at the EMB Regional Offices, majority of these projects are considered as non-ECPs located in ECAs. **Figure 5-1** shows that, despite the increased number of applications at the EMB Central Office in 2007, the number of ECCs approved almost equaled the applications which could be indication of improvements. From the discrepancies in the number of ECC Applications vs. ECC Approvals in **Figure 5-2**, it is presumed that some of these applications were denied an ECC, have not been pursued, and/or are still pending (processing not completed) at the time of recording. The large volume of applications in the EMB Regional Offices, coupled with the fact that the office handling the processing of the ECC applications nationwide are ad hoc units, can be seen as major contributory factors in the cases of pending applications.

Figure 5-3 shows the distribution in terms of the average volume of transactions vis a vis ECC approval accomplishments in the various regions. On the average, Region IV-A receives and issues the greatest number of ECCs.



Source: EMB-DENR

Figure 5-3. Annual Average ECC Applications and Approvals at the ROs (2003-2007)

Iterative process of improving the system has been undertaken through the development, implementation review, and revision of procedural manuals which from 1996 to the present has already reached four versions. Aside from addressing the problems in ECC application processing expediency, the continuous improvement efforts also address the concerns regarding the clarification of which projects are covered or not covered by the ECC requirement. The standardization of requirements and procedures is one of the main features of the latest version of the procedural manual which contains guidance documents and forms.

Challenges

After almost three decades since the establishment of the Philippine EIS System, approximately **40,665** ECCs have been issued. Of these, **518** are classified as ECPs and approximately **40,147** as Non-ECPs. **Figure 5-4** shows the distribution of the ECC issuance across the various regions.

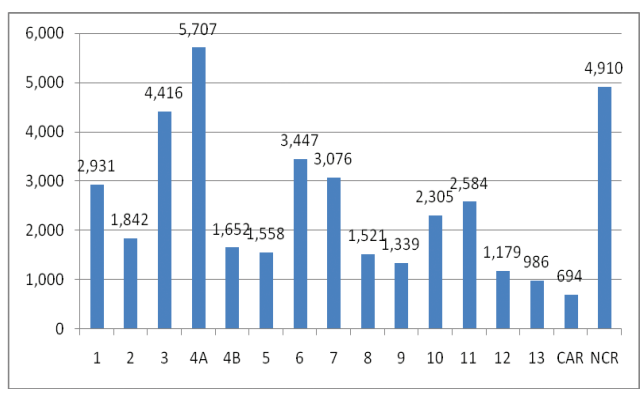


Figure 5-4. Total ECC issued as of 2007

The next challenge is how EMB would track down what has happened with these voluminous number of projects that have been issued with ECCs, as to whether they are still operational and are complying with the ECC conditions and EIS requirements. In the past, most of the limited resources of EMB have been utilized in expediting the processing of ECC applications. Very minimal attention has been given to compliance monitoring. Current efforts are now being undertaken on the **inventory of these projects** as an initial step.

Likewise, an environmental risk-based **monitoring prioritization scheme** has been developed and is now being employed to ECC issued projects so as to strategize and rationalize monitoring targets to what is doable and at the same time accomplishing the objective of safeguarding the environment. **Table5-2** provides a summary of ECC issuances across different regions with corresponding environmental risk rating. It can be seen that Region IV-A issued the most number of ECCs while Region 3 has the highest percentage of high risk projects.

Table 5-2. Summary of ECC Issuances Nationwide as of 2007

Region	Total ECC issued as of 2007	Risk Category, % Low	Medium	High
CAR	694	97.9	1.6	0.5
NCR	4,910	100.0	0.0	0.0
1	2,931	55.5	44.5	0.0
2	1,842	97.5	2.5	0.0
3	4,416	44.3	33.6	22.1
4A	5,707	52.9	46.1	1.0
4B	1,652	68.3	29.9	1.8
5	1,558	63.5	36.5	0.0
6	3,447	94.9	5.1	0.0
7	3,076	100.0	0.0	0.0
8	1,521	93.5	6.3	0.2
9	1,339	94.8	5.2	0.0
10	2,305	100.0	0.0	0.0
11	2,584	100.0	0.0	0.0
12	1,179	98.0	1.3	0.7
13	986	96.9	3.1	0.0
TOTAL	**40,147**			

Source: EMB-DENR

Considering the volume of ECCs issued, effort must be exerted to classify these projects for better management. A web-based internal database system, which has recently been developed, is a valuable tool in tracking down the status of ECC applications and compliance to ECCs, and for strategizing further monitoring activities.

Monitoring protocols, have likewise been developed to improve the system compliance monitoring with the end goal of achieving better environmental performance for projects issued with ECCs. One monitoring scheme which may be considered "endemic" to the Philippines is the establishment of the Multi-Partite Monitoring Teams (MMT). Multi-partite monitoring was conceptualized from the search for an effective mechanism for partnerships based on trust, equity and empowerment and had its formal roots in 1989. Through the years, a lot of lessons and good practices as well as bad experiences had been encountered in operationalizing the MMT System. Those who encountered bad experiences with the MMT System implementation became proponents for the move to abolish MMTs. With this, the EMB made the move to organize an MMT National Convention.

Quarterly Monitoring by MMT

Through EMB's collaboration with the Pollution Control Association of the Philippines Inc.(PCAPI), Region IV-Chapter, the First National MMT Convention was held last

Site inspection is conducted to verify the actual status of the proposed project and its existing environment in connection to the ECC application for the proposed project

May 4-6, 2005 at the Bayview Park Hotel, Roxas Blvd., Manila. The three-day convention was conducted with the theme "Stronger Public-Private Sector Partnership Through Multi-Partite Monitoring in the EIS System." Multipartite monitoring has evolved to become one of the DENR's foremost contributions to good governance and sustainable development. But even after two decades of MMT implementation, there has been very little stock-taking of knowledge gained and much less exchange of such rich knowledge and useful experiences that can cross-fertilize the formation and operations of other existing as well as new MMTs. Thus, the convention was implemented to provide an interactive and productive milieu for the various MMT stakeholders with the aim of documenting and to share MMT Best Practices; to identify issues and concerns for optimizing partnership among the key stakeholders of multipartite monitoring; to discuss forthcoming and recent policy issuances of DENR and EMB related to MMTs and multipartite monitoring; and to explore institutional mechanism for regular communication and collaboration among MMTs and the other stakeholders. A total of 248 participants attended the convention, comprising of NGOs,peoples' organizations, LGUs, DENR-EMB and Industry sectors.

Representatives from various MMT Era were asked to share experiences with implementing the MMT System. Following is a list of the presentations at various era:

Pre-DAO 21

- Leyte Industrial Development Estate Multipartite Monitoring: Its Rationale and Best Practices (from an LGU representative)
- Learnings from Marcopper Mining Multi-partite Monitoring Team (from an EMB Regional Director)
- Experience of Mindanao Geothermal Project on Multi-Sectoral Monitoring (from a project proponent respresentative)

DAO 92-21 Era

- Quezon Power (Philippines) Ltd. Co Multi-partite Monitoring Team (from an LGU representative)

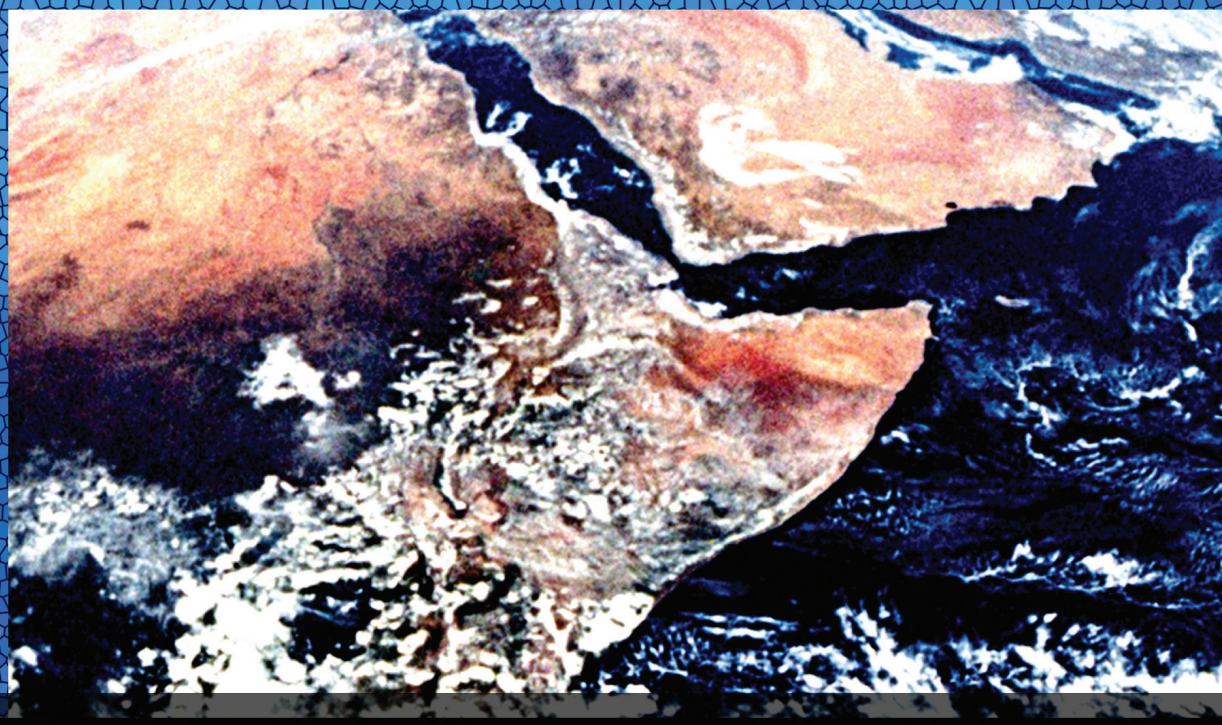
DAO 96-37 Era

- San Roque Multipurpose Project – Multipartite Monitoring Team (from a former DENR Undersecretary and a project proponent representative)
- MMT Experience in Malampaya Gas Pipeline Project (from a project proponent representative)

