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NATIONAL AIR QUALITY STATUS REPORT

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NATIONAL AIR QUALITY STATUS REPORT 2021





Department of Environment and Natural Resources Environmental Management Bureau Environmental Quality Management Division Air Quality Management Section

NATIONALAR 2021 OUALITY Status Report

MESSAGE

The National Air Quality Status Report (NAQSR) for CY 2021, a comprehensive reflection of our nation's atmosphere, not only underscores the levels of pollutants affecting our air but also highlights the effectiveness of national policies aimed at safeguarding public health and the environment.

The NAQSR is designed to be a vital tool for public awareness and transparency. By making this information accessible to all, we aim to empower the public with knowledge about the extent of air pollution in the country, its primary sources, and the effectiveness of the government's ongoing efforts. Through this, we hope to foster a deeper understanding of the air quality challenges we face, and the solutions being pursued.

The report also provides critical insights into the air quality performance of various industries, reinforcing our commitment to transparency and accountability in addressing air quality issues.By doing so, we ensure that all sectors of society are involved in achieving cleaner air for the present and future generations.

As we continue to combat air pollution, the Department of Environment and Natural Resources (DENR), through the Environmental Management Bureau (EMB), reaffirms its commitment to uphold the principles of Republic Act 8749 or the Philippine Clean Air Act of 1999.

Together, we will work towards a future where clean air is a reality for every Filipino.

Abatement of the country's air pollution is one of the priority programs of the Department of Environment and Natural Resources (DENR). Under Republic Act 8749 or the Philippine Clean Air Act of 1999, the DENR through its Environmental Management Bureau (EMB), is continuously devising strategies in coming up with effective tools as basis in making decisions and policies for cleaner air. One such tool is the development of this National Air Quality Status Report (NAQSR) for CY 2021.

On behalf of the DENR, I commend the EMB for the comprehensive development of this NAQSR for CY 2021. This report provides a detailed assessment of the air quality management in the country. It also offers a clear analysis of the current air quality situation, emerging trends, and future projections, while identifying key programs and areas that require ongoing monitoring and intervention.

The unwavering commitment of our EMB's Central and Regional Offices, in partnership with various agencies and stakeholders, in providing recommendations for both Executive and Legislative actions, as reflected in this Report, manifest their desire to achieve a better air quality for our Filipino people.

This NAQSR for CY 2021 is particularly significant as it captures the air quality trends and events of the year 2021, including the EMB's proactive responses to air quality challenges at the time of COVID-19 pandemic. It addresses air pollution management, updates on the National Ambient Air Quality Guideline Values, and improvements in the designation, operation, and monitoring of Air Quality Monitoring Stations.

This Report also showcases EMB-led projects and policy developments aimed at implementing the Clean Air Act of 1999 effectively at both the national and regional levels.

Achieving cleaner, safer, and healthier air is crucial in realizing the DENR's vision of a nation that enjoys and sustains its natural resources while fostering a clean and healthy environment for all. And the DENR remains fully committed in supporting the EMB towards its efforts to achieve this vital goal.



ATTY. WAN MIGUEL T. CUNA, CESO I Undersecretary for Field Operations and Supervising Undersecretary for EMB & MGB Luzon and Visyas

JOSELIN MARCUS E. FRAGADA, CESO III Undersecretary for Field Operations and Supervising Undersecretary for EMB & MGB Mindanao

A MESSAGE FROM THE EMB DIRECTOR

On behalf of the Environmental Management Bureau of the Department of Environment and Natural Resources, we are pleased to present the National Air Quality Status Report (NAQSR) for CY 2021.

This publication is a comprehensive technical report of the air quality situation in the Philippines for 2021, the second year of the COVID-19 pandemic, where air quality nationwide has improved, especially in terms of PM10 and PM2.5, as there was limited movement in transportation and mobility, because of the new normal.

The NAQSR also covers discussion on best practices and challenges encountered in air quality management, efforts and contributions of the EMB Central and Regional Offices, as well as other national government agencies, local government units and various stakeholders in the implementation of RA 8749, or the Philippine Clean Air Act of 1999.

Also included in this Report are the status of approved, current and other policies and programs that are under development, the status of the updating of various air quality standards, guideline values, other EMB-led projects on air quality management, and accomplishments of the Regional Offices in their respective Air Quality Management programs.

The NAQSR is just one of the many efforts and initiatives of the EMB in ensuring the attainment of clean, safe and healthy air for all Filipinos. We are very thankful to our officials, staffs, partners and stakeholders for making this possible. Together, let us all act for cleaner, safer and healthier air.

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ENGR. GILBERT C. GONZALES, CESO III EMB Director and concurrent Assistant Secretary for Field Operations

PREFACE

As a continuing white paper prepared by the Department of Environment and Natural Resources - Environmental Management Bureau, the National Air Quality Status Report (NAQSR) has been providing the summary of the Institutional mechanisms, status of air quality, challenges, opportunities, and ways forward in managing air quality. This latest NAQSR covering the year 2021 highlights policies that were implemented on both local and national scale, and the actions of the Airshed Governing Boards (AGBs) in each region which contribute to the improvement of air quality in their respective areas. Environmental agencies around the country are being equipped with new skills and information with the updating of the National Ambient Air Quality Guideline Values (NAAQGV) and limits on Hazardous Air Pollutants (HAZAP), and the implementation of new guidelines related to the operation of Air Quality Monitoring Stations (AQMS) nationwide. Stocktaking activities. capacity building, and the retooling of skills of regional office staff, which includes but is not limited to basic meteorology training, air dispersion modeling training, and field air sampling training, further emphasize this trend. This report also covers the air quality management approach in the second year of the global pandemic brought about by COVID-19. Contents include reports on the state and trends of air pollution during the pandemic and during the period where limited economic and transport activities are re-opening. The report also contains actions from the regional offices and initiatives from the government agencies and stakeholders, with recommendations for necessary executive and legislative action. The identification of critical areas, activities, or projects that will need closer monitoring or regulation are included in the way forward. On the regional level, the AGBs and LGUs have focused on approaches related to the testing of air stacks present in industrial establishments and the general compliance of industries with existing air emission guidelines in the country is also covered. Other relevant policy decisions such as the planned Electric Vehicles Industry Development Act (EVIDA) would also be discussed. Upon the approval of the Secretary of the Department, the National Air Quality Status Report shall be submitted to the office of the President and Congress on or before March 31 of every year and shall cover the preceding calendar year.



EXECUTIVE SUMMARY

As of 2021, the air quality nationwide in terms of PM₁₀ has notably improved in the last eight years. The annual average decreased by 56.77%, from 60.49 μ g/Ncm in 2012 to 26.15 μ g/Ncm in 2021. A possible explanation for the sharp decrease of PM₁₀ between years 2019 and 2020 is the limited human movement and economic activity during the declaration of community quarantine period starting March 2020. Aside from the year 2014, the national average of PM_{2.5} emission levels has been in compliance with the national guideline value. Aside from peaks in years 2014, 2017, and 2019, the general trend of PM_{2.5} in NCR is generally downward, reaching a value of 17.83 μ g/Ncm in 2021.

The National Emission Inventory (NEI) for the years 2019-2021 highlights critical insights into the sources of air pollution across the nation. Mobile sources emerge as the predominant contributor, accounting for a substantial 56.04% of total emissions. Stationary sources follow closely behind, responsible for 35.36% of emissions, underlining the significance of regulating industrial and commercial activities. Additionally, area sources contribute 8.60% to the overall emissions profile, underscoring the importance of addressing diverse localized pollution sources.

The NAQSR 2021 also emphasizes the status of the approved policies, policies under development, and central to regional projects that have important impacts on air quality. The approved policies include the adoption of interim protocols in the conduct of remote site activities during COVID-19 Pandemic, manuals for Siting Criteria and design of the Philippine Air Quality Monitoring Stations, as well as manuals for data handling conventions for criteria air pollutants, establishment of the network centers that monitors CEMS and clarificatory policy on the source-specific monitoring and reporting results to include standard oxygen correction factor. In relation to the air quality status of five EMB projects that have important impacts on air quality are reported, namely, the studies on PUJ modernization, the review of NESSAP and Updated Guideline Values for Hazardous air pollutants in ambient air, updating the standards and methods for air quality measurement and projects by the regional offices.



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LIST OF ABBREVIATIONS

AAQS	Ambient Air Quality Standards			
AAQMS	Ambient Air Quality Monitoring Stations			
APMMN	Asia Pacific Mercury Monitoring Network			
AQ MIS	Air Quality Management Information System			
AQGV	Air Quality Guideline Value			
AQI	Air Quality Index			
AQMF	Air Quality Management Fund			
AQMgtS	Air Quality Management System			
AQMS	Air Quality Management Section			
As	Arsenic			
ASBU	Anti-Smoke Belching Units			
ASGB	Airshed Governing Board			
АТМ	Air Traffic Management			
BAM	Beta Attenuation Monitor			
BLISTT-ASGB	Baguio-La Trinidad-Itogon-Sablan-Tuba-Tublay Airshed Governing Board			
BPB ASGB	Bulacan Pampanga Bataan Airshed Governing Board			
BRT	Bus Rapid Transit			
CAA	Clean Air Act			
CAAQMS	Continuous Ambient Air Quality Monitoring System			
CAR	Cordillera Administrative Region			
Cd	Cadmium			
CDTA	Capacity Development Technical Assistance			
CEMS	Continuous Emission Monitoring System			
CENRO	City Environment and Natural Resource Office			
CHED	Commission on Higher Education			
CME	Coco-Methyl Ester			
CNG	Compressed Natural Gas			
со	Carbon Monoxide			
CO2	Carbon Dioxide			
coc	Certificate of Conformity			
CREVI	Comprehensive Road Map on the Electric Vehicle Industry			
C.Y.	Calendar Year			
DA	Department of Agriculture			
DAO	Department Administrative Order			
DENR	Department of Environment and Natural Resources			
DepEd	Department of Education			
DILG	Department of Interior and Local Government			



LIST OF ABBREVIATIONS

DLSU	De La Salle University
DOAS	Differential Optical Absorption Spectroscopy
DOE	Department of Energy
DOF	Department of Finance
DOH	Department of Health
DOST	Department of Science and Technology
DoTr	Department of Transportation
DPWH	Department of Public Works and Highways
DTI	Department of Trade and Industry
EANET	Acid Deposition Monitoring Network in East Asia
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EMB	Environmental Management Bureau
ENRO	Environment and Natural Resources Office
EO	Executive Order
EPSL	Environment and Pollution Studies Laboratory
ERLSD	Environmental Research and Laboratory Service Division
EVIDA	Electric Vehicle Industry Development Act
GDP	Gross Domestic Product
GHG	GreenHouse Gases
H2S	Hydrogen Sulfide
Hg	Mercury
IG	Implementing Guidelines
IIS	Integrated Information System
IRR	Implementing Rules and Regulations
JAO	Joint Administrative Orders
LGU	Local Government Unit
LpM	Liters per Minute
LRT	Light Rail Transit
LTFRB	Land Transportation Franchising and Regulatory Board
LTO	Land Transformation Office
MC	Memorandum Circular
MO	Memorandum Order
MV	Motor Vehicles
MVIC	Motor Vehicle Inspection Centers
MVIS	Motor Vehicle Inspection System
NAAQGV	National Ambient Air Quality Guideline Value
NAQSR	National Air Quality Status Report

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LIST OF ABBREVIATIONS

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NCR	National Capital Region			
NEHAP	National Environmental Health Action Plan			
NEI	National Emissions Inventory			
NESSAP	National Emission Standard for Source Specific Air Polutants			
NGA	National Government Agencies			
NGO	Non-Governmental Organizations			
NO ₂	Nitrogen Dioxide			
NOx	Nitrogen oxides			
NSO	National Statistics Office			
O3	Ozone			
OPMS	Online Permitting and Monitoring System			
PAGASA	Philippine Atmospheric Geophysical Astronomical Services Administration			
PAHs	Polycyclic Aromatic Hydrocarbons			
Pb	Lead			
PCA	Partnership for Clean Air			
PCO	Pollution Control Officer			
PD	Presidential Decree			
PETC	Private Emission Testing Center			
PM	Particulate Matter			
PM10	Particulate Matter with aerodynamic diameter less than 10 micron			
PM2.5	Particulate Matter with diameter less than 2.5 microns			
PMS	Particulate Matter System			
POPs	Persistent Organic Pollutants			
PTO	Permit to Operate			
PUB	Public Utility Bus			
PUV	Public Utility Vehicle			
QA	Quality Assurance			
QC	Quality Control			
RA	Republic Act			
RCM	Rotary Club of Makati			
RO	Regional Office			
SO2	Sulfur Dioxide			
SOx	Sulfur Oxide			
тс	Tricycle			
TEOM	Tapered Element Oscillating Microbalance			
UP-IESM	University of the Philippines - Institute of Environmental Science			
	and Meteorology			
US EPA	United States Environmental Protection Agency			
UV	Utility Vehicle			
VOCs	Volatile Organic Compounds			
WHO	World Health Organization			
XRF	X-Ray Fluorescence			
Kerke sta				

NATIONAL AIR QUALITY STATUS REPORT 2021



OVERVIEW OF THE REPUBLIC OF THE PHILIPPINES

300,000 km² LAND AREA [1]

17 REGIONS

QUEZON CITY

MANILA CAPITAL OF THE PHILIPPINES

113.9 MILLION POPULATION (2021) [2]

1.5 % ANNUAL POPULATION GROWTH RATE, 2021 [3] 71 (F), 67 (M) LIFE EXPECTANCY (2021) [4]

93.5% LITERACY RATE OF PERSONS > 5 YEARS OLD , PSA 2020 [5]

3,548.83 USD GDP (2021) [6]

- DATA SOURCES: 1 Philippines Place Explorer Data Commons 2 https://www.indexmundi.com/philippines/religions.html 3 http://www.healthdata.org/philippines





POLICY AND INSTITUTIONAL ASPECT IN AIR QUALITY MANAGEMENT

The Philippine Clean Air Act of 1999 (RA 8749) serves as the principal legislation delineating the government's responsibility to safeguard and enhance the public's entitlement to a healthy and ecologically balanced natural environment. RA 8749 also incorporates provisions for establishing a nationwide program on air pollution management, underscoring the accountability of polluters for exceeding acceptable pollution thresholds. Its overarching goal is to ensure clean air for all, recognizing it as a fundamental human necessity and fostering cooperation between the government and citizens.

Air Quality Management primarily falls under the jurisdiction of the Department of Environment and Natural Resources (DENR), administered through its line agency, the Environmental Management Bureau (EMB). While the DENR is tasked with the conservation, management, and sustainable utilization of the nation's environmental resources, including forests, mineral reserves, and public lands, the EMB is responsible for formulating strategies, programs, and environmental quality standards to prevent pollution and safeguard natural habitats.

RA 8749, also known as the Clean Air Act of 1999, facilitated the transformation of the EMB from a staff bureau to a line bureau. The execution of RA 8749 is overseen by the Air Quality Management Section (AQMS) within the Environmental Quality Management Division (EQMD) of the EMB's Central Office, in collaboration with the EMB Regional Office's Environmental Monitoring and Enforcement Division (EMED) and Clearance and Permitting Division (CPD).

The respective roles of other Philippine government agencies in Air Quality Management, as delineated by RA 8749, are detailed in Table 1.



AGENCIES	BASIS UNDER THE RA 8749	ROLES
Department of Transportation (DoTr)	Section 21 Section 25 Section 46	The DoTr is mandated to implement emission standards for motor vehicles (every two years), impose fines and penalties for violating these standards, and conduct emission testing activities. It is also mandated to establish the roadside Motor Vehicle Inspection System (MVIS).
Department of Trade and Industry (DTI)	Section 21 Section 22 Section 46	The DTI contributes to the requisite regulations and training programs to ensure that vehicles and engines conform to certified emission standards as prescribed by the other government agencies as part of the provisions of the Clean Air Act.
Bureau of Product Standards (BPS)		The BPS is consulted on setting specifications for all types of fuel and fuel-related products for the improvement of their composition with the goal of increased efficiency and reduced emissions. These specifications are adopted by the BPS as the Philippine National Standards (PNS).
Bureau of Import Services (BIS)	IRR Rule XII, Section 2	The BIS formulates regulations and guidelines that will ensure rebuilt and imported secondhand motor vehicles and engines will satisfy the emission standards as prescribed in the Clean Air Act.
Department of Energy (DoE)	Section 26	The DoE is the primary consulting agency setting the specifications for fuel composition for increased efficiency and reduced emissions. It also specifies the permissible content of additives in all types of fuels and other fuel-related products. These standards are primarily based on existing public health research studies on threshold levels of air pollution exposure.





Table 1. National Governmental Agencies and their roles as per RA 8749. (continued)

THE RA 8749	ROLES
Section 15 Section 22 Section 26 Section 33 Section 31	The DOST coordinates with DENR to establish a National Research and Development Program for the prevention and control of air pollution. This specifically focuses on the development of methods used in various industries to achieve this goal.
	The Industrial Technology Development Institute (ITDI-DOST) conducts research and development on multiple initiatives related to the management of the environment, such as laboratory/hazardous waste management and biomass and animal industry waste management.
	PNRI regulates all projects that utilize or handle radioactive material and nuclear technologies.
	PAGASA regularly monitors various meteorological factors affecting the environment, which includes the levels of
	greenhouse gases and ozone. They coordinate with the DENR to effectively guide air pollution monitoring and standard-setting activities.
IRR, Part V, Section 3	PSA's role is to design the computerized Air Quality Database, which contains data from the Ambient Air Monitoring Network and the Emissions Inventory and is accessible to the public.
Section 8	DILG, alongside the individual LGUs, are tasked to prepare and develop action
Section 10 Section 24 Section 36 Section 37 Section 7	plans consistent with the Integrated Air Quality Framework, which includes provisions for the attainment and management of air quality standards within designated airsheds and includes the designation of non-attainment areas.
	Section 15 Section 20 Section 33 Section 31 IRR, Part V, Section 3 Section 10 Section 24 Section 37 Section 37 Section 37 Section 37



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AGENCIES	BASIS UNDER THE RA 8749	ROLES
Department of Interior and Local Government – Local Government Unit	Section 8 Section 10 Section 24 Section 36 Section 37 Section 7	These agencies are part of the process of carrying out the Air Quality Control Action Plan consistent with the previously mentioned framework. They have authority to enforce the action plan and its provisions for their local jurisdictions. Prepare and implement a program for designation of non-attainment areas;
Department of Education		
Department of Agriculture	Section 39	These agencies are all tasked to promote continuing information and educational campaigns on air quality management alongside the DENR.
Philippine Information Agency		





5



MANDATE

The DENR-EMB's mandate on air quality management is to implement the following national environmental laws:

Presidential Decree 1586, s. 1978 (Environmental Impact Statement System)

PD 1586, or "Establishing an Environmental Impact Statement System, Including Other Environmental Management Related Measures and for Other Purposes," was enacted in 1978. This decree formally established the Environment Impact Assessment System to facilitate a procedure for identifying the environmental impacts of any public projects, ensuring the rational and orderly balance between socio-economic development and environmental protection. The EIA is intended to be a planning and management tool for the use of decision makers in the government and proponents in other sectors and communities to address possible negative risks and consequences caused by projects to the environment.

Republic Act 8749 (Clean Air Act of 1999)

The provisions of RA 8749 aim to achieve and maintain clean air throughout the Philippines. The National Air Quality guideline values for criteria pollutants is one of the primary standards that all cities and municipalities need to meet, and it is important to keep this in mind while establishing development policies that inevitably affect the environment as much as it does the economy, between socio-economic development and environmental protection. The EIA is intended to be a planning and management tool for the use of decision makers in the government and proponents in other sectors and communities to address possible negative risks and consequences caused by projects to the environment.

Republic Act 9003 (Ecological Solid Waste Management Act of 2000)

The provisions of RA 9003 under Section 48 emphasizes that all kinds of open burning of solid wastes are prohibited and are punishable by penalties and fines. EIA is intended to be a planning and management tool for the use of decision makers in the government and proponents in other sectors and communities to address possible negative risks and consequences caused by projects to the environment.

Executive Order 320, s. 2004

EO 320 designates the EMB as the designated agency as the National Authority as required of participating countries to the Clean Development Mechanism (CDM) as part of the Kyoto Protocol created by the UN Framework Convention on Climate Changes (UNFCCC).





IANDATE

The DENR-EMB's mandate on air quality management is to implement the following national environmental laws:

Republic Act 9729 (Climate Change Act of 2009)

Republic Act 9729 (Climate Change Act of 2009)

Section 5 of RA 9729 enumerates the composition of the Climate Change Commission, where the Secretary of the Department of Environment and Natural Resources is part of the Advisory Board. In Section 13, it is said that in the formulation of the National Climate Change Action Plan, the identification of greenhouse gas (GHG) mitigation potentials shall be included. Although the GHG are defined in the Act as the constituents of the atmosphere that contribute to the greenhouse effect, but not limited to carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride, some of which are not yet included in the regular air quality monitoring of DENR-EMB. Section 15(c) states that the role of DENR is to oversee the establishment and maintenance of a climate change information management system and network, including on climate change risks, activities and investments, in collaboration with other concerned national government agencies, institutions and LGUs.

Executive Order 489, s. 1991

EO 489 institutionalized the Interagency Committee on Environmental Health (IACEH), which is composed of several heads of government agencies tasked with the formulation and implementation of policies, guidelines, and programs for environmental health protection. They are also in charge of the National Environmental Health Action Plan (NEHAP). One of the seven sectoral groups for the NEHAP as detailed in the implementing guidelines of EO 489 is the Air Quality and Health Sector, the chairperson of which is the secretary of DENR and vice-chairperson is the secretary of DOTr.

Executive Order 192, s. 1987

EO 192 restructured the EMB to its present configuration and provided it with its mandates for the development of environmental standards, formulation of rules and regulations on the use of natural resources, and provision of assistance to other government agencies on the implementation of relevant programs and policies. Under the provisions of this executive order, the EMB is mandated to provide research and laboratory services and serve as secretariat in the adjudication of pollution cases.





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FUNCTIONS

The EMB has many functions in developing and implementing environmental laws, such as advising the DENR Secretary on matters relating to environmental management. The EMB formulates plans and policies and sets appropriate environmental quality standards (for water, air and noise pollution) for the prevention, control of pollution and protection of the environment, and exercises direct supervision over its regional offices in the implementation of plans and programs. The central and regional offices of the bureau discharge both staff and regulatory functions.

This agency also has the authority to issue permits and clearances (that fall under the scope of RA 8749, RA 9003, RA 9275, RA 6969, and PD 1586) and monitor compliance with said laws. They also provide secretariat support to the pollution adjudication board (per EO 192), the Interagency Committee on Environmental Health (IACEH, per EO 489), and to the National Solid Waste Management Commission (as provided for in Section 4 of RA 9003.

The functions of the EMB also include the development and implementation of a research and development program in support of environmental monitoring, compliance to environmental measures, studies on existing and potential environmental problems and issues, and implementation of systems for the recognition of environmental laboratories. The agency would also promote measures to disseminate information and educational campaigns to encourage participation of an informed citizenry in environmental quality planning and monitoring. The EMB would serve as a focal point agency for international agreements and commitments including activities as part of international delegations.

OUR VALUES

VISION

A nation empowered to protect our finite natural resources, attuned to the pursuit of sustainable development, for a clean and healthy environment that enhances the Filipino quality of life for present and future generations

MISSION

To protect, restore, and enhance environmental quality towards good public health, environmental integrity, and economic viability.







STATUS OF DEVELOPMENT OF NEW POLICIES ON AIR QUALITY

Several Memorandum Circulars of the EMB in 2021 related to air quality management [7] are approved as per C.Y. 2021 and are listed in Table 2.

Table 2. Air Quality Management policies that are approved in C.Y. 2021

Document Numbe	er Title	Date Approved
EMB MC 2021-02	Adoption of Interim Protocols in the Conduct of Remote Site Activities in the Implementation of all laws under the Mandate of Environmental Management Bureau (EMB) during the COVID-19 Pandemic	January 28, 2021
EMB MC 2021-06	Adoption of the Manual for Siting and Design of Philippine Air Quality Monitoring Stations	May 03, 2021
EMB MC 2021-07	Manual on Data Handling Conventions for Criteria Air Pollutants	May 03, 2021
EMB MC 2021-14	Establishment of an Integrated Air Quality Network Center that Monitors and Serves as Repository of Real-Time Industrial Emission from Firms required to Install Continuous Emissions Monitoring Systems (CEMS) / Continuous Opacity Monitoring System (COMS) through the use of a Uniform Data Acquisition and Handling System (DAHS), and in relation to clarify pertinent provisions of Department Administrative Order No. 2017-14	August 16, 2021
EMB MC 2021-15	Clarifying the requirements stated under Section	October 12, 2021





EMB MEMORANDUM CIRCULAR NO. 2021-02

Adoption of Interim Protocols in the Conduct of Remote Site Activities in the Implementation of All Laws Under the Mandate of the Environmental Management Bureau (EMB) During the COVID-19 Pandemic [8]

OBJECTIVE

To ensure effective implementation of all environmental laws covered by the EMB's mandate, the use of remote technologies when field monitoring, validation, inspection, assessment, and other field activities (hereinafter referred to as site activities) which may not be physically possible in view of the reasonable circumstances which may pose a great risk, or otherwise prohibited by law, during the COVID-19 pandemic is hereby adopted.

PROTOCOLS ON CONDUCT OF REMOTE SITE ACTIVITIES

All concerned officials and personnel shall adhere to protocols in evaluating the compliance of the industry, proponent, operator, and third-party environmental service providers, etc. for all environmental laws. This includes the performance of site activities through remote platforms such as Microsoft Teams or Zoom.

An issuance of Notice of Conduct of Remote Site Activity is required for any concerned party at least seven working days before the conduct of any activity, and an entry meeting or conference needs to be done prior to discuss the purpose of the activity, areas subject to remote monitoring, validation, inspection, assessment, and any restrictions that the concerned party may impose on the EMB. The conduct of remote site activity should conform to the guidelines prescribed in pertinent policies such as the Environmental Impact Statement System (PD 1586), Clean Air Act (RA 8749), Clean Water Act (RA 9275), Toxic Substances and Hazardous and Nuclear Wastes Control Act (RA 6969), Ecological Solid Waste Management Act (RA 9003), and the Recognition of Environmental Laboratories. Lastly, an exit meeting or conference should be conducted to discuss the summary of findings with the party concerned after any remote site activity. If applicable, a timeline of the corrective actions that the concerned party agreed to undertake. Provided, a follow-up remote site activity may be scheduled, or submission of corrective action report may be requested from the concerned party.

EMB MEMORANDUM CIRCULAR NO. 2021-06 Adoption of the Manual for Siting and Design of Philippine Air Quality Monitoring Stations [9].

OVERVIEW

Since the monitoring of air quality is both a local and a national concern, this MC contains the mandate that a country-wide approach should be adopted for air quality monitoring applications. This will ensure that all applications will be a consistent part of overall planning to achieve the national objectives while the local problems are being attended to. MC 2021-06 is structured like a manual that outlines the siting requirements and design for air quality monitoring stations across the country.

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SITING GUIDELINES

Generally, all monitoring sites must be designed and fitted with equipment that complies with available US EPA requirements. Section 4 of this MC elaborates on all these requirements in detail. A measure called the Spatial Scale of Representativeness (SSR) is also used to determine the appropriateness of the location as an adequate monitoring station, which considers factors such as the terrain, weather, climate, and amount of population of the area.

OTHER REQUIREMENTS

Section 5 details the requirements for the meteorological mast, which measures wind speed, wind direction, and other meteorological data. Section 6 highlights the positioning of collocated air samplers to be installed in the air quality monitoring station and includes specific requirements for siting when the station is located on an open path (i.e., a roadside station). Section 7 lists the specific requirements of the design of the air quality monitoring station, such as the equipment shelter, structures, fences, and the general area of the station. Section 8 contains methods of analyses to determine the area representativeness of an air quality monitoring station and whether it is optimized for its location or is redundant.

EMB MEMORANDUM CIRCULAR NO. 2021-07 Procedural Manual on Data Handling Protocol for Criteria Air Pollutants [10]

OVERVIEW

MC 2021-07 provides information for the EMB on the proper procedures in determining whether a certain air quality monitoring station is meeting the guideline values set for in the Clean Air Act and its Implementing Rules and Regulations (IRR). It clarifies requirements for data handling and completeness, and the procedures for handling missing data, different sampling frequencies, and calculating spatial averages for criteria air pollutants.

GUIDELINES

The MC primarily contains instructions for comparing data gathered from air quality monitoring stations to the National Ambient Air Quality Guideline Values (NAAQGVs). Information is also provided for data capture requirements, required sampling frequency, determination of airsheds as attainment or non-attainment area, and conversion of concentration values to AQI values.





EMB MEMORANDUM CIRCULAR NO. 2021-14

Establishment of an Integrated Air Quality Network Center that Monitors and Serves as Repository of Real-Time Industrial Emission from Firms required to Install Continuous Emissions Monitoring Systems (CEMS) / Continuous Opacity Monitoring System (COMS) Through the Use of a Uniform Data Acquisition and Handling System (DAHS), and in Relation to Clarify Pertinent Provisions of Department Administrative Order No. 2017-14 [11]

OBJECTIVE

The objective of MC 2021-14 is to effectively and efficiently transmit emissions data from the CEMS/COMS of industrial sources to the EMB DAHS server for the purpose of monitoring its compliance with the emission standards set forth under the Clean Air Act.

DATA HANDLING

The EMB-Central Office (EMB-CO) shall have the authority to access the DAHS server of all EMB-Regional Offices (EMB-ROs) and shall be responsible for integrating every regional DAHS server. To do this, the EMB-ROs shall ensure that their DAHS server is compatible with the DAHS server used by the EMB-CO. All EMB-ROs shall establish a secured infrastructure to receive and store CEMS/COMS data.

To effectively monitor the emissions data being transmitted to the EMB FTP server, the EMB-RO shall require the industries to transmit CEMS/COMS data to the EMB-DAHS server for validation. The validation process shall check compliance of said data with the emission standards and the veracity of data submitted, among others. Thereafter, the EMB-RO shall forward the said data to the EMB-CO FTP server for record-keeping. Further, the EMB-RO shall require all firms operating CEMS/COMS to transmit (in real-time) the data based on the standards as follows:

Parameter (mg/Ncm)	Data Transmission	1-hour Equivalent Based on AO 2017-14
Gases (CO, NOx as NO₂, SOx as SO₂) and Particulate Matter (PM)*	Once every five (5) minutes	12 x 5 minutes
Opacity**	Once every five (5) minutes	12 x 5 minutes

Table 3 Specifications of parameters that are required to be submitted by firms operating CEMS/COMS

*Should be expressed in mg / Ncm corrected to standard oxygen as prescribed by EMB. **Unit of measurement in percent (%).



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EMB MEMORANDUM CIRCULAR NO. 2021-15

Clarifying the requirements stated under Section 14, Rule XIX of DAO 2000-81 [12]

SUMMARY

This memorandum circular serves to clarify the provisions of DAO 2000-81, specifying that source-specific monitoring and reporting requirements mandated upon permit issuance by the EMB will include a condition. This condition stipulates that sample results taken at the emission point must be adjusted using a Standard Oxygen Correction Factor, as presented in Table 4. Additionally, the memorandum circular includes equations for correcting stack concentration values.

Table 4 Standard Oxygen Correction Factor for source-specific equipment.

Equipment	Standard Oxygen Correction Factor *
Oil Fired Boilers including diesel, light fuel oil, heavy fuel oil, and bunker C, natural gas-fired boilers	9%
Coal-fired boilers	9%
Diesel/distillate, petrol, and bunker C fired generator sets	13%
Natural gas-fired gas turbines	15%
Cement kilns	10%
Petroleum refinery heaters	7%
Natural gas-fired boilers	7%
Waste-to-Energy (WTE) 1: Rice Hulls, Bagasse, Biomass-fired boilers	11%
Waste-to-Energy (WTE) 2: Cocoshell, Wood, wood waste-fired boilers	13%
Steel rolling mill furnace (Reheating furnaces)	13%
Steel smelting furnace (Electric arc and induction furnace)	13%

*The values were derived based on the following: (1) Actual measurements and theoretical calculations; (2) Comparison with International Standards; (3) Central Tendencies of data from Stack Test Reports; and (4) Comments from different Industries



The table below (Table 5) provides an overview of the ongoing policy documents under review at DENR-EMB as of the calendar year 2021.

Table 5. In Progress Policy documents				
Policy	Status			
Guidelines in the Implementation of Stationary Source Mass Emission Rate Standards (MERS) – Phase 1	The draft policy is currently being reviewed by the academe who will conduct the Air Dispersion Modelling (ADM) relative to the development of standards. A public consultation was held on 24 November 2021.			
Guidelines on Ambient Air Quality Guideline Values / Standards for Hazardous Air Pollutants – Phase 2	Analysis of filters by the University of the Philippines (UPD) College of Science, Institute of Environmental Science and Meteorology (IESM) is ongoing			
Manual of Air Pollution Source Installation (APSI)	Finalization of draft Manual is being done by Innogy Solutions Inc and is targeted to be finished by February 2022			
Guidelines on Online Stack Sampling Platform – Phase 1	Ongoing consultation with EMB programmers			
Improvement of Online Web-based Emissions Inventory Data Bank – Phase 2	Project is moved to FY 2022			
Development of Local Emission Factors for Emission Inventory Improvement				
Guidelines on Outsourcing of Ambient Air Quality Monitoring in Existing and Proposed Airsheds	Draft policy was finalized and will be transmitted to the EPTWG			
Guidelines on ETV for Locally Developed Air Quality Monitoring Instruments				
Guidelines on CEMS/COMS Audit Service Providers				
Improvement of Online SMR System	Ongoing consultation with EMB programmers			

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STATUS OF AIR QUALITY MANAGEMENT FUND

From 2020 to 2021, variance in actual versus the target of collections and remittances slightly increased (from ~34% in 2020 to -31% in 2021).

The yearly allotment of funds to the EMB includes the Air Quality Management Fund (AQMF), which is labeled as Fund 337. This was formerly Fund 155 but was changed in 2016 due to UACS's revised chart of accounts. The fund collections reported here include supervision and regulation enforcement fees, other service income, other gains, and LTO fines and other penalties. Per the provisions of National Budget Circular 542, the EMB should report annual budget reports and assessment reports under their transparent seal (as required under the National Budget Circular Nos. 507 and 507-A dated January 31, 2007, and June 12, 2007, respectively) [13]. The status of the Air Quality Management Fund in the years 2020 to 2021 can be seen in Table 6.

2020 [14]				2021 [15]			
AQMF	Target (in Philippine Peso)	Actual (in Philippine Peso)	Variance	Target (in Philippine Peso)	Actual (in Philippine Peso)	Variance	
Supervision and Regulation Enforcement Fees	119,918,000	79,451,558.54	-34%	132,210,000	91,883,373.17	31%	
Other Service Income	26,000	236,840.50	811%	28,000	685,459	2,348%	
Other Gains	-	-	-	÷	-	-	
LTO Fines and Penalties	-	-		-	-	-	
Total	119,944,000	79,688,399.04	-	132,238,000	92,568,832.67	-	

Table 6. Status of Air Quality Management Fund 2020-2021



Status of Management of Air Pollution Sources

According to the National Emission Inventory for the year 2019-2021, mobile sources remains to be the largest source of air pollution, which accounted for 56.04% of emissions nationwide. Stationary sources were responsible for 35.36% of emissions, while 8.60% was contributed by area sources [16].