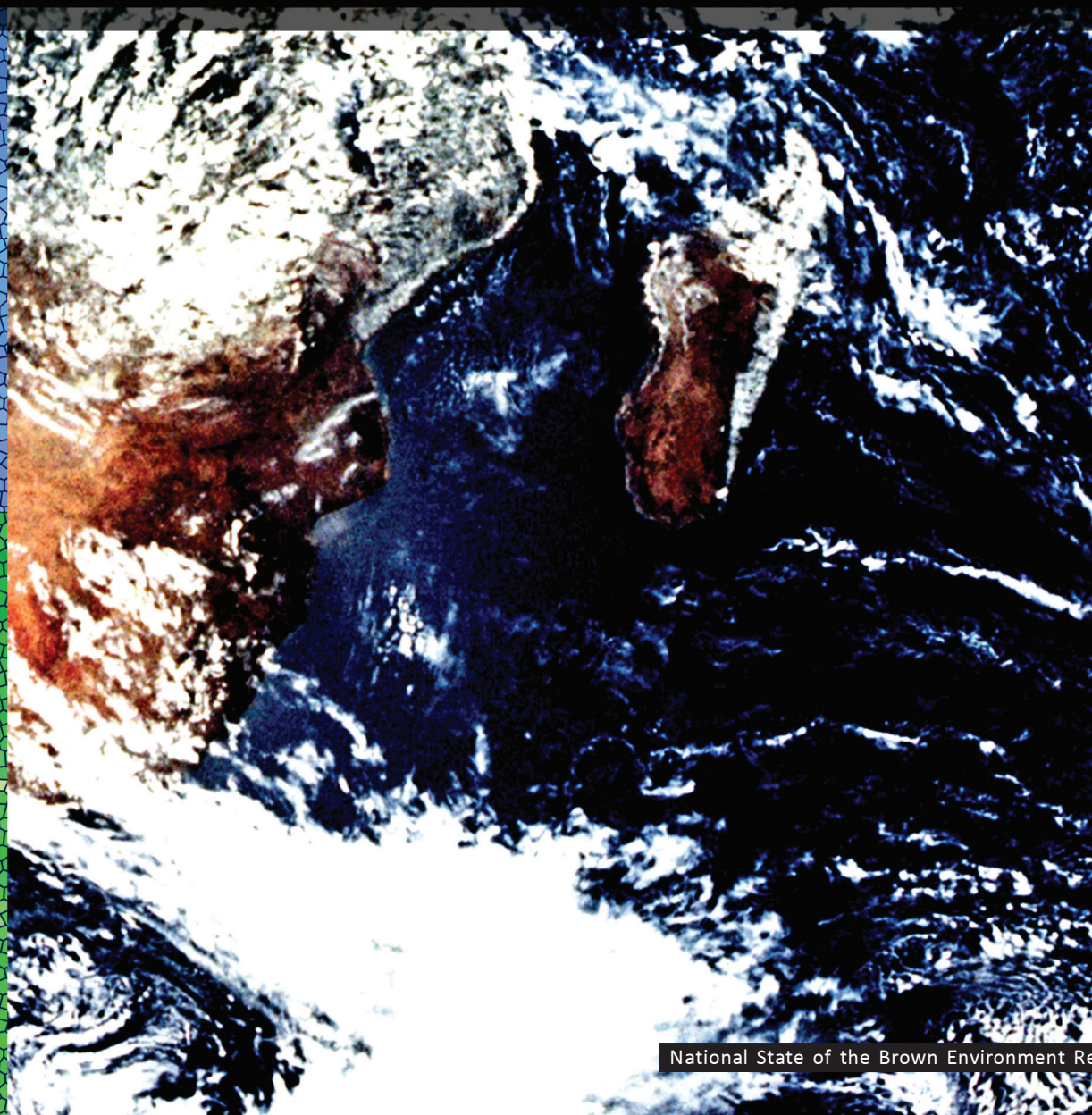
Clustering MMTs

- EMB-Region 6 Experience and Practices (from an EMB Regional mid-level official)
- EMB-Region 7 Experience and Practices (from an EMB Regional Director)

Recently, guidance documents as to the formulation of the MMT Manual of Operations with code of ethics and customized monitoring report forms for the MMTs and project proponents had been developed to further improve the EIA Monitoring and Evaluation System. A series of trainings on this were conducted by the EMB in collaboration with a national network of universities and colleges (the Philippine Association of Tertiary Level Educational Institutions in Environmental Protection and Management) in 2007, and these were participated in by MMTs from various regions nationwide.



Compliance to Multilateral Environmental Agreements



National State of the Brown Environment Report

6. Compliance to Multilateral Environmental Agreements

This chapter discusses the various international multilateral environmental agreements which the Philippines is a signatory to.

6.1 The Stockholm Convention

6.1.1 Brief Description

In May 2001, the Treaty on Persistent Organic Pollutants has been approved and signed by 90 nations through a Diplomatic Conference spearheaded by the United Nations Environment Programme in Stockholm, Sweden. Hence, the treaty was termed as Stockholm Convention.

Considered as one of the many important initiatives growing out of the 1992 Earth Summit, the treaty represents the most ambitious effort by the global community, to date, to rein in and ultimately halt the proliferation of toxic chemicals.

The treaty calls for the reduction of releases of dioxins and furans – toxic by-products of burning and industrial production with the goal of their continuing minimization and, where feasible, ultimate elimination.

6.1.2 Status of the Phase-out of Persistent Organic Pollutants (POPs) in the country

The Philippines is a party to the Stockholm Convention on Persistent Organic Pollutants and as part of its commitment to the Convention, the Philippine government has drafted a National Implementation Plan that outlines its programs to meet its obligations under the Convention. The same plan was likewise drafted to address the specific issues on POPs in the country.

Specifically, the National Implementation Plan aims to:

- Outline the country's national objectives for the reduction and elimination of POPs production, importation, use and releases

- Define the country's priorities and position to reduce and eliminate POPs releases

- Design programs to remove barriers to the effective implementation of POPs phase out and release reduction measures under the Convention

- Plan programs for information exchange, public education, communication, and awareness raising

- Enhance capacity through capability building as required, including institutional strengthening, training, equipment, legal and regulatory measures, enforcement, monitoring, etc.

- Design programs to identify the need for any country-specific exemptions, and if necessary, prepare a report to the Convention justifying this need

- Outline the needs for transfer of technology and know-how and/or enhanced use and development of indigenous knowledge and alternatives and the estimated costs of needed investments

Name of Banned POPs Substances

In the Philippines, the Fertilizer and Pesticide Authority (FPA) of the Department of Agriculture monitors prohibited and banned pesticides, which include chemicals that fall under the category of POPs.

Currently, there are nine pesticides that have been totally banned by the FPA as shown in **Table 6-1**.

Table 6-1 POPs-Pesticides and their Current Status in the Philippines

POPs-Pesticides	Status
Aldrin	Banned since 1989
Chlordane	Banned since 1999
Dieldrin	Banned since 1989
Endrin	Banned since 1983
Heptachlor	Banned since 1989
Toxaphene	Banned since 1989
Hexachlorobenzene	No record of importation, and registration in the Philippines from the FPA and EMB. Technically banned (never accepted for registration)
Mirex	No record of importation and registration in the Philippines from the FPA and EMB. Technically banned (never accepted for registration)
DDT	No local distribution was obtained. Exclusively used by the Department of Health (DOH) since 1978 for malaria control purposes. But banned by DOH since 1992. Banned in the country in 2005

Source: Fertilizer and Pesticide Authority

POPs Monitoring

Releases of polychlorinated dibenzo-*p*-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) or dioxins and furans were estimated based on the Standardized Toolkit of UNEP Chemicals, using the data compiled for 2004 by various government, non-government and private agencies. Activity statistics were taken from industry profiles, annual reports and other central statistical data.

Table 6-2. Summary of PCB Inventory for All Companies/Entities, 2007

Source Category	No. of Equipment Containing PCB	No. of Non-PCB Equipment	No. of PCB-Free Equipment	No. of Equipment with Unknown PCB Concentration	Total Weight of Equipment Containing PCB Oil (kg)	Total Quantity of PCB Wastes Generated (kg)
Manufacturing	13	1,830	1,843	3	3,854.00	1,175.04
Power generation	26	2,072	2,096	24	71,611.73	130,452.60
Electric distribution	948	52,836	53,784	940	160,694.63	222.00
Sale/distribution of electrical equipment	0	75	75	0	0.00	0.00
Retro filling/retrofitting of transformer	0	0	0	0	0.00	0.00
Waste storage/treatment/ disposal	0	6	6	0	0.00	0.00
Waste transport	1	7	8	1	0.00	0.00
Commercial building	0	0	0	0	0.00	0.00
Others	11	2,426	2,437	11	0.00	129,676.60
Total*	999	57,884	58,881	979	236,160.36	131,641.64

Source: EMB-DENR
*A company belonging to many categories may have its equipment counted more than once.
For the total though, only distinct equipment are counted.

Table 6-3. PCB Tracking Per Year

	No. ofEquipment Containing PCB Oil and PCB-contaminated Equipment	Total Weight ofEquipment ContainingPCB Oil and PCB-contaminated Equipment (kg)	Total Quantity of PCB Wastes Generated (kg)
1976	1	5,771.73	0.00
1990	6	0.00	0.00
1994	10	0.00	0.00
2000	1	132.00	0.00
2003	10	15,000.00	0.00
2004	314	69,366.82	0.00
2005	581	103,108.81	201.00
2006	5	1,560.00	1,016.00

Source: EMB-DENR

Table 6-4. Summary of PCB Inventory According to Region, 2007

Region*	No. of Equipment Containing PCB	Total Weight of Equipment Containing PCB (kg)	Total Quantity of PCB Wastes Generated (kg)
1	2	29,500.00	0.00
2	0	0.00	0.00
3	1	0.00	0.00
5	590	45,019.81	14.00
6	378	140,445.82	497.44
7	1	0.00	1,173.60
8	0	0.00	0.00
9	0	0.00	0.00
10	6	15,000.00	129,676.60
11	0	0.00	0.00
12	12	124.00	0.00
13	3	299.00	0.00
4A	10	0.00	0.00
4B	0	0.00	280.00
CAR	0	0.00	0.00
NCR	2	0.00	0.00

Source: EMB-DENR

*Only regions with registered plants are shown.

Table 6-5. Summary of PCB Inventory According to Zone, 2007

Zone	No. of Equipment Containing PCB Oil and PCB-contaminated Equipment	Total Weight of Equipment Containing PCB Oil and PCB-contaminated Equipment (kg)	Total Quantity of PCB Wastes Generated (kg)
Industrial	0	0.00	0.00
Rural	577	49,231.54	0.00
Urban	3	299.00	208.00

Source: EMB-DENR

Table 6-6. Classification of Equipment, 2007

Type of Equipment	Total No. of PCB Equipment
Capacitor	109
	10,415
Circuit Breaker	592
Distribution Transformer	5,052
Feeder Recloser	27
LABORATORY CHEMICALS	1
Line Recloser	39
Oil Switch	27
PCB LIQUIDS	1
Power Capacitor	201
Sectionalizer	47
Transformer	49,901

Source: EMB-DENR

Table 6-7. Status of PCB Equipment, 2007

In Use	On Standby	Rework/ Decommissioned	Storage for Disposal	Total No. of Equipment
46,009	1,547	961	891	66,412

Source: EMB-DENR

6.1.3 Initiatives on Research and Development (R and D), and IEC on Persistent Organic Pollutants (POPs)

6.1.3.1 Department of Science and Technology

The Department of Science and Technology had the following activities in the field of R and D on POPs. They are the following:

- Second National Inventory of Dioxins and Furans
- R and D on management of plastic residual wastes, waste to energy systems, and cleaner production and energy efficiency
- Dissemination of results of the National Inventory of Dioxins and Furans through lectures and seminars
- Participation in the preparation of the National Implementation Plan for POPs as member agency of the Philippine Inter-agency Committee on POPs
- Participation in the Regional Best Available Technologies (BAT) and Best Environmental Practices (BEP) Forum for East and Southeast Asian countries
- Assistance in the preparation of project proposals for the updated inventory of dioxins and furans releases; and promotion, adoption and monitoring of BAT and BEP

6.1.3.2 De La Salle University

The De La Salle University–Department of Chemical Engineering under the Asian Regional Research Programme on Environmental Technology (ARRPET) undertook a research entitled "Pilot Plant; Polychlorinated Biphenyl Degradation".

The pilot plant in the research is aimed to be a modification of the existing wastewater treatment system of the Planters Agro-Chemical Corporation.

The overall objective of the project is to treat the chlorinated aromatic POPs pesticides in the Planters Agro-Chemical Corporation areas.

6.1.3.3 Environmental Management Bureau (EMB-DENR)

As the focal point for Stockholm Convention on the Elimination of POPs in the Philippines, the EMB-DENR pursues several on-going programs and regional activities. Among them are:

a. Completed Canadian International Development Agency (CIDA) - funded project on Risk Assessment and Management, and Capacity Building on POPs in the Philippines

b. GEF-UNIDO assisted Global Programme to Demonstrate Regional Viability and Removal of Barriers that Impede Adoption and Successful Implementation of Available Non-burn Technology for Destroying POPs

The four-year project, slated to start in March 2008, covers the destruction of 1,500 tons of polychlorinated biphenyl (PCB) – containing equipment and wastes that form part of

the 6,879 tons of PCB wastes that were identified during an initial inventory process of PCBs in the country.

c. Integrated POPs Management Project

This is a GEF and World Bank (WB) project preparatory grant to manage POPs in the country, set for approval in February 2008.

The said project includes the following components:

- Establishment of dioxins and furans laboratory
- PCB management from dismantling, decommissioning and Transport
- Remediation of contaminated sites
- Environmental Assessment of the project

d. GEF-UNIDO Regional BAT and BEP Forum for East and Southeast Asian Countries to Promote Strategies to Reduce Elements of unintentional POPs for Industries

This is the first regional forum to be initiated by the Philippines through the EMB in cooperation with the Pollution Control Department of the Ministry of Natural Resources and Environment of Thailand and UNIDO.

The expected Project Outcomes are :

- Adoption of guidelines and guidance on BAT and BEP addressing specific features of industry, common practices including local and traditional practices in the region and related socio-economic considerations.

- Application of pollution prevention measures prior to the introduction of BAT and BEP strategies in the country.

- Derivation of Unintentional POPs data, baselines, inventories from representative industrial sources in a country and projected at a regional scale.

- Establishment of BAT and BEP regional coordination mechanism, specifically developing human resources and networking.

- Development of adequate capacity in monitoring and assessment, specifically in sampling, analysis and reporting of unintentional POPs.

6.1.3.4 Bureau of Customs

The Bureau of Customs (BOC) supports the efforts of the Stockholm Convention by prohibiting the entry of POPs pesticides in the country.

The BOC launched in January 2005 a major computerization project called **ASYCUDAWORLD** (e-Customs) Project, intended to upgrade and enhance the existing computer system. The project aims primarily to enhance and upgrade BOC's core and support system, including the hardware and network infrastructure, such as servers and workstations, with the following features:

- an automated import and export cargo clearance process, decision support system, and support infrastructure that will further sharpen and strengthen BOC's ability to meet strategic thrusts, to effectively carry out its mandated tasks and to satisfy current and future information requirements for better trade facilitation, enhanced revenue collection, and more reliable and effective enforcement;

- a streamlined process between the BOC and other agencies in the electronic exchange of information such as licenses and permits required for cargo clearance;

- a realization of the ASEAN Single Window's vision of ensuring prompt clearance of Imports through single submission and processing of Customs Data and single decision- making for cargo release; and

- an extensive use of e-commerce solutions that will allow non face to face transaction process that will be more convenient to the transacting public.

Since ASYCUDAWORLD is based on international standards and uses the internet, BOC can achieve compliance to various international/regional/bilateral/multilateral trade agreements, commitments and conventions, more trade cooperations with other countries, and more efficient exchange of information.

6.1.4 Challenges

As to the problem of illegal trade of banned PCBs, strict monitoring must be observed.

With limited budget allocation, there have been constraints on the application of BAT and/or BEP among industries in order to dispose banned, unwanted, and obsolete POPs-pesticides confiscated in the country.

6.2 Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

6.2.1 Brief Description

The Rotterdam Convention is a multilateral agreement that aims to promote shared responsibility and cooperative efforts in the international trade of hazardous chemicals. It was entered into force on February 24, 2004, and to date has 111 parties and 73 countries, including the Philippines, as signatories.

The Convention focuses on information exchange, which has two main components: the Prior Informed Consent (PIC)

procedure and the information exchange procedure. The PIC procedure is a means to formally obtain and disseminate the decisions of importing countries in receiving future shipments of restricted chemicals. The information exchange procedure, on the other hand, requires Parties to inform other countries of a ban or severe restriction on a particular chemical it implements on a national scale.

The Convention applies to banned or severely restricted chemicals and severely hazardous pesticide formulations. However, narcotic drugs and psychotropic substances, radioactive materials, wastes, chemical weapons, chemicals used as food additives, food and chemicals in small quantities for research and analysis are not covered by the convention.

The Rotterdam Convention achieves the following advantage for its signatories:

- Provides early warning system
- Keeps chemicals-related problems from getting worse
- Empowers developing countries
- Ensures labeling and hazard communication
- Promotes communication and information exchange among countries

In the Philippines, the EMB-DENR and the FPA-DA perform the role of Designated National Authorities (DNA) for the Convention. Both government agencies are responsible for undertaking administrative functions required by the Convention, including the operation of the PIC and information exchange procedures in the country.

6.2.2 Status of Implementation of Prior Informed Consent Procedure for Chemicals

A. Chrysotile Asbestos

The Philippine Government recommends that the inclusion of chrysotile asbestos be deferred in Annex III under the Rotterdam Convention in the 4th Conference of Parties. It was the consensus of the Inter-agency Committee to strengthen national legislations and control relating to Asbestos under Chemical Control Order (CCO) for Asbestos (DENR Administrative Order No. 2000-02). Currently, the concerned industry is required to conduct air quality monitoring for asbestos within the workplace prior to renewal of Importation Clearance once a year.

Further, in order to establish an informed decision-making, it has also been agreed that a Special Team from DOLE-Bureau of Working Conditions and Occupational Safety and Health Center) be created to conduct on-site monitoring of 26 asbestos importers, distributors, users and manufacturers regarding compliance to Rule 1410 (Construction Safety), Rule 1090 (Hazardous Materials), Rule 1080) Personnel Protective Equipment and Rule 1070 (Occupational Health and Environmental Control. The DOH and DOLE are proposing for the conduct of medical surveillance program for workers exposed to asbestos on a yearly basis to establish the baseline data.

B. Endosulfan

The FPA-DA is the agency regulating the use of all pesticides in the Philippines by virtue of PD 1144 enacted in 1977. The FPA has the mandate of ensuring the agricultural sector's adequate supplies of pesticides and educating this sector in the use of this input aside from fertilizers.

Pesticides are commonly used and proven to be beneficial to agricultural productivity. Pesticides however, are poison/toxic just like any other chemical formulations and should be handled and used properly. It may endanger humans, animals and the environment.

With the recent sinking incidence of MV Princess of the Star in the country with 10 tons of insoluble technical grade endosulfan, FPA has decided and agreed on the inclusion of endosulfan in Annex III of the PIC under the Rotterdam Convention. Endosulfan (CAS No. 115-29-7) is presently listed as "severely restricted" as per FPA Board Resolution and is allowed to be used for pineapple plantations against mite (*Steneoarsonemus ananas*) that harbors the bacterium (*Pantoea citrea*) and is responsible for "pink diseases". In the Philippines, the only allowable formulation since 1995 is the 5% emulsifiable concentrate. Historically, since 1995, the importation is only for 20 tons per year of the technical grade Endosulfan which is formulated to 5% EC and is used for pineapple as 0.06% working solution.

The FPA believes that its inclusion in Annex III will strengthen the shared responsibility and cooperative efforts of the Philippines with other countries towards monitoring of its uses.

C. Tributyltin

Tributyltin (TBT) compounds are among the listed chemicals under the Priority Chemical List (PCL) per DENR Administrative Order No. 1998-58 now revised to DAO 2005-27. As PCL chemicals, they are regulated by the DENR through the EMB.

Tributyltin is used in anti-fouling paints for ship hulls and quays, as biocide to prevent the fouling of appliances and equipment submerged in coastal and aquatic environments, and as materials and wood preservatives, among others.

Since 1998, historical records have shown no importation and usage data of the following tributyltin compounds: tributyltin oxide, tributyltin benzoate, tributyltin Chloride, tributyltin fluoride, tributyltin linoleate, tributyltin methacrylate, tributyltin naphthenate.

6.2.3 Challenges and Recommendations

After the Inter-Agency Technical Working Committee (TWC) consultations in collaboration with industry groups and NGOs, the Philippine government agrees to recommend to the Conference of Parties to include endosulfan and tributyltin in Annex III of this Convention in compliance to obligations of exporting countries to PIC procedures and to provide additional avenue for monitoring entry of these substances in the country.

The EMB-DENR is challenged to strictly implement and consistently monitor industrial operations, practices and programs to control and/or minimize the hazards and risks of asbestos that might affect the environment, workers and the general public.

While FPA is also challenged to institute strong mechanisms to prevent pesticides from harming human health and the environment, it has also adopted stringent evaluation of the risks and benefits involved in the importation and use of pesticides.

6.3 The Strategic Approach to International Chemicals Management (SAICM)

6.3.1 Brief Description

The Strategic Approach to International Chemicals Management (SAICM) was adopted by the International Conference on Chemicals Management (ICCM) on 6 February 2006 in Dubai, United Arab Emirates. The SAICM is an international policy framework to foster the sound management of chemicals.

The SAICM was developed by multi-stakeholder Preparatory Committee and supports the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that, by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health.

The SAICM comprises three core texts as follows:

· The **Dubai Declaration**, which expresses the commitment to SAICM by ministers, heads of delegation and representatives of civil society and the private sector;

· The **Overarching Policy Strategy**, which sets out the scope of SAICM, the needs it seeks to address and the objectives for risk reduction, knowledge and information, governance, capacity-building and technical cooperation and illegal international traffic, as well as underlying principles and financial and institutional arrangements. The ICCM adopted the Overarching Policy Strategy which together with the Dubai Declaration constitutes a firm commitment to SAICM and its implementation; and

· A **Global Plan of Action,** which sets out proposed work areas and activities for implementation of the Strategic Approach. The ICCM recommended the use and further development of the Global Plan of Action as a working tool and guidance document.

6.3.2 Status of Philippine Compliance to the National Commitments under the SAICM

The EMB-DENR is the focal point in the implementation of the SAICM.

In compliance to the national commitments under SAICM, the EMB enforces the provisions of Republic Act 6969 and its IRR which regulate, restrict or prohibit the importation, manufacture, processing, sale, distribution, use, and disposal of chemical substances and mixtures.

Specifically, the EMB has the following tasks:

1. Implementation of all international agreements on chemicals management (Stockholm Convention, Rotterdam Convention, Montreal Protocol, Basel Convention);

2. Issuance of a CCO on chemicals found to pose unreasonable risk or hazard to public health and the environment;

3. Conduct of PICCS; and

4. Issuance of PMPIN.

The other agencies which have active role in achieving the Philippines' compliance to SAICM are the following:

1. FPA-DA

a. regulates and ensures safety in the manufacture, formulation, importation, distribution, storage, sale, transport, use, and disposal of pesticides and fertilizers in the country as mandated by PD 1144;

b. registers fertilizer and pesticide products for agricultural use;

c. issues licenses that are pre-requisite to the importation, distribution, reformulation or any activity that involves fertilizer, pesticide, and other agricultural products;

d. ensures through monitoring and coordination with government product standards agencies, that the products comply with their standards, are handled safely and appropriately based on their occupational health and safety standards and use;

e. imposes penalties or sanctions for violation of the set of rules and standards. Another primary function is to educate fertilizer and pesticide handlers through training and information dissemination.; and

2. Bureau of Plant Industry (BPI) under DA

Republic Act 7607, otherwise known as the "Magna Carta for Small Farmers mandates the BPI-DA to monitor the level of chemical residues of agricultural crops and by-products and recommend policies for the safety of consumers.

3. BOC

Presidential Decree 1454 as amended (Tariff and Customs Code of the Philippines) mandates the BOC to enforce other allied regulations, such as the Chemical Control Order.

4. DOH

The DOH has the sole authority to import DDT by virtue of FPA Pesticide Circular No. 4, series of 1989 that has restricted the use of DDT except for malaria control purposes.

6.3.3 Challenges

Globally, the following challenges have to be addressed:

a. A major driving force for the establishment of the Strategic Approach has been the recognition of the growing gaps between the capacities of different countries to manage chemicals safely, the need to improve synergies between existing instruments and processes and the growing sense of urgency regarding the need to assess and manage chemicals more effectively to achieve the 2020 goal of the Johannesburg Plan of Implementation.

b. There is also the need for countries to have more effective governance structures to help make the Strategic Approach a lasting success.

c. The existing international policy framework for chemicals is not completely adequate and needs to be further strengthened.

d. The implementation of established international policies is uneven.

e. Coherence and synergies between existing institutions and processes are not completely developed and should be further improved.

f. There is often limited or no information on many chemicals currently in use and often limited or no access to information that already exists.

g. Many countries lack the capacity to manage chemicals soundly at the national, sub-regional, regional and global levels.

h. There are inadequate resources available to address chemical safety issues in many countries, particularly to bridge the widening gap between and among developed countries, on the one hand, and developing countries and countries with economies in transition, on the other hand.

6.3.4 Recommendations

a. Risk assessment and management strategies, supported by improved scientific understanding of the role and behavior of substances, addressing product life cycles , are central to achieving risk reduction;

b. Risk reduction measures, appropriately informed by scientific methods and consideration of social and economic factors are needed to reduce or eliminate the harmful effects of chemicals and their inappropriate uses;

c. The development of safer alternatives, including alternatives to chemicals of concern, and affordable sustainable technologies should be accelerated;

d. Developing countries and countries with economies in transition need better access to affordable, safer technologies and alternatives which will also assist in reducing illegal traffic in hazardous chemicals;

e. Knowledge, information and public awareness are basic needs for decision – making for the sound management of chemicals, including products and articles containing chemicals; and

f. Proposals need to be developed on enabling capacity building and implementation activities. for the sound management of chemicals for support under the Quick Start Program.