The implementation of the anti-smoke belching operations of the DENR-EMB (also known as Bantay Tambutso Program) continues in 2021. While this operation is mostly based in Metro Manila, initiatives for air pollution source management were also handled by the Regional Offices. The Bantay Tsimneya Program handles the monitoring and enforcement of policies and regulations related to stationary sources of air pollution emissions. [17]

The EMB launched the improved version of the Online Permitting and Monitoring Systems (OPMS) and its Permit to Operate (PTO) Air Pollution Source Equipment and Installation Version 2. This change was made to make the application process for permits easier for stakeholders and industry partners, and to ensure environmental compliance more effectively.

In line with EMB MC 2021-14, which builds on the provisions of DAO 2017-14 and EMB MC 2020-03, EMB is also establishing an integrated air quality network center, which is a system that acts as a central repository of all data and information related to industrial emissions of firms with Continuous Emission Monitoring Systems (CEMS) / Continuous Opacity Monitoring System (COMS) [19]. This is achieved through the usage of a uniform Data Acquisition and Handling System (DAHS). This system aims to monitor the compliance of industries through transmission of air quality data in real time and is being used by EMB Regional Offices to transmit real-time data on air emissions to the EMB Central Office as of 2021.

The enactment of EMB MC 2021-06 and MC 2021-07 also led to technological advancements in the management and operation of Air Quality Monitoring stations in the country. The manual for siting and design and the manual for data handling protocols for criteria pollutants are to be reviewed every two years to address any issues and challenges that may be encountered.

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Management of Stationary Sources

Table 7. Management of Stationary Sources for 2020-2021

		2020		2021 [20]			
Implementation of Clean Air Regulation		Target	Total	Percentage of Accomplishment (vs Annual)	Target	Total	Percentage of Accomplishment (vs Annual)
Issuance of Permit to Operate	PO for Air issued (no.) (Moving Target)	8,728	9,999	115%	8,660	11,239	130%
	New	2,171	2,646	122%	2,512	4,952	197%
	Renewal	6,557	7,353	112%	6,148	6,287	102%
Industrial Compliance Monitoring	Firms/Industri es surveyed (no.)	2,709	4,200	155%	3,150	4,196	133%
	Firms/Industri es monitored (no.)	15,859	19,521	123%	16,220	18,143	112%

The term "stationary source" refers to any building or fixed structure, facility or installation that emits or may emit any air pollutant. If a specific property is situated within an attainment region for a specific pollutant, it is required to pay a charge for these emissions as an existing stationary source of air pollution emissions. Table 7 shows the implementations of the issuances of permits to operate (PTOs) and industrial compliance monitoring for years 2020 and 2021.

The EMB conducts emission testing of firms considered as stationary sources to determine their compliance with the National Emission Standards for Source Specific Air Pollutants (NESSAP). Any such firm or building or facility that may emit air pollutants must secure a valid PTO issued by the EMB Regional Director unless otherwise stated under Annex C of MC 2020-17. These PTOs include the name and address of the firm, date of issuance and expiration of PTO, applicable emission limits, reportorial requirements, list of APSI and APCD with corresponding capacity, and operational and other conditions. They are also required to designate a Pollution Control Officer (PCO) to oversee all environmental permits and clearances and submit quarterly Self Monitoring Reports (SMRs) and the semi-annual Compliance Monitoring Report (CMR) (if applicable) to the EMB.

For voluminous stationary sources, EMB can refer them to their Accredited Third Party Source Emission Testing Firms (per DAO 2013-26) if there is any need for emission testing. For large sources which may emit >750 tons/year of any regulated pollutant, installation of COMS/CEMS is required. The data coming from these systems are submitted in real time to the EMB Data Acquisition and Handling System (DAHs) of the EMB Central and Regional Offices [21].





Table 8. Management of Mobile Sources for 2020-2021

		2020			2021 [22]		
Implementation of Clean Air Regulation		Target	Total	Percentage of Accomplishment (vs Annual)	Target	Total	Percentage of Accomplishment (vs Annual)
Issuance of COC	COC issued (no.)	300	440	147%	300	432	144%
Monitoring of Private Emission Testing Centers (PETCs)	PETCs Monitored with a report submitted (no.)	571	768	135%	556	594	107%

The term "mobile source" refers to sources of air pollution that come from on-road vehicles, non-road vehicles, and engines [23]. Mobile sources are currently the largest source of emissions due to various factors such as the continued operation of vehicles with pre-Euro standard specifications and vehicles that are noncompliant to present emission standards. Other identified factors include traffic congestion and the continual increase of motor vehicles operating on the roads, among others.

To monitor the emissions from mobile sources, the EMB employs Private Emission Testing Centers (PETCs) nationwide. The agency is also in charge of issuing Certificates of Conformity (COCs) for new motor vehicles as a requirement for initial registration with the Land Transportation Office (LTO). The application process is done through the Online Permitting and Monitoring System (OPMS) of EMB. The actual number of COCs issued are shown in Table 7.

To reduce air pollution emissions from vehicles, the agency promotes the use of non-motorized transport (such as bicycles) and the use of 'cleaner fuels' such as liquefied petroleum gas (LPG) and compressed natural gas (CNG). Hybrid cars and electric vehicles are also gaining more support from the government, private and public sector.

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Plots of Vehicle Registration

In the Annual Report of the Land Transportation Office (LTO) for 2020 and 2021 (Figures 1 and 2), the total number of vehicles registered in the Philippines numbers 11,851,192 for 2020 [24], which increased to 12,363,374 in 2021 [25]. The LTO currently classifies all Motor Vehicles (MVs) for registration into seven groups: cars, utility vehicles (UV), sports utility vehicles (SUV), trucks, buses, motorcycles/tricycles (MC/TC), and trailers.

It should also be noted that the number of total registrations were lower during the year 2020 due to periods of time when there were no transactions occurring in all the regions due to the Enhanced Community Quarantine Lockdown (ECQ). Because of the ECQ, the LTO issued MC 2020-2203 or the Extension of Validity of Motor Vehicles Registration with plate numbers ending in 6, 7, 8, 9, and 0, up until December 31, 2020. [26]



Figure 1. Vehicle registration per region for 2020



Plots of Vehicle Registration



Figure 2. Vehicle registration per region for 2021

Referring to Figure 2 on the regional registration disaggregated by type of vehicles, the regions of I, 4-B, V, VIII, X, XIII (CARAGA), and CAR registered less than 100,000 new motorized vehicles. The highest number of new motor vehicles registered as of December 2021 was recorded in the NCR region with 595,225 new vehicle registrations. No data was available for the BARMM region for both years. In NCR alone, a total of 3,037,303 registered vehicles were tallied, and managing this fleet is important to the management of emissions from motor vehicles in Metro Manila.

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Figure 3. Number of registered cars, utility vehicles, trucks and buses nationwide, C.Y. 2021

As the economy has begun to open up after the year 2020, the number of motor vehicles registered in the country is expected to increase. From 69,638 units in 2020, the amount of passenger automobiles sold increased to 97,179, an increase of 39.5 percent [27]. This category accounted for 33.0 percent of all vehicle sales in 2021. A total of 197,044 commercial vehicles were sold in 2021, which accounted for 67.0 percent of total sales that year [28]. For all categories, a total of 294,223 vehicles were sold in 2021, an 18.6 percent increase from the previous year.



ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

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Status of Ambient Air Quality Monitoring (AAQM)

Sampling stations with varying levels of equipment capabilities are located all over the country, and they are further classified according to which criteria pollutants they are capable of monitoring, and the method as to how they sample the ambient air. The highest number of AQMS stations are in NCR, which on its own has 33. Region III has nine stations, and Region V has seven stations. Regions I, VI, and XI have six stations each, Regions IV-A, VII, and IX have five stations each, Regions II, IV-B, X, and XIII have four stations each, and CAR and Region XII have three stations each. Region VIII only has one active AQMS station.



2021 EMB Air Quality Stations (PM10 Stations - Monitoring Method)

Figure 5. DENR AQMS Stations for 2021





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Ambient Air Quality Monitoring Capabilities of EMB

As of the most updated tally in 2021, a total of 109 AQMS stations can be found in the whole Philippines. Fifty-five (55) of the stations for AQMS used the manual sampling method, twenty-eight (28) stations used the Particulate Matter Monitoring System (PMS), twenty (20) stations for Open-Path, and six (6) stations for Conventional.

55	28	20	6
MANUAL	PMS STATIONS	OPEN-PATH	CONVENTIONAL
STATIONS		STATIONS	STATIONS

Some stations, more specifically 20.18% of all stations, were considered damaged or no longer available for use, which could be because of the environmental impact on the machine, wearing out or breaking of parts, and long-term data deficiencies.

Table 9. Status of Ambient Air Quality Monitoring Stations (AAQMS)

Type of Station	Total No. of Stations	Functional / Operational	Not Operational
CAAQMS -PMS	28 (NCR: 15, Others: 13)	22 (NCR: 13, Others: 9)	6 (NCR: 2, Others: 4)
CAAQMS - Conventional	6 (NCR: 2, Others: 4)	3 (NCR: 2, Others: 1)	3 (NCR: 0, Others: 3)
CAAQMS - Open-path	20 (NCR: 3, Others: 17)	11 (NCR: 0, Others: 11)	9 (NCR: 3, Others: 6)
Manual Reference Method	55	51	4
Total	109	87	22
	F	Percent Functional/Operational	79.81%
		Percent Not Operational	20.18%



The DENR-EMB has a commitment to reporting reliable data on ambient air quality and to this end they use prescribed monitoring equipment and technology to ensure that any data released is with satisfactory quality, and at par with national and international standards. The specific requirements for the construction and installation of equipment in air quality monitoring stations were standardized following the enactment of MC 2021-06.

Currently, the siting guidelines for air quality monitoring stations in the DENR-EMB monitoring network is based on US EPA's requirements, specifically the two appendices of the CFR Title 40 Part 58. [29] Considerations are also given to the local conditions and data availability, such as population, economic activities, level of urban development, and present land uses. The procurement of required equipment of the DENR-EMB-CO was described as restrictive because its monitoring objective is mainly for compliance with regulations.

As of present, there are two types of Air Quality Monitoring Stations (AQMS) installed nationwide: the Continuous Ambient Air Quality Monitoring Station (CAAQMS), and Manual Monitoring Station.



AQMS in terms of Population

Figure 6. Population vs number of AQMS stations (2021) Data Source: Philippine Statistics Authority and EMB-CO AQMS

It is important to study the amount of people who are served by each individual AQMS station. According to this graph, which compares the population and the amount of AQMS, the NCR has a high population and the highest number of stations in all regions at 33. This is not the case with other regions with particularly high populations like Regions III and IV-A, which have nine and five stations, respectively. Region VIII only currently has one station that serves the entirety of the regional population there.



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For an overview of the general nationwide air quality, an annual geometric mean was calculated using the annual averages from the monitoring stations with a data capture rate of over 75%. It is important to note that the averaged station data may not entirely represent the air pollution situation in specific areas, which can vary depending on existing land use/land cover, topography, and overall climate. Refer to Figures 7-9 for the time series of the annual averages of PM₁₀, PM_{2.5} and TSP, respectively.







Figure 9 TSP concentration from 2013-2021, Annual averages.

Overall, the air quality nationwide in terms of PM₁₀ has notably improved from 2012 to 2020. The annual average decreased by 56.77%, from 60.49 μ g/Ncm in 2012 to 26.15 μ g/Ncm in 2021. A possible explanation for the sharp decrease of PM₁₀ between years 2019 and 2020 is the limited human movement and economic activity during the declaration of community quarantine period starting March 2020.

Aside from the year 2014, the national average of PM_{2.5} emission levels has been under the national guideline value, which also decreased in 2016 from 35 μ g/Ncm to 25 μ g/Ncm. Aside from peaks in years 2014, 2017, and 2019, the general trend of PM_{2.5} in NCR is generally downward, reaching a value of 17.83 μ g/Ncm in 2021.

The long-term nationwide trend for TSP is unclear as it has been rising and falling over the past decade, with some years, specifically 2016, 2018, and 2019, having an exceedance over the national guideline value of 9 0 µg/Ncm. In NCR however, there is a visible trend for TSP levels going downwards in the past few years, up to 78 µg/Ncm in 2021, which is the only year documented here where the TSP levels are under the national air quality guideline.

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Policy Milestones with Notable Impacts to Air Quality Improvement

Trends in the level of emitted air pollutants can run concurrent to the issuance, implementation, and enforcement of policy/legislative measures, internationally held environmental standards, and local internal measures adapted by government agencies for the reduction of air pollution emissions. Notable trends in air quality, particularly PM₁₀ and PM_{2.5} in conjunction with the issuance of air quality control policies are visualized in Figures 10-11.

The Biofuels Act of 2006 enforced a minimum percentage for bioethanol content in vehicle fuels, particularly 1% minimum in diesel and 5% minimum in gasoline by 2008. This was increased to 10% minimum bioethanol content in gasoline by 2010. The country's implementation of Euro IV/4 fuel standards and emission standards in 2015 and 2016, respectively, came with a slight downward trend of PM₁₀ emissions. Interventions by DENR-EMB, specifically the reinstatement of the requirement for industrial firms to submit test results for sulfur dioxide (SO₂) emissions in 2019, the implementation of the Air Quality Network Center in 2020, and the implementation of the oxygen correction factor for industries in 2021, may have further contributed to the decrease in emissions for PM₁₀ and TSP.



Pursuant to Biofuels Act 2006 minimum of 2% biodiesel content of Diesel

Pursuant to Biofuels Act 2006 minimum of 1% biodiesel content of Diesel

Pursuant to Biofuels Act minimum 5% bioethanol content of Gasoline

Pursuant to Biofuels Act minimum 10% bioethanol content of Gasoline

Implementation of EURO IV Fuels

Implementation of EURO IV/4 Emission Standards

Reinstatement of requirement for the firms to submit test result for Sulfur Dioxide (SO2)

Implementation of Air Quality Network Center, requiring major industries to connect their CEMS/COMS to EMB Data Center.

Implementation of Oxygen Correction factor for industries

Figure 10. Policies issued with significant impacts on PM₁₀.





Pursuant to Biofuels Act 2006 minimum of 2% biodiesel content of Diesel

Pursuant to Biofuels Act 2006 minimum of 1% biodiesel content of Diesel

Pursuant to Biofuels Act minimum 5% bioethanol content of Gasoline

Pursuant to Biofuels Act minimum 10% bioethanol content of Gasoline

Implementation of EURO IV Fuels

Implementation of EURO IV/4 Emission Standards

Reinstatement of requirement for the firms to submit test result for Sulfur Dioxide (SO2)

Implementation of Air Quality Network Center, requiring major industries to connect their CEMS/COMS to EMB Data Center.

Implementation of Oxygen Correction factor for industries

Figure 11 Policies issued with significant impacts on PM 2.5









Status of Emission Inventory

The previous national emission inventory was conducted in CY 2018. The spatial distribution of pollutants (CO, NOx, PM, SOx, and VOCs) indicates specific areas where they are higher. Regions IV-A and XII have about 958 thousand and 1.074 million tons of CO emissions respectively, and NCR emitted 3.7 million tons in total. NOx emissions were highest in Regions III, IV-A, XII, and NCR. PM emissions were highest in regions III, IV-A, X, and NCR. SOx emissions were highest in regions III, IV-A, VII, X, and NCR. VOC emissions were uniformly high except for regions IV-B, V, VI, and CAR, and NCR emitted the highest amount with 1.367 million tons.

Spatial Distribution for PM, SOx, CO, NOx, VOC

The 2021 National Emissions Inventory for the Philippines provides crucial insights into the distribution of key pollutants across various emission sources. Particulate matter emissions predominantly stem from stationary sources, accounting for 56.43% of the total, followed by mobile sources at 28.21% and area sources at 15.36%. Carbon monoxide emissions exhibit a stark contrast, with mobile sources being the primary contributor at 85.45%, followed by area sources at 12.79% and stationary sources at a mere 1.76%. Nitrogen oxides emissions also show a significant portion from mobile sources, contributing 52.99%, while stationary sources account for 35.76% and area sources for 11.25%.

Moreover, sulfur dioxide emissions are dominated by stationary sources, comprising 98.15% of the total, with negligible contributions from mobile and area sources. Volatile organic carbon emissions follow a similar pattern to carbon monoxide, with mobile sources being the primary contributor at 95.89%, while stationary and area sources account for 0.93% and 3.18%, respectively. These findings underscore the critical role of targeted regulations and interventions, particularly in sectors such as transportation and industry, to effectively mitigate emissions and address air quality concerns in the Philippines.



Figure 12 National emissions inventory, 2019-2021

Status of Emission Inventory



Figure 13. Percentage of pollutant per source

SOURCE	РМ	со	ΝΟΧ	SOX	VOC	TOTAL
STATIONARY	1,663,259.54	157,708.46	682,399.90	5,435,017.64	29,481.58	7,967,867.12
MOBILE	831,358.40	7,665,458.35	1,011,182.70	81,444.35	3,037,070.99	12,626,514.80
AREA	452,864.81	1,147,551.01	214,743.92	20,978.89	100,668.83	1,936,807.46

Table 10. Emissions Inventory (per Pollutant)

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Status of Emission Inventory

Regional Percentage for PM, SOx, CO, NOx, VOCs

The regional emissions inventory for the Philippines covering 2019-2021 provides a detailed breakdown of pollutant sources across various regions, offering valuable insights into emissions distribution and contributing factors. Among stationary sources, particulate matter emissions vary significantly across regions, with R4A exhibiting the highest contribution at 72%, followed by NCR at 21%. Carbon monoxide emissions also display regional disparities, with NCR representing the highest share at 30%, while R4A and R3 from stationary sources contribute substantially as well, at 27% and 19%, respectively. Additionally, nitrogen dioxide emissions are particularly notable in R4A, constituting 74% of the total, indicating the significance of industrial activities in this region. On the other hand, sulfur dioxide emissions are predominantly from R4A, accounting for 84%, underscoring the regional concentration of industrial processes emitting sulfur compounds. Lastly, volatile organic carbon emissions exhibit variation, with R10 at 46%, highlighting the significance of localized sources such as industrial and urban activities.

Mobile sources also contribute importantly to regional emissions, with notable differences across regions. For instance, R12 stands out with the highest contributions in particulate matter and carbon monoxide emissions, at 21% and 27%, respectively, emphasizing the impact of vehicular traffic in urban centers. Furthermore, nitrogen dioxide emissions are substantial in R4B, increasing for 24%, along with significant contributions from NCR, R10 and R12. However, sulfur dioxide emissions in R4 predominates, comprising 48% of the total, suggesting a concentration of mobile sources emitting sulfur compounds in this region. Volatile organic carbon emissions show variability, with R12 again leading at 23%, followed by NCR and R10, highlighting the influence of vehicular emissions activities on air quality.

Regarding area sources, particulate matter emissions are highest in R9, accounting for 70%, emphasizing the significance of agricultural activities in this region. Carbon monoxide emissions, however, show a different pattern, with R4A having the highest percentage at 60%, indicating the influence of non-point sources such as open burning in this region. Nitrogen dioxide emissions from area sources are highly accounted in R4A as well, constituting 86% of the total, highlighting the concentration of non-point sources such as open burning and urban emissions. Sulfur dioxide emissions vary across regions, with notable contributions from R6 and R9 at 34% and 37% respectively, reflecting the influence of localized open burning, even possibly for space heating and cooking. Volatile organic carbon emissions also exhibit regional differences, with notable contributions from R9 and R10 at 19% and 29% respectively, suggesting the influence of open burning and other area source emissions in these regions.



Emission Inventory 2019-2021 for Carbon Monoxide (CO)



Figure 14. Emission Inventory 2019-2021 for CO

Data Source: EMB - Central Office

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Emission Inventory 2019-2021 for Nitrogen Oxides (NOx)



Figure 15. Emission Inventory 2019-2021 for NOx



Emission Inventory 2019-2021 for Particulate Matter





Emission Inventory 2019-2021 for Sulfur Oxides (SOx)



Figure 17. Emission Inventory 2019-2021 for SOx



Emission Inventory 2019-2021 for Volatile Organic Compounds (VOC)



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Status of Emission Inventory





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Status of EMB Projects related to Air Quality Management

DENR-EMB is aiming to produce publications and studies in order to know more about the current status of the air quality in the Philippines. In doing so, it is expected that data from these studies will become more accessible to the public for the enhancement of knowledge for the improvement of air quality in the Philippines.

The current **Emission Charge System**, also known as the Environmental User Fee System / Market-Based Mechanism thru Incentive / Trading Mechanism, is currently pending the issuance of the appropriate Implementing Guidelines or Implementing Rules and Regulations as of the year 2021.

1. Studies on Public Utility Jeepney Modernization

A comprehensive study on policy implications of the PUJ modernization program and other proposed measures, including health benefit assessment, was conducted by researchers at De La Salle University (DLSU). [30]. The evaluation of health risks was linked to the estimated levels of air emissions of four pollutants: PM_{2.5}, PM₁₀, NOx, and SO₂. Interventions resulting in the reduction of air pollution emissions over time include the phasing in of Euro 4 (and later standards) compliant PUJs and buses, including other forms of public transportation vehicles, improvement of accessibility of residential areas, and a reworking of the present tax schedule for vehicles and petroleum fuel products (gas). [31] A comprehensive plan implementing these measures is expected to result in lesser public health risks.

2. Review Of NESSAP and Updated National Ambient Air Quality Guideline Values for Hazardous Air Pollutants in Ambient Air

Since 2020, the EMB has been enforcing the new breakpoints for PM2.5 for the National Ambient Air Quality Guideline Values (NAAQGV) as established by DENR AO 2020-14. All regional offices, cities and municipalities are expected to take the new guideline values for PM_{2.5} in account when enforcing standards for air quality from stationary and mobile sources.

The current version of the National Emission Standards for Sources Specific Air Pollution (NESSAP) and Ambient Air Quality Standard (AAQS) pertaining to stationary sources of air pollution is defined in RA 8749. These values are still used to this day, and the DENR is currently working to update these standards. The new policy direction has focused on the regulation and curtailment of industrial activities for the protection of public health and safety. [32]





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Also, the DENR-EMB has mandate to review and publish a list of hazardous air pollutants with corresponding ambient guideline values, which is necessary to protect the health, safety, and general welfare of the people. This is in awareness of the potential health hazards of gaseous air pollutants to human beings. The project, Development Of Guidelines Values For Hazardous Air Pollutants - Phase 2 aims to prescribe the ambient air quality guideline values of hazardous air pollutants, particularly, twenty-four (24) elements and compounds of interest listed below:

Particulate-phase PAHs (15 parameters)	Black Carbon (BC)	
Naphthalene	Potentially Toxic elements from particulate matter:	
Acenaphthylene	(4 parameters)	
Acenaphthene	• As	
Fluorene	• Cd	
Anthracene	• Hg	
Phenanthrene	• Pb	
Fluoranthene	Gaseous HAZAP	
Pyrene	Dihydrogen Sulfide (H2S) from the long-term	
Chrysene	monitoring data of the DENR-EMB designated	
 Benzo(b)fluoranthene 	geothermal airsheds	
 Benzo(k)fluoranthene 	Benzene	
 Benzo(a)pyrene 	Toluene	
 Indeno(1,2,3)cd pyrene 	 p-Xylene. 	
 Dibenzo(a,h)anthracene 		
 Benzo(g,h,i)perylene 		

Table 11. List of Hazardous Air Pollutants with guideline values being developed for C.Y. 2021

The source data for the establishment of the guidelines are provided from the regulatory-grade air quality monitors and sites of the DENR-EMB. Suspended particulate matter samples were derived from the regulatory-grade air particulate samplers provided by the DENR-EMB-EQD-AQMS. The filters have undergone documentation, pre-checking, preservation and portioning. The filters that passed the documentation stage are analysed for Black carbon in UP-IESM-EPSL and then for potentially toxic elements (As, Cd, Hg, Pb) in DENR-EMB-ERLSD. After XRF analysis, the sampled filters are returned back to UP-IESM-EPSL for portioning a quarter of the filter for extraction using miniaturized technique using GC-MS-MS in DENR-EMB-ERLSD for PAHs analysis.

Generated outputs from this project are policies on recommended Ambient Air Quality Guideline Values for Hazardous Air Pollutants Phase 2 parameters that are based on health risk-assessment methodologies.

3. Updating the methods for the analysis of ambient and stationary source parameters for air quality

The DENR-EMB-ERLSD initiated the project titled, *Review, Evaluation And Updating Of Methods For Sampling And Analysis Of Ambient Air And Stationary Source Emissions* with the primary objective of updating the methods and parameters for AQM to keep abreast of the recent trends in air quality management practices and to support the AQM in analyzing environmental samples using latest techniques and parameters. This also includes the methods for sampling and analysis and limits (or guideline values) of emerging air quality parameters (such as Black Carbon, Organic Carbon, Total VOCs, PAHs, POPs) obtained from legislations, regulations, handbooks and technical/published scientific papers from priority countries.

4. Automated reporting of data from Data Acquisition and Handling Systems (DAHS)

The EMB Memorandum Circular 2021-14 lays out the requirements and provisions for the EMB Central Office to be able to effectively acquire and process data on air emissions from regional offices. The sources of data include Air Quality Monitoring Stations (whether automatic or manual) which measure the ambient air in the region and industrial establishments (including Environmentally Critical Projects) with a Continuous Emission Monitoring System (CEMS) or a Continuous Opacity Monitoring System (COMS). It is expected that all EMB Regional Offices would comply with this new regulation and connect all their air quality monitoring networks/data sources to the server in the EMB Central Office within one year from the publication of MC 2021-14.

5. Status of Ambient Air Quality-related Projects by the Regional Offices

The implementation of EMB Memorandum Circulars 2021-06 and 2021-07 provided a guideline for the construction and operation of new and existing air quality monitoring stations in the country. Of note is the initiatives taken by regional offices to increase their real-time collection rate to 75%, as part of compliance measures with national government standards, and which is also included as part of the criteria for the assignment of attainment and non-attainment areas in the region. Table 12 summarizes the responses gathered from all regional EMB offices on the status of ambient air quality monitoring in their respective areas.

Region	Responses
CAR	EMB-CAR currently monitors ambient air quality in the region in cooperation with LGUs. Monitoring stations are also being run by the LGUs of the City of Baguio and Municipality of Bangued, Abra.
NCR	The LGUs in the NCR currently implement programs and ordinances which enforce the current air quality guidelines. Each LGU aims to reduce and mitigate the amount of greenhouse gases and PM being produced.
R1	Region I continues to strictly implement the existing environment codes with pertinent provisions on air quality, which covers standards as defined in RA 8749, RA 9003, and the National Clean Air Program "Control of Pollution" central sector.
R2	Four monitoring stations remain active in Region II in 2021 monitoring the levels of ambient TSP, PM_{10} , SO_2 , and NO_2 . The levels monitored are all within the NAAQGV as specified in the provisions of RA 8749. The methods used in the air sampling were also in accordance with the provisions of RA 8749.
R3	Region III monitors air quality through its active DOAS and PMS automatic air quality monitoring systems, to make up for the unavailability of the function of the manual stations during the pandemic.

Table 12. Status of ambient air quality monitoring in the Regional offices, C.Y. 2021.



Table 12. Status of ambient air quality monitoring in the Regional offices, C.Y. 2021. (continued)

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R4A	Five monitoring stations in total were active in 2021. Data from three stations that measured $PM_{2.5}$ and PM_{10} throughout the year indicate that they are within the latest NAAQGV for both 24-hour and 1 year averages. Values of measured NO_2 and SO_2 were also within 24-hour maximum tolerances.
R4B	Region IV-B currently enforces the provisions of RA 8749. Guidelines on the management of air pollution are handled at the local level, such as a provision on "Air and Noise Pollution Management" in Ordinance 04-2017 in the Municipality of Baco, Oriental Mindoro.
R5	Seven monitoring stations were active in Region V in 2021 monitoring the levels of ambient PM ₁₀ . The monitored levels are within the NAAQGV as specified in the provisions of RA 8749. Values of PM _{2.5} measured in Legazpi City were characterized as "good" and within the current air quality guidelines.
R6	Region VI currently runs ambient air monitoring stations to monitor the ambient air quality of the region. The salient features of RA 8749 are presented and implemented on a barangay level (Bisita Barangay) for the management of sources of air pollution.
R7	Five monitoring stations were active in Region VII in 2021 monitoring the levels of TSP and PM ₁₀ . The monitored levels are classified as being between "good" and "fair" and are within the NAAQGV as specified in the provisions of RA 8749.
R8	The monitoring station in Tacloban City reports levels of PM_{10} and $PM_{2.5}$ that are within the current air quality guidelines. The monitored levels are classified as being in the "good" category.
R9	Three monitoring stations were active in Region IX in 2021 monitoring the levels of PM_{10} and $PM_{2.5}$, which are within the current air quality standards for long term guideline values. These stations also monitored the levels of other air pollutants such as SO_2 , O_3 , NO_2 , benzene, toluene, p-xylene, and CO.
R10	Major industries in the region are now able to transmit air emission data using CEMS/COMS to the Regional and Central Data Acquisition and Handling System (DAHS) pursuant to EMB MC-2021-14. Five monitoring stations measured the levels of PM _{2.5} , which measured levels that are generally within the latest 24-hour NAAQGV.
R11	Region XI can conduct confirmatory stack sampling for sources of PM and SOx using an accredited 3rd party emission testing firm. Air quality guidelines (RA 8749) are enforced locally with LGUs having ordinances against public smoking and smoke belching vehicles.
R12	Region XII conducts regular checking of motor vehicles on roadsides to ensure the standards set by RA 8749 on mobile sources. Ambient air monitoring was strategically conducted as a study using a portable ambient air analyzer, as services are still limited in this region.
R13	Four monitoring stations in total are active in Region XIII, two of which are manual stations and two of which are continuous stations. Aside from a few instances where the levels were exceeding the 24-hour value, the majority of the levels measured for air emissions of TSP, PM_{10} and $PM_{2.5}$ were within the latest NAAQGV as of 2020. The monitored levels were classified as being mostly in the "good" to "fair" category. These stations also monitored the levels of other air pollutants such as SO_2 , NO_2 , O_3 , and CO .





Airsheds are areas of the same climate, meteorology, and topology which affects the interchange and diffusion of pollutants in the atmosphere. As of C.Y. 2021, the DENR-EMB designated a total of 22 airshed nationwide (Figure 19), 17 of which are regular airsheds (based on meteorology and topology), while five are geothermal airsheds.

2021 Airsheds in the Philippines



Figure 19. Designated airsheds in the Philippines, C.Y. 2021.



Contribution of the Airshed Governing Board

Pursuant to the provisions of RA 8749, common action plans would need to be formulated for each airshed, and for this purpose, a governing board, to be referred here as the Airshed Governing Board, would be established. Each individual Airshed Governing Board is headed by the Secretary of Environment and Natural Resources as its chairperson, with members from provincial governors, city/municipal mayors, representatives from concerned government agencies, representatives from non-government organizations, and representatives from the private sector. The Airshed Governing Board is tasked with the formulation of policies, preparation of a common action plan (Air Quality Control Action Plan), coordination of its functions among its members, and submission and publication of an annual Air Quality Status Report for each airshed. Table 13 summarizes the responses involving the noteworthy contribution of each region's representative Airshed Governing Board are as follows:

Region	Responses
CAR	The BLISTT Airshed Task Force, composed of DOTr-CAR, EMB-CAR, deputized members of the LGUs, and other stakeholders, conducts quarterly anti-smoke belching apprehension activities in the region.
NCR	The Airshed Governing Board has helped in the execution of the action plans being implemented in the NCR. Some LGUs such as Manila, Quezon City, and Taguig took the initiative to monitor air quality using sensor-based air quality monitoring, to collocate sensor-based units, and to determine the correlation factor between the reference equipment and sensor-based units.
R1	The EMB technical staff conducted an orientation to the staff from the Provincial Government of La Union-Environment and Natural Resources Office (PG-ENRO), where they demonstrated the procedures in siting, operating and maintaining both Manual and Continuous Ambient Air Quality Monitoring Equipment. The Roadside Anti-Smoke Belching Unit (ASBU) also conducted their operations and garage emission testing. A joint mangrove planting and river cleanup activity was also conducted.
R2	To implement the provisions of RA 8749, the Airshed Governing Board has conducted several virtual meetings over the year to present resolutions that were mandated in the region for the preservation of air quality. These include: "A Resolution Requesting the LGU Members of the PIESTTA Airshed Governing Board to Provide the EMB-RO 2 the List and/or Copies of Projects and Activities, Establishments, Policies, and Ordinances Related to the Clean Air Act (RA 8749)",

Table 13 Summary of the contribution of the Airshed governing Board per Region, C.Y. 2021





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Table 13 Summary of the contribution of the Airshed governing Board per Region, C.Y. 2021. (continued)

R2

R3

R6

R7

R8

"A Resolution Earnestly Requesting the Allocation of Funds for the Purchase of Continuous Ambient Air Monitoring System (CAAMS) Equipment to be Established Within the PIESTTA Airshed", and "A Resolution Requesting the EMB-RO 2 to Further Establish Additional Air Quality Monitoring Stations Within the PIESTTA Airshed".

The Airshed Governing Board in Region III strictly implemented Clean Air Programs. LGUs established their policies based on RA 8749 such as bans on smoking, management of open burning of wastes, replacing old jeepneys into modernized jeepneys with better and cleaner emissions, installation of green walls on buildings, etc. Stakeholders from the ASGB benefited from the cascading of information including air quality monitoring data, as well as trainings conducted for air quality monitoring. Various agencies and other LGUs are actively participating and shares mandates relative to the implementation of the Clean Air Act.

R4A The Airshed Governing Board in Region 4-A contributed its continuous coordination with other agencies during the data collection period for the airshed's emission inventory and associated dissemination of IECs.

R4BThe Baco-Calapan City-Naujan (BCN) Airshed Governing Board, which consists of various agencies, LGUs, CSOs, and the private sector, formulated resolutions for the management and prevention of air pollution in the region in 2021. BCN Airshed made a board resolution entitled "Resolution Urging the Local Government Units in the Airshed Area to Monitor the Designated Firecrackers Display Zone in their Localities", which aims to minimize the risk of injuries and casualties in Oriental Mindoro from firecrackers. The Airshed Board also created a board resolution for the creation of Baco-Calapan City-Naujan Anti-Smoke Belching Unit that may help the Local Government Unit in apprehending mobile vehicles failing to comply with emission standards based on RA 8749.

R5 The Airshed Governing Board members in Region V help in providing data needed for the preparation of emission inventory and air dispersion modelling of air quality within the established airsheds.

The Airshed Governing Board in Region VI contributes significantly to support of the provisions of the Clean Air Act for the preservation and maintenance of healthy ambient air quality. Programs implemented include the operation of ambient air monitoring stations, the Metro Iloilo Airshed Anti-Smoke Belching Unit (IEC and enforcement teams), free garage smoke emission testing for major transport groups, Bisita Barangay for presentation of the salient features of the Clean Air Act, conduct of ODS Forum for awareness of the effects of climate change, mangrove treeplanting activities, and other IECs disseminated through the radio program and social media initiative "E Busina Mo".

The Metro Cebu Airshed Governing Board (MCASGB) works with its constituent member LGUs within the Metro Cebu Airshed to adapt and implement best practices pertaining to air quality management.

The active members of the Airshed Governing Board in Region VIII represent the different sectors that correspond to the various aspects concerning the regulation and maintenance of air quality in the region.

Table 13 Summary of the contribution of the Airshed governing Board per Region, C.Y. 2021. (continued)

R8	It is responsible for creating and formulating plans, policies, and resolutions which help to improve air quality within the region and lessen the effect of air pollution on the population, environment, and resources. Its unified objective is to attain common goals towards the attainment of a healthy environment and a better future for the Airshed.
R9	The Airshed Governing Board in Region IX handles information dissemination for the air quality result within the region for the knowledge of concerned agencies. Public-facing information on air quality is disseminated through the use of an e-billboard contributed by the private sector (i.e. Universidad de Zamboanga).
	The Airshed Governing Board in Region X paved the way for LGUs to initiate focused interventions in
R10	terms of air quality management. Its LGU members were able to come up with their respective 5-Year Air Quality Management Action Plans which identified various issues and concerns on air quality. Policies and regulations were also formulated for the management of open burning of wastes, smoke belching vehicles, and smoking in public places. Capacity development and IECs have also become staple activities in engaging the public and various stakeholders about the importance of managing our air resources.
R11	The Airshed Governing Board in Region XI conducts regular meetings where current air quality data is presented. Air quality concerns were also raised by its members during meetings. Through the data presented and discussions, activities and action plans were formulated to enhance the operationalization of the Airshed. To ensure the implementation of decisions made during the GB meeting, resolutions were crafted and approved.
R12	The Airshed Governing Board in Region XII held various meetings, trainings, workshops, and other activities for the management of air quality. The status of the ambient air is monitored by the means of regularly collected sample results. Plans and activities held throughout the year were proposed and approved by the Board, including tree planting activities, anti-smoke belching operations, seminars and workshops on clean air management, GIS trainings, garage testing of PUVs, entity-level and community-level greenhouse gas inventory, and virtual and in-person activities promoting IECs for clean air.
	The Airshed Governing Board in Region XIII contributed to the LGU implementation of IECs (including
R13	Clean Air Programs). Environmental month celebrations in the region included the conduct of roadside anti-smoke belching operations and mobile air conditioning/refrigeration system monitoring, tree-growing activities, and IECs. The Board also issued a resolution recommending the Province of Agusan del Norte to procure two (2) units PM ₁₀ High Volume Samplers for air quality monitoring. The Board also encouraged the active participation of LGUs in the conduct of simultaneous airshed-wide emission inventories for mobile sources, as well as the conduct of a survey for residential/commercial cooking and building/construction activities for airshed area source emissions.





Detailed Airshed Management Reports

Each Airshed Governing Board also provided responses that included the actions that were taken by all concerned agencies for the management of the airshed and the management of air quality in each region. This includes specific activities and initiatives that were implemented by the Airshed Governing Board, its member provincial and municipal governments, and stakeholders from the academe, transportation sector, and private sector.

Table 14 Summary of actions of the Airshed governing board members in the air quality management, C.Y. 2021

Region	Responses
CAR	Green Buffer Zones are established within the BLISTT areas. They are located near areas with high traffic congestion to help absorb CO2 emissions from vehicles. The areas are located along the school compound of Saint Louis University and along the diversion of the strawberry farm in La Trinidad, Benguet.
NCR	 The NCR has identified several initiatives promoted by its constituent LGUs such as the following: Las Piñas – Greening program along major roads, city ordinance prohibiting burning of solid waste, profiling of establishments for compliance to provisions of RA 8749 (in terms of sources of air pollution) Makati City – Orientation of the GHG Reduction Ordinance to tricycle operators, GHG Biggest Loser Contest, Urban Greening Program, Updating GHG Management Framework Plan of Makati City, Free emission testing activity, Project H.A.N.G.I.N (Healthy Air in Good Indoor Environment), Makati Bantay Tambutso (BanTam) Manila – Operations of Hinga Manila Task Force, Turn-over of Air Quality Monitoring Stations, Revitalization of Parks and Plazas (Mehan Garden, Anda Circle, Hidden Garden), Vertical Gardening and Roof Gardens (also including barangay and SK initiatives), Installation of Bicycle Racks, Installation of Solar Panels in Schools, "Nilad for Maynila" Project, Waste Diversion Initiatives Marikina – Redevelopment of open spaces and parks into green areas (removal of concrete, planting of carabao grass, usage of pavers and gravel for permeable surface, planting of tall trees for carbon sequestration and air purification), vertical gardening in school buildings, mitigation of roadside particulate matter, anti-smoke belching operations, clearing of vacant lots.

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NCR	 Parañaque – Greening programs in PNR Site and Veterans, purchase of electric tricycles, of which 32 were given to barangays and the remaining were distributed to different homeowners' associations. Pateros – Urban gardening program (in cooperation with BPI and Shell Foundation) Quezon City – Establishment of an air quality monitoring network to enable the development of targeted and effective policies and programs to reduce air pollution in line with national standards and WHO guidelines, development of monitoring and information system to allow real-time sharing of air quality data with the public, conduct of Quezon City Baseline Air Quality Study (under the technical assistance and funding from Clean Air Fund) and deployment of low-cost air quality sensors (including reference-level air quality monitoring equipment)
R1	 The region's Roadside Anti-Smoke Belching Units (ASBU) conducted their operations throughout the year, including garage emission testing. In Dagupan City and Lingayen, Pangasinan, the simultaneous Joint Mangrove Planting and River Clean-up Activity was conducted on November 25, 2021. EMB Region I conducted a comparative study of air quality status before and during the Enhanced Community Quarantine (ECQ) and Modified General Quarantine. This involved the following actions: For stationary sources: Installation and connection to EMB Central Office Data Acquisition and Handling System (hardware and software) of the three (3) Environmental Critical Projects with CEMS/COMS in the region; Intensified Stack Emission Testing, CGA and CEMS/COMS RATA Observation conducted both physically and virtually; Intensive survey and monitoring of permittees for Region 1, with a total of 711 permits to operate (APSI) issued and a total of 1,228 establishments compliance monitoring conducted with the Clean Air Act physically and virtually. For mobile sources: Request of data from Land Transportation Office (LTO) for the preparation of Regional Emission Inventory to account air emissions from mobile sources and continuous recommendation to Local Government Units of effective and efficient traffic management plan within their locality; Establishment of two (2) Private Motor Vehicle Inspection Centers in Laoag City, Ilocos Norte and Alaminos City, Pangasinar; Intensification of the conduct of Joint monitoring with DTI, LTO and EMB of the Accredited and Operational Private Emission Testing Centers and Private Motor Vehicle Inspection Centers. For area sources: Strict implementation of RA 9003 (Ecological Solid Waste Management Act of 2000) and RA 8749 (Clean Air Act of 1999) on an LGU level





Regular anti-smoke belching operations are being conducted regularly in the provinces of Cagayan and Isabela in coordination with the provincial local governments and the Land Transportation Office. Clean-up drives are conducted in different municipalities within the region.

The amount of trees required to be planted in tree planting activities in the region is calculated using a devised formula for carbon emission sequestration using references from US EPA, US Department of Energy, and EcoTree.Green. The amount of trees planted or donated by the proponents of these tree planting activities are based on this formula. In Tuguegarao City, an ordinance was enacted (City Ordinance 26-08-2021) establishing the Tuguegarao One Million Trees Movement, a project which aims to be able to plant one million trees in the next three years with the cooperation of the DENR, DA, DOLE, DSWD, the Cagayan State University, the Schools Division of Tuguegarao City, and the proponent, the Northern Natural Resource Conservation, Inc. (NNRC).

Since the collection of data from manual samplers has stopped due to the pandemic, the Region III office has conducted continuous monitoring of air quality using automatic stations, specifically the DOAS and PMS. They are also connected to the Central Office for compliance with EMB guidelines.

Other activities conducted include roadside vehicular emission testing, modernization of jeepneys to Euro IV compliant vehicles, and monitoring the open burning of wastes. The regional office conducts trainings for the usage of air quality monitoring equipment and mapping of air pollution sources. An Environmental Data Quality Monitoring Center is in the process of being constructed to monitor emissions from industrial establishments.

Policies are being implemented on the LGU level for the management of air quality, prohibition of smoking in public areas, and for the modernization of public utility vehicles.

Currently, continuous ambient monitoring stations in Region IV-A are connected to a central air quality command center. The EMB Region IV-A continuously conducts emission inventories from mobile sources. The Regional Offices envision the procurement of local technologies and air quality monitoring devices (prioritizing low-cost and sensor-based devices) to monitor larger areas within the region.

EMB MIMAROPA Region conducts regular monitoring of air quality in Baco-Calapan City-Naujan (BCN) Airshed in Oriental Mindoro, and also in Puerto Princesa City with its Continuous Ambient Air Quality Monitoring Station (PPC CAAMS), located in Palawan State University, Puerto Princesa City, Palawan. BCN Airshed is monitoring particulate matter 10 (PM₁₀) while PPC CAAMS is capable of monitoring PM₁₀ and PM_{2.5}.



R2

R3

R4A

R4B

The agency also conducted Garage Testing Activities last November 2021 in Baco, Calapan City, and Naujan, Oriental Mindoro. Technical personnel were also conducting inspection and verification of the compliance of establishments in the MIMAROPA Region. Notices of Violation (NOVs) would be issued to those firms found to be violating RA 8749 and other environmental laws. A stack emission test was also conducted for establishments with generator sets with a rated capacity above 300kW.

EMB Region V has moved to capacitate the technical personnel from partner LGUs in Daet, Camarines Norte, Masbate City, and Tabaco City in conducting Ambient Air Quality Monitoring within their areas. An Anti-Smoke Belching Operation Roadside Apprehension was also conducted during the celebration of the National Clean Air Month.

A prohibition on the open burning of wastes is being enforced on the barangay level and ordinances are already being implemented to impose citation tickets on violators. The EMB Region V implements continuous information dissemination regarding the effects and impacts of open burning of waste.

In addition, these are the ordinances enacted in specific LGUs which are relevant to airshed management:

- Naga City: City Ordinance No. 99-084 (Anti-Smoke Belching Ordinance of the City of Naga); Emission & Sound Level Testing of Tricycles/Trimobile; Sound Level Testing of Generator Sets of business/commercial establishments and requiring said establishments to provide sound-proofing materials and secure Permit-to-Operate (PTO) from DENR-EMB V; City Ordinance No. 2021-010 (An ordinance regulating the Land Filling/Back Filling Activity in the City of Naga)
- Legazpi City: City Ordinance No. 0007-2016 (An Ordinance Enacting the Environment Code of the City of Legazpi); City Ordinance No. 0024-2015 (The 2015 Revised Traffic Code of the City of Legazpi which includes Section 81 providing list of streets designated as a bike lane); City Ordinance No. 0017-2009 (The Legazpi City Integrated Ecological Solid Waste Management Ordinance of 2009); Legazpi City Community Level Greenhouse Gas (GHG) Inventory; City Ordinance No. 14-0011-2017 (An Ordinance Revising Ordinance No. 07-2002, otherwise known as an Ordinance Prohibiting Smoke Belching in the City of Legazpi, providing for the procedures for inspection, examination of motor vehicles and imposing penalties for violation of this ordinance); Executive Order No. 17-2018 which aired infomercial audio/video clips of Information and Education Campaign about the Air Quality in Legazpi City, Airshed Programs, and Air Pollution Effects in social media, broadcast media, cinemas, private malls and private and government-owned outdoor/indoor LED screen.

EMB Region VI conducts regular compliance monitoring of industries in compliance to RA 8749 as part of mitigating emissions from stationary sources. The Metro Iloilo Airshed Anti-Smoke Belching Unit (MIA-ASBU)

R6 Enforcement & IEC Team employs a proactive approach with its conduct of roadside inspections and apprehensions to achieve and maintain healthful air.

LGUs have adapted Governing Board Resolutions and turned it to local ordinances in relation to open burning of wastes. Violators of said ordinances are given corresponding fine/penalty.





R4B

While no new policies were enacted in the year 2021 on the LGU level, the following policies are still being implemented:

- Iloilo City's Anti-Smoking Ordinance. The Iloilo City Anti-Smoking Task Force (ICAST) is stringently implementing the amended ordinance, ordering a total ban on smoking in all establishments.
- Under the amended ordinance, Regulation Ordinance No. 2006-150 or The Comprehensive Anti-Smoking Ordinance of Iloilo City, establishments are prohibited to put up smoking areas for smokers. Violators will be fined the following: Php 1,500 for the first offense, Php 2,500 for the second offense, and Php 5,000 and one-week closure for the third and succeeding offenses.
- Oton, Iloilo's Stricter Enforcement of Zoning Sanitation and other environmental ordinances. The LGU has issued Executive Order (EO) No. 6, also known as "An Order Directing the Municipal Environment and Natural Resources Office (MENRO) to Issue Environmental Clearance to Applicants with Business Establishments that Qualify with the Standard Sanitation." Under this EO, business permits of all applicants shall be subject to assessment and evaluation in order to qualify for the issuance of Environmental Sanitation Clearance from the MENRO. After such approval, their environmental application can be further directed to the concerned Agency.
- The Pavia P4MP Farmers Association based in Pavia, Iloilo conducts Farmer's Field School on Climate Change Adaptation and Mitigation in order to educate their farmer and seven (7) DOLE registered Farmers Association under the organization. The group also advocates and practices no burning of rice straw to avoid the emission carbon dioxide, carbon monoxide, nitrogen dioxide and sulfur dioxide that causes air pollution.

EMB Region VII, through the SWEET-EnMOs, in partnership with LGUs, proactively monitors incidences of open burning of wastes including improper waste disposal.

Capacity building has been conducted for Air Dispersion Modeling using AERMOD software for technical staff.

R7

EMB Region VII has also partnered with UP Cebu for the ABOT-REHAB project on the rivers within Mandaue City, which aims to describe environmental quality through correlating air and water quality in these areas. In partnership with the Aboitiz Group of Companies, and under the Adopt-a-CAMS program of EMB, a Continuous Ambient Air Quality Monitoring Station (CAAQMS) was installed in the region in 2021. The program aims to maximize the scope of monitoring ambient air quality with the help of partners in the private sector to give updates on air quality to the public.



ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

R6

R8	EMB Region VIII works with LGUs for the issuances of local ordinances implementing the provisions of RA 9003 to manage the open burning of wastes. The compliance of LGUs is being monitored through the personnel of the Solid Waste Management Section. EMB also disseminates IECs such as learning events and capacity building activities held on a virtual platform with the participation of LGU and MENRO staff. NGAs and LGUs have developed diversion and bypass roads to improve the efficiency of the road network with the goal of facilitating access to Tacloban City as part of traffic engineering activities.
R9	 EMB Region IX is continuously improving the ambient monitoring and enhancing the monitoring of air quality in the region through its online real-time Continuous Emission Monitoring Systems (CEMS) and Environmental Quality Monitoring Center. Technical staff have undergone training in 2021 for stack emission testing, airshed designation, and air dispersion modeling. For stationary and mobile sources, Self-Monitoring Reports (SMR) are submitted by the establishments and NGAs such as the Land Transportation Office (LTO) under the Department of Transportation (DOTr) submit their data for mobile sources. Current environmental provisions related to open burning of wastes are being implemented on an LGU level through ordinances and resolutions.
R10	 EMB Region X continually conducts ambient air quality monitoring with at least the required 75% data capture rate. Annual concentration data of PM_{2.5} monitoring in all AQMS are generally within the guideline values. Amidst the pandemic where the regular activities of the offices have been affected, the use of online platforms were maximized. Specific mention is made to the strengthening of monitoring of crematoriums in the wake of the surge in the number of cremated bodies to ensure that the provisions of RA 8749 are still being complied. Member LGUs of the airshed board were encouraged to address the open burning of wastes by enacting ordinances to ban the activity and impose fines and penalties for violators. Seven major industries in the region, including two cement plants, four coal-fired power plants, and one sintering facility, operate their own CEMS/COMS which connects with the Regional and Central Data and Handling System (DAHS) pursuant to EMB MC 2021-14.




Table 14 Summary of actions of the Airshed governing board members in the air qualitymanagement, C.Y. 2021 (continued)

- Individual ordinances active in the LGUs of Region X as of 2021 include the following:
 - Municipality of Jasaan, Misamis Oriental
 - Ordinance 150-2021 (Ordinance prohibiting vaping in all public places, includes amendments to Ordinance 122-2019 to include the banning of all forms of e-cigarettes)
 - Ordinance 160-2020 (Ordinance enacting the Ecological Solid Waste Management Ordinance of the Municipality of Jasaan, Misamis Oriental – made valid by the Sangguniang Panlalawigan ng Misamis Oriental by resolution 1203-2021, includes provisions on ban on open burning)
 - Cagayan de Oro City
 - Ordinance 13102-2016 (Ordinance regulating all smoke-belching motor vehicles)
 - Municipality of Villanueva, Misamis Oriental
 - Ordinance 602-2018 (Ordinance penalizing all owners of smoke-belching vehicles)
 - Municipality of Tagoloan, Misamis Oriental
 - Ordinance 26-2017 (Ordinance regulating all smoke-belching vehicles)
 - City of El Salvador, Misamis Oriental
 - Ordinance 26-2013 (Ordinance enacting the Environmental Code of the City of El Salvador, Province of Misamis Oriental, includes provisions on vehicle emission controls and a permitting system (through coordination with the LTO) to ensure that emissions from vehicles are within standards and to impose fines and penalties for violators)

The Region XI offices conducted virtual monitoring at the time of the pandemic to continuously monitor establishments that emit air pollution. The continuous ambient air sampling in the entire airshed was also prioritized together with the maintenance of the continuous ambient air quality monitoring station (CAAQMS) which was running 24/7. This was to ensure that monitoring procedures would continue in the absence of access to manual ambient air monitoring equipment.

EMB Region XI can conduct confirmatory stack sampling for PM and SOx for the stationary sources within the region to verify the sampling results by the accredited 3rd party source emission testing firm and for investigation purposes. Emissions from significantly large stationary sources such as power plants and cement plants are already monitored through Data Acquisition and Handling Systems.

Airshed management activities in the region include monthly roadside anti-smoke belching operations, real-time monitoring of air quality using monitoring stations, enactment of local ordinances for the prohibition of open burning of wastes, and training of local environment offices for the operation of air quality sampling equipment, air dispersion modeling, and on-site validation of air monitoring stations.



ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

R10

R11

Table 14 Summary of actions of the Airshed governing board members in the air quality management, C.Y. 2021 (continued)

LGU policies on air quality effective in the year 2021 in Region XI include the following: *Davao City*

- Comprehensive Anti-Smoking Ordinance (first enacted in 2002 and amended in 2012), which bans smoking in all public places and enclosed places but has an option for designating a smoking area, provided by embellishments pass through a series of rigid inspections by Anti-Smoking Task Force. Its goal is to make majority of public places completely smoke-free.
- The Anti-Smoke Belching Ordinance of Davao City (passed in 2006) protects the air quality of the Davao City Airshed by the conduct of random vehicle testing and the issuance of citation tickets to vehicles found to exceed the emission standards.
- Ordinance 0309-07 (passed in 2007) bans the aerial spraying of chemicals as an agricultural practice. The ordinance was passed to protect the communities around agricultural plantations as well as communities downstream and the river systems.
- The Davao City Ecological Solid Waste Management Ordinance (enacted in 2009) establishes a
 program for ecological solid waste management in compliance with RA 9003 to ensure the
 protection of public health and the environment.

• The Zoning Ordinance of Davao City (implemented in 2015) declared a total of 74,684 hectares (or 31% of the city's inland area) as conservation, forest, parks and recreation or mangrove rehabilitation. A total of 26,104 hectares included tree cover from various species and 19 urban parks are being maintained, including roadsides and road islands.

Tagum City

- City Ordinance No. 454 s. 2010 (which revises City Ordinance No. 23 s. 1991) regulates noise pollution generated by all motor vehicles.
- EMB Region XII conducted several activities for the maintenance of air quality in the local airshed, which include the following:
- Roadside anti-smoke belching apprehension activities
- Site inspection and tree growing activities in airshed-adopted areas (Purok Bagong Silang, Brgy. Linan, Tupi, South Cotabato). A one-hectare area was designated within the tarsier sanctuary in said barangay, and the total site measures approximately 50 hectares with 69 tagged tarsiers, and species of local trees such as lawaan, nabul, and narra, in addition to fruit trees such as guyabano, avocado, and marang.
- **R12**
- Garage testing of public utility vehicles, using gas analyzers for gasoline-fueled vehicles and opacimeters for diesel-fueled vehicles. The tests were carried out at the Koronadal City Integrated Public Transport Terminal and a total of ten percent of the total number of buses and vans per municipality were tested.
 - Ambient air baseline monitoring using portable air analyzers, installed for 24 hours per site/LGU. The municipalities of Norallah, Surallah, Sto. Nino, T'boli, Lake Sebu, Banga, Tantangan, Tampakan, and Polomolok were covered.
 - Orientation-Workshop on Entity-Level and Community-Level Greenhouse Gas Inventory for South Cotabato Airshed LGUs





R11

Table 14 Summary of actions of the Airshed governing board members in the air quality management,C.Y. 2021 (continued)

 Compliance monitoring of industries to ECC conditions and the implementation of MC-2021-03 on the CEMS connection of industries to central DAHS for stationary sources Periodic monitoring of the private emission testing centers to emission testing procedures, compliances to JAO No. 01 – series of 2007 for mobile sources Capacity building activities with the Local Government Units and other related line agencies on the implementation of RA 8749. Initiatives on the LGU scale included the issuance of air-related permits as a prerequisite for business, policies aimed to prohibit the open burning of waste, and issuance of tricycle franchises only to those who comply with emission testing and other requirements.
EMB Region XIII implements various programs and conducts activities related to the maintenance of air quality in the region, such as Clean Air Programs, roadside anti-smoke belching operations, monitoring of vehicular air conditioning/refrigeration systems, tree-growing activities, airshed-wide emission inventories, supporting LGUs in conducting surveys on residential and commercial indoor cooking activities, and IECs related to air pollution emissions.
Air quality monitoring was conducted through established CAAQMS and manual monitoring stations. It is expected that in 2021 when economic activities and public transportation partially resumed, concentrations of criteria pollutant emissions would increase.
 Other relevant activities include: Capacity building of LGUs within the Agusan del Norte – Butuan City Airshed for simultaneous vehicle counting activities Assessment of results of stack testing conducted for stationary industrial sources, including confirmatory sampling if an exceedance is noted. Data results would be stored in a database for future reference.

- Crafting of an ordinance for the establishment of an anti-smoke belching unit in Cabadbaran City
- Implementation of existing ordinances in LGUs regarding noise pollution and open burning of wastes



R12

R13

Response to Mobile Source Emissions

In alignment with the provisions of the Clean Air Act, DENR and DOTr have laid out policy requirements for emission standards for motor vehicles, which include maximum emission limits that are reviewed every two years (or as the need arises). It is also expected that concerned agencies will impose measures such as inspection and monitoring of emissions of mobile vehicles, closing of roads or areas to specific types of vehicles at any given time, and conduct emission testing (whether through accredited centers or directly as part of an initiative from the local government). Each regional office and Airshed Governing Board has conducted various measures over the past year to monitor and manage air emissions from mobile or vehicular sources, which are as follows:

Table 15 Summary of actions of the Airshed governing board members in the Regions in the managementof mobile sources, C.Y. 2021

Region	Responses			
CAR	The BLISTT Airshed Task Force routinely conducts a quarterly smoke-belching apprehension activity with DOTr-CAR, EMB-CAR, deputized members from the member LGUs of BLISTT and other stakeholders.			
NCR	Agencies in Metro Manila have supported the existing activities implemented during the time of the pandemic such as the operationalization of the Bus Rapid Transit and other alternative transport options, jeepney rerouting, and regulation of tricycle transports. During the pandemic, ambient air pollution dropped to almost 50% due to the minimal means of transportation operating.			
R1	EMB Region I conducts quarterly anti-smoke belching operations, and in cooperation with LTO, the Regional Emission Inventory which covers air emissions from mobile sources. The office also recommends efficient traffic management plans to LGUs. Two Private Motor Vehicle Inspection Centers were established in the region (in Laoag, Ilocos Norte and Alaminos City, Pangasinan). The joint monitoring in coordination with DTI, LTO, and EMB involving accredited and operational Private Emission Testing Centers and the Motor Vehicle Inspection Centers was intensified. LGUs have been upgrading their government vehicle fleets with Euro 4 standard compliant units, and also strengthening the enforcement of the traffic management plan to reduce vehicular emissions and contribute to minimized traffic congestion.			





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Table 15 Summary of actions of the Airshed governing board members in the Regions in the management of mobile sources, C.Y. 2021 (continued)

R2	EMB Region II conducts regular anti-smoke belching operations in coordination with the provincial governments and the LTO. These activities are conducted in various locations in the provinces of Cagayan and Isabela. The region's Anti-Smoke Belching Campaign aims to reduce pollutant emission concentrations coming from vehicular sources, promote public awareness, inculcate environmental responsiveness among motorists, and encourage a culture of voluntary compliance with environmental regulations. Santiago City conducts a yearly monitoring of LGU vehicles as part of its "Oplan Usok-Sita" initiative.
R3	EMB Region III, alongside LTO, DPWH, and the LGU of San Fernando, conducted joint roadside emission testing activities. This was done along Jose Abad Santos Avenue (Ologapo-Gapan Road) to determine vehicles emitting air pollutants above the set standard limits under RA 8749. Violators are issued with Temporary Operator's Permit (TOP from LTO) and are given ample time to fix/repair their vehicle to pass the emission standards.
R4A	EMB Region IV-A continuously conducts emission inventories from mobile sources.
R4B	EMB MIMAROPA conducted Garage Testing Activities last November 2021 to celebrate Clean Air Month in Baco, Calapan City, and Naujan, Oriental Mindoro. Transport vehicles such as jeepneys were tested during the activities. Drivers of public vehicles were reminded to properly maintain their vehicles to assure their compliance with RA 8749. Currently, the action of the BCN Airshed Governing Board Members is to reactivate the Baco-Calapan City-Naujan Airshed Anti-Smoke Belching Unit (BCNASBU) to enforce the provisions of RA 8749 or the Philippine Clean Air of 1999 for mobile sources.
R5	EMB Region V conducted an Anti-Smoke Belching Operation Roadside Apprehension during the celebration of the National Clean Air Month. However, as a consideration to the drivers due to the ongoing pandemic and economic crisis, no tickets and penalties were issued. Rather, the activity was conducted to raise awareness of the importance of proper engine and vehicle upkeep to reduce air pollution emissions from vehicular sources. IECs on these Anti-Smoke Belching Operations are also conducted on the barangay level in partnership with LGUs and NGAs/NGOs to raise awareness in maintaining the good quality of air within the region. The LGU of Legazpi City implemented Executive Order No. 17-2018 which broadcasts infomercial audio/video clips of IECs about the current air quality in the city, including current status of airshed programs, and the effects of air pollution. This is disseminated through the means of social media, broadcast media, cinemas, private malls and private and government-owned outdoor/indoor LED screens.

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Table 15 Summary of actions of the Airshed governing board members in the Regions in the management of mobile sources, C.Y. 2021 (continued)

Currently, as of 2021, in Region VI, limited public utility vehicles could operate during the quarantine period. The creation of the Metro Iloilo Airshed Anti-Smoke Belching Unit (MIA-ASBU) Enforcement & IEC Team is a proactive approach to achieve and maintain healthful air in highly urbanized areas in the region. They conduct roadside inspection and apprehension of smoke belchers, with the objective of instilling discipline among the members of the transport sector to adhere to the mandate of Clean Air Act and determining the efficacy of the series of smoke emission testing activities.

EMB Region VI also conducts free garage smoke emission testing for major transport groups within the airshed area for awareness of the contribution of mobile sources to air pollution.

The Southern Oton Jeepney Operators and Drivers Association (SOJODA) Transport Group based in Brgy. Cabanbanan, Oton, Iloilo is the most active transport group of Metro Iloilo Airshed. The group regularly attends MIAGB meetings. As a MIA-ASBU member, they are consistently present during the conduct of Roadside or Garage Smoke Emission Testing, IEC activities, roadside inspection, and apprehension activities. One of the best practices being implemented by the group to lessen air pollution is a mandatory coding scheme where 15 units are not plying the usual routes daily. Approximately 9,000 liters in a month is saved and for 12 months, around 108,000 liters of fuel were not utilized and exhausted to the air as pollutants.

A Refresher Course on Motor Vehicle Maintenance for MIA Transport Groups members was conducted on November 6-7, 13-14 and 20-21, 2022 at San Agustin St., San Miguel, Iloilo (MITSCOOP garage)

Comparing the average concentration recorded for manual and automatic air quality monitoring stations, there is a significant decrease in TSP and PM₁₀ concentration for after the implementation of the enhanced community quarantine in the region.

The EMB Region VI is conducting regular inspection of Private Emission Testing to ensure validity of their calibration certificates.

The office also continues to aid the Province of Guimaras on the creation of Guimaras Anti-Smoke Belching Unit (ASBU) Task Force thru MIA Resolution No. 2020 – 02.





R6

Table 15 Summary of actions of the Airshed governing board members in the Regions in the managementof mobile sources, C.Y. 2021 (continued)

R7	EMB Region VII will donate a portable gas analyzer to LTO Region VII to support its mandate of regulating emissions from mobile sources.		
R8	EMB Region VIII's response to mobile emission was the reduction of riding capacity per vehicle to 50% in compliance to social distancing on all public/private transportation. This includes the use of scheduled assigned shuttle services to ferry employees from point to point.		
R9	In Region IX, the maximum passenger capacity for jeepneys and other public transportation were minimized. EMB relies on the Self-Monitoring Reports (SMR) submitted by the establishment for stationary and NGAs such as the Land Transportation Office (LTO) under the Department of Transportation (DOT) for mobile sources.		
R10	The EMB-Region X office through the Airshed Governing Board is actively engaged in anti-smoke belching activities in coordination with the LGUs in the airshed as a visible approach in communicating the actions of the government to regulate the land transport sector and transition to a more sustainable transport system (as part of the jeepney modernization process). The LGUs under the airshed management also provides information for emissions inventories of mobile sources through the conduct of motor vehicle counting activities. The data gathered can be used in transport planning initiatives. Existing ordinances are in place in Cagayan de Oro City and the municipalities of Villanueva and Tagoloan in Misamis Oriental for the regulation and apprehension of smoke-belching vehicles. A permitting system is also in place in the municipality of El Salvador, Misamis Oriental in coordination with LTO to ensure that the operating motor vehicles are within existing environmental standards for emissions.		
R11	In 2021, public transportation resumed its 100% sitting capacity. The air quality monitoring stations within the entire airshed are operational to monitor the real-time concentration of air pollutants in the area. For mobile source management, monthly roadside Anti Smoke Belching Operation (ASBO) with Davao City ENR Office Team was conducted to strictly apprehend vehicles that are emitting smoke that exceeds the mobile emission standards. Local ordinances are still in effect in the region, such as the Anti-Smoke Belching ordinance of Davao City was passed in 2006 to protect the air quality of the Davao City Airshed declared under the Clean Air Act of 1999. Per its provisions, random vehicle testing would be regularly conducted, and citation tickets would be issued to violators exceeding the emission standard.		



Table 15 Summary of actions of the Airshed governing board members in the Regions in the managementof mobile sources, C.Y. 2021 (continued)

EMB Region XII conducted Roadside Anti-Smoke Belching Apprehension which aims to ensure compliance of vehicles with the emission standards set by RA 8749 or the Philippine Clean Air Act. Random monitoring was conducted to apprehend in-use vehicles, including trucks, utility vehicles, buses, and motorcycles, for fuel efficiency and management and vehicular regular maintenance. During the activity, 15 different types of vehicles were tested. All vehicles had passed the said roadside emission testing.

The EMB Personnel from the Ambient Monitoring and Technical Services Section, as well as representatives from the Koronadal City Terminal and City ENRO Koronadal actively participated in the garage vehicle emission testing activity. In this activity, a gas analyzer was used for gasoline-fueled vehicles and opacimeter for diesel-fueled vehicles. Each equipment measures the level of carbon monoxide and hydrocarbons for spark ignition vehicles and smoke opacity for compression ignition engine vehicles. Ten percent of the total number of vehicles (bus and van) per municipality were tested, and all the samples passed. The tests were carried out Koronadal City Integrated Public Transport Terminal.

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For the management of air emissions from mobile sources, periodic monitoring of the private emission testing centers to emission testing procedures was conducted (to check compliances to JAO No. 01 – series of 2007). Random roadside emission testing in coordination with LTO and the member LGUs was also conducted.

On a local level, the issuance of tricycle franchises is only to those who comply with emission testing and other requirements set by the LGU.

In response to emissions from transport, EMB Region XIII conducts roadside anti-smoke belching monitoring, mobile air conditioning/refrigeration system monitoring, mobile vehicle counting activities, simultaneous airshed-wide emission inventories, and IECs. As public transportation resumed in 2021, it was observed that there was a significant increase in the number of vehicles compared to the year 2020 when the pandemic was at its peak.





PUV Modernization Program

The Department of Transport (DOTr) launched an initiative for the modernization of public utility vehicles, most notably jeepneys and buses, in 2017, which is still ongoing to this day. It was launched as a reform of the existing transportation industry by replacing old units with more modern units with the goal of increasing the efficiency and sustainability of public transport in the country. DENR-EMB, as the agency which is mandated to, in this case, monitor and manage air emissions from mobile vehicular sources, is expected to coordinate with the Airshed Governing Boards of each region, including their constituent LGUs, to promote actions to improve air quality in their airsheds through the modernization of public transport vehicles or improvement of existing transport technologies. The responses of the regional offices on this matter are summarized in Table 16.

Table 16 Summary of actions of the Airshed governing board members in the Regions towards the PUV modernization Program for the C.Y. 2021

Region	Responses	
CAR	EMB-CAR is planning on conducting a pilot test of electric vehicle transport to be conducted in Camp John Hay and the UP Baguio campus, which aims to reduce overall mobile emission levels from transport sources.	
	Transportation during the year 2021 has been limited due to the downsizing of PUV and jeep routes due to the pandemic. Vehicle traffic levels have lessened, likely due to restrictions of movement only to those who are working (unless for medical reasons/emergency).	
NCR	LGU initiatives include the purchase of electric tricycles in Parañaque (140 units in total, of which 32 were given to barangays and the remaining were distributed to different homeowners' associations), regular conduct of anti-smoke belching operations in Marikina, clean fleet management seminars, free emission testing activities, and Bantay Tambutso (BanTam) program in Makati, and the installation of bicycle racks in Manila.	
R1	Part of the initiatives set by the action plan for the PUVMP in Region I is the gradual replacement of old jeepney units with newer Euro IV-compliant units.	



 Table 16 Summary of actions of the Airshed governing board members in the Regions towards the PUV modernization Program for the C.Y. 2021 (continued)

R2	The Jeepney Modernization Program was launched by the Land Transportation Franchising and Regulatory Board (LTFRB) in Region II as part of the nationwide PUV Modernization Program (PUVMP).
R3	Some LGUs in Region III are implementing the used of modernized jeepneys to lessen the emission of air pollution. Modern jeepneys are compliant with the Euro IV standard which is considered environment friendly as compared to previous vehicle models.
R4A	The office in Region IV-A has currently not identified other mode of transportation which will permanently replace the public utility vehicles used and route rationalization.
R4B	EMB MIMAROPA supports the Public Utility Vehicle Modernization Program and its agenda of improving the efficiency of the transport system and making it more environmentally friendly. In coordination with the EMB Recognized PCO Training Organizations, EMB MIMAROPA technical staff provides/serves as lecturers on PCO training, which includes information on jeepney modernization and the use of e-vehicles.
R5	LTFRB – Region V has introduced the new modernized PUV jeepney units since July 11, 2019, and the transition to these new units is still ongoing. Some units are already being utilized by the jeepney drivers with the route Legazpi City to Tabaco City and vice versa. Based on the emission inventory conducted by EMB Region V last 2016-2018, it was found out that almost 75% of emissions come from mobile sources. It is expected that they would decrease once the Jeepney Modernization implementation is completed.
R6	Iloilo City and Neighboring municipalities have responded to the jeepney modernization program. The City Loop Integrated Alliance of Jeepney Owners and Drivers' Association (CLIAJODA) and Iloilo City Alliance Operators and Drivers Transport Cooperative (ICAODTC) initially deployed four units to ply the route from the Iloilo Terminal and General Services, Inc. (ITGSI) terminal in Barangay Ungka, Jaro district going to the City Proper
έ ν	via Jaro CPU (Central Philippine University) and vice versa; two units from Arevalo district to City Proper and vice versa; and one unit for the route from the ITGSI terminal to the City Proper via Diversion Road and vice versa.
R7	According to the response from EMB Region VII, they are not the appropriate agency to be implementing the Jeepney Modernization program, but the agency strongly supports the said program.