6.4 The Montreal Protocol on Substances that Deplete the Ozone Layer

6.4.1 Brief Description

The 1985 Vienna Convention for the Protection of the Ozone Layer was the first framework for co-operative activities to protect the ozone layer. Under this Convention, parties agreed to cooperate with each other in scientific researches to improve the understanding of the atmospheric processes, to share information on ODS production and emissions and

to implement preventive measures to control ODS emissions. Adopted in March 1985 and signed by 21 states, the Vienna Convention does not contain legally binding controls and targets.

In the Philippines, the Montreal Protocol on Substances that Deplete the Ozone Layer was put into force on January 1, 1989. The DENR-EMB thru the Philippine Ozone Desk (POD) acts as the national coordinator of programs for the implementation of the Montreal Protocol. The POD was created to facilitate and coordinate ODS phase-out projects and policies. Among the functions of the POD are the following:

- Ensure compliance to the timetable to phase out ODS in the country
- Handle the issuance of clearances for all ODs importations
- Strengthen procedures for restricting ODS imports
- Coordinate with relevant government agencies
- Supervise and monitor phase-out projects
- Evaluate effectiveness of phase-out activities
- Collect national data on ODS consumption

The following substances are controlled under the Montreal Protocol:

- Chlorofluorocarbons (CFC) (CFC 11 & CFC 12)
- Hydrochlorofluorocarbons (HCFC)
- Trichloroethane (111 TCA)
- Carbon Tetrachloride (CTC)
- Methyl Bromide
- Hydrobromofluorocarbons (HBFCs)
- Halons
- Bromochloromethane (BCM)

6.4.2 Status of Philippine Compliance

The First Philippine Country Program for the Phase-Out of ODS was prepared in May 1993. This Program specified the Philippine ODS phase-out schedules and laid out the plans, programs, and activities that the country would undertake in phasing out ODS.

There are currently three major projects being implemented by the POD. These are the Institutional Strengthening Project, the National Methyl Bromide Phase-Out Strategy, and the National Chlorofluorocarbon (CFC) Phase-Out Plan. These projects are funded by the Multilateral Fund for the Implementation of the Protocol with the World Bank as the implementing agency.

Institutional Strengthening Project

The Institutional Strengthening Project (ISP) is the backbone of all projects as it supports the EMB-DENR in implementing its mandates. It has assisted the Philippine Government to comply with its commitments to the Montreal Protocol. Among the strategies it has adopted to control the consumption of ODS include the implementation of an import quota system , ODS licensing and monitoring , as well as awareness raising and coordination with the private sector, stakeholders and partner agencies.

National Chlorofluorocarbon Phase-Out Plan (NCPP)

The National Chlorofluorocarbon Phase-out Plan is the biggest project implemented by the POD. It aims to enable the government to phase out CFC consumption of the country according to the schedule stipulated by the Montreal Protocol. It combines policy and regulatory interventions to phase out the use and importation of CFC, so as not to adversely affect the economic functions of society.

Since 1992, there was a steady decline in the total consumption of ODS. Substantial efforts had led to the total phase-out of Methyl Chloroform in 1997 and CFC 113, 114 and 115 as well as Halon 1301 and 1211 in 1999. Importation of CFC-11 has likewise been banned in 2005.

The phase out of the remaining 2,017.6 metric tons of chemicals included in the Annex A, Group 1 of the Protocol started in 2003 and end in 2010.

The sectors to be affected are the manufacturers of products using CFC, servicing centers for car air-conditioners, household air-conditioners and refrigerators and chillers. The project encourages these sectors to shift to alternatives by providing technical and financial assistance.

National Methyl Bromide Phase-out Strategy

The National Methyl Bromide Phase-out Strategy (NMBPS) aims to gradually reduce and eliminate a total of 10.3 tons of methyl bromide by January 1, 2009. It also seeks to find viable and permanent alternatives to cushion the effects of the phase-out. The FPA-DA implements the project in coordination with the POD-EMB.

Since its commencement in 2005, a total of 5.44 ODP tons of Methyl Bromide has already been eliminated.

To assure compliance, import distribution and use control mechanism were put into practice through the import permit (Certificate Authorizing Importation of Pesticide-CAIP) and Permit to Purchase (PP) procedure as well as monitoring and inspection system by way of Disposition Reports, usage and inventory inspection mechanism. Likewise, the project conducted dialogues and consultations and trainings to the affected sectors. Investment-wise, seven organizations; four government and three private companies were granted with personal protective equipment (PPEs) and gas concentration monitoring gadgets. Methyl Bromide consumption verification vis-à-vis project implementation were also undertaken by independent auditors covering the years 2005, 2006 and

2007. Verification audits are likewise scheduled to cover the year 2008 and the start of the phase-out period in 2009.

To assure sustainability and compliance to the phase-out, appropriate regulatory policies have been put in place to integrate project activities in the regular functions of the FPA.

6.4.3 Challenges

Some of the challenges are the following:

- Illegal trade of ODS, specifically proliferation of smuggled CFCs;
- Demand for banned ODS – carbon tetrachloride, CFCs, and Halons;
- Sustainability of Methyl Bromide controls and continued registration of alternatives after MLF project completion;
- Sustained implementation of DAO 156 (2004) after MLF project completion (IRR for the Transition from CFC-containing MDIs to CFC/ODS-free alternatives used in the treatment of bronchial asthma and COPD;
- Sustainability of the enforcement of DAO 03 (2006) "Implementation of the NCPP on motor vehicles;"
- Few service shops accredited by the Department of Trade and Industry in relation to the number of voucher grantees under the National CFC Phase-out Program;
- Absence of local standards for refrigerant cylinders;
- Importation of second-hand vehicles and appliances with CFCs as refrigerant;
- Absence of national standards on the refrigerants of water dispensers and other appliances;
- Adjusted phase-out schedule for hydrochlorofluorocarbons (HCFCs);and
- Replacement of CFC-based chillers.

6.4.4 Recommendations

- Addressing the issue regarding the illegal trade of ODS, there is a need for the passage and enforcement of the Omnibus guidelines for the apprehension and penalties for illegal trade cases, and the preparation of the OPLAN CFC;
- Replacement of existing chillers that use CFCs and other ODS;
- Preparation of a Sustainability Plan by the FPA and the BPI of the DA and other partner agencies;
- Strengthening the implementation of the ban on CFC-based salbutamol MDIs and the circulation of the list of available alternatives to medical practitioners, hospitals, drugstores and the general public.
- Pursuing market monitoring to determine shift from use of CFC-based salbutamol MDIs;
- Inclusion of Mobile Air Conditioning (MAC) inspection in the Motor Vehicle Inspection System;
- Revision of the policy on the certification of service technicians as a requirement for the accreditation of service shops;
- Development and adoption of Philippine National Standards for refrigerant cylinders;
- Development, adoption and enforcement of policy to regulate the importation of second-hand vehicles and appliances with CFCs;
- Inclusion of water dispenser and other similar appliances in existing national standards (PNS) relative to refrigerants' use;
- Conduct of an HCFC survey and formulation of the HCFC phase-out plan; and
- Provision of an attractive financing scheme for the chiller owners and undertaking of an information campaign to support this undertaking.

6.5 The United Nations Framework Convention on Climate Change (UNFCCC) and The Kyoto Protocol

6.5.1 Brief Description

Climate change is considered as one of the most serious threats to sustainable development, with adverse impacts expected on the environment, human health, food security, economic activity, natural resources and physical infrastructure. Scientists agree that rising concentrations of anthropogenically-produced greenhouse gases in the Earth's atmosphere are leading to changes in the climate. The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), completed in November 2007, finds that there is more than 90% probability that human action has contributed to recent climate change and emphasizes the already observed and projected impacts of climate change. It also analyzes various options for mitigating climate change.

The international political response to climate change began with the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. The UNFCCC sets out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases to avoid "dangerous anthropogenic interference" with the climate system. The UNFCCC entered into force on 21 March 1994, and now has 192 parties.

The Kyoto Protocol

In December 1997, delegates at the Conference of Parties (COP) 3 in Kyoto, Japan, agreed to a Protocol to the UNFCCC that commits developed countries and countries in transition to a market economy to achieve emission reduction targets. These countries, known under the UNFCCC as Annex I parties, agreed to reduce their overall

emissions of six greenhouse gases by an average of 5.2% below 1990 levels between 2008-2012 (the first commitment period), with specific targets varying from country to country. Following COP 3, parties began negotiating many of the rules and operational details governing how countries will reduce emissions and measure their emission reductions. The process was finalized in November 2001 at COP 7 in Marrakesh, Morocco, when delegates reached agreement on the Marrakesh Accords. These Accords consisted of a package of draft decisions for adoption at COP/Meeting of Parties (MOP) 1 and laid down detailed rules on the Protocol's three flexible mechanisms, reporting and methodologies, land use, land use change and forestry (LULUCF), and compliance.

6.5.2 The Philippine Commitments to the UNFCCC

The Philippines, being largely archipelagic in nature and frequently beset with typhoons and thunderstorms, renders itself as highly vulnerable to the impacts of climate change such as extreme weather events and sea level rise. The country's once vast biological diversity has significantly declined thereby making the Philippines as one of the top hotspots in global biodiversity. The increasing recurrence of the El Niño phenomenon has likewise resulted to seasonal aridity or seasonal dryness in some parts of the country which may further result to desertification, if not immediately addressed. Moreover, the country's status as a "developing country" and current globalization efforts have further aggravated the population living under poverty line due to the country's limited economic resources to adapt to these natural disasters and to strengthen programs to preserve the country's remaining biodiversity and natural resources.

Recognizing the need to urgently address these problems on environment and natural resources, the country actively participated in the said Rio "Earth" Summit. The Summit called for an international response for cooperation and support to these issues which resulted to the signing of three multilateral environmental agreements, one of which is the UNFCCC. Through these Conventions, country Parties could benefit through information and experience sharing as well as various forms of assistance in addressing these issues.

The following are commitments stated in the Convention, particularly from the developing countries or non-Annex 1 Parties:

a. Prepare and submit its national communication on climate change highlighting the country's national inventory of greenhouse gas (GHG) emissions to the UNFCCC Secretariat on an agreed period of time. The national communication shall contain the steps being undertaken by the country in addressing the global issue of climate change;

b. Promote and cooperate with other countries in scientific, technological, technical, socio-economic and other researches including systematic observations related to the climate system and to climate change and in turn develop these researches into a database of information which could be shared and exchanged with other countries;

c. Cooperate in preparing measures and plans to adapt to the impacts of climate change including the conduct of vulnerability and adaptation assessments;

d. Integrate climate change concerns in national policies and actions;

e.Promote and cooperate with other countries in developing, applying and transferring of technologies, practices and processes that control, reduce or prevent human-induced GHG emissions in all relevant sectors of the country; and

f.Promote and cooperate with other countries in undertaking education, information and training activities to raise awareness on climate change and its impacts and encourage public participation in addressing them.

6.5.3 Philippine Compliance and Initiatives to the UNFCCC

In response to the global call for international action to address the problem of climate change, the Philippines both signed and ratified the UNFCCC. And even before the signing of the Climate Change Convention during the Earth Summit in June 1991, the Inter-Agency Committee on Climate Change (IACCC) has already been created by virtue of Presidential Administrative Order No. 220 which was signed by then President Corazon C. Aquino in May 1991. The IACCC is chaired by the Secretary of the DENR and co-chaired by the Secretary of Science and Technology (DOST). The EMB acts as the Secretariat to the IACCC.

Since then, the Philippine government through the EMB/IACCC, which also currently acts as the technical focal point for climate change concerns embarked on several projects and activities related to information and awareness campaigns and capacity building. Outstanding among these was its Project on Enabling Activity to Prepare the Initial National Communication to the UNFCCC. This national communication highlighted the 1994 National Greenhouse Gas Emissions and laid down the country's efforts in response to the objectives of the UNFCCC. In the process of preparing this document, a number of training-workshops, as well as consultation meetings, have been conducted. This was then submitted in December 1999 to the UNFCCC Secretariat.