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Table 16 Summary of actions of the Airshed governing board members in the Regions towards the PUV modernization Program for the C.Y. 2021 (continued)

R9During the pandemic, the maximum passenger capacity for jeepneys and other forms of public transportation were reduced.R9The PUV modernization program in Region IX primarily involves the conversion of two- stroke to four-stroke engines for tricycles, and the introduction of class 2 modern jeepneys.R10EMB Region X strongly supports the Jeepney Modernization Program of the government. The City Government of Cagayan de Oro submitted their Local Public Transport Route Plan (LPTRP) to the LTFRB, which was initially submitted during the common year of 2020 and which is still being evaluated with revisions in 2021. The actions taken also include the improvement of existing transportation modes and route rationalization for PUVs.R11Davao City's implementation of the PUJ/PUV Modernization Program involves the replacement of specific jeep routes (Catalunan Grande and Toril) with bus routes.R12In Region XII, Jeepney modernization. In addition to these measures, the regional office has identified routing schemes and implemented them for public transport to prevent traffic and congestion along roads. To reduce traffic congestion further, farm-to-market roads were constructed, traffic lights were installed, and traffic management officers were stationed.R13Butuan City has responded to the jeepney modernization program since 2019. There are currently three cooperatives which operate new models of motorized jeepney. As part of this program, the new motorized jeepneys also operate new routes that are being established within the city.	R8	Region VIII recognizes that the usage of modernized jeepney units help reduce harmful emissions from vehicles for the community. Most importantly, the program helps reduce the heavy traffic in the country. Identified routes for modernized jeepneys are from Tacloban City to nearby northern Barangays/Municipalities such as Brgy. Palanog, Cabalawan, Sta. Rita, Samar. From the southern part of Tacloban City, jeepneys are expected to travel to and from Tanauan, Dulag, Alang-alang, Jaru and Carigara.		
 EMB Region X strongly supports the Jeepney Modernization Program of the government. The City Government of Cagayan de Oro submitted their Local Public Transport Route Plan (LPTRP) to the LTFRB, which was initially submitted during the common year of 2020 and which is still being evaluated with revisions in 2021. The actions taken also include the improvement of existing transportation modes and route rationalization for PUVs. Davao City's implementation of the PUJ/PUV Modernization Program involves the replacement of specific jeep routes (Catalunan Grande and Toril) with bus routes. In Region XII, Jeepney modernization actions include the Identification of current transportation modes and route rationalization. In Koronadal City and General Santos City, electric jeeps and city buses have replaced some of the old jeepney units for transport. In addition to these measures, the regional office has identified routing schemes and implemented them for public transport to prevent traffic and congestion along roads. To reduce traffic congestion further, farm-to-market roads were constructed, traffic lights were installed, and traffic management officers were stationed. R13 Butuan City has responded to the jeepney modernization program since 2019. There are currently three cooperatives which operate new models of motorized jeepney. As part of this program, the new motorized jeepneys also operate new routes that are being established within the city. 	R9	During the pandemic, the maximum passenger capacity for jeepneys and other forms of public transportation were reduced. The PUV modernization program in Region IX primarily involves the conversion of two-stroke to four-stroke engines for tricycles, and the introduction of class 2 modern jeepneys.		
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	R13	Butuan City has responded to the jeepney modernization program since 2019. There are currently three cooperatives which operate new models of motorized jeepney. As part of this program, the new motorized jeepneys also operate new routes that are being established within the city.		







Policy initiatives on the LGU level for the management of air quality involve the issuance and implementation of various ordinances, resolutions, and other relevant documents, which are listed here by region/municipality/city.

Table 17 LGU Policies related to Air Quality Management

Region	Document No.	Responses	Municipality/City
CAR	(N/A)	Environmental Code	Baguio City and La Trinidad, Benguet
NCR	Ordinance 8607	"Declaring a parcel of land, known then as DECs property, located at Arroceros Street Manila, across the street from the Metropolitan Theatre and the Mehan Garden and beside Pasig River as a permanent forest park pursuant to the Republic Act 5752, to be known as the Arroceros Forest Park and appropriating funds"	City of Manila
	EO 35 s. 2020	"Establishing the "Hinga Maynila" Task Force for better Air Quality Management in the city of Manila"	
	E.O. No. 2019-004	"Creating the Task Force Pangkalikasan in the City of Urdaneta"	
R1	E.O. No. 2011-005	"Organizing the Junior Bantay Pangkalikasan in all Secondary and Elementary Schools in the City of Urdaneta"	Urdaneta City, Pangasinan
1	E.O. No. 2011-006	"Creating the Bantay Ilog of the City of Urdaneta"	1
	E.O. No. 2016-031	"Reorganizing the Urdaneta City Solid Waste Management Board"	



	E.O. No. 2017-016	"Creating the Task Force Bawal ang Plastik in the City of Urdaneta"	
	City Ordinance No. 026-2011	"This ordinance shall be known as "An ordinance regulating the use of Plastic Bags on dry and wet goods and prohibiting the use of Polystyrene Plastic (Styrofor/Styrofoam) in the City of Urdaneta and prescribing penalties thereof"	Urdaneta City, Pangasinan
	City Ordinance No. 028-2011	"This ordinance shall be known as the "Environmental Code of 2011 of the City of Urdaneta"	
	Municipal Ordinance No. 2015-06	An Ordinance Enacting the Environment Code of the Municipality of Binalonan	
R1	Executive Order No. 04	Creation of the Municipal Solid Waste Management Board (MSWMB)	
	Executive Order No.320	Updates on Municipal Solid Waste Management Board (MSWMB) November 12, 2021	
	Resolution No. 2019-01	Resolution Prescribing the Schedule of Waste Collections from Every Barangay Materials Recovery Facility in Binalonan, Pangasinan	Binalonan, Pangasinan
	Executive Order No. 2021-08	Reorganizing the BESWMC, January 4, 2021	
	Executive Order No. 2021-06	An order organizing the BESWMC, January 5, 2021	
	Executive Order No. 2021-25	Reorganizing the Barangay Solid Waste Management Committee	
	Barangay Ordinance 2018-02	An Ordinance Prescribing Fee for Collection of Solid waste in Barangay Sumabnit, Binalonan, Pangasinan	
	Barangay Ordinance No. 2017-01	An Ordinance Prescribing Fee for Collection of Solid Waste in Barangay Camangaan, Binalonan, Pangasinan	. Jon

	Executive Order No. 2021-152	Reorganizing the Municipal Planning Team to Update the CLUP 2022-2031 and Zoning Ordinance	Binalonan, Pangasinan
	Ordinance No. 2017-106	Enacting the ENVIRONMENT CODE of the Municipality of Mangaldan, Pangasinan	
	Ordinance Number 2009 – 55	Ecological Solid Waste Management Ordinance of the Municipality of Mangaldan	Mangaldan,
	Ordinance Number 2009 – 52	An ordinance introducing the use of Citation Ticket for improper disposal of garbage and other forms of unsanitary practices in the municipality of Mangaldan, Pangasinan and providing penalties for violation thereof	Pangasinan
	Municipal Ordinance No.4 Series of 2002	Comprehensive Solid Waste Management Ordinance of the Municipality of Sta. Barbara, Pangasinan	
	EO No. 22-64		
	Ordinance No. 2010-04 Series of 2010	Ordinance amending Ordinance No.03, Series of 2002 (Environment Protection and Management Code of the Municipality of Sta. Barbara, Pangasinan)	Sta. Barbara, Pangasinan
	Resolution No. 354 Series of 2005	Resolution approving Municipal Solid Waste Management	
	Resolution No. 89 Series of 2004	Resolution requiring all barangays, this municipality, to allocate five (5%) percent of their annual budget as counterpart fund to support the implementation of the municipal solid waste management system within their respective jurisdiction.	
	EO No. 4S-2018	"An ordinance providing for an Ecological Solid Waste Management, prescribing fees for solid waste management services declaring certain acts prohibited and providing penalties thereof."	Binmaley, Pangasinan



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 	4	Table 17 LGU Policies related to Air Quality Ma	anagement (continued)	
	Draft Municipal Ordinance EO No. 2S-2018	An ordinance enacting the Municipal Environment Code of the Municipality of Binmaley, Pangasinan.		
	No. 3S-2011	An ordinance regulating the disposal and management of hospital, clinics and other related medical Institutions waste materials within the Municipality of Binmaley.		
	Passed Ordinance #9S-2005	"An ordinance prohibiting the dumpsite of waste refuse, garbage, non biodegradable objects and other waste materials in any place and providing penalties thereof.		
R1	Municipal Ordinance No. 1S-1998	Binmaley Comprehensive Solid Waste Management Ordinance.	Binmaley, Pangasinan	
	EO #2015-10	An order creating the Project Management Team (PMT)		
	SB Resolution No. 99-2015	Authorizing Mayor Simplicio L. Rosario to enter into a MOA with NHA regarding Land Development of the identified resettlement area in Papaguayan.		
	Resolution No. 47 series of 1998	Enacting a comprehensive Solid Waste Management ordinance of the Municipality of Binmaley.		
	(N/A)	 Enforcement of Oplan Usok-Sita Monitoring, inspection, and testing of vehicles Issuances of permits to approved generators by CENRO 	Santiago City, Isabela	
R2	City Ordinance 26-08-2021	 Tuguegarao One Million Trees Movement Planting and growing of one million trees over three years to counter the effects of climate change Joint project of Tuguegarao City LGU, DENR, DA, DOLE, DSWD, Cagayan State University (CSU), Schools Division of Tuguegarao City, Northern Natural Resource Conservation, Inc. (NNRC) 	Tuguegarao City, Cagayan	

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	City Ordinance 2016-84-04	Zoning Ordinance of the City of San Jose del Monte	San Jose del Mente
R3	City Ordinance 2017-017-02, Article V	Air Quality and Noise Management and Energy Saving Practices	Bulacan
	(N/A)	Prohibition of smoking in public places and public vehicles	San Jose del Monte, Bulacan and Balanga City, Bataan
	City Ordinance No. 2014-008 Series of 2014	An Ordinance Prohibiting the Use of Motor Vehicles that Produce Excessively Loud and Disturbing Noise Within the City of Bacoor.	
	City Ordinance No. CO 5-2014 Series of 2014	An Ordinance Amending City Ordinance No. 2014-008, also known as the "Anti-Motor Vehicle Noise Pollution Ordinance of 2014"	City of Bacoor, Cavite
R4A	Municipal Ordinance No. 19 Series of 2010	An Ordinance Requiring All Types of Motor Vehicles and Motorized Equipment Plying the Highways, Roads and Streets or Operated Withing the Territorial Limits of the Municipality of Bacoor, Cavite to Undergo Smoke Testing and Imposing Penalties for Violations Hereof.	
	City Ordinance No. 17-09 (General)	Regulating the Use of Videoke and Other Audio-Amplified Machines in the City of General Trias	City of General Trias, Cavite
	Resolution No 055-16 Series of 2016	Resolution Adopting the Ecological Solid Waste Management Act of 2000 (R.A. 9003) and Establishing the Ecological Solid Waste Management (ESWM) Program in the Municipality of Maragondon, Cavite"	Maragondon, Cavite
	Ordinance No. 131	Prohibiting the Use of Modified Mufflers or Modified Exhaust Pipes of Motorcycles Within the Territorial Jurisdiction of the Municipality of Indang, Province of Cavite and Prescribing Penalties Therefor and for Other Purposes	Indang, Cavite



	Ordinanc e No. 99-006	An Ordinance Enacting the Municipal	Imus, Cavite
N.	Ordinance No. 2021-182	The Mendez-Nuñez Environment Code of 2021	Men <mark>dez-</mark> Nuñez, Cavite
	Ordinance No. 2019-154	An Ordinance Prohibiting the Open Dumping and Open Burning of Solid Waste	
	Resolution No. 2020-224 City Ordinance No. 2020-32	An Ordinance Regulating the Use and Operation of Videoke and Karaoke Machines and Other Similar Sound Emitting Devices in the City of San Pedro, Laguna and Providing Penalties for Violation Thereof.	
	Resolution No. 2008-38 Municipal Ordinance No. 2008-07	An Ordinance Establishing the Comprehensive Ecological Solid Waste Management of the Municipality of San Pedro, Laguna and Imposing Penalties for Violation Thereof	San Pedro, Laguna
	Resolution No. 2021-211 City Ordinance No. 2021-22	An Ordinance Enacting the City of San Pedro Vehicle Emission Control and Providing Penalty for Violation Thereof.	
	Ordinance No. 1720-2011 (Article IV)	Air Quality and Noise Management and Energy Saving Practices	Sta. Rosa, Laguna
WIF.	City Ordinance No. 2019-900	An Ordinance "Prohibiting Smoke Belching Within the Territorial Jurisdiction of the City of Antipolo" as Amended	
	City Ordinance No. 2018-851	An Ordinance Institutionalizing the Electric Vehicle Project for Local Transportation in the City of Antipolo and for Other Purposes	City of Antipolo, Rizal
32	City Ordinance No. 2011-439	An Ordinance Regulating the Smoke Belching Vehicles Plying Within the Territorial Jurisdiction of the City of Antipolo	
10	Ordinance No. 49-S-2011	An Ordinance Enacting the Environmental Code of the Municipality of Baras, Rizal	Baras, Rizal

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	Ordinance No. 2015-34	Ordinance for the Regulation of Smoking in Public Places	
	Resolution No. 04-2003	Resolution Supporting the National Confederation of Tricycle Operators and Drivers Associations and its Local Chapters for the Moratorium and Stands in Compliance with Clean Air Act of 1999	Teresa, Rizal
R4A	Ordinance No. 012, S. 2022	An Ordinance Prohibiting Littering, Dumping, Throwing of Garbage, Trash, Rubbish, Refuse and Other Waste Materials in Open or Enclosed Public Places and Requiring All Owners, Lessees, Occupants of Residential, Commercial, Institutional, Financial Business Establishment, Whether Private or Public to Maintain Cleanliness and to Refrain from Any Other Acts or Omissions Contrary to Cleanliness, Sanitation and Orderliness, Prescribing Penalty for Violation Thereof and for Other Purposes.	Binangonan, Rizal
	Ordinance No. 033, S.2020	An Ordinance Adopting the Municipality of Binangonan Solid Waste Management Code 2020	
	Ordinance No. 003, S. 2020	An Ordinance Amending the Environment Code of the Municipality of Binangonan, Province of Rizal	
	Ordinance No. 2016-016	Environmental Protection and Waste Management Code of Cainta, Rizal	Cainta, Rizal
	Resolution 84-2017	Ordinance on Ecological Solid Waste Management	San Agustin, Romblon
	Resolution 46-2021	Ordinance Prohibiting the Open Burning of Garbage	San Jose, Romblon
	Article VIII of Resolution 04-2017	Air and Noise Pollution Management	Baco, Oriental Mindoro
R4B	Ordinance 68-2014	Ordinance Mandating the Planting of Trees as a Requirement for the Issuance of Marriage License	Naujan, Oriental Mindoro



Table 17 LGU Policies related to Air Quality Management (continued)

	Ordinance 10-2008	Anti-Smoking Ordinance	Calapan City, Oriental Mindoro
	Resolution 4-2010	Resolution Enjoining Establishments, Firms, Company, Government, and Private Entities/Groups and Individual to Refrain from Open Burning of Waste Materials in their Respective Areas	Sta. Cruz, Marinduque
	Ordinance 99-084	Anti-Smoke Belching Ordinance of the City of Naga	
	(N/A)	Emission and Sound Level Testing of Tricycles and Trimobiles	
	(N/A)	Sound Level Testing of Generator Sets of business/commercial establishments and requiring said establishments to provide sound-proofing materials and secure Permit-to-Operate (PTO) from DENR-EMB V	Naga City, Camarines Sur
	Ordinance 2021-010	An ordinance regulating Land Filling/Back Filling Activities in the City of Naga	
	Ordinance 0007-2016	An Ordinance Enacting the Environment Code of the City of Legazpi	
R5	Ordinance 0024-2015	The 2015 Revised Traffic Code of the City of Legazpi (Section 81 provides a list of streets designated as a bike lane)	
	Ordinance 0017-2009	The Legazpi City Integrated Ecological Solid Waste Management Ordinance of 2009	
	(N/A)	Legazpi City Community Level Greenhouse Gas (GHG) Inventory	
	Ordinance 14-0011-2017	An Ordinance Revising Ordinance No. 07-2002, otherwise known as an Ordinance Prohibiting Smoke Belching in the City of Legazpi, providing for the procedures for inspection, examination of motor vehicles and imposing penalties for violation of this ordinance	Legazpi City, Albay



	EO 17-2018	Broadcasting of infomercial audio/video clips of Information and Education Campaigns about the Air Quality in Legazpi City, Airshed Programs, and Air Pollution Effects in social media, broadcast media, cinemas, private malls, and private and government-owned outdoor/indoor LED screen	
R6	Regulation Ordinance 2014-527	Comprehensive Anti-Smoking Ordinance of Iloilo City	lloilo City, Iloilo
	EO 6	An Order Directing the Municipal Environment and Natural Resources Office (MENRO) to Issue Environmental Clearance to Applicants with Business Establishments that Qualify with the Standard Sanitation	Oton, Iloilo
R7	Metro Cebu AGB Resolution No. 2020-01	Enjoining the National Government Agencies (NGAs), Local Government Units (LGUs), Government Owned and Controlled Corporations (GOCCs), Government-Run Colleges, Universities, Public Schools and Technical Institutions Within the Metro Cebu Airshed to Adopt the Four-Day Compressed Workweek or a Blended Four-Day Compressed Workweek and Work-from-Home Scheme in Which Reporting to Work Places Shall be from Monday Until Thursday Only and Friday Shall be Observed as an "Environment Day"	Metro Cebu Airshed
	Metro Cebu AGB Resolution No. 2020-02	Enjoining Industries, Commercial Establishments and Private Entities to Provide Shuttle Services or Carpooling Arrangements for their Employees and Workers, Help Reduce the Number Of Vehicles Plying the Road Networks and Eventually Contribute to the Reduction of Vehicular Emissions in Metro Cebu	
R8	City Ordinance No. 2009-10-160	The Anti-Smoking Ordinance of Tacloban City	Tacloban City, Leyte



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			Table 17 LGU Policies related to Air Quality Management (continued)	
	1	City Ordinance No. 2017-13-37	An Ordinance Providing for an Integrated Ecological Solid Waste Management for Tacloban City", Article VII, Section 24 - Prohibited Acts (Open Burning)	
	R9	Ordinance 2019-40 (Proposed)	Environmental Code of the City of Zamboanga	Zamboanga City
		Ordinance 150-2021	Ordinance prohibiting the use of electronic cigarettes (vaping) in all public places within the Municipality of Jasaan	
		Ordinance 150-2021	Ordinance prohibiting the use of electronic cigarettes (vaping) in all public places within the Municipality of Jasaan	Jasaan, Misamis
		SP Misamis Oriental Resolution 1203-2021	An Ordinance Enacting the Solid Waste Management Ordinance of the Municipality of Jasaan, Misamis Oriental	Oriental
	R10	Ordinance 13102-2016	An Ordinance Regulating All Smoke- Belching Motor Vehicles Plying and Traversing the Territorial Jurisdiction of Cagayan de Oro City and Providing Penalty for Violation Thereof	Cagayan de Oro City
		Ordinance 602-2018	An Ordinance Penalizing All Owners of Smoke-Belching Machine, Equipment, and Vehicles Operating/Plying within the Territorial Jurisdiction of the Municipality of Villanueva, Misamis Oriental	Villanueva, Misamis Oriental
~		Ordinance 26-2017	An Ordinance Regulating All Smoke- Belching Vehicles Plying and Traversing the Territorial Jurisdiction of Tagoloan, Misamis Oriental and Providing Penalty Thereof	Tagoloan, Misamis Oriental
		Ordinance 26-2013	Establishment of Permitting System (to ensure that the emission of vehicles operating in the City of El Salvador is in accordance with the standard provided for under existing laws with corresponding fines and penalties)	City of El Salvador, Misamis Oriental
1		Ordinance 0247-12	Comprehensive Anti-Smoking Ordinance	

	Ordinance 0280-06	Anti-Smoke Belching Ordinance	•••
	Ordinance 0309-07	Banning of Aerial Spraying of Chemicals as an Agricultural Practice	
R11	Ordinance 0361-10	Davao City Ecological Solid Waste Management Ordinance	Davao City
	(N/A)	Zoning Ordinance of Davao City, implemented in 2015, declared a total of 74,684 hectares (or 31% of the city's inland area) as conservation, forest, parks & recreation or mangrove rehabilitation. A total of 26,104 hectares were planted with various tree species and 19 urban parks are being maintained, including roadsides and road islands.	
R11	Ordinance 454 s. 2010	An Ordinance Revising Municipal Ordinance No. 23, Series of 1991, "An Ordinance Regulating the Noise Pollution Generated by All Motor Vehicles Within the Municipality of Tagum and Providing Penalties for Violation Thereof."	City of Tagum, Davao del Norte
	Ordinance s. 2022	An Ordinance Establishing the Environment Code of the City of Tagum	
R12	(Proposed)	Anti-Smoke Belching Ordinance	General Santos City
R13	SP Ordinance No. 5598- 2018	Smoke-Free Ordinance	Butuan City
	SP Ordinance No. 2123- 97	Anti-Smoke Belching Unit Ordinance	

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Designation Of Attainment and Nonattainment Areas

The term "attainment areas" refers to delineated areas where the existing air quality complies with the National Ambient Air Quality Guideline Values. Their designation is based on monitoring data collected using reference methods and real-time monitoring including the usage of meteorological data and other relevant data covering existing nearby sources.

Since the Air Quality Principles stated in the IRR of RA 8749 mentions that the recognition that the cleaning of the environment is primarily area-based, government agencies measure progress in management of air quality with the term "airsheds", which are defined as areas with similar climate, meteorology and topology which affect the interchange and diffusion of pollutants in the atmosphere. Subareas within airsheds may have varying levels of air quality, and may require differing approaches to similar problems, development programs and prospects.

Section 6 of the DAO 2000-82 also states that the criteria for establishing area designation boundaries shall be geographic in extent, and in consideration of the air quality data, meteorology, topography as well as the distribution of population or emissions. To operationalize the airshed, the DENR-EMB developed an airshed assessment checklist, as of September 2021, resulting in seven (7) Category 1 (Inactive Airshed) and fifteen (15) Category 2 (Active Airshed).

Region	Airshed Name	Category
NCR	National Capital Region Airshed	Category 1 – Inactive Airshed
CAR	BLISTT Airshed	Category 2 – Active Airshed
R1	Northeastern Pangasinan (NEPA) Airshed	Category 2 – Active Airshed
R2	Metro Tuguegarao (PIESTTA) Airshed	Category 2 – Active Airshed
R3	Bulacan-Pampanga-Bataan Airshed	Category 2 – Active Airshed
R4A	Cavite-Laguna-Rizal Airshed	Category 1 – Inactive Airshed

Table 18 Category Status and Activity as of C.Y. 2021 of Designated Airshed Nationwide



R4A	Makiling-Banahaw (Mak-Ban) Geothermal Airshed	Category 1 – Inactive Airshed
R4B	Baco-Calapan City-Naujan Airshed	Category 2 – Active Airshed
R5	Naga City Airshed	Category 2 – Active Airshed
R5	Bacon-Manito (Bac-Man) Geothermal Airshed	Category 2 – Active Airshed
R5	Legazpi City Airshed	Category 2 – Active Airshed
R6	Metropolitan Iloilo Airshed	Category 2 – Active Airshed
R7	Metro Cebu Airshed	Category 2 – Active Airshed
R7	Southern Negros Geothermal Airshed	Category 1 – Inactive Airshed
R8	Leyte Geothermal Airshed	Category 1 – Inactive Airshed
R8	Tacloban City Airshed	Category 2 – Active Airshed
R9	Zamboanga City Airshed	Category 2 – Active Airshed
R10	Metro Cagayan de Oro Airshed	Category 2 – Active Airshed
R11	Davao City Airshed	Category 2 – Active Airshed
R12	North Cotabato Geothermal Airshed	Category 1 – Inactive Airshed
R12	South Cotabato Airshed	Category 1 – Inactive Airshed
R13	Agusan del Norte-Butuan City Airshed	Category 2 – Active Airshed

 Table 18 Category Status and Activity as of C.Y. 2021 of Designated Airshed Nationwide (continued)

It is also understood that the subsequent lockdowns since 2020 has setback the operationalization of airsheds. To address this impact, contingency actions were implemented in 2021 by the regional Airshed Governing Boards as countermeasures to address the impact of the COVID-19 pandemic to the original schedule for the designation of attainment and non-attainment areas are listed in Table 19.



 Table 19 Contingency actions from Regional Offices in addressing the setbacks brought by the CoVID-19 related

 lockdowns in operationalizing the airshed governing boards as of C.Y. 2021

Region	Responses
CAR	Green Buffer Zones were established in the BLISTT airshed, which consist of areas where trees were planted to sequester carbon from mobile vehicular sources in traffic congested areas. This included areas near the school compound of Saint Louis University and along the diversion of the strawberry farm in La Trinidad, Benguet.
NCR	The activities for the designation of attainment/non-attainment areas in NCR were not accomplished due to community restrictions and the delay of conducting of activities. In addition, the air quality data gathered from the stations were not able to meet the 75% data capture rate during this period. The region has yet to complete the activities such as emission inventory, dispersion modeling, and carrying capacity analyses to be able to designate attainment and non-attainment areas in the region.
R1	EMB Region I, Northeastern Pangasinan (NEPA) Airshed Governing Board and Pangasinan State University (PSU) continuously disseminate IECs on the implementation of the provisions of the Clean Air Act.
R2	EMB Region II was able to conduct the data gathering step of the preparation of the Emission Inventory. The office sent letters to concerned agencies and municipalities to request for the necessary data. Ambient Air Quality Monitoring is also being continuously conducted to comply with the minimum required data capture rate of 75% per sampling, month, quarter, and year.
R3	The rice mill industrial establishment located inside the Intercity Industrial Subdivision in Brgy. Wakas, Bocaue, Bulacan is a candidate for designation of Non-Attainment Area. As of the current schedule, it is expected to be designated by the 1st Quarter of CY 2024. Based on the results of sampling in Intercity Station, the Annual Geometric Mean of Total Suspended Particulates (TSP) for CY 2021 is 208 µg/Ncm. The result exceeded the annual standard set under the National Ambient Air Quality Guideline Values of the Implementing Rules and Regulations of Republic Act 8749.
R4A	For Makiling-Banahaw Geothermal Airshed, as recommended by AQMS CO, the Region IV-A office continuously implements the pre-designation activities for the airshed while waiting for the guidelines for Designating attainment/non-attainment areas in terms of hydrogen sulfide (H2S) emissions.
R4B	EMB MIMAROPA Region procured a consultancy service for air dispersion modeling for the BCN Airshed in Oriental Mindoro. The third-party consultant would conduct an emission inventory for the stationary, mobile and area sources. Then, they would be conducting an annual average geographic distribution and population density to determine the dispersion of pollutants in the airshed. These would serve as the inputs for the air dispersion modeling proper. This is one of the bases to determine which areas would be designated as attainment/ nonattainment areas.





 Table 19 Contingency actions from Regional Offices in addressing the setbacks brought by the CoVID-19 related

 lockdowns in operationalizing the airshed governing boards as of C.Y. 2021 (continued)

R5	The Air Quality Modelling of the Ground-Level Particulate Matter (PM_{10}) Concentration within the Legazpi City Airshed was conducted last CY 2021. The endorsement for the designation of the Legazpi City Airshed as an attainment area was being prepared to be submitted to the EMB Central Office.
R6	In 2021, the AGB formulated a resolution creating the Emission Inventory Team that will be responsible for the data gathering within Metro Iloilo Airshed to be used in air dispersion modeling and carrying capacity study as one of the requirements in the process of designation of attainment/nonattainment areas in the region. Aside from this, the Board approved an updated Work and Financial Plan for the conduct emission inventory surveys scheduled for years 2022 and 2023. The Board also conducted a training on Air Dispersion modeling with AQMS Central Office Personnel
R7	The Region VII office procured AERMOD software in preparation for the activities for the designation of attainment/non-attainment areas.
R8	As of CY 2021, EMB Region VIII was on the process of complying with the requirements for the designation of attainment/non-attainment areas. All objectives and plans were moved that year due to restrictions and health protocols imposed by the COVID-19 pandemic.
R9	Region IX reports no designation for attainment/nonattainment areas within the region. However, the office continues to conduct ambient air sampling and data gathering for the process of said designation.
R10	For CY 2021, the Region X office is still undergoing the required Air Dispersion Modeling Study prior to the designation of attainment/non-attainment areas in the airshed.
R11	The Davao Airshed proposal to be designated as an attainment area for PM_{10} by year 2022 was not pushed through due to insufficient representative air quality data. An insufficient number of air quality sampling activities were conducted due to the COVID-19 lockdown during 2020 and 2021. The monitoring data of CY 2020 was not able to attain a 75% minimum annual data capture rate for it to be considered as a representative data set. With this, this Office is aiming for the CY 2021 which is already above 75% minimum data capture rate and the upcoming 2022 air quality data to be used as basis for the designation of the entire Davao City Airshed as an attainment area for PM_{10} , which is targeted to be by June 2023.
R12	EMB XII is aiming to declare Tupi as an Attainment Area.
R13	The Region XIII office lists proposed areas for the designation of PM_{10} attainment areas in the region, namely: Butuan City, Cabadbaran City, Municipality of R.T. Romualdez, Municipality of Buenavista, and Municipality of Nasipit. Butuan City is additionally also listed as a proposed area for designation of $PM_{2.5}$ attainment area. A three-year annual data set was submitted to the EMB Central Office for evaluation.



PI A

Plans On Source Apportionment Studies

Some regional offices have been able to conduct source apportionment studies from their current capabilities in air quality monitoring. The CAR office has finished a source apportionment study, with the next steps including the monitoring of black carbon levels in the region. In NCR, a project is being conducted by its RO with the Partnership for Clean Air for source apportionment using the filters collected from manual air quality monitoring stations.

EMB Region 1 plans to procure a Total Suspended Particulate Sampler for the testing of air sample filters, specifically the presence of trace metals or heavy metals in the air. The study will be conducted with possible collaboration with the UP Institute of Environmental Science and Meteorology for the source apportionment of air samples from the NEPA Airshed in Region I.

TSP samples from the Intercity Air Quality Monitoring Station in Region III were preserved and subjected to Source Apportionment analysis and studies. This is being done in support for the designation of Intercity Industrial Subdivision as a Non-Attainment Area. Air filters from other equipment (such as 13mm filters collected from a TEOM 1405D unit) are being submitted to the University of the Philippines for source apportionment studies as well.

EMB Region IV-A, through its Provincial Environmental Monitoring Offices, monitors Private Emission Testing Centers within the region.

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Actions In Managing the Open Burning of Wastes

All regional offices have responded that there are measures in place, mostly existing ordinances and related policies on the LGU scale, that prohibit open waste burning activities as mandated under RA 9003 and RA 8749. These policies would also issue sanctions and penalties to all violators. DENR continuously conducts IECs regarding the effects and impacts of open burning of waste. During meetings with stakeholders and LGUs, the agenda for strict monitoring and reminders regarding the prohibition of open burning of waste and steps to take to lessen the occurrence of such illegal practices is a common recurrence. The Regional offices stated their actions on open burning of wastes, as per C.Y. 2021, summarized in Table 20.

Table 20 Specific actions reported by the regional offices in managing open burning of wastes.

Region	Responses
CAR	The BLISTT AGB has set up monitoring stations for the City of Baguio to complement the ambient air monitoring done by EMB-CAR.
NCR	While it is not expected that the open burning of wastes would be applicable in NCR due to limited space, the Office continuously conducts monitoring of different barangays and meetings with LGUs and stakeholders regarding the open burning of waste.
R1	LGUs in the region have institutionalized ordinances related to the management of solid waste at a local level.
R2	EMB-Region II Environmental Monitoring Officers (EnMO) are asked to report open burning of waste within the region. The monitoring officers advised localities regarding the proper segregation and disposal of waste. Clean-up drives were also conducted in different municipalities in the region.
R3	EMB Region III's Solid Wastes Management Section is tasked to monitor open burning activities and investigate complaints. Concerned LGUs are invited by this office and informed on the monitored incidents that have occurred in their respective jurisdiction and are given at least 2 weeks to clear the area where the open burning activity had occurred.
	As a reminder and as stated in RA 8749, "LGUs are mandated to promote, encourage and implement in their respective jurisdiction a comprehensive ecological waste management



R3	that includes waste segregation, recycling and composting". The regional office coordinates with concerned agencies such as DILG-BFP for the reports on events on open burning activities. This will help in the emissions inventory specially in area sources estimation of emitted air pollutions.
R4A	EMB Calabarzon's Solid Waste Management Section monitors and reports open burning of waste to its respective LGUs. They also conduct IECs together with the LGU and EMB 4A EEIS.
R4B	EMB MIMAROPA Region, through its Solid Waste Management Section, has dedicated its efforts to manage and implement environmental laws banning the open burning of wastes.
R5	Open burning is being prohibited on the barangay level and ordinances are already being implemented to impose citation tickets on violators. EMB Region V implements continuous information dissemination regarding the effects and impacts of open burning of waste.
R6	Airshed member LGUs have adapted Governing Board Resolutions and turned it to local ordinances in relation to open burning of wastes. Violators of said ordinance are given corresponding fine/penalty. Environmental Monitoring Officers (ENMOs) are also conducting regular monitoring operations.
R7	SWEET-EnMOs, in partnership with LGUs, are proactively monitoring the open burning of wastes, including improper waste disposal in the region.
R8	The management of open burning of wastes is handled by the regional office's Solid Waste Management Section, which implements the provisions of RA 9003 with assistance from the LGUs.
R9	Monitoring and enforcement of penalties is handled by the region's Airshed Governing Board thru the LGUs (MENROs and CENROs).
R10	The issue of open burning has been included as a key result area in the implementation of the region's Air Quality Management Action Plan with IEC components for public information.
R11	Environmental Monitoring Officers (EnMOs) are assigned to LGUs in the region and conduct regular monitoring of open burning of wastes.
R12	The enforcement of the open burning was extended to DENR satellite offices and monitoring via Environmental Monitoring Officers of EMB XII to local government units.
R13	EMB-Region XIII conducts regular monitoring with their Environmental Monitoring Officers.