With assistance from and in collaboration with the different international partners and local organizations, the country was able to conduct various studies on vulnerability and adaptation assessment, workshops on GHG mitigation

options, technology needs assessment, and Clean Development Mechanism (CDM) -related capacity development activities. Orientation seminars and executive briefings were likewise continuously conducted among government agencies and even in the private/industry sector.

Continuous efforts are being done on information, awareness-raising and education on climate change among the different sectors, such as government and non-government sectors, the academe, LGUs, policy makers, finance and business sector, and others. These brought about the production of various IEC materials on climate change consisting of primers, poster-calendars, fact sheets, exhibit materials, handouts and a video documentary.

To date, following the Philippine ratification of the Kyoto Protocol and as the DENR had been directed to act as the Designated National Authority (DNA) for CDM, the country has started the implementation of the CDM national process. Hence, the DENR, thru the EMB, has been receiving and evaluating applications for CDM project activities.

As of July 11, 2008, the DNA has been able to receive 80 project activities in terms of CDM projects. Of these 80 project activities, 56 Letters of Approval (LOA) had been issued for project activities. Most of the approved projects deal with energy-related activities, while the rest pertain to waste management measures. The first project activity to be issued an LOA in 2005—and which has also been issued Carbon Emission Reduction (CER) credits—is a wind power project in Ilocos Norte. From the applications received so far, an estimated annual CERs of about 2,879,843 tons of carbon dioxide would have been generated. Also, as of July 14, 2008, the Philippines ranks seventh (7th) in the world in terms of the project activities registered, having successfully registered 19 projects. These projects registered in the Philippines represent about 1.70% of the 1,116 project activities registered throughout the world. The top countries in terms of CDM approval include India, China, Brazil, Mexico, Malaysia, and Chile. The Philippines is currently competing with Korea in the rankings.

Most of these applications, about 80% are small-scale projects, and account for about 79,000 CERs of the country's annual total. Being smaller in scale, these kinds of projects are more affordable and easier to undertake. These small-scale projects mostly involve methane recovery and electricity generation from swine and poultry waste water as well as sewage treatment. Others bring about methane avoidance from biomass decay through composting in cooperation with the Metro Manila Development Authority, biogas production from an ethanol distillery and biogas generation. Some projects involve biomass and utilize rice husks for heat generation at steam laundry facilities and rice mills, as well as coconut husks for steam boilers at feedmills. There are also mini-hydropower projects and projects undertaking the rehabilitation of watersheds and promoting the retrofitting of tricycles.

The other 20% of these projects are regular or large-scale projects which account for 53,000 to 582,000 CERs per year. Some of these projects generate renewable energy from sources like wind, geothermal and hydro power. Others undertake the treatment of wastewater from an ethanol plant, waste heat recovery at a sinter plant, as well as landfill gas recovery from two waste landfill sites—the Payatas and Montalban dumpsites. There are projects that promote rice husk biomass used at cement plants and at a sugar mill. Lastly, there are projects promoting organic waste composting and blended cement.

The country is likewise moving towards the preparation of its Second National Communication which basically contains updates of the previous contents, particularly the national GHG emissions, vulnerability assessment and adaptation measures, climate mitigation efforts, and information, training and education efforts.

In terms of efforts being made to promote adaptation to climate change, measures were undertaken under the mandates of each of the respective departments and agencies. These measures contribute towards preparing the people for the adverse effects of climate change.

In the case of the DOST, for example, they are currently upgrading their capabilities to anticipate changes in weather forecasting, specifically, towards improving their climate profile data base. The DENR, in turn, is working towards identifying areas, ecosystems, and species that would be most vulnerable to natural hazards through geo-hazard mapping as well as hydro-dynamic and resiliency assessment. Efforts are also being made to strengthen the protection of these vulnerable areas through the establishment of protection areas and the implementation of protection measures. The DENR is also working to expand the capacities of river basins, thru dredging, river bank stabilization and the strict regulation of water utilization. Protection of the water aquifer is also done through the strict regulation or outright banning of groundwater extraction.

The Department of National Defense (DND) is developing effective early warning and disaster response systems to forewarn communities of weather calamities and other dangers—in a large part also through the projects of the National Disaster Coordinating Council (NDCC). The DILG is likewise undertaking measures to enhance the capabilities of LGUs for disaster prevention and management. The DA, is also pursuing measures to strengthen food security through the development of dry cultivation and technologies that would increase the resiliency of crops to increased temperatures. As for the DOH, there are measures being made to undertake surveillance and establish quick response systems in case of the outbreak of climate change-related diseases like malaria, dengue and even cholera and typhoid fever.

There are also proposed pipeline projects aimed at enhancing adaptation to climate change. An adaptation

project will be undertaken by the World Bank which would focus on the development and demonstration of the systematic diagnosis of climate-related problems and the design of cost-effective adaptation measures. The World Bank project will also integrate climate risk awareness and responsiveness into the economic and operational planning of the Philippine government, particularly with respect to the management of agriculture and natural resources. This project is being spearheaded by the DENR through the Foreign-Assisted and Special Projects Office. The objectives sought to be achieved by the project include the improvement of the coordination of the DENR's adaptation policy, the implementation of climate risk reduction measures in key productive sectors, the strengthening of proactive disaster management capabilities within the NDCC, and an enhancement of the provision of scientific information for climate risk management.

There is also a recently-approved Millennium Development Goals (MDG) Joint program proposal on adaptation. This project will be sponsored by the Spanish government for three years, and will be undertaken in cooperation with a number of local and international partners. The funding would be given under the MDG achievement fund under the Millennium Development Goal Fund (MDGF) Country Thematic Window for Environment and Climate Change. The project aims to achieve positive outcomes in the areas of policy, planning and programming, capacity development of concerned national and local government institutions, and in the capacity development of communities to develop demonstrable climate change adaptation measures. The outputs sought to be achieved include climate risk reduction and awareness raising. Pilot projects will also be implemented in key sectors like water, agriculture, coastal, forestry, and health.

The Philippine government has also been undertaking mitigation measures. These measures are examples of efforts that while not initially undertaken as part of efforts to address climate change, will eventually contribute to a solution to the problem. In the case of the Department of Energy (DOE), for example, they are undertaking measures to accelerate the use of renewable and alternative energy sources and promote more efficient power generation and conservation. The DTI in turn, is promoting efficiency in production and the use of low carbon technologies among industries in the Philippines. As for the DOTC, they are promoting the reduction of fuel consumption through the imposition of stricter registration and franchising requirements for land transportation operators. The DOTC is also implementing campaigns against smoke belching and emissions, PETC monitoring, and encouraging conversion of engines and vehicles into fuel-efficient units.

In line with their measures to increase food security, the DA is also developing methods for dry land rice cultivation and minimizing waste decomposition. The DA is also working to promote wider use of organic fertilizer and at the same time reduce reliance and use of pesticides among our farmers. For the DILG, there is a campaign to promote better waste management through widespread adoption of the "3Rs" (reduce, recycle and re-use) measures. This is in addition to the development of technologies that would convert waste to energy. The DENR, in turn, is working towards a better management of air quality in the country, especially in urban areas through airshed councils. Efforts are also being undertaken to further reduce air pollution through strict smokestack monitoring and the prohibition of open burning. Also worth noting are the DENR's efforts to expand vegetation cover through the Green Philippines program.

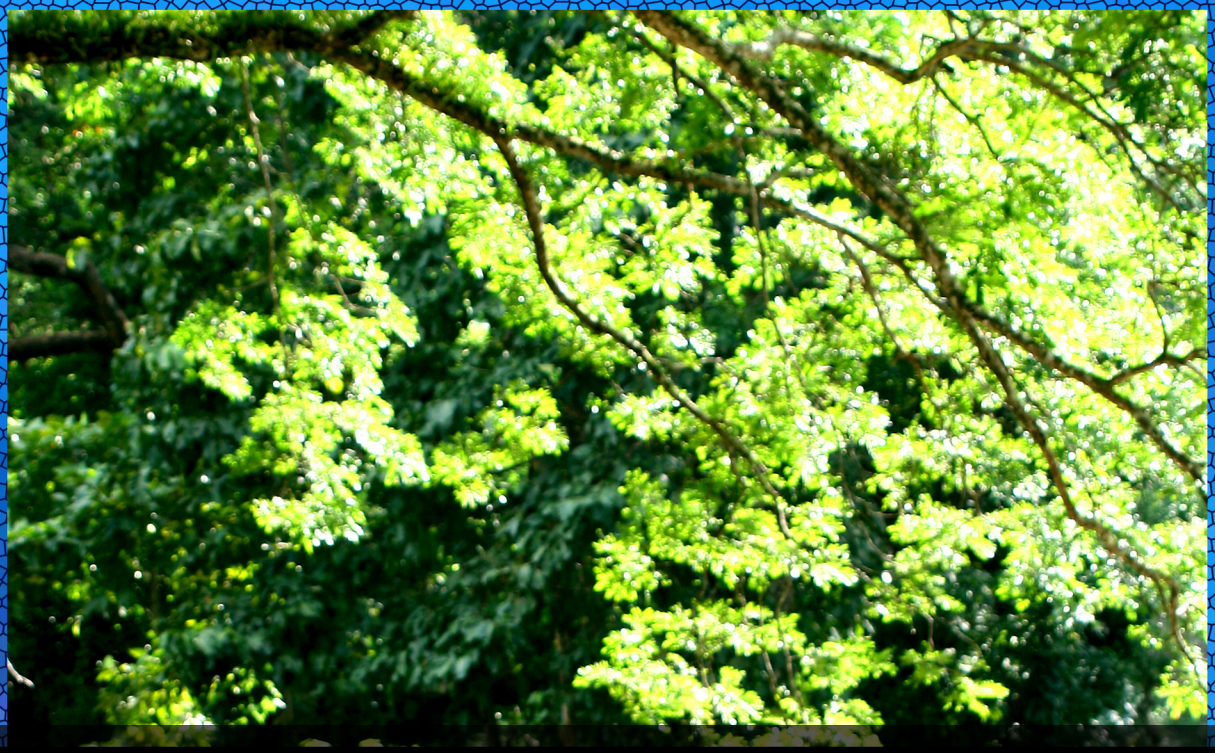
CDMs are also mitigation measures. The country has received 80 CDM applications so far, 56 of which have been issued LOA.

As far as public awareness, education and capacity building activities are concerned, information materials are also continuously developed and disseminated. These include poster calendars, primers, handouts, fact sheets, and even a video documentary on climate change with support from the KLIMA Manila Observatory. Likewise, there are briefings for legislators.

In line with these efforts to increase awareness of the climate change crisis within the ranks of government, there are also capacity-building efforts to reach employees of and officials of the Executive Branch, such as the senior officials of the DENR, NEDA, the DTI, and especially the Board of Investments (BOI), including those in the private and public sectors. The private sector is particularly encouraged to get involved in the implementation of CDMs.

In this regard, various technical training courses have also been conducted, as well as further training in conducting GHG emission inventory. Likewise offered are CDM-related training courses, namely the *Basic Course*, *Major Steps in the CDM Project Cycle*, and *Evaluation of CDM projects*. In terms of capacity building and promoting awareness of CDMs, an official CDM country guide, brochures, as well as the CDM country fact sheet, had been developed. An investment road show for eco-securities has also been staged, as well as lead participation in international carbon expositions.

Some of the continuing activities are the conduct of local, regional and national training workshops as well as the archiving of baseline data and baseline calculation guide. Linkages have been established with relevant government institutions and agencies in the private and business sectors. There is an existing CDM clearing house (at *http://www.cdm-dna.emb.gov.ph*) which covers the CDM implementation process in the Philippines. Likewise, CDM manuals on GHG Reduction Monitoring as well as on Emission Reduction Purchase Agreements have been developed.



Environmental Education

** Photo at back courtesy of Palawan State University.*

7. Environmental Education

7.1 Current Environmental Education Status

The year 2005 saw the onset of the United Nations Decade of Education for Sustainable Development (UNDESD) for 2005-2014. For the Philippines, the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR), which likewise chairs the Sub-Committee on Information and Education of the Philippine Council for Sustainable Development, initiated the multi-sectoral crafting of the National Environmental Education Action Plan (NEEAP) for Sustainable Development (SD) for the same decade since 2004.