Action Plan to Strengthen Land-Use Planning to Address Air Pollution (DPWH, DILG)

As part of the initiatives of the DENR under RA 8749, certain measures are encouraged to be implemented for the goals of the Air Quality Control Action Plan. This section involves the responses of the Regional Offices to address air pollution from a land-use planning standpoint.

For tables indicating status of implementation of action plans, "Proposed" refers to items that have only been suggested or proposed to the agencies involved, "Planned" refers to actions that have not started but are indicated in a planning document, "In effect" refers to ordinances and other policies that are currently being implemented in the region or LGU, "Ongoing" refers to ongoing activities, actions, or projects whether happening only once or recurring, and "Completed" refers to fully completed projects or activities. Some ROs have provided more specific descriptions of the status of implementation of these items, in Table 21.

Region	Location	Actions to Strengthen Land-Use Planning	Status of Implementation
CAR	BLISTT Airshed	The BLISTT Action Plan for the upcoming CY 2022 contains provisions for the strengthening of land use planning, establishment of green buffer zones, and tree planting. Pilot areas are the Saint Louis University vertical garden and the La Trinidad area, where plant boxes and tree planting areas are planned along the strawberry fields.	Planned
NCR	NCR	Vertical gardening is being promoted and implemented on the LGU level, including the greening programs for the cities of Parañaque, Marikina, Las Piñas, Makati, Manila, and the municipality of Pateros.	Ongoing
R1	NEPA Airshed	Adoption of the NEPA Airshed Air Control Action Plan	In effect

Table 21 Specific actions of Regional offices in implementing the action to strengthen land-use planning, C.Y 2021.



Table 21 Specific actions of Regional offices in implementing the action to strengthen land-use planning, C.Y 2021. (continued)

	Region I	One of the plans to strengthen land-use planning to address air pollution is the construction of roads for re- routing traffic schemes (as part of Build Build Build program), which was also planned to be included in the Air Quality Control Action Plan (AQCAP) formulated by LGUs.	Ongoing
R2		No data available.	
R3	City of San Fernando, Pampanga	Joint roadside emission testing activity (with EMB RIII, LTO RIII, and DPWH RIII)	Conducted in CY 2021
	Region III	Coordination with DILG-BFP for the reporting of open waste burning events	Ongoing
R4A	Multiple LGUs	Manila-Cavite Toll Expressway Project (MCTEP) Segment 5 (started since 2019).	Ongoing
		South Luzon Expressway (SLEX) TR4 Realignment Project (Calamba City, Alaminos and San Pablo City, Laguna, Sto. Tomas, Batangas and Tiaong, Candelaria, Sanaya, and Tayabas, Quezon) (since 2019)	
		Cavite-Laguna Expressway (CALAX) Cavite Section (Subsection 5 (Sta. Rosa to Silang East IC) was open to traffic last August 24, 2021.). This will reduce traffic congestion particularly in Governor's Drive, Aguinaldo Highway and Sta. Rosa-Tagaytay Road which are heavily congested.	
R4B	Region IV-B	Coordination with local government units	Ongoing
R5	Naga City, Camarines Sur	City Ordinance No. 99-084 or the "Anti-Smoke Belching Ordinance"	Aggressive and regular effort to monitor emission of all public and private transportation



Table 21 Specific actions of Regional offices in implementing the action to strengthen land-use planning, C.Y 2021. (continued)

			vehicles, conducted monthly
		City Ordinance No. 2021-010 or the "Land Filling Regulation Ordinance"	Monitoring of on-going development in the city to mitigate adverse impact of fugitive dust
Ró	lloilo City	Finalization of Clean Air Action Plan	Ongoing
	Metro Iloilo	Continuous roadside inspection and monitoring of motor vehicles including smoke emission testing with Metro Iloilo Airshed Anti-Smoke Belching Unit (MIA ASBU)	
	Iloilo City	Resolution Ordinance No. 2013-348 - An Ordinance Amending Regulation Ordinance 2006-150 Otherwise Known as an Ordinance Providing for a Comprehensive Anti-Smoking Campaign in the City of Iloilo City and Other Purpose	In effect
	lloilo City	2020-2025 Iloilo City Comprehensive Development Plan	In effect
		Iloilo City Comprehensive Land Use Plan (CLUP) and Zoning Ordinance (ZO) 2021-2029	
		Establishment of Eco-Parks/Green zones	Ongoing
R6		Municipal Ordinance 2009-12: "An Ordinance Prescribing the Preservation, Development and Management of the Environment and Natural Resources of the Municipality of Oton, Iloilo"	
	Oton, Iloilo	Municipal Ordinance 2018-326: "Prohibition of Open- Burning in the Municipality of Oton"	In effect
		Municipal Ordinance 2017-297: "Anti-Smoking and Vaping Ordinance"	



Table 21 Specific actions of Regional offices in implementing the action to strengthen land-use planning, C.Y 2021. (continued)

	Pavia, Iloilo	Municipal Ordinance 2015-03: "An Ordinance Prohibiting Open-Burning & Prescribing Penalties Thereof" Ordinance No. 2018-05: "Ordinance Regulating Emissions from Road Construction/Demolition Activities, Transportation of Construction Materials and Quarry Supplies and Prescribing Penalties Thereof	In effect
R7	-	No data available.	
R8	Tacloban City	New zoning of Industrial, Residential Zones and Commercial Center with approved CLUP	Proposed
		Facilities & Solar Farm with approved CLUP	Planned
R9	Region IX	Resolution for the transfer of the site of the main airport in the Zamboanga region	Planned
R10	Region X	Flood management programs	Planned
R11	-	No data available.	
R12	Region XII	Infrastructure projects with DPWH – building of new roads and conversion of dusty roads to paved roads, which are essential in reducing pollution caused by mobile and area sources	Ongoing
R13	Region XIII	Include new access/by-pass roads to decongest national/major thoroughfares between neighboring cities and municipalities	Ongoing





Action Plan to Strengthen Transport Planning to Address Air Pollution

This section involves the responses of the Regional Offices to address air pollution from a transport standpoint, specifically involving public transport, aviation, and maritime vehicles.

Table 22 Specific actions of regional offices in implementing the action to strengthen transport planning, C.Y 2021

Region	City	Action Plan to Strengthen Transport Planning	Status of Implementation
CAR	Multiple LGUs	The BLISTT Airshed Task Force on Anti-Smoke Belching was organized in CY 2019, which apprehends smoke belching vehicles. EMB-CAR distributed opacimeters to the LGUs of La Trinidad, Sablan, Tuba and Itogon. DOTr and EMB-CAR conducted Deputation Seminar on RA 8749 and Motor Vehicles with the BLISTT LGUs	Completed
NCR	Muntinlupa City	 The Muntinlupa City LGU conducted the following activities in line with the strengthening of transport planning: Improvement of sidewalks to promote active mobility, Expansion of the City Alternative Route Entry and Exit System (CARES) Ordinance, Research and introduction of possible alternative modes of transportation, Implementation of a number coding scheme for private vehicles, Establishment of designated and connected bike lanes, Traffic signalization of major intersections along National Road, Deployment of E-jeepneys along major thoroughfares, 	Ongoing



NCR	Muntinlupa City	 Proposed procurement of hybrid or electric vehicles for government service vehicles, Conduct of basic traffic management training for different stakeholders, Conduct of training for government drivers for fuel conservation, and Proposed pedestrianization along Alabang (ongoing planning) 	
NCR	Marikina City	The Marikina City LGU collaborated and partnered with other LGUs and national government agencies like the Department of Public Works and Highways for funding assistance to construct bike lanes in city roads with the goal of reducing air pollution.	Ongoing
	NEPA Airshed	Adoption of the NEPA Airshed Air Control Action Plan	In effect
R1	Region I	Gradual replacement of old jeepneys with modern units compliant with Euro IV standards.	Ongoing
R2	Region II	Jeepney Modernization Program under PUV Modernization Program of LTFRB Region II	Ongoing
R3	Region III	Reporting of Transport Planning and Action Plans	Ongoing
R4A	Multiple	LRT Line 2 East Extension Project (from Brgy., Santolan, Pasig City to Brgy. Mayamot, Antipolo City)	Completed
	LGUs	LRT line 1 Cavite Extension Project (Cities of Parañaque and Las Piñas and Municipality of Bacoor, Province of Cavite) (ongoing since 2013).	Ongoing
R4B	Region IV-B	More transport cooperatives for modernized jeepneys are established with the encouragement with the support of the LGUs to further improve the quality of air and reduce emissions from mobile sources	Ongoing
R5	Naga City, Camarines Sur	City Ordinance No. 099-084 or the "Anti-Smoke Belching Ordinance"	Phase out and non- renewal of PUV franchise under the City Government for vehicles that

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	Naga City, Camarines Sur	City Ordinance No. 099-084 or the "Anti-Smoke Belching Ordinance"	failed to meet the standard requirement of the City in Air Quality Emission Standard.
R5		City Ordinance No. 2017-030 Bicycle Ordinance	Construction of the Almeda Extension Highway and Balatas - Jimenez Park Road will start on 2020 to address traffic and air pollution.
		Allocation of Fund for establishment of additional road network in Naga City	For project bidding
		Establishment of Green Space and Walk Street in CBD	
R6	Region VI	Regional offices of CAAP and Coast Guard implements policies for aviation and maritime air emissions in the region	In effect
		Maritime Industry Authority thru Marina Circular No. SR 2020-06 mandates use of 0.50% M/M Sulphur limit on fuel oil for all Philippine registered ships.	
		Iloilo City Regulation Ordinance No. 2013- 344, "The 2013 Perimeter Boundary Ordinance of the City of Iloilo" and its amendment through Iloilo City Regulation Ordinance No. 2016-291 which limit the entry of provincial jeepneys in the city	In effect
	Iloilo City	Closure and removal of Molo PUV Terminal and transfer to Mohon Terminal in Arevalo as per Executive Order No. 95 series of 2020	Completed
		Construction of 11-kilometer bike lanes at the Diversion Road and selected roads of lloilo City	



		Iloilo City Alliance of Operators and Drivers Transport Cooperative (ICAODTC) - 28 units of modernized vehicles started operating in November 2019 for Ungka Terminal, Jaro to Iloilo City via Central Philippine University route and vice-versa	
R6	lloilo City	Alliance of Provincial Operators and Drivers Transport Cooperative (APODTC) - 15 units of modernized vehicles started operating in December 2020 for Ungka Terminal, Jaro to Cabatuan route and vice-versa	In effect
		Metro Iloilo Transit Service Cooperative (MITSCOOP) - 27 units of modernized vehicles started operating in January 2021 for San Miguel – Iloilo City route and vice versa	
	San Miguel, Iloilo	EMB R6 -MIAGB - Refresher Course on Motor Vehicle Maintenance for MIA Transport Groups members conducted on November 6-7, 12-13 and 20-21, 2022 at San Agustin St., San Miguel, Iloilo (MITSCOOP garage)	Completed
	Region VI	Free Garage Smoke Emission Testing (SET) and IEC Forum (Barangay, Drivers & Operators of Transport Group) every other month	Completed
	Region VI	Roadside Inspection/Apprehension with IEC	Ongoing
R7	Metro Cebu	Green Loop project	Planned
R8		Study for the utilization of the main road, Real St. and Old Road Sagkahan to cater to one-way routes during morning and afternoon rush hours.	
	Tacloban City	E-Jeepneys are currently operating in the Northern Barangays of the city and V&G subdivision (biggest subdivision in Tacloban City). There is also an ongoing procurement of additional units.	Ongoing





R8	Tacloban City	 To reduce traffic congestion along Maharlika-Apitong-Abucay-Nulatula-Diit Road, the 6.4 km Tacloban City Bypass Road traversing Caibaan to Tigbao, Tacloban City was opened on March 15, 2021. There are continuing routes from Tigbao to San Juanico undergoing construction. This will divert vehicles away from the city proper and decrease traffic caused by travelling vehicles crossing Leyte and Samar. Ongoing construction (road widening) to decongest choke points. Start of operation of VH Testing Private Motor Vehicle Inspection Center (PMVIC) 	Ongoing
	Palo, Leyte	Conduct of regular anti-smoke belching operations by LTO RO 8, TESDA, and EMB RO 8 to apprehend violators and encourage vehicle owners to be responsible in maintaining automobiles as part of their contribution to abate air pollution.	Ongoing
R9	Region IX	Implementation of banning the two (2) stroke engines and converting to much efficient four (4) stroke engines.	In effect
	1	The introduction of Class 2 modern jeepneys for much modern and efficient public transportation.	Ongoing
R10		LGU policies to monitor the number and frequency of trips of marine vessels	Proposed
	Region X	Onshore docking electrification strategy (to discourage the use of marine vessel diesel engine generators while docked in ports)	
	Region XI	The creation of bypass roads and flyovers to minimize the impact of mobile pollution during peak hours.	Completed
R11		Implementation of the mass transport system (HPB's- Jeepney Modernization) program that will encourage the individual to use mass transport system instead of using a private car.	In effect



Table 22 Specific actions of regional offices in implementing the action to strengthen transport planning, C.Y 2021 (continued)

R12	Koronadal City and General Santos City	Identification of existing transportation modes, route rationalization	Ongoing
		Electric jeeps and city buses can now be observed in Koronadal City and General Santos City replacing old-type jeepney cars for public transport.	In effect
R12	Region XII Identifying and application of routing schemes for public transport to prevent traffic and congestion along roads; farm-to-market roads, traffic lights, and traffic management officers		In effect
		For aviation and maritime air emissions, continuous capacity building for aviation and maritime air emissions should be conducted to improve and create policies that regulate them.	Proposed
R13	Region XIII	Transport plan, including additional public routes, establishment of specific drop-off/pick-up points, and construction of new access roads to decongest traffic in the city center.	Ongoing

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Air Research Roadmap (DOST) 2021

The DOST Sustainable S&T Clean Air Roadmap lays out the overall strategies on the use of new technologies, capacity building of agencies and institutions, and the formulation and implementation of new policies over the years 2019 and onwards.



Figure 20 DOST-PCIEERD's road map on air research, 2019-2023



Comprehensive Roadmap for the Electric Vehicle Industry (CREVI)

On June 1, 2021, Senate Bill 1382, or the "Electric Vehicles and Charging Stations Act" underwent its third reading. This text would be finalized as Republic Act 11697, or the "Electric Vehicles Industry Development Act" by July 26, 2021. Once the bill is signed into law, concerned government agencies will need to draft the Comprehensive Roadmap for Electric Vehicle Industry (CREVI), which is a national development plan that is intended to accelerate the development and usage of electric vehicles (EV) in the Philippines. The CREVI is comprised of the EVs and charging stations component, manufacturing component, research and development component, and human resource development component. DENR's role in the CREVI is to consult with the concerned NGAs, public and private stakeholders, on the recycling and disposal of EVs, EV parts, and charging stations (under the provisions of RA 6969), establish guidelines on the handling of wastes (in coordination with DOE), and include EVs in the comprehensive air pollution management and control program in accordance with RA 8749.



Figure 21. EV Charging Station at the DENR Headquarters, Visayas Ave. Q.C.

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CLIMATE ACTIONS IN RELATION TO AIR QUALITY MANAGEMENT

DENR Administrative Order No. 2021-22, or the "Guidelines on Mainstreaming, Cascading and Institutionalizing Climate Change Concerns in the Environment and Natural Resources (ENR) Priority Programs", were made to adopt the identified climate change responsive indicators for the DENR priority programs and projects in the annual work and financial plans of the DENR Offices, to identify corresponding programs, projects, and activities (PPAs), and to determine the needed actions or interventions to enhance and institutionalize mainstreaming of climate change in the DENR priority programs and projects. Clean Air (as mentioned in Section 3) is listed as one of the priority programs of DENR. Climate responsive outputs and outcome indicators, such as the capacity building of the EMB Regional Offices and Airshed Governing Boards, were also mentioned in its Annex B.

The CCS is a Designated National Authority (DNA) of the DENR for the Clean Development Mechanism (CDM) of the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) to facilitate and promote development of CDM project activities that contribute to the UNFCCC objective of stabilization of greenhouse gas concentrations in the atmosphere.

Plans and Programs of the Climate Change — Service

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One of the tasks of the CCS is to operationalize the DENR's Climate Information and Knowledge Management Framework and System.

Updates on the status of the monitoring and evaluation of the Philippines's Nationally Determined Contributions (NDCs)

As communicated to the UN FCCC in 2021, the Philippines emits an average of 1.98 metric tons of CO2 equivalent per capita in 2020, which is below the global average of four (4) metric tons per capita. [33] The Philippines commits to a projected GHG emissions reduction and avoidance of 75%, of which 2.71% is unconditional, which refers to policies and measures which can be undertaken using nationally mobilized resources, and 72.29% is conditional, which refers to policies and measures which require support or the means of implementations under the Paris Agreement. This commitment is measured against a projected business-as-usual cumulative economy-wide emission of 3,340.3 metric tons of CO2 equivalent for the same period.

It is expected that the planned climate change mitigation actions would strengthen the ability of the country to adapt and mitigate the effects of climate change, including through enhanced access to climate finance, technology development and transfer, and capacity building, especially on sustainable consumption and production practices.

ARR 2021 OUALITY Episodes

Volcano Eruptions

Volcanic ash consists of powder-size to sand-size particles that have been blown into the air by an erupting volcano. Falling ash contains fine particulate matter which may cause several health problems. On July 1, 2021, 3:37 PM, the Philippine Institute of Volcanology and Seismology (PHIVOLCS) raised the Alert Level of Taal Volcano to 4 (Magmatic Unrest) during a five (5) minute eruption, which generated a dark jetted plume approximately one kilometer high. DENR-EMB through its regional offices continuously monitored the ambient air quality by conducting more frequent sampling, which include hourly and daily AQI monitoring. Spikes in the observed amount of air pollutants are determined. EMB also published its monitoring data daily on its website during this period. The following map shows the location of the air quality monitoring stations that were active during the Taal eruption.



Figure 22 Air Quality Index warnings over the Taal volcano area on July 1, 2021.

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The wind direction and speed as assessed show surface winds coming from the northeast to the southwest, which affected the dispersion of the ash plume coming from the Taal Volcano. Lighter particles such as PM ₁₀ and PM_{2.5} would likely remain suspended above the ash plume at a height of 10 to 15 kilometers, while heavier particles such as TSP (which mostly consist of fine scoria and coarse volcanic particulates) has the tendency to settle in nearby areas (Batangas, Cavite, and parts of Metro Manila) due to gravity. The DOST – PHIVOLCS has also issued ballistic projectile hazard maps (Figure 23), hazard maps for for Tsunami/Lakewater Oscillation and Fissuring (Figure 24), and Base Surge hazard map (Figure 25) as guidance for evacuation protocols and awareness of the general public.



Figure 23 PHIVOLCS ballistic projectile hazard map on July 1, 2021.





Figure 24 PHIVOLCS ballistic projectile hazard map on July 1, 2021.

TAAL VOLCANO TSUNAMI/LAKEWATER OSCILLATION and FISSURING HAZARDS MAP

Legend



Aprimitizative boundaries based on NSO data are approximate.

Hazard Zone lends are based on data from Instancel eruptions of 1754, 1911, and 1965.

As a general reminder, the Taul Volcano Island is designated as Permanent Danger Zona (PDZ).

Areas within and close to the Valcavo Island may be affected by large volcavic fragments replorively target out (ballatic projectiles) from the vent.

Areas around Taal Volcano that coski include those extending beyond the ovverage of this map may expectence fadout tephra/asthol. Patiout tephraviatifal disposition depends on provailing wind direction and magnitude of emption. but is generally benever new the active wait and thes out indefinitely away from the emption center.

Assomptions

1. English will occur anywhere within the volcano intend.

 Worst-case scenario is similar to the 1754 emption.
 If the emption center occurs outside the volcano island, histaird zonetion boundaries will change.

Bused on Ruelo (1983), PHIVOLCS (1999)

Base data from J. S. Rañola, NAMRIA Topographic Base Maps, PHIVOLCS, and the GIS Laboratory

Modified 2011



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Figure 25 PHIVOLCS ballistic projectile hazard map on July 1, 2021.



Administrative boundaries based on NSD data are approximate.

Date Surge Hazard Zone kinits are based on the reconstructed extents of the work-case engities of 1754 using anangy-line modeling. This is replicated for five (5) potential engibles weath, namely. Tail Volkano Island Main Cruter, Brundlang Molaki, Prophaso, Of-Columit and Brundlang Munit, Buffer Zones are methed out at one (1) sitemater aread distance from the hazard zone kinits as additional precentionary zones, in case such are needed, for public safety guidance.

As a gunaral rumindor, Taal Valcano Island is designaled as a Permanent Danger Zone (PDZ).

Areas within and close to the Vokano Island may be affected by large volcanic fragments explosively thrown out (balledic projection) from the vent

Areas amond Taal Volcaro Ital could include those extending beyond the coverage of bis map may expension failout technologintal. Falout technol anthal deposition depends on prevailing wind direction and magnitude of enumber, but is generally heavier near the active west and thins out indefinitely every from the enumber center.

Assumptions

 Possible eruption from vanous antive vents within the volume intent were considered for modeling.
 Worst-case scenario is similar to the 1754 eruption 3. If the eruption center occurs outside the volumo reland, excepting OW-Calent, feizand constant boundaries wit change.

Based on Ruelo (1983): PHIVOLOS (1999)

Base date from J. S. Rericle, NAMRM Topographic Base Maps, PM/VOLCS, and the GIS Laboratory

Modified by M.A.Y. Bontas, A.C. Pidsowi, A.D. Aquino, and P.J. Delos Reyes, Geology and Geophysics R&D Dutation (3GRDD)

As of April 2011









Figure 27. Measurements of PM_{2.5} in NCR between 12 AM on December 31, 2020 and 7 AM on January 1, 2021.

For the entirety of NCR, it was found that there was a significantly lower concentration of PM_{2.5} during NYE 2021 compared to NYE 2020. This may be attributed to the strict measures being implemented by the Metro Manila Mayors pursuant to MMDA Resolution No. 20-17 "Prohibiting Individual and Household Use of Firecrackers and Other Pyrotechnic Devices During General Community Quarantine". In contrast with the NYE 2019 and NYE 2020 PM_{2.5} measurements, a 64% and 43% decrease were observed, respectively.

Outside of NCR, during the CY 2021 NYE celebration, a total of thirteen (13) stations and six (6) stations measured PM₁₀ and PM_{2.5} ambient air quality data, respectively. It was found that the Koronadal City Station in South Cotabato measured a maximum of 166 ug/Ncm PM₁₀ during 12:00 MN to 2:00 AM on January 1, 2021, which is above the PM₁₀ 24-hour National Ambient Air Quality Guideline Value (NAAQGV) of 150 ug/Ncm. It was also found that the three (3) stations exceeded the 24-hour NAAQGV of 35 ug/Ncm for PM _{2.5}.

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Figure 28. Measurements of average PM₁₀ in stations outside of NCR from 12 AM on December 31, 2020 to 2 PM on January 1, 2021.



Figure 29 Measurements of average PM_{2.5} in stations outside of NCR from 12 AM on December 31, 2020 to 2 PM on January 1, 2021.

A special sampling activity was conducted on the New Year's Eve of 2022 in Region X, which yielded a 24-hour measurement of 13.2 μ g/Ncm of PM_{2.5} on December 31, 2021 and 10.2 μ g/Ncm on January 1, 2022, respectively.



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Air Quality During the pronouncement of Alert Levels

Several EMB-ROs have reported a reduction in the amount of air pollution, particularly from vehicular sources, considering the community quarantine due to the reduced amount of public transport, carpooling measures, and route alterations. While most areas with continuous air quality monitoring stations were able to use them with minimal human interaction when this wasn't possible due to the quarantine, some areas have reported reduced data capture, especially for manual stations.







Best Practices for Stationary and Mobile Source Management

Table 23 Best practices of the Regional offices in the management of stationary and mobile sources, C.Y. 2021.

Region	Best Practices in Air Quality Management
CAR	EMB-CAR has mapped the industries with Permits to Operate in the region. For the mobile sources, the RO is in close coordination with DOTr-CAR for the operation of the BLISTT Airshed Task Force on Anti-Smoke Belching, wherein the BLISTT LGUs take part in apprehension. Every quarter, there is a rotation of where the operation takes place. The RO uses the smoke meter machine from the City of Baguio LGU, and later the machines given by EMB CAR to the LGUs. At least two teams conduct each operation.
NCD	Transportation during the year 2021 has been limited. Because of this, the traffic has lessened and only those who are working were allowed to go out unless it was for medical reasons or an
NCR	emergency. The LGUs in NCR have still continuously implemented their activities to achieve cleaner air in this time. An example of such an activity is free emission testing for motor vehicles during Clean Air Month.
R1	EMB Region 1 and the Northeastern Pangasinan (NEPA) Airshed Governing Board crafted and adopted through a resolution the NEPA Airshed Air Control Action Plan, which aims to address the pertinent issues and concerns on air quality management, land use and transport planning.
	EMB Region 1, together with the Land Transportation Office Region 1 and LGU ASBU team members regularly conducts the quarterly Anti-Smoke Belching Unit Operation and Information, Education and Communication (IEC) Campaign in the covered LGUs of the NEPA Airshed. Moreover, in coordination with the LGUs, ASBU Campaigns are also being conducted in areas outside the Airshed.
	EMB Region 1 also conducts regular monitoring of its permittees and industries with CEMS/COMS. Regular monitoring of Private Emission and Testing Center is also being conducted by the Region. All industries with CEMS/COMS have also connected with the Central Data Acquisition and Handling System (DAHS). EMB Region 1 also proposed for the purchase of its own Regional DAHS.



Table 23 Best practices of the Regional offices in the management of stationary and mobile sources, C.Y. 2021 (continued).

The Jeepney Modernization pr	ogram within	Region 1 is	also or	n-going an <mark>d</mark>	facilitated by the
Department of Transportation.	Traffic Mana	agement and	traffic r	e-routing sc	hemes are being
implemented by the LGUs.					5°

In coordination with TESDA Region 1, LTO Region 1, and the NEPA AGB, EMB Region 1 covered LGUs for the conduct of the Motor Vehicle Emission Control Technician to capacitate concerned LGUs in ASBU operations.

EMB Region 1 also conducted a series of Emission Inventories and Greenhouse Gas Emission Inventories for LGUs.

- Implementation of the devised formula for CO2 emission calculation in determining the required number of trees to be planted/donated by the proponent to compensate for their CO2 emissions from source installations. The formula was devised using references from US EPA, US Department of Energy, and EcoTree Green.
- Strengthen permitting of industries within PIESTTA airshed.

R2

R4B

R5

 Close coordination with LGUs and LTO in the implementation of anti-smoke belching operations within the region.

R3 The Region III office implemented EMB MC 2021-14 to monitor the emissions coming from industries such as Cement Plants and Power Plants. To this end, they are also heading the construction of an Environmental Data Quality Monitoring Center.

R4A The Region IV-A office conducts strict monitoring of industries based on their Permit Conditions and submission of Emission Test Reports. They have also put up an online test plan made by EMB IV-A MIS for easier submission and evaluation of test plans.

EMB MIMAROPA Regional Office and its Field Offices are strictly implementing the provisions of RA 8749. Technical personnel were conducting inspection and verification of the compliance of establishments in the MIMAROPA Region. Notices of Violation (NOVs) will be issued to those firms who are found to violate the relevant environmental laws.

The Regional Office was also strict in implementing stack emission testing for establishments with generator sets that have a rated capacity above 300kW.

Additionally, in celebration of the Clean Air Month last November 2021, EMB MIMAROPA Region conducted Garage Testing Activities in Baco, Calapan City, and Naujan, Oriental Mindoro. Transport vehicles such as jeepneys were tested during the activities. In this activity, the drivers of public vehicles were reminded to properly maintain their vehicles to assure their compliance with RA 8749.

EMB V, in partnership with LGUs and NGAs/NGOs, conducts regular Anti-Smoke Belching Operations and Information, Education, Communication (IEC) Campaigns on a barangay level to raise awareness in maintaining the good quality of air within the region.



Table 23 Best practices of the Regional offices in the management of stationary and mobile sources, C.Y. 2021 (continued).

The Legazpi City LGU implemented Executive Order No. 17-2018, which allows for the airing of infomercial audio/video clips related to air quality in the city, airshed programs, and the effects of air pollution. The information will be disseminated through social media and broadcast media channels, cinemas, and screens in private malls and outdoor/indoor LED screens in government-owned buildings.

For stationary sources, EMB Region VI conducts regular compliance monitoring of industries, and only allows for new applications or renewals of Permits to Operate if they are in compliance with RA 8749. Establishments with APSI operating without PTO are subject to surveys and are required to comply with the permitting requirements of RA 8749.

The creation of the Metro Iloilo Airshed Anti-Smoke Belching Unit (MIA-ASBU) Enforcement & IEC Team is a proactive approach to achieve and maintain healthful air. They conduct roadside inspections and apprehensions alongside IEC activities. The main objective of these activities is to instill discipline among the members of the transport sector for adherence to the mandate of the Clean Air Act and to determine the efficacy of the series of smoke emission testing activities.

As part of the PUV Modernization Program, the Metro Iloilo Airshed Governing Board supports the transition to Euro 4-compliant vehicles to

lessen the particulate emissions from mobile sources. Jeepney driver organizations under the MIAGB have started to transition to Euro 4 engines and established transport cooperatives. Other actions include IEC Campaigns involving engine maintenance and proper fuels, which were disseminated to jeepney drivers and operators.

The Southern Oton Jeepney Operators and Drivers Association (SOJODA) Transport Group based in Brgy. Cabanbanan, Oton, Iloilo, is the most active transport group operating in the Metro Iloilo Airshed. The group regularly attends MIAGB meetings. As a MIA-ASBU member, they are consistently present during the conduct of Roadside or Garage Smoke Emission Testing, IEC activities, roadside inspection, and apprehension activities. One of the best practices being implemented by the group to lessen air pollution is a mandatory coding scheme being used on a daily basis. This measure is estimated to save about 9,000 liters of fuel a month, for an annual savings of approximately 108,000 liters.

The Regional Office is also conducting regular inspection of Private Emission Testing Centers to ensure validity of their calibration certificates.

EMB Region VI has continued to provide assistance to the Province of Guimaras for the creation of Guimaras Anti-Smoke Belching Unit (ASBU) Task Force, thru MIA Resolution No. 2020 – 02.

EMB Region VII, in partnership with the Aboitiz Group of Companies, has installed the first Continuous Ambient Air Quality Monitoring Station (CAAQMS) in the Philippines under the Adopta-CAMS program of EMB.



ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

R7

R6

Table 23 Best practices of the Regional offices in the management of stationary and mobile sources, C.Y. 2021 (continued).

	This program aims to maximize the scope of monitoring ambient air quality with the help of private partners to give updates on air quality to the public.
R8	Tacloban City is one of the recipients of a total of forty-five (45) units of eco-passenger friendly vehicles (E-JEEP) plying the streets of Tacloban City as part of the PUV Modernization Program. Each vehicle is equipped with a CCTV camera, TV screen, overhead air fans, charging socket, digital signboard, cushioned comfortable seats, and the use of a reloadable value card which can be used whenever a passenger takes a ride.
R9	EMB Region IX relies on the Self-Monitoring Reports (SMR) submitted by individual establishments for stationary sources, and NGAs such as the Land Transportation Office (LTO) under the Department of Transportation (DOT) for mobile sources.
R10	In 2021, all seven major industries in Region X composed of two cement plants, four coal-fired power plants, and one sintering facility, had an operational CEMS/COMS which are required to transmit emissions data to the EMB Central Office through its Data Acquisition and Handling System (DAHS) pursuant to EMB MC 2021-14.
R11	EMB XI can conduct confirmatory stack sampling for PM and SOx for industrial establishments to verify the sampling results by the accredited 3rd party source emission testing firms. The emissions from significantly large stationary sources such as power plants and cement plants are already connected to the EMB-CO through the uniform Data Acquisition and Handling System. For mobile source management, regular monthly PETC monitoring within the region and monthly Anti Smoke Belching Operation together with Davao City – City ENRO ASBU Team are conducted.
	For stationary sources, EMB Region XII conducts compliance monitoring of industries to ECC conditions and complies with MC-2021-03 by connecting the CEMS connection of industries to the central DAHS.
R12	For mobile sources, periodic monitoring of the private emission testing centers to emission testing procedures is conducted as to comply with JAO No. 01 – series of 2007. The Regional Office also conducts random roadside emission testing in coordination with the Land Transportation Office (LTO) and Local Government Unit, and also conducts capacity building with the LGU and other related line agencies.
R13	For stationary sources, EMB Region XIII evaluates test plans and proper personnel scheduling to observe the stack testing conducted by the third party firms accredited by DENR-EMB. Once the result has been submitted, it will be assessed, and confirmatory sampling would be conducted if there is a noted exceedance. The data results will be stored in a database for future reference. For mobile sources, the Regional Office conducts actual vehicle counting with the assistance of all LGUs within the airshed to ensure that the data inputs for mobile source emissions inventory is closer to the actual figures.
545 (C. 1997)	

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Supervision Of NGA / LGU Regarding Land Use and Transport Planning to Address Air Pollution from the Mobile /Transport Source of Air Pollution

Region	Best Practices by NGAs and LGUs
CAR	The BLISTT Airshed Task Force was organized to tackle the emission coming from vehicles, however only Baguio City and Municipality of La Trinidad, Benguet had passed their Environmental Code (other LGUs have yet to pass said ordinance). For the best practices of LGUs/NGAs on land use planning, the BLISTT Airshed had designated a monthly "CARLESS Day". DENR-CAR, LGU Baguio City, Municipality of La Trinidad and Benguet State University designates Thursday, while UP Baguio designates Wednesday their CARLESS Day. The concept of CARLESS Day is for employees to not bring in their car or transport on these designated days, and to encourage the usage of carpooling, public transport, or walking. They report their carbon footprint on BLISTT Airshed Governing Board meetings and reduce emissions from their car.
NCR	Based on the results of present and previous Emission inventories, Mobile Sources have the biggest contribution, Traffic Engineering Office can recommend possible solutions to lessen the congestion of vehicles during rush hours that greatly influence the air quality in certain area.
R1	One of the best opportunities for the National Government Agencies (NGAs) and Local Government Units (LGUs) in air quality management within Region I is to constantly search for traffic re-routing schemes to minimize or mitigate the air pollution coming from vehicles caused by traffic. Due to the large number of vehicles on the road, some NGAs and LGUs use or purchase Euro 4 vehicles to reduce the amount of harmful chemicals in the air. LGUs strengthen the enforcement of the traffic management plan in order to improve traffic flow within the central business district and to strengthen the implementation of an effective an efficient traffic management plan.
R2	No update has been reported for CY 2021.
R3	Currently, the members of the Airshed Governing Board, specifically the LGUs, are being requested/urged to report their Transport Planning and action plans to address air pollution in their area of coverage. EMB RIII and other concerned agencies may provide the assistance relative to this matter. Some LGUs are promoting the use of greenwalls to their stakeholders. Others are implementing the used of air pollution. Modern jeepneys are compliant with Euro IV standards,



Supervision Of NGA / LGU Regarding Land Use and Transport Planning to Address Air Pollution from the Mobile /Transport — Source of Air Pollution (continued)

	which is considered more environment friendly as compared to previous standards.
R4A	No update has been reported for CY 2021.
R4B	Road traffic re-routing during rush hour periods is implemented to prevent road congestion. The modernization of jeepneys is also encouraged and implemented mostly in the provinces in MIMAROPA region.
R5	The Local Government Units (LGUs) in Region V have been regularly monitoring the emission of all public and private transportation vehicles with the implementation of their Anti-Smoke Belching Ordinance. Some LGUs have also designated bike lanes within their area of jurisdiction.
R6	LGUs within Region VI have Traffic Management Offices to manage, supervise and enforce penalties to transport vehicles within their jurisdictions.
R7	Cebu City passed the "2020 Multi-sectoral Air Quality Council Ordinance of the City of Cebu" which aims to enforce ambient air quality guideline values that assure a breathable air for the people in Cebu City with the authority to assess, regulate, and monitor reports, applications, and emissions related to air pollution.
R8	EMB Region VIII is working on the development of diversion and bypass roads to improve road network efficiency, enhance travel experience and facilitate access to Tacloban City. Tacloban City Bypass Road is a 6.405-kilometer bypass road along Daang Maharlika connecting Barangays Nula-Tula and Caibaan - Tigbao-Santa Fe-San Miguel Road The regional office would contribute to the implementation of one-way traffic scheme in Real St. Tacloban City especially on rush hours with open window at 9:00 PM to 4:00 PM and one scheme on 07:00 AM- 9:00 AM & 4:00 PM-6:00 PM.
R9	Traffic management programs were implemented in Region IX.
R10	No update has been reported for CY 2021.
R11	EMB Region XI conducts roadside operations and anti-smoke belching operations. Local traffic ordinances control the traffic flow and creates alternate routes to decongest the traffic flow during peak hours.
R12	Region XII focused on law enforcement of traffic policies to commuters and all sectors by local government units/local ordinances, licenses, renewals, and equipment. The projects included applying engineering solutions for traffic management; road improvements, traffic lights, bridges, alternate routes, and human traffic aid, to balancing environmental solutions on transportation management; greening programs and fuel efficiency.
R13	The constituent LGUs of Region XIII conduct roadside anti-smoke belching monitoring and implement jeepney modernization, add transport routes, and build new access roads.