The NEEAP for SD for 2005-2014 is the country's support commitment to the UNDESD. The NEEAP envisions an environmentally-literate and proactive citizenry imbued with a sense of responsibility to care, protect and enhance environmental quality that is conducive to their well-being and supporting of a nation's economic development and unified in its pursuit of peace, social justice and equity in the use of natural resources.

In 2006, the EMB-DENR organized a multi-stakeholder "Forum on Accelerating Environmental Education Towards Sustainable Development: Taking Up the Challenges," and the following arose as significant problems on environmental education towards sustainable development:

1. Problems of Integrating Environmental Education Towards Sustainable Development in the Philippines (all levels/all sectors)

- Curriculum
- Educational Materials
- Training and capacity-building for educators/trainers
- Institutionalization

2. Lack of dedicated units on Environmental Education for the Department of Education (DepEd), and the Commission on Higher Education (CHED)

3. Lack of Technical Panel on Environmental Education Towards Sustainable Development for the CHED

4. Lack of Specific Textbooks for Subjects which have integrated Environmental Education in the Curricula

- Four Catholic Educational Association of the Philippines' (CEAP's) Modules which integrated Environmental Education in Makabayan (Social Studies) and Science in High School, need to be massively reproduced for public high schools, and the concept replicated to the public elementary levels.

Specifically, the following initiatives, problems and commitments emerged from the major government education and environment departments:

7.1.1 From the Department of Education-Bureau of Elementary Education

Initiatives

Conduct of curricular review so that the concepts of education for sustainability are integrated in the different learning areas across grade levels.

Examples of this are portions of Sibika at Kultura (Civics and Culture) in Grades 1, II, III, and Heyograpiya/ Kasaysayan/Sibika (Geography/History/ Civics for Grades IV and VI which integrated concepts of ecology, solid waste

management, rights of humans and children, and overall environmental protection in the subjects.

In Science and Health for Grades III, IV, V and VI, concepts of ecology, solid waste management are integrated.

In Edukasyong Pangtahanan at Pangkabuhayan (Home Economics and Livelihood Education), for Grade V, concepts of ecology, solid waste management, and overall environmental protection are integrated.

In subjects in English and Filipino subjects, concepts on human rights, to a clean, safe and healthful environment are integrated.

Issuance of DepEd Orders and Memoranda in support of the celebration and observance of sustained efforts of protecting the country's environment and natural resources.

Development of instructional materials focused on some of the underlying themes of environmental education for sustainable development.

Problems

Lack of preparation of teachers in teaching core contents of sustainability.

Insufficient materials and information that will support the delivery of basic learning contents of education for sustainable development.

Lack of funds for the production of materials to be distributed to the schools.

Commitments

Integration of the aims and objectives of environmental education in the school curricula.

Continuing with the linkages with other agencies/ organizations to come up with meaningful programs and activities.

Dissemination of the different programs and activities pertaining to education for sustainability to all DepEd regional and education field offices.

Strengthening of the integration of health education concepts in the school curricula, as well as in the materials that the sector is developing for community health, environmental health, family and others.

7.1.2 From the Department of Education-Bureau of Secondary Education

Initiatives

Restructuring of the Basic Education Curriculum, to integrate concepts on environmental education. The integration of environmental education is multi-disciplinary (across subject areas) and multi-level (across year levels). The high school students are introduced to the fundamental awareness, concerns and commitment to the environment in Science, Social Studies, Values Education, Technology and Livelihood Education, and Health in MAPEH (Music, Arts, Physical Education and Health). Although concepts are not specifically spelled out in English and Filipino, most of the reading materials are either stories, poems or essays about the environment. In special science high schools, Earth and Environmental Education is taught as a separate subject.

A set of reading materials, which have content on the environment, in English I-IV have been printed out by DepEd and distributed to teachers in the field.

Issuance of DepEd Memoranda promoting programs related to environmental education.

Establishing of linkages with other agencies, and private organizations, where teachers may also upgrade their competencies to integrated environmental education, through trainings.

Holding of science fairs and science camps as alternative awareness in learning about the environment.

Providing scholarships to deserving teachers.

Problems

There are no specific textbooks for the subjects which have integrated environmental education in the curricula. It follows, therefore, that there are no specific materials on the integration process such that everything is dependent on the commitment of the teacher to do research work on environmental education integration.

Lack of qualified/trained teachers. While some teachers attend seminar-workshops on special topics, including different teaching and evaluation strategies, majority of the education graduates are not yet equipped with the necessary teaching/learning skills to implement what are spelled out in the learning competencies.

Limited resources of the DepEd

Commitment

Despite limited resources, the DepEd shall continue to promote environmental education as an integral part of the educational system.

7.1.3 From the Department of Education – Bureau of Alternative Learning Systems (BALS)

Incorporation of environmental education in the different alternative learning systems' programs as follows:

- Basic Literacy
- Accreditation and Equivalency System
- Indigenous People's Education

Environmental education is focused in Learning Strand 2-Problems-solving and Critical Thinking in the Basic Literacy; and in the Accreditation and Equivalency System. In the Indigenous People's Education, environmental education is focused on Learning Strand 4-Development of Self and a Sense of Community.

Development of support instructional materials for environmental education, examples of which are as follows:

Basic Literacy Materials

- May Tungkulin Ako sa Kapaligiran
- Sulong Kalikasan Tungo sa Tagumpay

Accreditation and Equivalency-Elementary Level

- Paano Kaya ang Buhay Kung Wala ang mga Halaman
- Paano Kaya ang Buhay Kung Wala ang mga Hayop
- Ating Linisin ang Kapaligiran
- Ano ang Nangyayari sa Ating Kalikasan

Accreditation and Equivalency-Secondary Level

- Ang Bunga ng Kapinsalaan ng Kapaligiran
- Pag-uuri ng mga Halaman
- Isang Pagbabalik Tanaw sa Ating Ecosystem
- Ang Ecosystem
- Pagkokompost

Likewise adopted and translated by the DepEd-BALS were Package Learning Materials on Environment (PLANET) for Sustainable Development:

- Water Pollution (PLANET 1)
- Forest Conservation (PLANET 2)
- Waste Management (PLANET 3)

Networking and building alliance with various sectors, to ensure wider coverage of ALS programs and projects, thru BIGATIN (Building Inter-Agency Ground Alliance Towards Institutionalization Nationwide)

Commitments

Inclusion of environmental messages in all learning materials that will be produced.

Environmental themes shall be included during regular meetings with networks such as NGOs, BIGATIN, etc.

7.1.4 From the Technical Education and Skills Development Authority (TESDA)

Initiatives

Inclusion of environmental concerns in TESDA's programs as follows:

- Village-technologies for community-based agri-fishery training (harnessing community labor and indigenous materials)

- Plant for Life (a social volunteerism project, promoting food self-sufficiency and generating area-based self-employment opportunities

- Occupational Safety and Health, and Environmental Concerns in the Curriculum

* Inclusion of housekeeping and safety practices, waste management (e.g. disposal of used oil, ferric chloride, electrical varnish) in the curriculum of technical and vocational education training courses.

* Inclusion of the Clean Air Act, Environmental Compliance Certificate regulations in the automotive/land transport/ construction and vehicular/refrigeration air conditioning sectors

* Inclusion of recovery/recycling of refrigerants and retrofitting of refrigeration air conditioning system in the vehicular air conditioning-refrigeration courses (training, assessment and certification of refrigeration air conditioning/mobile air conditioning technicians nationwide)

7.1.5 From the Commission on Higher Education

Initiatives

Issuance in 2005 of CHED Memorandum No. 75, specifying the policies, standards and guidelines for the offering of environmental education curricular courses in higher education institutions. Earlier, CHED Memorandum Order No. 288, dated July 5, 1995, invoked appropriate portions of

Philippine Agenda 21, for the programs of higher education institutions.

Availability of mature technologies, thru research, development and extension function of higher education institutions, most especially state universities and colleges such as:

- renewable/non-conventional energy services (solar, wind, water)
- energy conservation and efficiency guides, training and information materials
- environment-friendly technologies

7.1.6 Other Initiatives for Higher Education

With coordination by EMB-DENR of the National Environmental Education Action Plan for Sustainable Development as part of the Philippine initiatives for the United Nations Decade of Education for Sustainable Development, the tertiary education sector thru the Philippine Association of Tertiary Level Educational Institutions in Environmental Protection and Management (PATLEPAM) was quick in assessing the regional status of environmental education in higher education, and drawing up of Regional Action Plans on Environmental Education for Sustainable (for 2005 to 2014), among higher education institutions, particularly by the PATLEPAM Regional Coordinating Centers for the following regions during the 2004 PATLEPAM National Senior Educators' Assembly in Environmental Protection and Management:

1. Region 2
2. Region 3
3. Cordillera Administrative Region
4. Region 5
5. Region 6
6. Northern Mindanao

The general issues identified in the NEEAP for the tertiary education sector are:

1. consider the preparation and competence of teachers for environmental education
2. lack of environmental reference materials in the Philippine setting; development of teachers' guidebook
3. need for innovative teaching strategies to make teaching for environment, interesting
4. establishment of linkages with other higher education institutions, industry, other government agencies and professional organizations

The aforementioned Regional Action Plans on Environmental Education for Sustainable Development generally revolve around environmental interventions in the following functions of the higher education institutions:

1. Instruction
2. Research and Development
3. Extension and Advocacy
4. Production
5. Policy

Shown in **Table 7-1** is a tentative list of universities and colleges in selected regions of the country, which offer specialized undergraduate and graduate degree programs on the environment

Table 7-1. Universities and Colleges with Undergraduate and Graduate Degree Programs Specializing on the Environment

Location	Name of School	Academic Programs
National Capital Region	Miriam College	- Bachelor of Science in Environmental Planning - Ph.D. in Environmental Education - Ph.D in Environmental Studies - M.A. in Education Major in Environmental Education - M.A. in Environmental Management - Master of Science in Environmental Studies - Certificate Courses on the following: * Environmental Education * Environmental Studies * Environmental Management
	De La Salle University-Manila	- Master of Science in Environmental Science and Ecosystems Management
	Technological Institute of the Philippines	- Bachelor of Science in Environmental and Sanitary Engineering
	Mapua Institute of Technology	- Bachelor of Science in Environmental and Sanitary Engineering
	Philippine Women's University	- Bachelor of Science in Environmental Science - Master of Science in Environmental Management

Table 7-1. Universities and Colleges with Undergraduate and Graduate Degree Programs Specializing on the Environment

Location	Name of School	Academic Programs
National Capital Region	University of the Philippines-Diliman	- Bachelor of Landscape Architecture - Certificate Program on Toxic and Hazardous Waste Management - M.S. Environmental Engineering - M.S. Environmental Science - Ph.D. Environmental Science - M.A. Ed. Environmental Education
Cordillera Administrative Region		
Baguio City	Saint Louis University	- Master in Mountain Engineering - Master of Science in Environmental Engineering - Master of Science in Environmental Conservation
Baguio City	University of the Cordilleras	- Bachelor of Science in SanitaryEngineering - Master in Mountain Engineering
Baguio City	University of Baguio	- Bachelor of Science in Sanitary Engineering
La Trinidad, Benguet	Benguet State University	- Bachelor of Science in Environmental Science - Master in Mountain Engineering
Region 1		
City of Batac, Ilocos Norte	Mariano Marcos State University	- Bachelor of Science in Environmental Science
Region 2		
Cagayan	Cagayan State University, Tuguegarao City	- B.S. in Environmental Studies
Isabela	Isabela State University,Cabagan, Isabela	- B.S. in Environmental Studies - M.S. in Environmental Studies
Nueva Vizcaya	Nueva Vizcaya State University, Bayombong, Nueva Vizcaya	- B.S. in Environmental Studies
Region 3 Muñoz, Nueva Ecija	Central Luzon State University	- Environmental Science subject under Elementary Education * Bachelor of Science in Elementary Science * Bachelor of Arts in Social Science - Master of Science in Environmental Management
Cabanatuan City, Nueva Ecija	Nueva Ecija University Science and Technology	- Bachelor of Science in Environmental Science
Tarlac	Tarlac State University	- Bachelor of Science in Environmental Science
Region 4A		
Dasmariñas, Cavite	De La Salle University-Dasmariñas	- Bachelor of Science in Environmental and Sanitary Engineering - B.S. Biology (with concentration in Environmental Science) - M.S. Environmental Science
Los Banos, Laguna	University of the Philippines at Los Banos	- Master of Science in Environmental Science - Ph.D. in Environmental Science
Region 5		
Naga City	Ateneo de Naga University	- A.B. Environmental Management - B.S. Environmental Science - M.S. Environmental Science
Naga City	University of Nueva Caceres	- B.S. Environmental Science