Management Responses to Natural Sources of Air Pollution

Region	Responses to Natural Sources of Air Pollution
CAR	The high cost of Ambient Air Quality equipment is not included in the budget. Because of this, the local AGB relies on EMB for the monitoring aspect.
NCR	In 2021, alert level 3 in the status of Taal Volcano was noted. During this period the region conducted manual sampling every day and hourly monitoring of AQI in the real-time station. To determine spikes in air quality results.
R1	The EMB Region I, Northeastern Pangasinan (NEPA) Airshed Governing Board and Pangasinan State University (PSU) continue to disseminate IECs related to the programs and implementations of the Clean Air Act.
R2	EMB Region II has no recorded natural calamity that affects the air quality within the region.
R3	EMB Region III conducted air quality monitoring to determine the level of concentrations of air pollutant, specifically PM_{10} and TSP in existing stations such as Meycauayan station, Intercity station, Mel-Vi station, Heroes Hall Station and Clarkfield station. Results of daily concentrations were submitted to EMB-CO.
R4A	When there are instances that the Taal Volcano is in Alert level 2, this office will conduct air quality monitoring using manual air quality monitoring equipment around the affected area. This office also utilizes data from the continuous air quality monitoring stations.
R4B	During the eruption of Taal Volcano last July and November 2021, EMB MIMAROPA was conducting daily sampling of air quality in the Baco, Calapan City and Naujan Air Quality monitoring stations. The air quality data that has been collected during the eruption was reported to the EMB Central Office and was presented to the Baco-Calapan City-Naujan (BCN) Airshed Governing Board Members.
R5	Currently, the Mayon Volcano remains at Alert Level 1 (abnormal) to Alert Level 0 (normal) according the the Mayon Volcano Bulletin issued by the Philippine Institute of Volcanology and Seismology (PHIVOLCS) last July 30, 2021.



Management Responses to Natural Sources of Air Pollution (continued)

1	EMB Region V continuously monitors the air quality within the region, especially at the areas most affected by the Mt. Mayon eruption last 2018 and is subject for air dispersion modelling in CY 2022 after three (3) years of manual ambient air quality monitoring.
R6	No recorded natural calamities such as volcanic eruption, ash fall, or other possible natural source of air emissions within the Region in CY 2021.
R7	The region has not experienced natural phenomena that affects air quality.
R8	No natural sources of air pollution
R9	EMB Region IX continues to operate all its available ambient air monitoring stations
R10	EMB Region X has no recorded natural calamities in CY 2021 that affected air quality.
R11	No volcanic eruption/ash fall was observed in the Davao Region, but our Continuous Air Quality Monitoring Station (CAAQMS) is operational on a 24/7 basis and standby Manual Sampler and Monitors are readily available for deployment during times of emergency or whenever there are potential sources of air pollution. The assessment of the concentrations will be the basis for the issuance of public advisory on the AQI level of the said natural calamities when there will be a volcanic eruption in the future
R12	There was no notable event such as those listed above monitored in 2021.
R13	No volcanic eruption/ash fall occurred within the jurisdiction of EMB Region XIII Office.

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Adopt-an-Ambient Air Quality Monitoring Station

An initiative of DENR is the "Adopt-an-Ambient Air Quality Monitoring Station", which allows for LGUs to acquire and install Continuous Air Monitoring Stations (CAMS) with the partnership and/or funding of a thirdparty firm, which could be a private company or otherwise non-governmental company. A notable example of this in 2021 is a CAMS in Region VII that was sponsored by a private company. Said RO, in partnership with Aboitiz Group of Companies, managed to install the first Continuous Ambient Air Quality Monitoring Station (CAAQMS) in the Philippines under the Adopt-a-CAMS program of EMB. In Region IV-A, a meeting and site visit was conducted on April 21, 2021 with JG Summit Petrochemicals Corp at the site of the old Batangas Air Quality Station for utilization for the Adopt-an-Ambient Air Quality Monitoring Station program. Regions II and III plan to negotiate with the mining sector for partnerships under the program. The program aims to maximize the scope of monitoring ambient air quality with the help of private partners to give updates on air quality to the public.



Outsourcing of Air Quality Monitoring Station

Region	Responses
CAR	Two industries are included in the Adopt-an-Ambient Monitoring System, which are Camp John Hay Corporation and Philex Mining Corporation. Their reports on air quality are given to EMB-CAR every month.
NCR	An air quality monitoring station was turned over to the City of Manila LGU. Coordination with other prospective sponsor establishments is ongoing
R1	EMB Region 1 and the Provincial Government of La Union (PGLU) entered a Memorandum of Agreement (MOA) under the Adopt-an-Air Quality Monitoring Station program. The PGLU purchased a PQ200 PM _{2.5} Air Quality Sampler to be established in the Municipalities of Bacnotan and Bauang, La Union. The sample filters will be analyzed by the Regional Environmental Laboratory.
R2	EMB Region II aims to procure low-cost air monitoring equipment which is still able to perform USEPA reference methods well (and is accredited by them) Regarding the Adopt-an-AQMS program, communication letters were sent to mining companies within Region II for possible partnership.
R3	Region III plans to use sensor-based air quality monitoring equipment to supplement data loss of existing monitoring equipment, and to this end is further implementing the "Adopt-an-Ambient Air Quality Monitoring Station" program. Partnerships under the Adopt-an-AQMS program have been discussed with mining industries during the latter part of CY 2021. Most of the companies expressed their willingness and committed to adopt an AQMS through partnership with other mining companies
R4A	Region IV-A ROs envision purchasing a large quantity of local technologies, which can be less expensive air quality measuring devices, such as the sensor-based air quality monitoring devices (to cater a huge area to be monitored in) within the region.





Outsourcing of Air Quality Monitoring Station (continued)

R4B	EMB MIMAROPA will tap mining companies and a processing plant in Palawan for the Adopt-a- CAMS program, which will enable the monitoring of air quality in Environmentally Critical Projects. This is part of an initiative for the purchasing of additional air sampling equipment to further enhance EMB MIMAROPA's capability to monitor different kinds of air pollutants.
R5	Region V is in the consulting process for the outsourcing of AQMS.
R6	There is an ongoing plan by Region VI to establish a sensor-based monitoring station in an identified transport terminal, to be donated by an industry partner in the region. This project may be expanded into a full-scale project to be established in major transport terminals within Region VI.
R7	Continuous Ambient Air Quality Monitoring Station (CAAQMS) was installed in the region in 2021, which funding was outsourced to a private company for its acquisition.
R8	Region VIII is the pilot region for the EMB-funded outsourcing program. Siting processes for prospective locations of AQMS started in 2021
R9	EMB Region IX plans to negotiate with the private sector for the outsourcing of AQMS.
R10	EMB Region X is in negotiations with partners for the Adopt-a-CAMS program.
R11	EMB Region XI is preparing Memorandums of Agreement (MOA) for sites of future outsourced air quality monitoring stations.
R12	EMB Region XII is in talks with DOLE Philippines Inc. (Polomolok) to establish an Air Quality Monitoring Station in the municipality.
R13	The Airshed Governing Board in Region XIII is planning to acquire at least two PM10 high- volume samplers, which can be outsourced to a different sector.





CHALLENGES & OPPORTUNITIES IN AIR QUALITY MANAGAMENT

Challenges In Air Quality Monitoring

Maintenance and operation of commercial/regulatory-grade AQMS

The challenges when it comes to monitoring air quality monitoring have mainly occurred on the hardware side. The most prevalent response from the Regional Offices is that they were having problems in terms of the after-sales of equipment itself.

THE PROBLEM

Problems relating to equipment after-sales usually occur due to the availability of reserved spare parts of AQM equipment. Some of them are nearly obsolete in the market. At the same time, problems such as the cost of the accessories needed for the equipment and the lack of people available for the calibration and operation of the machine arise. Despite these problems, some ROs prefer outsourcing imported AQM equipment due to their accuracy.

Opportunities in Air Quality Monitoring

THE OPPORTUNITIES

The ROs are also open about the usage of local equipment for air quality measurement. It should be noted however that existing guidelines state that they must be able to follow the US EPA's method of sampling. If local equipment for air quality measurement was available, the ROs anticipate that it would be much cheaper in terms of maintenance and operational costs. The timely delivery of replacement parts and benefits to local innovators is another opportunity that is seen with local equipment.

Online Permitting System for Permit to Operate

As part of its commitment of promoting environmental protection, particularly addressing air pollution, the DENR-EMB has launched the new and improved Permit to Operate (PTO) Air Pollution Source Equipment and Installation Version 2.0, as part of its Online Permitting and Monitoring Systems (OPMS) on August 18, 2021. OPMS is a premiere web application developed by DENR-EMB that offers end-to-end solutions for environmental compliance, especially for the installation of air monitoring equipment for establishments being identified as air pollution sources. Likewise, it is also the response of the EMB to the COVID-19 pandemic, which reduces the need for applicants to personally visit the Bureau's Regional Offices, to request and apply for their needed clearances and permits. This system complies with RA 8749 which states that all sources of air pollution subject to implementing rules and regulations must have a valid PTO. Any equipment or activity that has the potential to emit regulated pollutants should be covered by a valid PTO.

Integrated Information System (IIS)

The Integrated Information System (IIS) is an online system that enables the EMB to process any transactions remotely and serves as a database for all the documents going in and out of the EMB. The IIS was developed as part of the direction of the management to shift all the manual systems to online systems. This system is used by the Central Offices and the Regional Offices and Environmental Monitoring Officers (EnMOs) and other EMB staff are given training to make sure that each and every employee understands and have knowledge in using the System.



Interactive Air Quality Data Dashboard (Microsoft PowerBI)

Air quality monitoring data gathered from all the AQMS across the country is readily available on the EMB Official Website through its Interactive Air Quality Data dashboards. This allows the public to have easy access on Historical and Recent Statistics on Air Quality Monitoring Data (PM₁₀ and PM_{2.5}), Emissions Inventory, Anti-Smoke Belching Apprehension Data, and Permit-to-Operate Air Pollution Source Installation issued to Firms, among others. This system can be used anytime and anywhere if they have an internet connection and access to the EMB Website. Clients can select/filter specific air quality monitoring stations, year, or city, among other qualifiers.

Regional Offices' Response to the Pandemic that Has Affected Air Quality Management

Bus Rapid Transit

While initial proposals for a Bus Rapid Transit system along EDSA were being made since 2018, it is the Line 2 project (dubbed the Central Corridor, would eventually become the EDSA Carousel) which would be implemented during the time of the pandemic. Following the announcement of the Inter-Agency Task Force for the Management of Emerging Infectious Diseases (IATF-EID) of a community quarantine on March 16, 2020, which suspended practically all public and private transit along EDSA, the incentive to implement the EDSA Busway to be built was present. The EDSA Busway is only open to authorized buses and emergency vehicles like ambulances. These also enabled a higher level of implementation to technologies such as cashless transactions. The EDSA Carousel was more than simply a new way to manage traffic on EDSA. It was also about regulating the flow of people, especially in the middle of a pandemic, where the movement of people and their interaction with one another should be regulated more carefully than usual.

Expansion of Bike lanes in cities

A 313 km-long bike lane network in Metro Manila was inaugurated and opened to the public on July 27, 2021. [35]. The DOTr, DPWH, and MMDA has worked on the installation of bollards, lightings on bicycle paths, and painting of lanes, as part of the government's bicycle lane project to ensure the safety of the cyclists. It is expected that because traveling by bicycle does not emit hazardous carbon dioxide or other pollutants into the atmosphere, a modest increase in bicycle use each year might save 6 to 14 million tons of CO2.

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Intra-National, International Networks Collaborations

Region	Collaborations
CAR +	CAR has been a host to a remote site for the EANET, which studies air and wet deposition, $PM_{2.5}$, inland aquatic ecosystems, and soil and water vegetation since 2010.
NCR	EMB-NCR is a member of the Breathe-Life Project, in partnership with World Health Organization (WHO), UN Environment Programme (UNEP) and the Climate & Clean Air Coalition (CCAC) thru CAI-Asia.
	The region continuously supports the project "Clean Air for Sustainable Future: A Transdisciplinary Approach to Mitigate Emissions of Black Carbon in Metro Manila, Philippines (TAME-BC)" as stated in the NCR Airshed Governing Board Resolution No. 2018-01, implemented April 2019 (in partnership with German Government).
R1	EMB Region I ensured the continuous monitoring the status of the AQMSs in the region. The office designated and submitted the list of focal persons and alternate focal persons for the air quality management programs and activities.
	The RO also has collaborated with the Pangasinan State University for the development of the NEPA Airshed Air Quality Profile.
R2	EMB Region II has continuously collaborated with schools and LGUs to monitor the air quality trends and disseminate related information on air quality status. The stations operating as part of this collaborative process include St. Paul University Station, Buntun Elementary Hall Station, and Santiago City Hall Station, which are continually operational and being regularly maintained.
R3	The Region III office was involved with the collection of rainwater samples for the monitoring of mercury content in ambient air in collaboration with the Asia Pacific Mercury Monitoring Network (APMMN) through the EMB Central Office AQM Section.
R4A	EMB Region IV-A has not entered any intra-national and international engagement or collaborations in CY 2021.
	EMB MIMAROPA has Baco-Calapan City-Naujan Airshed Governing Board in Oriental Mindoro. It is composed of the following members: Government Agencies • Department of Environment and Natural Resources MIMAROPA Region
R4B	 Department of Transportation – LTO MIMAROPA Region Department of Health MIMAROPA Region Department of Trade and Industry MIMAROPA Region Department of the Interior and Local Government MIMAROPA Region Department of Science and Technology MIMAROPA Region

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Intra-National, International Networks Collaborations (continued)

• Department of Energy

- Department of Education MIMAROPA Region
- National Power Corporation

Local Government Units

- Provincial Government of Oriental Mindoro
- Municipality of Baco
- City Government of Calapan
- Municipality of Naujan

Civil Society Organizations / Academe / NGOs

- Roxas Operators, Drivers, and Allied Workers Service Transport Cooperative (RODASTCO)
- Kaunsayan Formation for Community Development (KAFCODE)
- Divine Word College of Calapan
- First Oriental Mindoro Rice and Corn Association (FORMIRCA)
- Calapan City Vendors Multi-Purpose Cooperative
- Adrialuna Farmers Association
- Calapan City Tricycle Operator Driver Allied Services Cooperative

Private Sector

- Pilipinas Shell Corporation Calapan Depot
- Power One Corporation

BCN Airshed Governing Board Members committed to connect with the local media for advocacy campaigns to inform citizens of air quality updates. EMB MIMAROPA was also managing social media and official website to provide air quality results and other activities related to Air Quality Management.

R5

R4B

The EMB V has not entered into intra-national or inter-national network collaborations but are open to do so in the near future.

EMB Region VI has so far only collaborated with the local academe, transport groups, and other organizations. Projects included the establishment of Air Quality Monitoring Station within schools and establishment of Anti Smoke Belching Unit within municipalities and provinces.

R7

R6

EMB Region VII partnered with UP Cebu for the ABOT-REHAB Project on the rivers within Mandaue City. The project aims to describe environmental quality through correlating air and water quality in these areas.

R8

The Region VIII office collaborated with Eastern Visayas State University - Tacloban Campus and De La Salle University in conducting studies on Emissions Inventory for (2019-2021) and Attainment and Non-attainment of the Tacloban City Airshed.



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Intra-National, International Networks Collaborations (continued)

R9	 EMB Region IX has not entered any intra-national and international engagement or collaborations in CY 2021.
R10	EMB Region X has not entered any intra-national and international engagement or collaborations in CY 2021.
R11	EMB Region XI was due to collaborate with the Balik-Scientist Program of the DOST. However, due to documentary time requirements, it was moved to 2022.
R12	EMB Region XII has not entered any intra-national and international engagement or collaborations in CY 2021.
R13	EMB Region XIII has not entered any intra-national and international engagement or collaborations in CY 2021.



Asia Pacific Mercury Monitoring Network Program (APMMN)

One of the EMB's current international linkages is the Asia Pacific Mercury Monitoring Program (APMMN). It is a partnership of government, non-government, and academic institutions cooperating to develop a harmonized network of ambient and wet deposition mercury monitoring in the Asia Pacific region with the goal of producing high quality data, important for addressing issues from mercury sources. The APMMN cooperatively measures mercury in precipitation in a network of sites operating in Asia and the Western Pacific region. The network addresses significant data gaps in a region where mercury emission estimates are the highest globally, and available measurement data are limited.

Mercury is a global pollutant that can be transported over long distances, across political boundaries and media. The cycling of mercury in the Earth's environment is complex and has many variables and processes occurring over time and space. Many studies have repeatedly shown the impacts of mercury on aquatic and terrestrial systems, including animals, plants, and people as mercury cycles in the environment. Given the global nature of this mercury problem and our limited understanding of these processes, work began on the Minamata Convention on Mercury in 2009. The Convention is an effort to fully understand and reduce anthropogenic mercury from entering the environment to protect human health and the environment. The Convention came into force on 16 August 2017 and currently, 128 countries are signatories to the Convention and 110 have ratified it.

As of 2018, a wet deposition mercury sampler was turned over to the DENR-EMB. The Hg Deposition Mercury Sampler located in Clark, Angeles, Pampanga has been measuring the amount of mercury in the ambient atmosphere, although the samples for the year 2021 have been delayed for analysis due to issues relating to the COVID-19 pandemic [36].

The EMB Region III personnel has been conducting weekly measurements and monthly deliveries to the EMB Central Office as prescribed by the operations and sampling procedures of the wet deposition sampler. All the collected samples are sent to the mercury lab at National Central University (NCU) in Taiwan, which analyzes all forms of mercury in single measurements and reports this as total mercury concentrations.





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Workshops and Trainings

List of Trainings from The EMB Central Office

Trainings and Workshops Conducted	Date Conducted
Environment and Natural Resources Academy (ENRA) Supervisory Course	April 21, 2021 September 27-28, 2021 November 18-19, 2021
Continuous Emissions Monitoring Systems (CEMS) Online Training Workshop [37]	September 15-16, 2021
National Air Quality and Airshed Management Workshop – 2021 [38]	September 20-24, 2021
Training on Comprehensive Meteorology and its Impact to Air Quality [39]	October - December 2021

List of Trainings from The EMB Regional Office

Region	Trainings and Workshops Conducted	Date Conducted
CAR	Workshop on deputation of anti-smoke belching (in coordination with DOTR-CAR within the BLISTT Airshed)	2021
CAR	Emission inventory workshop for the provinces of Abra and Kalinga	2021
NCR	GHG Inventory (Entity, Community, and Sectoral Level) and communication Planning	November – December 2021
R1	Training on Comprehensive Meteorology and Its Impact to Air Quality (organized by EMB Central Office)	October - December 2021



ENVIRONMENTAL MANAGEMENT BUREAU - AIR QUALITY MANAGEMENT SECTION

List of Trainings from The Regional Office

Region	Trainings and Workshops Conducted	Date Conducted
R2	National Air Quality and Airshed Management Workshop (organized by EMB Central Office)	September 20 – 24, 2021
R3	Trainings on the proper use of Air Quality Monitoring equipment (Includes training for proper site selection) – for Bulacan- Pampanga-Batan Airshed Governing Board Member LGUs	2021
R3	Training/Workshop on Emissions Inventory	2021
R3	Training on basic use of QGIS for mapping of air pollution sources	2021
R4A	Introduction to Emission Inventory	November 4, 2021
R4B	Training on Comprehensive Meteorology and its Impact to Air Quality (organized by EMB Central Office)	October 15 - 17, 2021
R5	Training on the Designation of Attainment and Non-Attainment Areas	June 11, 2021
R6	Virtual Capacity Building on Ambient Air Quality Monitoring	November 17, 2021
R6	EMB R6 -MIAGB - Refresher Course on Motor Vehicle Maintenance for MIA Transport Groups members	November 6-7, 13-14 and 20-21, 2022
R7	Capacity Building on Air Dispersion Modeling using AERMOD software	2021
R8	Training on the Operations & Calibration of Air Quality Monitoring Equipment	November 2, 2021





List of Trainings from The Regional Office

Region	Trainings and Workshops Conducted	Date Conducted
R8	Capacity Building for the Pre-designation Activities for Isabel Industrial Airshed	November 11-12, 2021
R9	2-day seminar-training on stack emission testing	2021
R9	3-day Training on Airshed Designation and Air Dispersion Modeling Workshop	2021
R10	Capability Development/Training on Water and Ambient Air Sampling Procedures and Analysis for LGUs Within the CDORBAR WQMA and Metro Cagayan de Oro Airshed	June 29 – 30, 2021
R11	Participated in the Training on Comprehensive Meteorology and its Impact to Air Quality	October - December 2021
R12	First Quarter Governing Board Meeting, Action Planning Workshop, and GIS Mapping Workshop	April 12-16, 2021
R12	Orientation-Workshop on Entity-Level and Community-Level Greenhouse Gas Inventory for South Cotabato Airshed LGUs	November 4, 2021
R12	Webinar On Youth and Climate Action	November 25, 2021
R13	Capacity Building of LGUs within the Agusan del Norte-Butuan City Airshed	July 9, 2021
R13	Capacity Building of Agusan del Norte-Butuan City Airshed Governing Board Members	December 9 – 10, 2021





LIST OF ACTIONS RELEVANT TO AIR QUALITY

GOVERNMENT AGENCY	PROJECT AND PROGRAMS	STATUS AND REMARKS
	 Shift to other modes of transport thereby reducing traffic congestion, and subsequently, air pollution. Construction of Active Transport Facilities, including Establishment of Bike Lane Networks, EDSA Greenways 	 Establishment of Bike Lanes Completed last June 2021 EDSA Greenways – Ongoing Procurement and Detailed Engineering Design
Department of Transportation	Mass Transportation Development, including railways, Bus Rapid Transit (BRT) and High Priority Bus System (HPBS) Projects under the Build, Build, Build Program, which are currently ongoing: <u>Rail Projects</u> • MRT-3 Rehabilitation Project • Metro Manila Subway • LRT-2 West Extension • PNR Clark Phase 1 (Tutuban – Malolos) • PNR Clark Phase 2 (Malolos – Clark) • PNR Clark Phase 2 (Malolos – Clark) • PNR Calamba • PNR Bicol • MRT Line 7 • MRT Line 4 • LRT-1 Cavite Extension • Mindanao Railways Project <u>BRT and HPBS Projects</u> • Cebu and Metro Manila BRT • Davao HPBS	Rail ProjectsMRT-3 Rehabilitation Project:Overall completion as of October 2021: 83.05%Rehabilitation Completion: 4Q 2021Project Completion: 2Q 2023Metro Manila Subway:Overall completion as of October 2021: 34.83%Partial Operations: 4Q 2026Full Operations: 3Q 2027LRT-2 West Extension:Overall completion as of October 2021: 5.69%Project Completion: 4Q 2024PNR Clark Phase 1 (Tutuban – Malolos)Overall completion as of October 2021: 51.30%Partial Operations: 2Q 2023Full Operations: 2Q 2024PNR Clark Phase 2 (Malolos – Clark)Overall completion as of October 2021: 32.51%Partial Operations: 3Q 2023Full Operations: 4Q 2024PNR Clark Phase 1 (Malolos – Clark)Overall completion as of October 2021: 32.51%Partial Operations: 3Q 2023Full Operations: 4Q 2024PNR CalambaOverall completion as of October 2021: 26.91%Partial Operations: 4Q 2025Full Operations: 4Q 2025Full Operations: 4Q 2025



ENVIRONMENTAL MANAGEMENT BUREAU - AIR QUALITY MANAGEMENT SECTION

LIST OF ACTIONS RELEVANT TO AIR QUALITY

GOVERNMENT AGENCY	PROJECT AND PROGRAMS	STATUS AND REMARKS
		<i>PNR Bicol</i> Overall completion as of October 2021: 10.73% Partial Operations: 1Q-2Q 2022 Full Operations: 3Q 2025
		<u>MRT Line 7</u> Overall completion as of October 2021: 62.10% Partial Operations: April 2022 Full Operations: 4Q 2022
		<u>MRT Line 4</u> On-going contract negotiation. Project Completion: 2025
Department of Transportation	partment of	<u>LRT-1 Cavite Extension</u> Overall completion as of October 2021: 60.18% Partial Operations: 1Q 2024 Full Operations: 2Q 2027
		<u>Mindanao Railways Project Phase 1</u> Overall completion as of October 2021: 6.57% Full Operations: 2Q 2023
		BRT and HPBS Projects <u>Cebu Bus Rapid Transit</u> Ongoing Procurement Full Operations: 2025
		<u>Metro Manila BRT</u> Ongoing Procurement, Preliminary Engineering Design Operations: 2024
		<u>Davao High Priority Bus System</u> For procurement of civil works packages Operations: 3Q 2023

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LIST OF ACTIONS RELEVANT TO AIR QUALITY

GOVERNMENT AGENCY	PROJECT AND PROGRAMS	STATUS AND REMARKS
	Ensuring air quality in road transport motor vehicles Projects/activities included are as follows: Private Motor Vehicle Inspection Centers Roadside inspection of Motor Vehicles	Ongoing
	 Public Utility Vehicle Modernization Program Components under the PUVMP are as follows: Policy Reforms Route Rationalization Local Public Transport Plan Industry Consolidation Fleet Modernization - new jeepney design standards; promoting use of EurolV diesel engines and other alternative sources of energy, including e-jeepneys. Financing Vehicle Useful Life Stakeholder Support Communications 	
	 Digital Transformation interventions, which lessens human interventions and reduce travel Electronic Toll Collections Land Transportation Management Systems, LTO Public Portal LTFRB Public Transport Online Processing System 	Ongoing



ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

LIST OF ACTIONS RELEVANT TO AIR QUALITY

AGENCY	ACTIVITY	BRIEF DESCRIPTION
Department of Science and Technology	Development of Intelligent Packaging Colorimetric Sensor as Total Volatile Base Nitrogen (TVBN) Indicator	The project developed a colorimetric sensor to indicate TVBN levels in packaged fish. It changes color based on total basic volatile nitrogen (TVBN) concentration such as ammonia gas, enabling freshness monitoring.
(ITDI)	Technical Standards	PNS ISO/TR 19601:2021: Nanotechnologies — Aerosol Generation for Air Exposure Studies of Nano-objects and their Aggregates and Agglomerates (NOAA)
Department of Science and Technology (PCIEERD)	Department of Science and Technology (PCIEERD) Strategic Activities	







LIST OF ACTIONS RELEVANT TO AIR QUALITY

AGENCY	ACTIVITY	BRIEF DESCRIPTION
Department of Science and Technology (PCIEERD)	PROJECT LINGAP LANGHAP: Low-cost 3D Printed Air Purifier System using Agricultural Waste-Based Activated Carbon Filter	The product air purifier combines activated carbon from biomass and HEPA filters for cost-effectiveness. It includes a PM _{2.5} sensor and IoT connection for data sharing. Bamboo is used for filter casing, treated to prevent degradation, with 3D-printed end caps for filtration layers.

PROJECT LINGAP LANGHAP: Low-cost 3D Printed Air Purifier System using Agricultural Waste-Based Activated Carbon Filter



A bamboo filter casing will be used to contain the activated carbon due to its high availability and faster production due to its already hollow and cylindrical form. The filter case housing will be made of bamboo treated with coats of varnish to prevent mold and degradation, with 3d printed end caps of HEPA filters and other filtration layers.

Data Source: PCIEERD 2021 Annual Report - DOST [40]



ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

LIST OF ACTIONS RELEVANT TO AIR QUALITY

AGENCY	ACTIVITY	BRIEF DESCRIPTION
DOST PAGASA	Operations and Upgrading of Synoptic Stations, 2021	 PAGASA completed the synoptic-airport station in Laguindingan and the synoptic-agromet station Isabela. These added to the 80 field weather stations established and operated by PAGASA nationwide. PAGASA installed a total of 36 (High Frequency RaDARS) HFRs in coastal areas nationwide; seven of which were in 2021. They are in Daan Batayan, Cebu; Catmon, Cebu; Danao, Cebu; Poro Cebu; Placer, Masbate; Cadiz, Negros and Madridejos, Cebu. Doppler Radars aid cloud detection, storm prediction, and weather forecasting, enabling forecasters to monitor weather systems' movement and development. PAGASA's 17 Doppler Radar Stations, with plans for three more, provide vital data during weather disturbances, with observation frequency increasing during tropical cyclones. Data is reported hourly or every 30 minutes if feasible. Automated Weather Stations (AWSs) feature built-in instruments and sensors for various weather parameters. They facilitate data collection in remote areas, enhancing PAGASA's forecasting capability. In 2021, 31 AWSs were installed, contributing to a total of 169 nationwide.
DOST PAGASA	Establishment of PAGASA-MIS Storage Expansion in Central Office and Disaster Recovery Site in Cebu	PAGASA's PAGASA-Meteorological Information System (PAGASA-MIS) integrates various observing facilities into one centralized database for meteorological data. Currently, data is archived for up to one-and-a-half years, with plans for storage expansion for improved accessibility and reliability.
DOST PAGASA	Integrated Digital Weather Forecasting Project	PAGASA's modernization efforts generate vast data from various facilities, necessitating automated analysis for weather forecasting improvement. The project aims to enhance computing hardware, collaboration tools, weather analysis, visualization, IT infrastructure, and system security for better weather services.





LIST OF ACTIONS RELEVANT TO AIR QUALITY

AGENCY	ACTIVITY	BRIEF DESCRIPTION
DOST PAGASA	All Weather Communication System (Phase 2)	The project aims to establish a comprehensive telecommunication network for PAGASA, connecting regional services, stations, and radars. It will provide real-time weather data and establish IP radio connections between the central office and regional divisions. The project will automate data processing and enable direct communication with field stations.
DOST PNRI	Establishment of Regional Early Warning Radiation Monitoring Network	PNRI has conducted several site inspections in preparation for the establishment of gamma dose radiation monitoring stations across the Philippines, which will serve as an early warning radiation monitoring network feeding invaluable data to decision makers in case of a nuclear or radiation-related emergency in the surrounding area.

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Figure 30. Site inspections (in photos) in preparation for the establishment of gamma dose radiation network stations (map) across the Philippines. Taken from PNRI Annual Report 2021. [41]

Establishment of Regional Early Warning Radiation Monitoring Network

PNRI has conducted several site inspections in preparation for the establishment of gamma dose radiation monitoring stations across the Philippines, which will serve as an early warning radiation monitoring network feeding invaluable data to decision makers in case of a nuclear or radiation-related emergency in the surrounding area



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LIST OF PROJECTS FROM DOST RELEVANT TO AIR QUALITY

PROJECT TITLE	DESCRIPTION	
Development of upcoming planned programs and projects		
Project 1 : AdVICE: Ad-hoc Vehicle Infrastructure Cooperative Environment AdVICE	Consists of 1) a collection of ride-hailing algorithms 2) data harvesting of evehicles, and 3) ride-hailing application. AdVICE aims to make e-trikes more efficient for use as a transportation option in small communities.	
Project 2 : EmoCION: Electric Mobility and Charing Infrastructure Operating as a Network	A smart network of energy-aware electric vehicles and charging stations. There will be cooperation between the electric vehicles and infrastructure. Operations such as scheduling of vehicles, route to take, charging designation, and charging time will all be coordinated such that the overall energy demand of the system will be optimized.	
Project 3. E-trike Deployment and Utilization Study Saving the environment	Project 3. E-trike Deployment and Utilization Study Saving the environment through minimal emission of engines is the focus of this on- going study. The utilization and deployment of the e-Trike will create awareness and acceptability to stakeholders in Tuguegarao City. It shall provide information on the performance of the e-Trike in terms of mileage, and battery performance.	
Optimal Placement Of Electric Vehicle Charging Stations In A Local Public (Charm Doe)	A methodology to strategically place fast charging stations within a local transportation system. This methodology will be used to pilot a network of charging infrastructure to be located in a city with electric tricycles. The project envisions that the existing e-trikes from DOE can be used to cater as transport service.	
Design, Development, Demonstration And Business Planning Of A Flexible Electric Van (Flev) For Logistics And Passenger Transport Use (9081)	This project in collaboration with DLSU and Valeo, a European company engaged in electric vehicle drive train development, through the EU funded SOLUTIONS Plus project of the Urban Electric Mobility Initiative. Partnering with Tojo Motors (Santa Rosa, Laguna) aims to accelerate the wider transition to sustainable urban electric mobility. The vehicle can be used as a dedicated logistics or public transport vehicle, or both ways. A prototype will be built and tested on the road and in the laboratory. Five (5) units will be adopted for demonstration by the Philippine Postal Corporation.	