Table 7-1. Universities and Colleges with Undergraduate and Graduate Degree Programs Specializing on the Environment

Location	Name of School	Academic Programs
Naga City	University of Sta. Isabel	- B.S. Human Ecology and Environmental Studies - Master in Management (major in Disaster Management)
Pili, Camarines Sur	Central Bicol State University of Agriculture	- B.S. Environmental Science - B.S. Agro-Ecotourism - M.S. Resource Management - M.S. Disaster Risk Management
Goa, Camarines Sur	Partido State University	- B.S. Environmental and Sanitary Engineering
Legaspi City	Bicol University	- B.S. Geothermal Engineering
Legaspi City	Divine Word College of Legaspi City	- A.B. Economics (with Environmental Economics)
Region 6		
Iloilo City	West Visayas State University	- Advanced Ecology subject under Master of Arts in Education (Biology) - Environmental Chemistry subjectunder * Master of Arts in Chemistry * Doctor of Science Education (Chemistry) - Environmental Science subject underMaster of Arts in Education (Physical Science) - Ecology and Field Study subjectUnder * Bachelor of Science in Biology * Bachelor of Science in Education (Biology, General Science)
Iloilo City	Central Philippine University	- Environmental Communication subject Under * Bachelor of Science in Journalism * Bachelor of Science in Development Communication and Broadcasting - Agroforestry subject under Bachelor of Science in Agriculture - Forest Ecology subject under Bachelor of Science in Forestry - Principles of Tourism, Tourism Planning and Development, Ecotourism Subject under Bachelor of Hotel and Restaurant Management - Environmental Education subject under * Bachelor of Hotel and Restaurant Management * Bachelor of Secondary Education (Social Studies) - Bachelor of Science in Environmental Science
Region 8		
Baybay City and Alang-alang Campus, Leyte	Visayas State University (formerly Leyte State University)	- M.S. Tropical Ecology - B.S. in Biology (major in Terrestrial Ecology) - B.S. in Environmental Management
Tacloban City, Leyte	Eastern Visayas State University	- B.S. in Environmental Science
Can-avid, Eastern Samar	Eastern Samar State University	- B.S. in Agriculture (Agroforestry)
University Town, Catarman, Northern Samar	University of Eastern Philippines	- Masters in Environmental Studies
Region 9		
Zamboanga City	Western Mindanao State University	- B.S. in Environmental Science - B.S. in Ecological and Environmental Engineering
Zamboanga City	Zamboanga State College of Marine Sciences and Technology	- M.S. in Environmental Engineering - B.S. in Marine Biology

Table 7-1. Universities and Colleges with Undergraduate and Graduate Degree Programs Specializing on the Environment

Location	Name of School	Academic Programs
Region 10 Cagayan de Oro City	Mindanao Polytechnic State College	- Master of Science - Doctor of Philosophy Science Education (Straight Program) Major in Environmental Science - Master in Environmental Geotechnics and Management - Master in Environmental Science and Technology - Bachelor of Science in Environmental Science and Technology
	Xavier University Liceo de Cagayan University	- Bachelor of Science in Marine Biology
Iligan City	Mindanao State University-Iligan Institute of Technology	- Master in Management major in Environmental Management - Doctor of Philosophy (Sustainable Development Studies) - Certificate in Sustainable Development Studies - Master in Sustainable Development Studies Areas of Specialization: * Sustainable Resource Management * Sustainable Community Development * Sustainable Economic Development * Sustainable Rural and Urban Planning * Sustainable Environmental Education - Master of Science in Environmental Science Fields of Specialization: * Environmental Planning and Management * Environmental Research * Environmental Education - Master of Engineering, Major in Environmental Engineering - Master of Science in Marine Biology
Bukidnon	Bukidnon State University	- Bachelor of Science in Environmental Science - Bachelor of Science in Management - Master of Science in Agricultural Economics - Master of Science in Agricultural Extension
Camiguin, Misamis Oriental	Camiguin Polytechnic State College	- Bachelor of Science in Eco-Tourism - Master of Science in Environmental Science - Master of Science in Marine Biology - Bachelor of Science in Environmental Science - Bachelor of Science in Marine Biology
Claveria, Misamis Oriental	Misamis Oriental State College of Agriculture and Technology	- Bachelor of Technology in Environmental Engineering - Bachelor of Technology in Environmental Management
Region 11	Davao Oriental State College of Science and Technology	- Bachelor of Science in Environmental Science
	University of Mindanao	- Bachelor of Science in Environmental Science
	University of the Philippines-Mindanao	- Master in Environmental Planning
	Broken Shire College	- Bachelor of Science in Environmental Science
	Philippine College of Technology	- Bachelor of Science in Environmental Science

Table 7-1. Universities and Colleges with Undergraduate and Graduate Degree Programs Specializing on the Environment

Location	Name of School	Academic Programs
Caraga Ampayon, Butuan City	Northern Mindanao State of Institute of Science and Technology	- Bachelor of Science in Environmental Science - Masters in Environmental Management

7.1.7 From the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR)

There are year-round international and nationally significant environmental events that serve as avenues for heightened social mobilization and multi-stakeholder public awareness and education programs that the EMB of the DENR, its central and regional offices, capitalize on, in partnership with various sectors. These events include World Water Day (March 22), International Earth Day (April 22), World Environment Day (June 5), Philippine Environment Month (June), National Clean Up Month (September), International Coastal Clean Up Weekend (Third Weekend of September), Ozone Protection Month (September), International Ozone Day (September 16), National Clean Air Month (November).

The EMB-DENR also engages in the following environmental education activities:

1. environmental materials development (fact sheets, modules, manuals, newsletters, state of environment reports, instructional posters, brochures, television and radio plugs, video documentaries, ecology game boards-website and other promotional materials)

2. environmental seminars/conferences/trainings (for various sectors such as business, other government agencies at the national and local levels, teachers, youth, civil society, media, church, and others)

3. networking with major educational associations, and other umbrella bodies of sectors (Philippine Association of Tertiary Level Educational Institutions in Environmental Protection and Management, Catholic Educational Association of the Philippines, Philippine Association of Colleges and Universities, Philippine Business for Environment, Philippine Chamber of Commerce and Industry, Civil Society Counterpart Council for Sustainable Development, and the other member-institutions of the Sub-Committee on Information and Education of the Philippine Council for Sustainable Development (PCSD) where the DENR thru the EMB acts as chair of the Sub-Committee

From the Other DENR Offices

The DENR, through its various offices like the Special Concerns Office, Public Affairs Office, the Office of Field Operations, Foreign-Assisted and Special Projects Office, and its other bureaus (Protected Areas and Wildlife Bureau, Forest Management Bureau, Ecosystems Research and Development Bureau, Mines and Geosciences Bureau, Lands Management Bureau), and the attached agencies also support the year-round international and national celebrations on the environment. They undertake conferences, seminars, special events, contests, exhibitions and the like to commemorate such dates. They also produce a number of environmental education materials by way of published reports, modules, posters, brochures and the like.

7.1.8 Other Initiatives on Environmental Education

The National Youth Commission's Green Brigade is a program that seeks to encourage youth in their communities to oversee the protection and maintenance of their environment. Executive Order No. 52 mandates the creation of Green Brigades nationwide, a program done in connection with the Sangguniang Kabataan. As such, the Sangguniang Kabataan allocates a portion of its budget towards supporting implementation of environment-related programs.

The Department of Science and Technology, through its various councils/institutes undertakes programs that will ensure that the students receive science-based quality information on environmental issues to encourage the development of environment-friendly solutions, devices, equipment and facilities. These various councils/institutes are the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD); Philippine Council for Advanced Science and Technology Research and Development (PCASTRD); Philippine Council for Aquatic and Marine Research and Development (PCAMRD);

Philippine Council for Health Research and Development (PCHRD); Philippine Council for Industry and Energy Research and Development (PCIERD); Forest Products Research and Development Institute; Industrial Technology Development Institute; Philippine Textile Research Institute; Philippine Atmospheric, Geophysical and Astronomical Services Administration; Philippine Institute of Volcanology and Seismology; National Research Council of the Philippines; Philippine Science High School Campuses; and Science Education Institute (SEI).

The DOST institutes, councils and attached agencies are involved in the development of education materials on environmental issues and concerns. Such materials developed include publication of books, development of modules and pamphlets to be used in teaching complicated concepts on environmental education. These also serve as reference materials for both teachers and students. Aside from printed materials, some activities were also done to complement learning of students, as in materials developed on botanical gardening, composting and the like.

The DOST, through the Philippine Science High School System, integrates environmental education in its curricula by having environmental science as an elective subject. This subject deals with major environmental problems and seeks to inculcate to students the need to solve these problems. However, its curriculum evolved to include major science concepts and environmental issues/concerns about the atmosphere, hydrosphere, lithosphere, energy resources and waste management. Some of the campuses also complement Summer Science Internship Program for incoming third year students to focus on Environmental Studies.

To address the lack of scholarship opportunities which limits the build up of environmental specialists, the DOST promotes excellence in research and development by providing scholarships. The DOST, through PCARRD provides scholarship grants for graduate studies on agriculture, forestry and natural resources. Also, the SEI, together with PCHRD, PCASTRD, PCIERD, PCAMRD, provide scholarship grants for graduate studies on Environmental Science through the implementation of the Accelerated Science and Technology Human Resource Development Program.

There are also a number of civil society organizations/non-government organizations and peoples' organizations which are into constituency-building/advocacy/education programs, some cross-sectoral, and some specialized, on the environment.

Environmental Administration

National State of the Brown Environment Report

8. Environmental Administration

Beginning the mid 1990's, the Philippine government's efforts were seen to have increased in the areas of environmental protection and natural resources conservation. The Rio de Janeiro's Earth Summit in 1992 could be regarded as a major catalyst to countries' participation as signatories to multilateral environmental agreements (including the Philippines'). These countries adopted and are supporting the implementation of a Global Agenda 21 on sustainable development. Subsequently, Philippine Agenda 21 was also adopted with a framework that features list of strategic action plans for the country's environment and sustainable development activities. In support of the Philippine Agenda 21 was the creation of the Philippine Council for Sustainable Development.

Through time, major environmental laws with their updated implementing rules and regulations that the EMB-DENR coordinates in implementation are:

- Presidential Decree 1586, the Philippine Environmental Impact Statement (EIS) System (1978)
- Republic Act 6969 or the Toxic Substances, Hazardous and Nuclear Wastes Control Act (1990)
- Republic Act 8749 or the Philippine Clean Air Act (1999)
- Republic Act 9003 or the Ecological Solid Waste Management Act (2001)
- Republic Act 9275 or the Philippine Clean Water Act (2004)

8.1 EMB Organizational Structure and Budget

The EMB has been transformed from a staff to a line bureau under the DENR. Its line bureaus status originated from the Philippine Clean Air Act of 1999 or RA 8749. There is an EMB Central Office and 16 Regional Offices nationwide **Figure 8-1** shows the EMB's organizational structure. The EMB budgetary appropriations from 2005 to 2007 are shown in **Table 8-1**.