ENVIRONMENTAL MANAGEMENT BUREAU - AIR QUALITY MANAGEMENT SECTION

LIST OF PROJECTS FROM DOST RELEVANT TO AIR QUALITY

PROJECT TITLE	DESCRIPTION
Safe, Efficient, and Sustainable Solar- Assisted Plug-In Electric Boat (Sessy E-Boat)	The project aims to create solar-assisted electric boats to serve as the first step into implementing a mode of transport that utilizes clean energy. In the future, the technology can be implemented on all applicable maritime spots in the country. This study will involve the prototyping of two (2) units of electric motor boats with solar panels. The design and implementation of the power and control system for efficient and sustainable electric boats will be the primary scope of the project. Project will use locally developed automatic identification system or AIS as safety feature.
Project 1: Design, Development and Fabrication of the Different Parts and Assembly of E-Trike (9332)	Project 1 will design, develop, and fabricate different parts of an electric tricycle (e-Trike). Different possibilities in improving the energy efficiency of the e-Trike will be considered. Studies will focus on the reduction of overall weight by improving body shell design and choosing lightweight materials; redesigning a lightweight chassis; improving mechanical energy transmission systems, and determining optimal electronic/electrical systems with respect to the mechanical design fo the tricycle
Project 2. Design, Fabrication And Testing Of Electrical And Electronic Systems Of A Locally Developed E- Trike (9333)	This project is in partnership with UP Diliman Power Electronics Laboratory and CSU. Difficulty in requesting for timely repair and/or replacement of damaged parts as most of the time there are no local offices of foreign suppliers. Lack of actual testing of components in local operating conditions. Easily affected by global supply and global events (special mention: COVID-19). Aside from designing the components to suit the desired application of CSU, knowledge transfer will be conducted by hosting researchers from CSU in UP Diliman and setting up a power electronics laboratory in CSU to be able to sustain the NICER for EV in Region 2. Power Electronics Laboratory
Project 3. Viability Study Of Conversion Of Conventional Tricycle To E-Trike (9455)	For this study, the tricycle models available in the region are the target units to be converted to e-Trike. There are two (2) prevalent models in the region and they are locally known as: "sidecar" and "center car". These 2 models differ in many ways but the distinction and where the local name was derived is based on the position of the motorcycle. For "sidecar", the motorcycle is located at the left side of the unit while for the "center car", the motor cycle is located at the center of the unit. Lithium lon battery will be used and a BMS will also be incorporated to protect the battery and prolonged its service life

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LIST OF ACTIONS RELEVANT TO AIR QUALITY

AGENCY	ACTIVITY
Department of Energy (DOE)	
	A Summary of the Extent of air pollution in the country, per type of pollutant and source
	An analysis and evaluation of the current state, trends and projections of air Pollution;
	An identification of critical areas, activities or projects which will need closer monitoring or regulation;
	Recommendation for necessary executive and legislative action; and
Department of Works and Highways (DPWH)	Other pertinent and qualitative and quantitative information concerning the extent of air pollution and the air quality performance rating of industries in the country
	Department Order No. 88 Series of 2020 (Prescribing Guidelines on the Design of Bicycle Facilities along National Roads) All projects of DPWH that involve new road and bridge construction or future expansion to relieve traffic congestions such as road/bridge widening, diversion/bypass roads, among others, shall include in its design the provision of bicycle facility, if feasible. Encouraging the use of bicycle, a uniform design of bicycle facilities shall be included in to achieve a consistent approach that will meet the needs and safe access of bicyclist and other road users.
Metropolitan Manila Development	Continuous operation of the Anti-Smoke Belching Unit (ASBU) to implement and enforce the Clean Air Act (RA 8749) through roadside inspection and apprehension, improving the "ambient air quality" of Metro Manila.
Authority (MMDA)	Implement a comprehensive Anti-Smoke Belching Program (Article 2, Section 5.d of RA 8749).



ENVIRONMENTAL MANAGEMENT BUREAU - AIR QUALITY MANAGEMENT SECTION

PROJECTS FROM THE HEALTH SECTOR

INSTITUTION	NAME OF PROJECT	ACTIVITY	PERIOD COVERED AND LOCATION OF IMPLEMENTATION
Lung Center of the Philippines	Anti-Air Pollution Program	The early findings of air pollution in the two cities mentioned warrant a genomic study by the DOH and the DOST among the jeepney drivers, commuters, sidewalk vendors, and other individuals exposed to air particulate pollutants, and this study should be done at the LCP to determine the risk of people to cancer, cardiovascular diseases, etc., and to determine other genetic defects that will affect future generations.	2021 Lung Center of the Philippines
Department of Health	Environmental Health Program	The Healthy Workplace and Environment Division – Health Promotions Bureau of the DOH , in collaboration with World Health Organization – Philippines continues to serve as secretariat of the Inter- Agency Committee on Environmental Health (IACEH). Periodical meetings on consultations for the development of Air Quality Guidelines on hazardous air pollutants, as well as the Stakeholder consultations for the National Air Quality Status Report are hosted by the DOH-DPCB.	2021 Nationwide





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LIST OF SCIENTIFIC MANUSCRIPTS

PUBLICATIONS FROM THE ACADEMIC SECTOR

Title of Manuscript	First Author, (Year), Universities Involved	Period Covered and Location of Implementation	Type of Manuscript
Seasonal Mapping and Air Quality Evaluation of Total Suspended Particulate Concentration Using ArcGIS-Based Spatial Analysis in Metro Manila, Philippines	Aniceto, KRD et al., (2021) Department of Civil engineering, Far Eastern University Institute of Technology (FEU Tech)	2016-2020, Metro Manila	Conference paper
Ambient air quality and the risk for Chronic Obstructive Pulmonary Disease among Metro Manila Development Authority traffic enforcers in Metro Manila: An exploratory study	Seposo, X., et al., (2021), School of Medicine and Public Health, Ateneo de Manila University	2016-2018, Metro Manila	Peer-reviewed paper
Geospatial analysis of COVID-19 lockdown effects on air quality in the South and Southeast Asian region	Ray, S. et al. (2021), Bengal Institute of Architecture, Landscapes and Settlements, Dhaka, Bangladesh	2020, Manila	Peer-reviewed paper
Estimation Of Nitrogen Dioxide (No2) Concentration Using Fengyun-4a Dust Storm Detection (Fy-4a Dsd) Product During The Covid-19 Lockdown In Metro Manila, Philippines	Solidum KA, et al., (2021), National Graduate School of Engineering, University of the Philippines Diliman, Quezon City, Philippines	2021, Metro Manila	Conference paper
The impacts of COVID-19 on the environmental sustainability: a perspective from the Southeast Asian region	Praveena, SV, et al., (2021), Department of Environmental and Occupational Health, Faculty of Medicine and Health Science, Universiti Putra Malaysia	2021, major urban areas of the Philippines	Peer-reviewed paper
The effect of COVID-19 pandemic on human mobility and ambient air quality around the world: A systematic review	Faridi, S., et al., (2021), Centre for Air Pollution Research (CAPR), Institute for Environmental Research (IER), Tehran University of Medical Sciences	2020, Manila	Peer-reviewed paper



ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

LIST OF SCIENTIFIC MANUSCRIPTS

PUBLICATIONS FROM THE ACADEMIC SECTOR

Title of Manuscript	First Author, (Year), Universities Involved	Period Covered and Location of Implementation	Type of Manuscript
Genotoxicity of PM _{2.5} and PM ₁₀ Particulates on Human Peripheral Blood Lymphocytes in Manila, Philippines	Estonilo, MKG, et al., (2021), Environment and Remote Sensing Research (EARTH) Laboratory, Department of Physics, De La Salle University, Manila 0922, Philippines	2015-2017, Manila	Peer-reviewed paper
Opposite trends of cold surges over South China Sea and Philippines Sea and their different impacts on PM _{2.5} in eastern China	Zhang, S., et al., (2021), Nanjing University of Information Science and Technology, Nanjing 210044, China	1979-2021, Philippine Seas	Peer-reviewed paper
Inter-comparison of chemical characteristics and source apportionment of PM _{2.5} at two harbors in the Philippines and Taiwan	Tseng, YL, et al., (2021), Institute of Environmental Engineering, National Sun-Yat Sen University, Kaohsiung City, Taiwan	2019, Manila	Peer-reviewed paper
Swidden Agriculture and Biomass Burning in the Philippines. Biomass Burning in South and Southeast Asia	Perez GJP, et al., (2021), Institute of Environmental Science and Meteorology, University of the Philippines Diliman	2016, Cabanatuan City, Philippines	Book Chapter
Emissions and Chemical Components of PM _{2.5} from Simulated Cooking Conditions Using Traditional Cookstoves and Fuels under a Dilution Tunnel System	Rosales CMF, et al., (2021), Institute of Environmental Science and Meteorology, University of the Philippines Diliman	2014, Quezon City	Peer-reviewed paper
Contrasting the Size-Resolved Nature of Particulate Arsenic, Cadmium, and Lead Among Diverse Regions. Atmospheric Pollution Research, 12(3), 352– 361.	Gonzalez, ME et al., (2021) Department of Chemical and Environmental Engineering, University of Arizona, Tucson, AZ, USA	2019, Manila	Peer-reviewed paper







LIST OF SCIENTIFIC MANUSCRIPTS

PUBLICATIONS FROM THE ACADEMIC SECTOR

Title of Manuscript	First Author, (Year), Universities Involved	Period Covered and Location of Implementation	Type of Manuscript
Measurement Report: Long-Range Transport Patterns into the Tropical Northwest Pacific During the CAMP2Ex Aircraft Campaign: Chemical Composition, Size Distributions, and the Impact of Convection. Atmospheric Chemistry and Physics, 21(5), 3777–380	Hilario, MRA et al., (2021) Manila Observatory, Quezon City, Philippines	2019, regions of Luzon island	Peer-reviewed paper
Measurement report: Firework impacts on air quality in Metro Manila, Philippines, during the 2019 New Year revelry	Lorenzo, GR et al., (2021) Manila Observatory, Quezon City, Philippines	2019, Quezon City	Peer-reviewed paper
Total organic carbon and the contribution from speciated organics in cloud water: airborne data analysis from the CAMP2Ex field campaign	Stahl C. et al., (2021) Department of Chemical and Environmental Engineering, University of Arizona, Tucson, AZ, USA	2019, regions of Luzon island	Peer-reviewed paper

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ENVIRONMENTAL MANAGEMENT BUREAU - AIR QUALITY MANAGEMENT SECTION

PROJECTS FROM THE NON-GOVERNMENTAL ORGANIZATIONS

ORGANIZATION	NAME OF PROJECT/ ACTIVITY	PERIOD COVERED/ DATE	ACTIVITY
Clean Air Asia	Philippine Congressional Oversight Committee for the Philippine Clean Air Act	January 27, 2021	Clean Air Asia urged the urgent revision of outdated emission standards to safeguard public health and mitigate climate impact. They appealed to Congress to expedite the review process and support air quality management initiatives. Committee Chairman Representative Alfonso Umali, Jr. of Oriental Mindoro acknowledged Clean Air Asia as a vital partner of the Department of Environment and Natural Resources.
Clean Air Asia	ADB TA 9068: Strengthening Knowledge and Actions for Air Quality Improvement	CY 2021	Clean Air Asia assisted in crafting a Clean Air Action Plan (CAAP) for La Trinidad, Philippines, along with cities in Mongolia, Vietnam, Pakistan, and Bangladesh. They prioritized technology and policy solutions to tackle air pollution sources and established CAAP Working Groups for sustained implementation. They also facilitated communication planning among city stakeholders to support CAAP measures.
Clean Air Asia	3M Manila Asia Blue Skies		Clean Air Asia facilitated Manila City Government's adoption of its CAAP through a draft Hinga Maynila (Breathe Manila) Task Force Resolution. They collaborated extensively with the task force, formed in 2020, in formulating and validating pollution control measures. They initiated air quality monitoring at Dr. Jose Fabella Memorial Hospital and conducted training workshops for task force representatives.



PROJECTS FROM THE NON-GOVERNMENTAL ORGANIZATIONS

ORGANIZATION	NAME OF PROJECT/ ACTIVITY	PERIOD COVERED/ DATE	ACTIVITY
Clean Air Asia	C40 Technical Assistance to Quezon City	CY 2021	Clean Air Asia developed the Roadmap for Air Quality Management Plan (AQMP) for Quezon City and assisted in creating a city-financed program on emission inventory, air quality communication, health impact assessment, and monitoring. They conducted baseline air quality studies and established an air quality monitoring network. Training sessions improved understanding and technical capabilities for city representatives.
Clean Air Asia	Emissions Inventory (EI) development for Paranaque City and Baguio City	CY 2021	With support from the DENR EMB NCR and the local government of Baguio City, the data collection process for the El development in Paranaque and Baguio City, respectively, was started in Q4 2021 by Clean Air Asia. Trainings on data collection and analysis pertinent to El development were conducted in December 2021 for both cities.
Clean Air Asia	Activities on sustainable transport towards improved air quality	CY 2021	 Clean Air Asia developed a Sustainable Urban Mobility Data Toolkit for the Department of Transportation, aiding data collection for Philippine Urban Mobility Programme (PUMP). Clean Air Asia supported Manila City's adoption of its CAAP through a draft Hinga Maynila Task Force Resolution. Clean Air Asia collaborated with Pasig City on grassroots-led air quality and transport management, conducting baseline activities and developing an emissions inventory.

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ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

PROJECTS FROM THE NON-GOVERNMENTAL ORGANIZATIONS

ORGANIZATION	NAME OF PROJECT/ ACTIVITY	PERIOD COVERED/ DATE	ACTIVITY
Clean Air Asia	Activities on the monitoring and regulation of point sources	CY 2021	 Clean Air Asia collaborated on drafting the DENR-EMB's Memorandum Circular detailing emission standards review and revision. A Consultation Workshop on Mass Emission Rate Standards (MERS) was coorganized by Clean Air Asia and DENR-EMB AQMS. Clean Air Asia created a document "Designing Environmental User Fees for Industrial Atmospheric Emissions in the Philippines: Analytical Framework and Illustration" outlining an initial methodology for setting emission charges in the Philippines' industrial sector. Clean Air Asia held consultations with EMB offices to identify capacity building needs in air quality modeling and emissions data management. Clean Air Asia conducted capacity building sessions with DENR EMB Region 3 and the Bulacan-Pampanga-Bataan Airshed Governing Board.
Clean Air Asia	Capacity building at the regional level through publications and materials	CY 2021	 Clean Air Asia released a new Guidance Area in 2021 within their IBAQ Guidance Framework, focusing on financing air quality and climate solutions. [42] Clean Air Asia's IBAQ Learning Portal expanded with twelve new training modules covering various topics in air quality management. [43]





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PROJECTS FROM THE NON-GOVERNMENTAL ORGANIZATIONS

ORGANIZATION	NAME OF PROJECT/ ACTIVITY	PERIOD COVERED/ DATE	ACTIVITY
Manila Observatory	Research Activities	CY 2021	The Air Quality Dynamics Laboratory, part of ASEP- CELLs, measured air pollution from a coal plant in Cagayan de Oro and black carbon levels in Manila and Quezon City. It also studied aerosol properties and jeepney route pollution. This research yielded five journal articles and two technical reports. The MO's Automated Weather Station network grew significantly with the addition of 163 Lufft weather stations donated by WPF in 2020, supplementing the existing 96 stations. Pandemic restrictions hindered maintenance efforts, but 32 Lufft and six Davis stations are operational as of 2021. Reconditioned stations are in Regions 3, 4-A, NCR, and Pangasinan. [44]
Institute of Environmental Science and Meteorology, University of the Philippines Diliman	Extension and Service through Capacity Building and Science to Policy	CY 2021	As the Regional Training Center of World meteorological Organization, the IESM was tapped by the EMB-AQMS to deliver the Basic Meteorology Training to capacitate the Regional Officers of EMB nationwide. Faculty experts in air quality (Prof. Gerry Bagtasa and Prof. Mylene Cayetano) are also tapped as resource speaker in the National Air Quality and Airshed Management Workshop in September 2021. The IESM also supports the policy formulation of EMB Central Office through its Projects: • HAZAP Phase 2 • National Air Quality Status Report (2019-2020) • Updating the Air Quality Parameters and Methods The IESM also continues to participate in measurement campaign in its extension phase, such as the Clean Air for a Sustainable Future, A Transdisciplinary Approach to Mitigate the Impacts of Black Carbon (TAME-BC)





PROJECTS FROM THE NON-GOVERNMENTAL ORGANIZATIONS

ORGANIZATION	NAME OF PROJECT/ ACTIVITY	PERIOD COVERED/ DATE	ACTIVITY
Rotary Club of Makati	Airtoday.ph	CY 2021	Migrating and revitalizing the Airtoday.ph to add the station from the National Science Complex of the University of the Philippines Diliman
Partnership for Clean Air	Commissioning of Scientific Advisory/Technical Assistance for the Designation of Attainment and Non-Attainment Areas for National Capital Region (NCR)	April 2021 to October, 2021	This study aims to designate attainment and non-attainment areas in Metro Manila through comprehensive analysis of criteria pollutants data. It involves analyzing databases from automated and filter-based collections, validating with satellite and ground monitoring data, and comparing with National Air Quality Guideline values. Exceedances for three consecutive years signify non-attainment areas. Compliance designates attainment areas.
Partnership for Clean Air	Consultancy Services for the Study on Air Particulate Matter Filters for Black Carbon (BC) of the Environmental Management Bureau - Cordillera Autonomous Region (EMB-CAR)	Project started on September 2021	Black Carbon (BC) contributes to global warming by absorbing solar radiation, emitted with co-pollutants affecting climate and ecosystem health. Research in CAR aims to provide BC and Particulate Matter (PM) concentrations using multi-wavelength studies, aiding local government in environmental regulation for public health protection from air pollution.
Partnership for Clean Air	Consultancy Services for the Source Apportionment Studies of Air Particulate Matter Filters for EMB- CAR	CY 2021	Source Apportionment Studies (SAS) aid Air Quality Management by identifying pollutant sources through receptor models. These models quantify emission rates and trace pollutant transport from source to downwind areas, elucidating physical and chemical transformation processes. DENR-EMB-CAR collected PM10 samples from various locations for SAS analysis, facilitating targeted pollution control measures.







PROJECTS FROM THE NON-GOVERNMENTAL ORGANIZATIONS

ORGANIZATION	NAME OF PROJECT/ ACTIVITY	PERIOD COVERED/ DATE	ACTIVITY
Partnership for Clean Air	Commissioning of Scientific Advisory/Technical Assistance for Source Apportionment Study in Metro Manila	CY 2021	The study aims to conduct source apportionment analysis of respirable air particulate pollution in Metro Manila sites from two of the filter-based APM EMB sampling sites—one roadside at the National Printing Office (NPO) sampling site and one ambient at the Muntinlupa sampling site.
Partnership for Clean Air	Support to the Academe partners	CY 2021	 PCA partnered with UP-CARE on June 1, 2021, to support LGUs, initially in NCR, in air quality monitoring. This involves crafting policies, guidelines, and providing technical support, funds, and data. The partnership aims to strengthen EMB-DENR's capacity in utilizing new technology and formulating policies for air pollution control. PCA collaborates with AiRMoVE, led by UP TCAGP, to enhance LGUs' emission reduction efforts. The partnership involves coordinating workshops, reviewing mapping and modeling outputs, and providing manpower support for local air quality management and policy development.

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ENVIRONMENTAL MANAGEMENT BUREAU - AIR QUALITY MANAGEMENT SECTION





Summary

Additional Stations under the Adopt-an-AQMS program

Under the Adopt-an-AQMS program, future air quality monitoring stations are expected to be established. One station in Region X is expected to be inaugurated by Dec. 2022. Many regions, such as Region VII, IX, XI, and XII, are still undergoing coordination and planning regarding financial support from sponsor companies and siting for future AQMSs in their areas.

Initiatives for Non-motorized Transport

The Metro Iloilo area in Region VI has constructed and implemented the wide usage of bicycle lanes. More space is expected to be allocated for this purpose with successive development plans. Similar initiatives are expected to be conducted on an individual LGU level in NCR.

Planning Interventions for Roads and Vehicle Infrastructure

The expansion and maintenance of large-scale road networks are one of the methods that are used by Airshed Governing Boards with the intent of reduction of idle traffic, more efficient use of vehicle travel time, and eventually, the reduction of overall air pollution emissions from mobile sources.

Region I and Region III offices have been monitoring area sources originating from their sections of the Tarlac-Pangasinan-La Union Expressway (TPLEX). Major infrastructure projects in Region VIII are now being constructed, such as the Cordova Bridge and the Cebu City BRT project. In Region IX, a skyway is to be constructed in the central district of Zamboanga City.

In NCR, the third phase of the Metro Manila Skyway has opened to the public with its intended goal of reducing congestion for vehicle traffic going between North and South Luzon. A similar strategy is being considered in the cities of Pasig and Taguig with the planned Ortigas-BGC flyover, which is expected to be open to traffic by the year 2022.



ENVIRONMENTAL MANAGEMENT BUREAU -AIR QUALITY MANAGEMENT SECTION

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Generative AI keywords:

- Page 40 Clean Air Sky
- Page 82 Burning of Wastes
- Page 84 Air Pollution

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- https://www.facebook.com/photo.php?fbid=745811384256077&set=pb.100064816653412.-2207520000&type=3
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- Page 137 Figure 30 Screen capture from PNRI Annual Report, 2021



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Appendix 1. National Air Quality Guideline Values, Air Quality Index Breakpoints and precautionary Advise

Parameter	Averaging Time	NAAQGV(µg/NCM)
TSP	annual 24-hour	90 230
	annual	60
PIVI 10	24-hour	150
	annual	35 (Until 31 Dec, 2015), 25 (By 1 January, 2016)
PM2.5	24-hour	75 (Until 31 Dec, 2015), 50 (By 1 January, 2016) 35 (By 28 December, 2020)
Cultur Diavida (CO.)	annual	80
Sullur Dioxide (SO ₂)	24-hour	180
	annual	-
Nitrogen Dioxide (NO ₂)	1-hour	-
	24-hour	150
	8-hour	60
	1-hour	140
Carbon Monovido (CO)	8-hour	10
	1-hour	35
Load (Ph)	annual	1
Leau (FD)	3 months	1.5

Notes:

*NCM stands for 'normal cubic meter', assuming that the samples were collected under 'normal' conditions or at standard temperature and pressure

- SO₂ and Suspended Particulate matter (TSP and PM) are sampled once every six days when using the manual methods. A minimum of twelve sampling days per quarter or forty-eight sampling days each year is required for these methods. Daily sampling may be done in the future once continuous analyzers are procured and become available.
- For short term values, maximum limits represented by ninety-eight percentile (98%) values not to exceed more than once a year.
- Annual values of TSP and PM are reported as Geometric Mean. *Geometric mean is used because the annual mean pollutant level in a year is dependent of the pollutant level from the previous year.
- Evaluation of the guideline for Lead is carried out for 24-hour averaging time and averaged over three moving calendar months. The monitored average value for any three months shall not exceed the guideline value.





Pollutant	Unit, Averaging Time	Good	Fair	Unhealthy for sensitive groups	Very unhealthy	Acutely unhealthy	Emergency
TSP	µg/Nm3, 24-hr	0 – 80	81 – 230	231 – 349	350 – 599	600 – 899	900 and greater
PM 10	µg/Nm3, 24-hr	0 – 54	55 – 154	155 – 254	255 – 354	355 – 424	425 – 504
PM _{2.5}	µg/Nm3, 24-hr	0 - 25	25.1 - 35.0	35.1 - 45.0	45.1 - 55	55.1 - 90	Above 91
SO ₂	ppm, 24-hr	0.000 - 0.034	0.035 – 0.144	0.145 – 0.224	0.225 – 0.304	0.305 - 0.604	0.605 – 0.804
0	ppm, 8-hr	0.000 - 0.064	0.065 – 0.084	0.085 – 0.104	0.105 – 0.124	0.125 – 0.374	а
U ₃	ppm, 1-hr	-	-	0.125 – 0.164	0.165 – 0.204	0.205 - 0.404	0.405 – 0.504
со	ppm, 8-hr	0.0 - 4.4	4.5 – 9.4	9.5 – 12.4	12.5 – 15.4	15.5 – 30.4	30.5 - 40.4
NO ₂	ppm, 1-hr	b	b	b	b	0.65 – 1.24	1.25 – 1.64

a. When 8-hour O₃ concentrations exceed 0.374 ppm, AQI values of 301 or higher must be calculated with 1-hour O₃ concentrations.

b. NO₂ has no 1-hour term NAAQG

Caution	TSP, PM10, Se and N	O2, Ozone 1O2	со		
None	GOOD	FAIR	GOOD	FAIR	
People with respiratory disease, such as asthma, should limit outdoor exertion.	Unhealthy fo grou	r sensitive ps			
Pedestrians should avoid heavy traffic areas.	Very unh	ealthy	Very unhealthy		
People with heart or respiratory disease, such as asthma, should stay indoors and rest as much as possible.					
Unnecessary trips should be postponed.	ertion.		Very unhealthy	Acutely unhealthy	
People should voluntarily restrict the use of vehicles.					
People should limit outdoor exertion.					
People with heart or respiratory disease, such as asthma, should stay indoors and rest as much as possible.					
Motor vehicle use may be restricted	Acutely unhealthy		Acutely unhealthy		
Industrial activities may be curtailed.					
Everyone should remain indoors, (keeping windows and doors closed unless heat stress is possible).					
Motor vehicle use should be prohibited except for emergency situations.	Emergency				
Industrial activities, except that which is vital for public safety and health, should be curtailed.					
People with cardiovascular disease, such as angina, should limit heavy exertion and avoid sources of CO, such as heavy traffic.			Unhealthy for sensitive groups	Acutely unhealthy	
Smokers should refrain from smoking.			Very unhealthy		
Everyone should avoid exertion and sources of CO, such as heavy traffic; and should stay indoors and rest as much as possible.			Emergency		



Appendix 2. Compilation of DAOs linked to RA 8749

Department(s)/ Agencies	Туре	Series (Year)	Order No.	Title/Description	Reference Articles/Section in RA 8749
DENR	DAO 2000 81 Implementing Rules and regulations for RA 8749		C2A1S6		
DENR	DAO	2000	82	Integrated Air Quality Improvement Framework- Air Quality Control Action Plan	C2A1S7
DOTC	DO	2001	31	Authorization of Private Emission Testing Centers	C2A2S23
DTI-DOTC	JAO	2001	01	Guidelines for Accreditation and Authorization of Motor Vehicle Emission Testing Centers	C2A2S23
DENR	MC	2002	03	Interim Guidelines for the Designation of an Airshed	C2A1S9
DTI-DOTC	TI-DOTC JAO		01	Clarification on the Implementation of the Procedure on the Accreditation and Authorization of Motor Vehicle Emission Testing Center (PETC)	C2A2S23 (mobile sources)
DENR DAO		2003	52	Revised Emission Standards for In-Use Motor Vehicles equipped with Spark Ignition and Compression ignition Engines	
DENR	DAO	2003	47	Designation of the Members of the Zamboanga City Airshed and its Governing Board	airshed
DENR	DAO	2003	45	Designation of Members of the Governing Board for Metro Cagayan De Oro Airshed, Province of Misamis Oriental Region X	
DENR	DAO	2003	33	Designation of the Members of the Naga City Airshed Governing Board Located in the Province of Camarines Sur, Bicol Region	
DENR	DAO	2003	27	Amending DAO 26, DAO 29 and DAO 2000-81 among others on the preparation and submission of Self Monitoring Report (SMR)	
DENR	DAO	2003	25	Hydrocarbon Standards for Motorcycle	
DENR	DAO	2003	16	Designation of the members of Agusan del Norte Airshed Governing Board	
DENR	DAO 2003 04 Initial Designation of BLIST Airshed and the Creation of its Interim Governing Board				
DENR-PAB Resolution 2003 04		04	Establishing the fine rating system for stationary sources for exceedance of any pollution or air quality standards set under RA 8749 and its IRR		

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Appendix 2. Compilation of DAOs linked to RA 8749 (continued)

DENR	DAO	2004	12	Designation of Leyte Geothermal Airshed and its Governing Board	
DENR	DAO	2004	53	Guidelines to implement the Tax Incentives provision under Section 13 of RA 8749	
DENR	DAO	2004	13	Designation of North Cotabato Geothermal Airshed and its Governing Board	
DENR	DAO	2004	12	Designation of Leyte Geothermal Airshed and its Governing Board	
DENR	DAO	2004	11	Designation of Bacon-Manito Geothermal Airshed and its Governing Board	
DENR	DAO	2004	11	Designation of Bacon-Manito Geothermal Airshed and its Governing Board	
DENR	DAO	2004	07	Establishment of Northeastern Pangasinan Airshed and its Governing Board	
DENR	DAO	2004	05	Establishment of Metro Tuguegarao (PIESTTA) Airshed and its Governing Board	
DENR	SO	2004	867	Creating a Special Review Committee within EMB to review project proposals for eligible funding to the AQMF	
DENR-DBM	Joint MC	2004	01	Implementing Guidelines on Operationalization of the Air Quality Management Fund under the Republic Act 8749	
DOTC	DO	2004	01	Rules and Regulations Concerning the Issuance of DOTC/LTO Authorization of Motor Vehicle Private Emission Testing Centers (PETCs)	
DOTC	DO	2004	34	An Order Promoting the Operation of Compressed Natural Gas (CNG) Buses in the Country	directs the LTFRB to issue franchises exclusive for CNG bus operation
DENR	MC	2005	13	Guidelines for designation of Attainment & Non- Attainment Areas	
DENR	MC	2005	10	Guidelines on the selection of qualified projects and activities eligible for funding under the AQMF	
DOTC	DO	2005		Amendment of Section 7.5 (IT Requirement) of Department Order No. 2004-01 Prescribing the Rules and Regulations Concerning the Issuance of DOTC/LTO Authorization of Motor Vehicle Private Emission Testing Centers (PETCs)	
DENR	DAO	2006	03	Guidelines for DENR Accreditation of Third Party Source Emission Testing Firms	

Appendix 2. Compilation of DAOs linked to RA 8749 (continued)

DENR-DOST	Joint MC	2006	01	Adopting Environmental Technology Verification Protocol (ETVP)	
DENR	DAO	2007	25	(revision of DAO-2006-03)Guidelines for DENR Accreditation of Third Party Source Emission Testing Firms	
DENR	DAO	2007	22	Guidelines on the installation of Continuous Emission Monitoring Systems (CEMS) Guidelines on the Requirements for Continuous Emission Monitoring Systems (CEMS) and other Acceptable Protocols, Thereby Modifying and Clarifying Certain Provisions of Sections 5, Rule X of DAO 2000-81 and other related Provisions	
DENR	DAO	2007	27	Revised Emission Standards for Motor Vehicles Equipped with Compression-Ignition and Spark-	
DENR	DAO	2007	27	Revised Emission Standards for Motor Vehicles Equipped with Compression-Ignition and Spark-	
DENR	MC	2007	03	ANNEX 1: Policy on Compliance and Permitting for Industrial Facilities Relating to Air Quality	
DENR-DTI- DOTC	JAO	2007	01	Amended Guidelines and Procedures for the Monitoring of Accredited and Authorized Private Emission Testing Centers (PETCs) and LTO Emission Testing Activities	
DENR	DAO	2010	23	Revised Emission Standards for Motor Vehicles Equipped with Spark Ignition and Compression Engine Excluding Motorcycles/Tricycles	
DENR	DAO	2013	13	Establishing the Provisional National Ambient Air Quality Guideline Values for PM2.5	
DENR	DAO	2013	26	Revised Guidelines for DENR Accreditation of Third Party Source Emission Testing firms	
DOTC	DO	2013	03	Reconstitution of the Vehicle Control Fund Committee (VPCFC)	
DENR	DAO	2014	14	Designation of Southern Negros Geothermal Airshed and its Governing Board	
DOE	DC (Department Circular)				
DAO	DAO	2016	23	EURO 4	

Appendix 3: Detailed Roles and Responsibilities Roles and Responsibilities in the Air Quality Management Administration



Department of Environment and Natural Resources

Act as overall of the lead agencies; prepare a National Air Quality Status Report which shall be used as a basis in formulating the Integrated Air Quality Improvement Framework; issue rules and regulations in the implementation of the Act.

Lead agency in the implementation of RA 8749: Environmental Management Bureau (EMB)

Functions of the EMB:

- To oversee ambient air quality monitoring and to prepare annual National Air Quality Status Reports pursuant to Section 6 of the CAA
- To design and develop, in cooperation with the National Statistical Coordination Board (NCSB), an
 information network for data storage, retrieval and exchange, which will serve as the central depositary of
 all data and information related to air quality;
- To issue and, from time to time, revise information on air pollution control techniques upon consultation with the appropriate committees, government agencies and local government units (LGUs)
- To, in coordination with other concerned agencies, review and/or revise and publish annually a list of hazardous air pollutants with corresponding ambient guidelines values and/or standards necessary to protect public health and safety, and general welfare;
- To design, impose on and collect regular emission fees from industrial dischargers as part of the emissions permitting system based on environmental techniques;
- To review, or as the need therefore arises, and revise and publish emission standards to further improve the emission standards for stationary sources of air pollution as well as emission standards for motor vehicles
- To develop, implement and monitor the functioning of permitting system as it may determine necessary for the prevention and abatement of air pollution by stationary sources, which amongst other addresses the need for program and project proponents to put up financial guarantee mechanisms to finance the needs for emergency response, clean-up or rehabilitation of areas that may be damaged during the program or project's actual implementation
- To monitor compliance with emission standards for stationary sources. EMB has the right of entry or access to any premises including documents and relevant materials; to inspect any pollution or waste source, control device monitoring equipment or method required; and to test any emission;





- To require any person who owns or operates any emission source or who is subject to any requirement of the CAA to (i) establish and maintain relevant records; (ii) make relevant reports; (iii) install, use and maintain monitoring equipment or methods; (iv) sample emission, in accordance with the methods, locations, intervals, and manner prescribed by the DENR; and (v) keep records
- To exercise such other powers and functions as provided by the law, the CAA and its IRR



Department of Transportation

Section 15 - Air Pollution Research and Development Program

 The Department, in coordination with the Department of Science and Technology (DOST), other agencies, the private sector, the academe, NGOs and POs, shall establish a National Research and Development Program for the prevention and control of air pollution. The Department shall give special emphasis to research on and the development of improved methods having industry-wide application for the prevention and control of air pollution. Such a research and development program shall develop air quality guideline values and standards in addition to internationally-accepted standards. It shall also consider the socio-cultural, political and economic implications of air quality management and pollution control.

Section 21 - Pollution from Motor Vehicles

- Implement the emission standards for motor vehicles pursuant to and as provided in the Act
- Participate in the formulation of an Action Plan for the control and management of air pollution from motor vehicles
- Contribute towards the establishment of procedures for inspection of motor vehicles, assist in the formulation and implementation of the National Motor Vehicle Inspection and Maintenance Program
- Authorize private emission testing centers (duly accredited by DTI)

Section 25 - Pollution from Other Mobile Sources

• The DENR, in coordination with appropriate agencies, shall formulate and establish the necessary standards for all mobile sources other than those referred to in Section 21 of this Act. The imposition of the appropriate fines and penalties from these sources for any violation of emission standards shall be under the jurisdiction of the DOTr.

Section 46 - Violation of Standards for Motor Vehicles

- Establish a roadside inspection system
- All law enforcement officials and deputized agents accredited to conduct vehicle emissions testing and apprehensions shall undergo a mandatory training on emission standards and regulations. For this purpose, the Department, together with the DOTr, DTI, DOST, Philippine National Police (PNP) and other concerned agencies and private entities shall design a training program.






Department of Trade and Industry – Bureau of Philippine Standards (DTI-BPS) and Board of Investors (DTI-BOI)

Section 21- Pollution from Motor Vehicles

- Participate in the formulation of an Action Plan for the control and management of air pollution from motor vehicles
- Contribute towards the establishment of procedures for inspection of motor vehicles, assist in the formulation and implementation of the National Motor Vehicle Inspection and Maintenance Program
- Accredit private emission testing centers (duly authorized by the DOTr)
- Develop and implement standards and procedures for the certification of training institutions, instructors and facilities and licensing of qualified private service centers and their technicians
- Prescribe regulations requiring the disclosure of odometer readings and use of tamper-resistant odometers, including tamper resistant fuel management systems

Section 22- Regulation of All Motor Vehicles and Engines

 The DTI shall promulgate the necessary regulations prescribing the useful life of vehicles and engines including devices in order to ensure that such vehicles will conform to the emissions which they were certified to meet. These regulations shall include provisions for ensuring the durability of emission devices.