Table 8-1. Budget of EMB, Calendar Year 2005 – 2007

Year	Appropriations, PhP
2005	287,045,000
2006*	287,045,000
2007	343,077,000

Source: EMB-DENR
*Re-enacted RA 9336

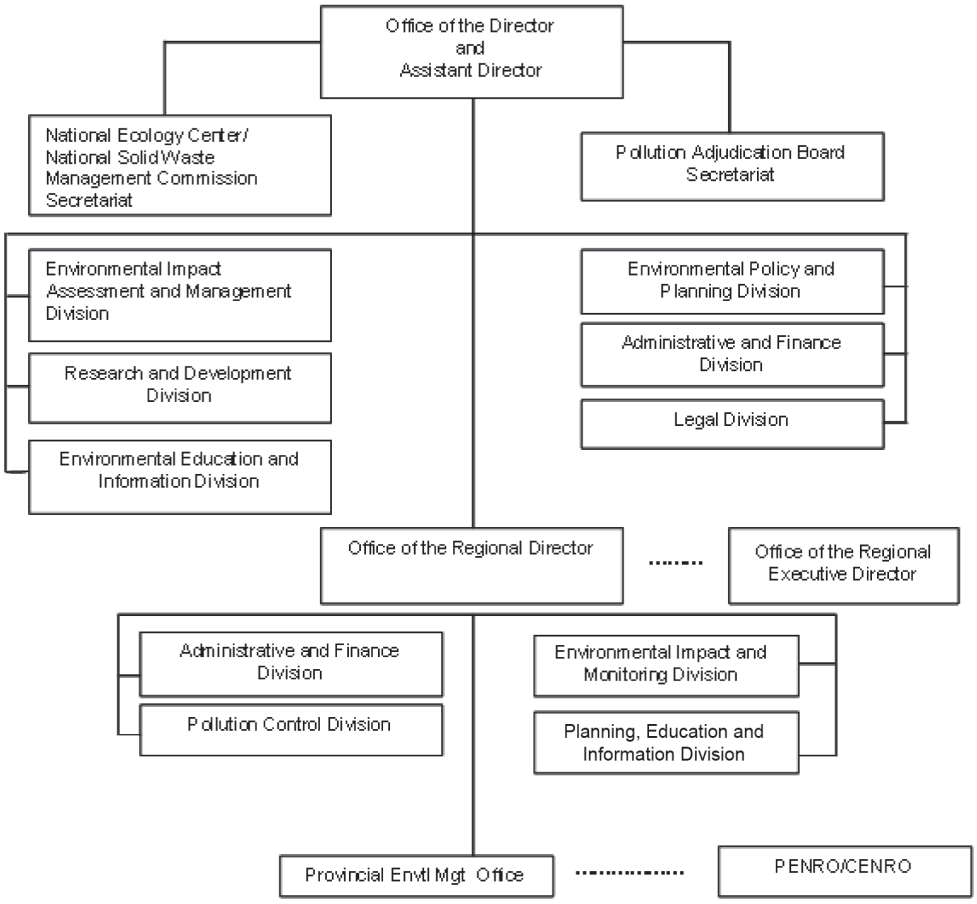


Figure 8-1. EMB Organizational Structure

8.2 Personnel Administration

To date, and based on DAO No. 17-2002 dated July 24, 2002, which defines the Organizational Structure and major responsibilities of the agency as a line bureau by virtue of Section 34 of the Philippine Clean Air Act (R.A 8749), the EMB Central Office and 16 regional offices nationwide have a total human power strength of 1,074 personnel. The inadequacy of regular/permanent staff is regularly augmented by casual, contractual (PS 101), and Object 29 types of hiring.

8.3 Personnel Capacity-Building

Trainings and capacity building programs are regularly conducted for the technical and administrative support personnel of the EMB. This is being done frequently, both mainly for the reason that the EMB has a broad mandate for five major environmental laws and a number of national commitments to multilateral environmental agreements. Likewise, there is a compelling need to fasttrack its efforts in accordance with the requirements and implementation of these frameworks. Multi-tasking for most of EMB's technical staff is then a necessity.

8.4 Pollution Adjudication Board

The Pollution Adjudication Board (PAB) is a quasi-judicial body created under Section 19 of Executive Order 192 for the adjudication of pollution cases.

Organizationally, the PAB is under the supervision of the Office of the DENR Secretary, the Department of Environment and Natural Resources (DENR) while the EMB is the one mandated by law to provide Secretariat support to the PAB.

The PAB's Organizational Placement is co-equal with the Regional Trial Court under *Section 7 (d) of PD 984 - Execution of decision ...Any decision or order of the Commission, after the same has become final and executory, shall be enforced and executed in the same manner as decisions of Courts of First Instance, ...*

8.4.1 Jurisdiction

As a quasi-judicial body, it assumes the powers and functions of the former National Pollution Control Commission with respect to the adjudication of pollution cases under Republic Act 3931 (Pollution Control Law) and

Presidential Decree 984 (National Pollution Control Decree of 1976). Its function was further expanded with the enactment of the Clean Air Act of 1999 (RA 8749) and the Clean Water Act of 2004 (RA 9275).

8.4.2 Gaps and Problems in the Adjudication of Pollution Cases

In the adjudication of pollution cases under the previous rule, the Board recognizes some problems in the implementation of the applicable environmental laws. Some of the main problems concern the following issues:

1) Acquisition of jurisdiction by the Board;

2) Graduation of fines and penalties;

3) Harmonizing administrative regulations and the statute;

4) Uniform interpretation of the statute;

5) Outdated procedure in the adjudication of cases since the PAB's procedure (PAB Resolution 1-C, Series of 1997 entitled "Revised Rules of the Pollution Adjudication Board (PAB) on Pleading, Practice, and Procedure in Pollution Cases") is still anchored on PD 984.

8.4.3 Measures Undertaken

To address the above concerns, the Board revised the old rules for the adjudication of pollution cases and framed new rules for the imposition of fines and penalties.

At present, the Board is in the process of creating the Revised PAB Procedural Rules that would finally settle the issues regarding adjudication procedures. Likewise, the Fine Ratings System under the Clean Water Act is also being drafted by the PAB that will be used later on for the determination of imposable fines upon respondent firms.

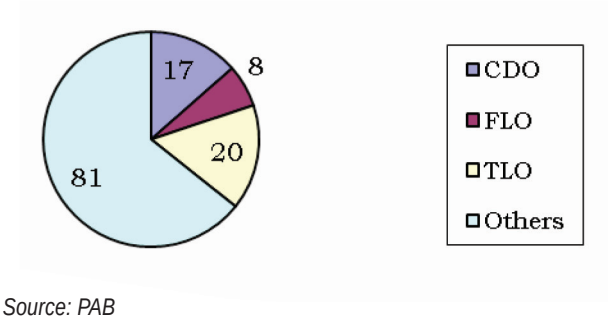
In the meantime, for violations falling under the CWA, the minimum fine (i.e. PhP 10,000.00) is being imposed per day of violation.

To expedite the process of adjudication for those cases whose only remaining issue is the determination of fines, the PAB has devised a subgroup called the PAB Committee of Fines[1] to come up with a recommendation for the Board during its regular meeting. This has been the practice of the PAB since 2002.

8.4.4 Cases Handled from 2006 to 2007

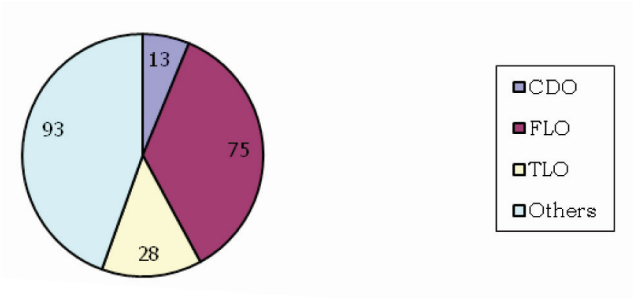
Cease and Desist Orders (CDO)

In 2006, the PAB issued 17 Cease and Desist Orders (CDO) shown in **Figure 8-2**. Ten of these were from the NCR which accounted for 58.82 percent of the total closure orders issued by the Board. Four were from CALABARZON which accounted for 23.53 percent of the said closure orders. Three of these were violations of both RA 9275 and RA 8749, five are purely air pollution cases while the rest are water pollution cases.



Source: PAB

Figure 8-2. Pollution Cases Handled in 2006



Source: PAB

Figure 8-3. Pollution Cases Acted Upon in 2007

As shown in **Figure 8-3,** the PAB issued 13 Cease and Desist Orders (CDO) in 2007. Five of these were from the NCR which accounted for 38.46 percent of the total closure orders issued by the Board. Four of these were violations of both RA 9275 and RA 8749 while the rest were violations of RA 9275 and hence, are by nature, water pollution cases.

Temporary Lifting Orders (TLOs)

Also in 2006, the Board issued a total of 20 Temporary Lifting Orders (TLO). On the other hand, in 2007, the Board issued a total of 28 TLOs to 18 different companies.

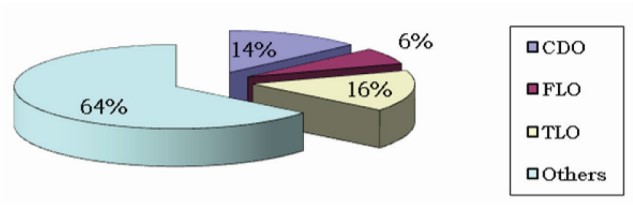
Other Directives

In 2007, the Board issued a total of 93 directives in the form of orders for re-sampling, denial of motion, fine imposition, hold in abeyance pending the submission of certain requirements, reiteration of CDO, Show Cause etc.

Formal Lifting Orders (FLOs)

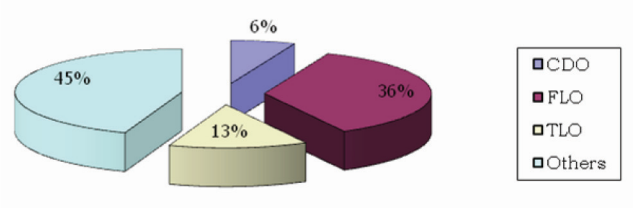
The PAB was able to resolve 75 cases in 2007. Among these were issuances of 27 Formal Lifting Orders (FLOs) while the rest were dismissed either for lack of jurisdiction or for having been inactive for more than 10 years pursuant to PAB Resolution No. 3, Series of 2006.

8.4.5 Analysis and Interpretation



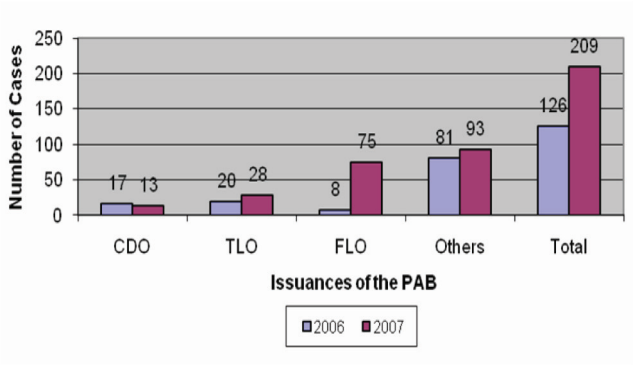
Source: PAB

Figure 8-4. Percentage Breakdown of the Pollution Cases Acted Upon in 2006



Source: PAB

Figure 8-5. Percentage Breakdown of the Pollution Cases Acted Upon in 2007



Source: PAB

Figure 8-6. 2006 vs. 2007 Accomplishments

In 2007, the PAB acted upon 201 pollution cases involving 128[1] companies nationwide. Six percent of these pollution cases that were deliberated by the Board resulted to issuances of CDOs while 11 percent resulted to issuances of TLOs. It can be observed that there seems to be a disparity in the above figures for the closure and temporary lifting orders issued by the Board. The reason for this is some of the existing TLOs were issued further extensions as warranted by the circumstances surrounding the case which accounted for the said difference in figures.

Further, the Board was able to resolve 37 percent of all the cases set for deliberation in 2007. This is so much greater than the percentage of closure orders it issued for same the year. This may be due to the fact that the volume of cases elevated before the Board is very small compared to the existing cases pending before the Board since 1988. This is also because the thrust of the current Board is to reduce the number of pending cases that have been inactive through the years by dismissing those cases that had been pending before the Board for more than 10 years due to delays not attributable to the respondent firms as well as those cases involving noise and other forms of nuisance[2] that were devolved to the Local Government Units (LGUs).

8.4.6 Recommendation

Less than a decade after the passage of the Clean Air Act of 1999, the anticipated increase in the number of air pollution cases has yet to materialize. This may be due to non-uniformity in the interpretation of the law with respect to the elevation of cases to the Board.

There is a need to renew campaign for disposing of archived cases.

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