Section 26- Fuels and Additives

 Pursuant to the Air Quality Framework to be established under Section 7 of this Act, the DOE, co-chaired by the DENR, in consultation with the Bureau of Product Standards (BPS) of the DTI, the DOST, the representatives of the fuel and automotive industries, academe and the consumers shall set specifications for all types of fuel and fuel-related products, to improve fuel composition for increased efficiency and reduced emissions: Provided, however, That the specifications for all types of fuel and fuel-related products set-forth pursuant to this section shall be adopted by the BPS as Philippine National Standards (PNS).

Section 46- Violation of Standards for Motor Vehicles

 All law enforcement officials and deputized agents accredited to conduct vehicle emissions testing and apprehensions shall undergo a mandatory training on emission standards and regulations. For this purpose, the Department, together with the DOTr, DTI, DOST, Philippine National Police (PNP) and other concerned agencies and private entities shall design a training program.

IRR, Rule XXXII, Sec 2

• The DTI through the Bureau of Import Services (BIS) shall formulate regulations and guidelines that will ensure rebuilt and imported second hand motor vehicles and engines will satisfy the emission standards for rebuilt and imported second hand motor vehicles as provided in these Implementing Rules and Regulations.





Section 26- Fuels and Additives

- Pursuant to the Air Quality Framework to be established under Section 7 of this Act, the DOE, co-chaired by the DENR, in consultation with the Bureau of Product Standards (BPS) of the DTI, the DOST, the representatives of the fuel and automotive industries, academe and the consumers shall set specifications for all types of fuel and fuel-related products, to improve fuel composition for increased efficiency and reduced emissions: Provided, however, That the specifications for all types of fuel and fuel related products set-forth pursuant to this section shall be adopted by the BPS as Philippine National Standards (PNS).
- The DOE, shall also specify the allowable content of additives in all types of fuels and fuel-related products. Such standards shall be based primarily on threshold levels of health and research studies. On the basis of such specifications, the DOE shall likewise limit the content or begin the phase-out of additives in all types of fuels and fuel-related products as it may deem necessary. Other agencies involved in the performance of this function shall be required to coordinate with the DOE and transfer all documents and information necessary for the implementation of this provision.

Department of Interior and Local Government

Section 39- Public Education and Information Campaign

 A continuing air quality information and education campaign shall be promoted by the DENR, the Department of Education, Culture and Sports (DECS), the Department of the Interior and Local Government (DILG), the Department of Agriculture (DA) and the Philippine Information Agency (PIA). Consistent with Section 7 of this Act, such campaign shall encourage the participation of other government agencies and the private sector including NGOs, POs, the academe, environmental groups and other private entities in a multi-sectoral information campaign.

Department of Science and Technology – (PNRI)

Section 26- Fuels and Additives

 Pursuant to the Air Quality Framework to be established under Section 7 of this Act, the DOE, co-chaired by the DENR, in consultation with the Bureau of Product Standards (BPS) of the DTI, the DOST, the representatives of the fuel and automotive industries, academe and the consumers shall set specifications for all types of fuel and fuel-related products, to improve fuel composition for increased efficiency and reduced emissions: Provided, however, That the specifications for all types of fuel and fuel related products set-forth pursuant to this section shall be adopted by the BPS as Philippine National Standards (PNS).

Section 33- Radioactive Emissions

All projects which will involve the use of atomic and/or nuclear energy, and will entail release and emission
of radioactive substances into the environment, incident to the establishment or possession of nuclear
energy facilities and radioactive materials, handling, transport, production, storage, and use of radioactive
materials, shall be regulated in the interest of public health and welfare by the PNRI, in coordination with the
DENR and other appropriate government agencies.

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Section 31- Greenhouse Gases

 Shall regularly monitor meteorological factors affecting environmental conditions including ozone depletion and greenhouse gases and coordinate with the DENR in order to effectively guide air pollution monitoring and standard- setting activities.

Implementing Rules and Regulations IRR section 22 (Air Quality Research)

Philippine Statistics Authority

IRR, Part V, Section 3

Air Quality Database. - The Bureau and the National Statistical Coordination Board (now PSA) shall design the Air Quality Database which shall be computerized and stored in a manner accessible to the public and shall contain data collected from the Ambient Air Monitoring Network and the Emissions Inventory.

Local Government Units

Section 8. Air Quality Control Action Plan

 To prepare and develop, with the assistance from the Department, an action plan consistent with the Integrated Air Quality Framework to attain and maintain the ambient of air quality standards within their respective airsheds as provided in Section 9 of the Act

Section 10- Designation of Non-attainment Areas

- To prepare and implement a program and other measures including relocation, whenever necessary, to protect the health and welfare of residents in the area
- To develop and submit to the DENR through the Bureau a procedure for carrying out the action plan for their jurisdiction, provided that the Department through the Bureau shall maintain its authority to independently inspect the enforcement procedure adopted

Section 24- Pollution from Smoking

 Smoking inside a public building or an enclosed public place including public vehicles and other means of transport or in any enclosed area outside of one's private residence, private place of work or any duly designated smoking area is hereby prohibited under this Act. This provision shall be implemented by the LGUs.

Section 36- Role of Local Government Units

 Local government units (LGUs) shall share the responsibility in the management and maintenance of air quality within their territorial jurisdiction. Consistent with Sections 7, 8 and 9 of this Act, LGUs shall implement air quality standards set by the Board in areas within their jurisdiction; Provided, however, That in case where the Board has not been duly constituted and has not promulgated its standards, the standards set forth in this Act shall apply.



Section 37- Environment and Natural Resources Office

• To establish an Environment and Natural Resources Office (ENRO) in every province, city, or municipality which shall be headed by the environment and natural resources officer appointed by the chief executive of every province, city or municipality in accordance with the provisions of Section 484 of the R. A. 7160



Section 39- Public Education and Information Campaign

 A continuing air quality information and education campaign shall be promoted by the DENR, the Department of Education, Culture and Sports (DECS), the Department of the Interior and Local Government (DILG), the Department of Agriculture (DA) and the Philippine Information Agency (PIA). Consistent with Section 7 of this Act, such campaign shall encourage the participation of other government agencies and the private sector including NGOs, POs, the academe, environmental groups and other private entities in a multi-sectoral information campaign.









Appendix 4. National Air Quality Guideline Values as of 2020

Appendix 4. Provisional National Ambient Air Quality Guideline Values for Particulate Matter 2.5

CATEGORY	COLOR	RGB COLOR CODE	HEX COLOR CODE	PM2.5 (UG/M3)	CAUTIONARY STATEMENTS
Good	Green	(0,228,0)	#00E400	0 - 25	None
Fair	Yellow	(255,255,0)	#FFFF00	25.1 - 35.0	None
Unhealthy for sensitive groups	Orange	(255,126,0)	#FF7E00	35.1 - 45	People with respiratory diseases, such as asthma should limit outdoor exertion.
Very Unhealthy	Red	(255,0,0)	#FF0000	45.1 - 55	Pedestrians should avoid heavy traffic areas. People with heart or respiratory disease, such as asthma, should stay indoors and rest as much as possible. Unnecessary trips should be postponed. People should voluntarily restrict the use of vehicles.
Acutely Unhealthy	Purple	(143,63,151)	#8F3F97	55.1 - 90	People should limit outdoor exertion. People with heart or respiratory disease, such as asthma, should stay indoors and rest as much as possible. Unnecessary trips should be postponed. People should voluntarily restrict the use of vehicles.
Emergency	Maroon	(126,0,35)	#7E0023	Above 91	Everyone should remain indoors (keeping windows and doors closed unless heat is possible); Motor vehicle use should be prohibited except for emergencies. Industrial activities, except those that which is vital for public safety and health, should be curtailed.



S	2021										
Ž	2020	*	*						*	*	*
V	2019	103	52						122	92	102
Z	2018	125		93	120		57	110		95	
fes	2017	140		127	136		55	126		66	
	2016	122		97	138		44	144		107	
ti Ci	2015	111		86	67		48	158		109	
Jan	2014	130		122	96	97	50	143		105	
7	2013			143	92	112	70			115	
Q	2012	135		123	72	96	62	148	-	114	
en	2011	128		121	74	103	58	136		101	
dsr	2010	160		162	105	152	62	138		132	
ຽ	2009	145	1	164	06	89	62	104		103	
ta	2008	134		156	107	144	74	125		103	È.
F	2007	146		146	102	125	65	134		110	
27	2006	153		157	104	138	72	121		<u>-</u> 	
Ч Ч	2005	183		152	129	163	87	124		138	
8	2004	211		206	170	164	105	133		134	
endix 5.20	MONITORING STATION LOCATION	Makati Bureau of Fire Cmpd., Ayala Avenue cor., Buendia St., Belair, Makati City	Manila Observatory Ateneo De Manila University Katipunan Road Q. C.	Valenzuela Municipal Hall, Pamantasan ng Lungsod ng Valenzuela, Valenzuela City	EDSA EAST Avenue BFD Compound East Avenue Q. C.	NCR-EDSA NPO Q.C	ATENEO Manila Observatory, Ateneo University	Mandaluyong City Hall, Maycilo Circle, Plainview, Mandaluyong City	National Ecology Center Cmpd. East Avenue Central, Quezon City	Dept. of Health, San Lazaro St., Rizal Avenue	Pamantasan Lungsod ng Valenzuela, Maysan Road Poblacion, Valenzuela City
Appe	REGION					NATIONAL	(NCR)				

2021					43.21	33.43				24				
2020		·			45.50	36.50		62	10.80		15			35
2019		95			51	20		87	1.93	19	22			60
2018		92				46.50		63	ę	22	23			
2017		95				59.50		51		24	12	46		
2016		107						75	28			72		
2015		104						145		24	47		68	
2014		81						127	81			83	51	
2013		97				69					40		47	
2012		108	216			72		24 24					46	
2011		125	197			1		1	117		9			
2010		125	219				125		130			.		
2009	126		294				132						¢.	
2008	85		282		2	200	133						N.	
2007	92		257	201			159		148					
2006	06		316	155			153		155					
2005	106		323	170			179							
2004	109		236	229			312		183					
MONITORING STATION LOCATION	LLDA Compound Pasig, City Hall	Marikina Sports Complex, Sumulong Highway, Sto. Niño, Marikina City	MRT-Taft Avenue Station EDSA Cor. Taft Avenue, Malibay, Pasay City	CAR-Plaza Garden	La Trinidad	Baguio City	Alaminos City, Province of Pangasinan, Infront of Nepo Mart	Vigan City, Ilocos Sur	San Fernando City, Beside Francisco Ortega Monument, Province of La Union	Batac City	Urdaneta City	San Carlos City	Dagupan City	EMB R2, Regional Government Center, Carig Sur, Tuguegarao City
REGION		NATIONAL CAPITAL REGION			Cordillera Administrative Region (CAR)		REGION 1							

S (continued
AAQM
Particulates
Suspended
Total
2004-2021
Appendix 5.

2021			36.44	18.56			24.23			22.27	20.47	
2020	40			38	*02	218*						
2019	57			I	I	I						
2018				106	44	293						
2017				217	41	412						
2016				316	20	396						
2015				180	68	244						
2014			41	202		482		-				
2013			ø					A		5		
2012		87	4	243		277	ß					
2011		108	21	128		344		×.				
2010		94	61					22				
2009		17	124	3.2	14			6				
2008			106					50				
2007		86	116	215	457			49	46			
2006		84	186					46	29			
2005		102	309					140	62			
2004		26	190					144	84			
MONITORING STATION LOCATION	St. Paul University Philippines, Mabini Street, Tuguegarao City	Tug. Sation Brgy. 10, Tufuegarao City	Saluysoy Station, Meycauyan, Bulacan	Mel-Vi Bldg., OG Road, Dolores, City of San Fernando, Pampanga	Biay Station- Sta.Cruz, Zambales	Intercity Station, Intercity, Wakas, Bocaue, Bulacan	Angeles City	Batangas Station	Cavite Station	Antipolo City	Biñan City	
REGION	REGION 2			REGION 3								

Appendix 5. 2004-2021 Total Suspended Particulates AAQMS (continued)

2021									35.27	
2020			20				20			
2019			21				21		36	
2018			20				20		09	124
2017									112	108
2016									57	78
2015		67	46	ى		67	46	Ø	50	72
2014									55	72
2013									78	96
2012						10-2			108	101
2011	159				159		Ĵ		52	69
2010				N. 4					57	102
2009				-					164	157
2008						1			72	84
2007									76	105
2006	110				110			1. A.	95	101
2005	86				86				88	83
2004	217				217				108	84
MONITORING STATION LOCATION	Capitol Site, PGENRO, Capitol Site, Calapan City, Oriental Mindoro	Calapan City Public Market, Calapan City, Oriental Mindoro	Municipal Hall, Municipality of Baco, Oriental Mindoro	Municipal Environment and Natural Resources Office (MENRO), Naujan, Oriental Mindoro	Capitol Site, PGENRO, Capitol Site, Calapan City, Oriental Mindoro	Calapan City Public Market, Calapan City, Oriental Mindoro	Municipal Hall, Municipality of Baco, Oriental Mindoro	Municipal Environment and Natural Resources Office (MENRO), Naujan, Oriental Mindoro	San Nicolas, Iriga City	Panganiban Drive, Diversion Road, Naga City
REGION			4-B						REGION	ى س

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ppendix 5. 2004-2021 To

2021	26.13	19.17	13.25	13.25	13.25				50.07	42.63
2020				34				73*		
2019				99			20*	138*		
2018				06		20	84		39.28	47.22
2017				83		60	75		40.96	48.99
2016				115		61	64	37.83		
2015				232	213	94	1 6			
2014				40	54	78	106	43		
2013				56	65	7	121	38.73	6	
2012						75	124	53.25		
2011	,			88	100	80	110	32	þ.,	
2010	7		51	50	5					1
2009			78	66						1
2008			80	135						
2007			67	110		80	137	-		
2006			89	87		87	159			
2005			141	8		88				
2004			182	104						
MONITORING STATION LOCATION	Daet	Sorsogon City	Jaro Police Station Cmpd., Iloilo City	Lapaz Plaza, Iloilo City	Oton, Iloilo City	DENR-7, Greenplains Subd, Banilad, Mandaue City	Cornilla Lao Residence Boundary of Barangays Inuburan & Langtad, City of Naga	Cebu Business Park, Cebu City	Municipality of Cardova	Municipality of Consolation
REGION	REGION	2		REGION 6			REGION 7			

2021	41.78	9.34	5.75		29.31	23.33	
2020		75	10		37.35	19.33	
2019		13				30.33	
2018		47.34	45.37			43.60	
2017		48.98	28.73			49.13	
2016		47.48	30.62		20	44.76	
2015		39.94	38.50		49	50	
2014		52	46.50				
2013		44	43			20.25	
2012					S.	40	61
2011		137	124	139		41	
2010		141	113	174		44	83
2009		165	135	181		66	60
2008		135	119	140		81	56
2007		128	105	110		87	63
2006		155	149	126		44	63
2005	45	154	161	170		44	
2004	73	220	209	218		56	
MONITORING STATION LOCATION	P&M Bldg. DENR Cpd., Sto. Niño Extn., Tacloban City	Zamboanga City Medical Center, Dr. Evangelista St., Zamboanga City	Barangay Sto. Nino, San Jose Road, Zamboanga City	Phil. Int. Dev't Inc. (PHIDCO), Baliwasan Seaside Zamboanga City	lligan City	Davao memorial park, phase II, Mc Arthur Highway, Davao City.	Las Palmeras Apartelle Open Compound, Quimpo Blvd., Davao City
REGION	REGION 8		REGION 9		REGION 10	REGION	÷

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Appendix 5. 20(REGION	REGION 11				REGION 12	
04-2021 Total Sus	MONITORING STATION LOCATION	Dacoville Subdivision, phase II, McArthur highway, dumoy, Toril, Davao city	Toril Open Park Area, Agton St., Toril Poblacion, Davao City	Reg 12- Station 1Infront of Palomolog South Cotobato	Reg 12-Station 2 Infront of Mun. Hall Suralla Cotobato City	Reg 12-Station 3 Infron t of Mun. Hall, Isulan Sultan Kudarat	Municipality of Tupi
pended I	2004	64	6	135	92	6	
Particulat	2005	63	66	20	80	78	
es AAQI	2006	99	99	88	86	85	
NS (con	2007	36	40	06	87	87	
tinued)	2008	31	34	86	83	83	
	2009	58	58	75	75	75	
	2010	65	150	73	73	13	
	2011	44		58	55	53	
	2012	35	92	715			54.16
	2013						20
	2014						56
	2015						
	2016						25
	2017						23.5
	2018						
	2019						30
	2020						41
	2021						32

2021							
2020					112*		82*
2019					95		6
2018					115		33
2017	31.12	18.95			84		65
2016	39.10	37.61			76		
2015	49	34.86			<u>6</u>	94	
2014	64		75		68	71	-
2013	51		63		68	61	
2012	57.40		50.97	54		43	
2011				55		50	•
2010				49			
2009				63			1 E
2008				63			1
2007				71			
2006				70			
2005				8			
2004				83			
MONITORING STATION LOCATION	Koronadal City	General Santos City	Municipality of Misdayap	New Asia, Butuan city	Station Petron Nasipit Depot, Nasipit Agusan Del Norte, Butuan City	Central Butuan, District 1 Ground, Butuan City	Cabadbaran City Hall, Cabadbaran City
REGION	REGION 12				REGION 13		

Appendix 6. 2013 – 2021 Particulate Matter 2.5 AAQMS

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020	25				1		1	ł	1	1	1	ł	ł	ł	1
2019 2	25				*		*	*	*	*	*	*	27	*	*
2018	25													24	
2017	25		30	29		67	46							22	
2016	25		20	29	22	46	45	19			20				15
2015	35		27	17	31	26	43	29	34	32	16	26	32	7	17
2014	35	50	29	19		43				23	37				
2013	35		29	21		36	4					R.			
LOCATION	NAAQGV	Commonwealth Ave, Q.C	Pamantasan ng Lungsod ng Valenzuela, Valenzuela City	DLSU, 2401 Taft Ave., Manila	Andrews Avenue, Pasay City	DPWH, Edsa, Nia Road	Navotas City Hall, M. Naval St. Navotas City	Rohm and Hass Property, Las Piñas City	Polytechnic Institute, City of Malabon	North Caloocan City Hall – Zapote Street, Caloocan City	Don Bosco Barangay Hall, Better Living Subdivision, Paranaque City	Makati Park, Dr. Jose P. Rizal Extension, East Rembo, Makati City	Pateros Elementary School, Pateros City	Pinaglabanan Shrine, San Juan City	Bureau of Corrections, New Bilibid Prison Reservation, Muntinlupa City
TYPE OF STATION		Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring
REGION									NCR						

20 2021									*				
2019 20:	*	*	19	*	*	*	*	*	14* 27	23*	1	15	0.49
2018			22			14			16		9	4	7
2017			24						15		51	12	ø
2016			34		31		8	23			16	5	12
2015	32	31	50		33				23		17	42	
2014													
2013						-			X				
LOCATION	Technological University of the Philippines- Taguig Campus, Taguig City	Hardin ng Pagasa, Mandaluyong City Hall, Plainview, Mandaluyong City	Brgy. Oranbo, Pasig	Hospital ng Muntinlupa Cpd., Civic Dr., Filinvest Ave. Corporate City, Alabang, Muntinlupa City	Parking Area of Marikina Justice Hall, Marikina City	UE-Caloocan Campus, Samson Road, Caloocan City	Manila Observatory, Ateneo de Manila University, Quezon City	NAMRIA, Lawton Avenue, Fort Andres Bonifacio, Taguig	Burnham Park, Baguio City	Plaza Garden, Central Business District, Lower Session Road, Baguio City	Mariano Marcos State University, Batac, Ilocos Norte	Barangay. Anonas, Urdaneta City, Pangasinan	Brgy., Parian, San Fernando City, La Union
TYPE OF STATION	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring		Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring		Continuous Monitoring	Continuous Monitoring	Continuous Monitoring
REGION		1	1		K D Z	1	1	1		1	CAR	1	1

REGION	TYPE OF STATION	LOCATION	2013	2014	2015	2016	2017	2018	2019	2020	2021
		CSI Lucao, Dagupan City, Pangasinan							63	1	
CAR	Manual/Reference Method	City Plaza, San Carlos City, Pangasinan						49	67	1	
	Manual/Reference Method	Dagupan City, Province of Pangasinan, western Central Elementary School				31	38	37	37	37	
	Continuous Monitoring	Heroes' hall, San Fernando, City of San Fernando, Pampanga			24	9		15	14*	ł	
REGION	Continuous Monitoring	City Government of Balanga, Balangay City Hall, Poblacion, Balanga City, Bataan				ъ	22	37	*	26	
m	Continuous Monitoring	Subic Bay Metropolitan Authority Bldg., 229, Waterfront Road, Subic Free port zone					2J		20	20*	
	Continuous Monitoring	Meycauayan City Hall, Meycauayan, Bulacan			28	26		28	*	I	
	Continuous Monitoring	City of Biñan, Biñan, Laguna			5	17		o	15	5	
REGION 4A	Continuous Monitoring	Ynares Center Compound, Antipolo City		3				17		6	
	Continuous Monitoring	(Near) City Hall of Santa Rosa, City Government Center, J.P. Rizal Blvd. Santa Rosa, Laguna				19.0	29.6	27	*	ł	
REGION 4B	Continuous Monitoring	Palawan State University, Tiniguiban Heights, Puerto Princesa, Palawan			4				24	ł	

2021											
2020	1	I	I	I	25*	I	0.0	15	*	8	
2019	1	10*	I	I	*	15*	5	23*	I	52	
2018	16	0	40	o		4	ъ		17	24	17
2017	17	13		5		10	ъ	22			
2016	4	10		21		10.57	14.82	26			
2015	8		4	26		4	17	21			
2014											
2013						- 7.					
LOCATION	Naga City PENRO, Naga City	EMB Region 5 Office, Regional Center Office, Rawis, Legaspi City	City Hall of Bacolod, New Government Center, Bacolod City	University of San Agustin, General Luna Street, Iloilo City	City Hall of Talisay, Tabunok, Talisay, Cebu	Western Mindanao State University, Normal Road, Zamboanga City	Ateneo De Zamboanga University, La Purisima Street, Zamboanga City	lligan Medical Center College, San Miguel Village, Pala-o, Iligan City, Lanao del Norte	El Salvador City School, Zone 2, Tuburan Brgy. Poblacion, Misamis Oriental	DENR Compound, Brgy. Macabalan, Cagayan De Oro	Balacanas Elementary School, Balacanas, Villanueva, Misamis Oriental
TYPE OF STATION	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Manual/Reference Method	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Manual/Reference Method	Manual/Reference Method	Manual/Reference Method
REGION	S NOISA		REGION 6	1	REGION 7	REGION 9				REGION 10	

2021						
2020	ω	41	I	ł	6	*
2019	27	9	19*	22*	17	ł
2018	21	23		22	15	ю
2017	21	23	16	18	16	10
2016	26	32	17	19	13	
2015	21	33	17	31	19	20
2014						
2013						
LOCATION	DC Station 16: Calinan National High School, Quirino Avenue, Davao City	DC Station 15: Davao International Airport, Catitipan, Buhangin District, Davao City	Pedro Acharon Sports Complex, Brgy. Calumpang, General Santos City	City of Koronadal, General Santos Drive, Koronadal City	Butuan City Local Government Unit (Compound of City Environment Office), Barangay Doongan, Butuan City, Agusan Del Norte	Caraga State University, Ampayon, Butuan City
TYPE OF STATION	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring
REGION	REGION	5	REGION	2	REGION 13	

Appendix 7. 2012 - 2021 Particulate Matter 10 AAQMS

REGION	TYPE OF STATION	rocation	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	Manual/Reference Method	National Printing Office Cmpd. EDSA Diliman, Quezon City	61	73	68	67	69	70	56	44	I	
	Manual/Reference Method	Marikina Sports Complex Cmpd.Sumulong Highway Brgy. Sto Nino, Marikina City	67	62	47	61	63	52	52	51	I	
	Manual/Reference Method	DOH Cmpd. Rizal Avenue Sta Cruz, Manila	51	69		60	59	62	62	57	I	
	Manual/Reference Method	MMDA Building Cmpd. Orense St. cor. EDSA Guadalupe, Makati City	54	67	52	42	40	36	43	36	ł	
	Manual/Reference Method	Pasay Rotonda Station EDSA cor. Taft Avenue Malibay, Pasay City	110	105								
	Manual/Reference Method	National Bilibid Prison, Muntinlupa		25	36	25	24	24	23	23	ł	
	Manual/Reference Method	Rizal Avenue Exit, Caloocan	151	150								
NCR	Continuous Monitoring	Commonwealth Ave., Quezon City			57							
	Continuous Monitoring	DLSU, Taft, Manila		29	27	31	31					
	Continuous Monitoring	DPWH, Timog EDSA, Quezon City		44	66	46	51					
	Continuous Monitoring	Pamantasan ng Lungsod ng Valenzuela, Valenzuela City			33	58	44	40				
	Continuous Monitoring	Manila Observatory, Ateneo De Manila University, Quezon City	38	50						*	ł	
	Continuous Monitoring	Valenzuela - Radio ng Bayan, Valenzuela City	58	74	53							
	Continuous Monitoring	NAMRIA, Lawton Avenue, Fort Andres Bonifacio, Taguig City	43	54						*	ł	
	Continuous Monitoring	Andrews Avenue, Pasay City		a.		78		99	75	1	ł	
	Continuous Monitoring	Navotas City Hall, M. Naval St. Navotas City				72	99	94	54	*	ł	

2021													
2020	ł	I	I	I	I	I	I	ł	I	I	I	I	ł
2019	*	*	I	*	*	I	61	*	*	*	*	*	*
2018	54	27	4	56	45		55	33		53	47	40	
2017	94	41					66	46			49	42	
2016	66	27			33			48	24	45		50	
2015	72	35	45	54	52		52	18	31	66	63	69	
2014													
2013									B		-		
2012					70								
LOCATION	Navotas City Hall, M. Naval St. Navotas City	Rohm and Hass Property, Las Piñas City	Polytechnic Institute, City of Malabon	North Caloocan City Hall – Zapote Street, Barangay 177, Caloocan City	Don Bosco Barangay Hall, Better Living Subdivision, Paranaque City	Makati Park, Dr. Jose P. Rizal Extension, East Rembo, Makati City	Pateros Elementary School, Pateros City	Pinaglabanan Shrine, San Juan City	Bureau of Corrections, New Billbid Prison Reservation, Muntinlupa City	Technological University of the Philippines-Taguig Campus, Taguig City	Hardin ng Pagasa, Mandaluyong City Hall, Plainview, Mandaluyong City	Brgy. Oranbo, Pasig	UE-Caloocan Campus, Samson Road, Caloocan City
TYPE OF STATION	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring	
REGION		<u>.</u>	NCR	-						-		-	

2021															
2020	ł	ł	48	27	20	25	71					62			
2019	*	*	59*	40	8	10*	82					87			
2018		45	66	27								63	ო	23	22
2017		51	62	40							46	51	12	12	24
2016		55									72	75	28	17	23
2015		56							68	73	75			47	24
2014									59	81	83				
2013			69					40	47						
2012			72	35				ξĿ,	46						
LOCATION	Marikina City Environmental Management Office (CEMO), Gil Fernando Ave., Brgy. Sto Niño, Marikina City	Parking Area of Marikina Justice Hall, Marikina City	Plaza Garden Park, Central Business District, Lower Session Road, Baguio City	Burnham Park, Baguio City	Benguet State University (BSU) Forestry Compound Trinidad Benguet	Philippine Economic Zone (PEZA), Loakan Road, Baguio City	Provincial Capital Ground, KM. 6, La Trinidad, Benguet	City Hall Compound Urdaneta City, Pangasinan	West Central Elementary School, Dagupan City, Pangasinan	City Plaza San Fernando City, Launion	City Plaza San Carlos City, Pangasinan	Plaza Burgos, Ilocos Sur, Vigan City	Brgy., Parian, San Fernando City, La Union	Barangay. Anonas, Urdaneta City, Pangasinan	Mariano Marcos State University, Batac, Ilocos Norte
TYPE OF STATION		Continuous Monitoring	Manual/Reference Method	Continuous Monitoring				Manual/Reference Method	Manual/Reference Method	Manual/Reference Method	Manual/Reference Method	Manual/Reference Method	Continuous Monitoring	Continuous Monitoring	Continuous Monitoring
REGION	ACM ACM				CAR					R				R	

(continued)
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REGION	TYPE OF STATION	LOCATION	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
22	Manual/Reference Method	Tuguegarao City Monitoring, St. Paul University Philippines, Mabini Street, Tuguegarao City			29				27			
	Manual/Reference Method	City Hall Grounds, Santiago City							1			
	Continuous Monitoring	Meycauayan City Hall, Meycauayan, Bulacan				45	42	38	43	49	50	
	Continuous Monitoring	City Government of Balanga, Balangay City Hall, Poblacion, Balanga City, Bataan					ω	36	34	I	34	
ß	Continuous Monitoring	Subic Bay Metropolitan Authority Bldg., 229, Waterfront Road, Subic Free port zone	7.15				2			29	24*	
		Airforce City, CSEZ, Angeles, Pampanga								ł	23*	
	Continuous Monitoring	Heroes' hall, San Fernando, City of San Fernando, Pampanga		<u>É</u>		29	10		7	18	4	
		Ynares Center Compound, Antipolo City	0.,						22	22*	21	
	Continuous Monitoring	City of Biñan, San Pablo St., Biñan City, Laguna				22*	30		4	17	12	
R4A	Continuous Monitoring	Cavite State University, Indang Cavite		32								
	Continuous Monitoring	Brgy. Bolbok, Batangas City		29								
	Continuous Monitoring	(Near) City Hall of Santa Rosa, City Government Center, J.P. Rizal Blvd. Santa Rosa, Laguna						30	34	a*	ı	

REGION	TYPE OF STATION	LOCATION	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	Manual/Reference Method	University of San Agustin, General Luna Street, Iloilo City				43	28	2	22			
R6	Manual/Reference Method	Leganes Municipal Grounds, Poblacion, leganes, Iloilo City				51						
	Manual/Reference Method	Oton National Elementary School, Oton, Iloilo City					38	57	81	42	20	
	Continuous Monitoring	City Hall of Bacolod, New Government Center, Bacolod City				28			58	71*	ł	
	Manual/Reference Method	Mabolo, Cebu City	17	73	58	52	50					
	Manual/Reference Method	Cebu Business Park, Cebu city	36	33	20	34	26					
R7	Continuous Monitoring	City Hall of Talisay, Tabunok, Talisay, Cebu								*	35*	
	Manual/Reference Method	Consolacion Municipal Hall, Consolacion, Cebu						49	47	55*	ł	
	Manual/Reference Method	Cordova Municipal Hall, Cordova, Cebu						41	39	40*	47*	
R8	Manual/Reference Method	Robinsons Place, Tacloban		2		64	61	54	45	47	16*	
	Continuous Monitoring	Western Mindanao State University, Normal Road, Zamboanga City		-		÷	12	10	21	28	I	
	Continuous Monitoring	Ateneo De Zamboanga University, La Purisima Street, Zamboanga City				20	17	5		13	10	
R9	Manual/Reference Method	Zamboanga City Medical Center. Compound, Dr. Evangelista Street Corners Veterans Ave., & Gov. Lim Ave., Zamboanga City		52	52	32	57	59	52	29	4	

REGION	TYPE OF STATION	LOCATION	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
ŝ	Manual/Reference Method	EMB - 9 Compound, Lantawan, Pasonanca, Zamboanga City (Started 2013)		34	41	45	39	38	39	14*	12	
в У	Manual/Reference Method	Philippine International Development Incorporated (PHIDCO), Baliwasan Seaside Zamboanga City Zamboanga del Sur		44	52	60	51	17	47	40*	*4	
R10	Continuous Monitoring	lligan Medical Center College, San Miguel Village, Pala-o, Iligan City, Lanao del Norte				49	50			57*	37	
R11	Manual/Reference Method	Approx. 70m from Amparo St. And 300m from Davao- Agusan National Highway		6	9	35		49	48	25	9	
	Manual/Reference Method	Brgy. 12-B, Mapa St. Corner J.P Laurel Ave., Davao City (Fronting Brgy. Hall)		21	21	45		56	42	28	15	
	Manual/Reference Method	Approx. 800m DMPI main gate, Davao Memorial Park Phase2, McArthur Highway, Matina, Davao City		4	15	34	33	36	31	19	4	
	Manual/Reference Method	Approximately 50m from Agton St. Open Park in front of Toril District Hall, Agton St., Davao City		27	30	57	57	57	63	41	21	
	Continuous Monitoring	Calinan National High School, Quirino Avenue, Davao City				36	61	57	34	34	24	
		Masbate Terminal Road, Masbate City		-						* თ	20*	
	Continuous Monitoring	Davao International Airport, Catitipan, Buhangin District, Davao City				73	54	40	46	35	26	

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Appendix 7.	REGION		R12		·			R13		
2012 – 2021 Particulate Matter 10 AAQMS (continued)	TYPE OF STATION	Manual/Reference Method	Continuous Monitoring	Manual/Reference Method	Continuous Monitoring	Manual/Reference Method		Manual/Reference Method	Continuous Monitoring	Continuous Monitoring
	LOCATION	Infront of Municipal Hall Tupi, South Cotabato	**City of Koronadal, General Santos Drive, Koronadal City	Municipal Hall of Midsayap	Pedro Acharon Sports Complex, Brgy. Calumpang, General Santos City	Central Butuan, District 1 Ground, Butuan City	Cabadbaran City Hall, Cabadbaran City	Petron Nasipit Depot, Nasipit Agusan Del Norte, Butuan City	Caraga State University, Ampayon, Butuan City	Butuan City Local Government Unit (Compound of City Environment Office)
	2012	54	57	51			7.1			
	2013	50	51	63						
	2014	56	64	75						
	2015		49		35	58		55	37	35
	2016	25	39		38			17		29
	2017	24	31		-19		22	17	19	28
	2018		42				30		Q	28
	2019	30	19*		38*		40*	44*	ł	32
	2020	41	32*		57*		26*	25*	*	27
	2021									



Appendix 8. Pertinent Policies on Air Quality

DOCUMENT NO.	TITLE	DATE APPROVED
DAO 2020-144	Establishing the Breakpoints for Particulate Matter 2.5 (PM _{2.5}) Air Quality Index (AQI) and Amending Section 5 (a) of DAO 2013-13 "Establishing the Provisional National Ambient Air Quality Guideline Values for Particulate Matter 2.5 (PM _{2.5})"	October 21, 2020
EMB MC 2020-0035	Mandating All EMB Regional Offices (EMB- ROs) to Establish an Air Quality Network Center using a Uniform Data Acquisition and Handling System (DAHS) which shall act as Repository of Industrial Emission of Firms Required to install Continuous Emission Monitoring Systems (CEMS) / Continuous Opacity Monitoring System (COMS)	January 27, 2020
EMB MC 2020-176	Guidelines on the Issuance of Permit to Operate (PTO) for Air Pollution Source Installation or Equipment (APSI/APSE) through the Online Permitting and Monitoring System (OPMS)	May 11, 2020

[4] https://emb.gov.ph/wp-content/uploads/2020/11/DAO-2020-14.pdf

[5] https://emb.gov.ph/wp-content/uploads/2020/05/MC-2020-003-MANDATING-ALL-EMB-REGIONAL-OFFICES-TO- ESTABLISH-AN-AQ-NETWORK-CENTER.pdf [6] ttps://emb.gov.ph/wp-content/uploads/2020/05/MC-2020-17-Guidelines-with-the-issuance-of-PTO-with-

Annex_May-11-2020-signed.pdf



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