



# PHILIPPINES

## Policies and Practices Concerning Acid Deposition

### 1. CURRENT SITUATION AND PROGRESS

#### General Evaluation

In the Philippines, the air quality is relatively good, except seasonal pollution episodes influenced by local sources, meteorology, and transboundary impacts, which are commonly attributed to forest fires and agriculture waste burning in the Southeast Asian region. The rapid economic development, urbanization, and other socioeconomic activities are significantly impacting the air quality of the country.

The yearly average concentration levels of PM<sub>2.5</sub> observed at Metro Manila site during 2015, 2016, and 2017 were 22, 20, and 18 (in  $\mu\text{g}/\text{m}^3$ ), respectively. The level of PM<sub>2.5</sub> was well within the prescribed National Ambient Air Quality Standards (NAAQS). However, it was about two times higher than the WHO guideline of 10  $\mu\text{g}/\text{m}^3$ . Whereas, the yearly averaged concentration levels of PM<sub>10</sub> at Metro Manila site during 2015 and 2016 were 33 and 29 (in  $\mu\text{g}/\text{m}^3$ ), respectively. The level of PM<sub>10</sub> was also well within the NAAQS, but slightly higher than the WHO guideline of 20  $\mu\text{g}/\text{m}^3$ . The concentrations levels of PMs (both PM<sub>2.5</sub> and PM<sub>10</sub>) and SO<sub>2</sub> are gradually decreasing at Metro Manila site, which could be attributed to the efforts of the government for improving air quality.

#### Main Pollution Sources and Trends

Emissions of air pollutants from road transport is a significant contributor to air pollution in the country. As per National Emission Inventory of 2015, about 88 percent of air pollutants are emitted from the mobile sources, 10 percent from stationary sources such as power plants and factories, and 2 percent from area sources such as constructions, open burning of solid wastes in National Capital Region (NCR) of Manila. Whereas, at national level, about 65 percent of air pollutants are emitted from mobile sources, 21 percent from stationary sources, and 14 percent from area sources. The number of vehicles has been increasing in the country. From 2010 to 2014, registration of vehicles has been increased by 22 percent in five years. Vehicle standards are at Euro 2 currently.

**National Ambient Air Quality Standards (NAAQS) vs. WHO Guidelines**

Air Pollutants	Average Time	NAAQS ( $\mu\text{g}/\text{m}^3$ )	WHO Guidelines ( $\mu\text{g}/\text{m}^3$ )
TSP	24-hr	230	-
	1-yr	90	-
PM <sub>10</sub>	24-hr	150	50
	1-yr	60	20
PM <sub>2.5</sub>	24-hr	50	25
	1-yr	25	10
SO <sub>2</sub>	24-hr	180	20
	1-yr	80	-
NO <sub>2</sub>	1-hr	-	200
	24-hr	150	-
	1-yr	-	40
O <sub>3</sub>	1-hr	140	-
	8-hr	60	100



## Participation in the EANET

The Philippines has participated in the EANET monitoring activities since 2001 and currently have three wet and dry deposition monitoring sites, four soil and vegetation monitoring sites, and two inland aquatic environment monitoring sites. Following is the framework of the institutional arrangement for the implementation of the EANET activities in the Philippines:

- National Focal Point: Department of Environmental and Natural Resources, Environmental Management Bureau
- Scientific Advisory Committee Members: Institute of Renewable Natural Resources, College of Forestry and Natural Resources, University of the Philippines Los Baños
- National QA/QC Manager: Air Quality Management Section, Environmental Quality Section, Environmental Management Bureau, Department of Environment and Natural Resources
- National Center: Air Quality Management Section, Environmental Quality Division, Environmental Management Bureau, Department of Environment and Natural Resources

## 2. SITE INFORMATION

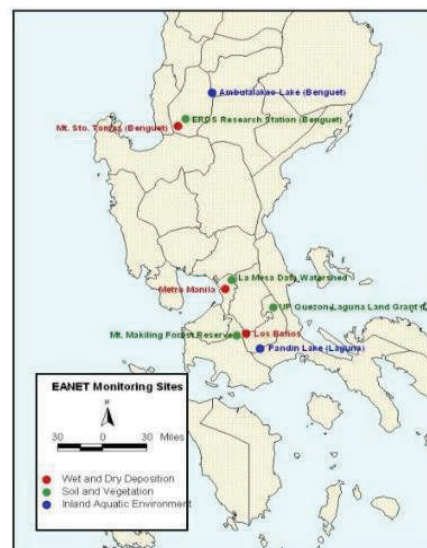
### National Air Quality Monitoring Network:

- Open-Path Monitoring Stations - 20 Stations for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, CO, O<sub>3</sub>, and Meteorological Parameters;
- Particulate Monitoring System/Station: 27 Stations for PM<sub>10</sub>, PM<sub>2.5</sub>, and Meteorological Parameters;
- Manual Monitoring - 48 Stations for TSP, PM<sub>10</sub> or PM<sub>2.5</sub>; and
- Conventional Monitoring - 6 Stations for SO<sub>2</sub>, NO<sub>2</sub>, CO, O<sub>3</sub>, and Meteorological Parameters.

Monitoring Sites	Site Classification	Location			Parameters Measured			
		Latitude	Longitude	Altitude (m)	Wet Dep.	Dry Dep.	Soil & Veg.	Inland water
Metro Manila	Urban	14°38'09" N	121°04'43" E	55	✓	✓		
Los Baños	Rural	14°09'53" N	121° 15'00" E	25	✓	✓		
Mt. Sto. Tomas	Remote	16°25' N	120°36' E	1500	✓	✓		
Mt. Makiling Forest Reserve	Rural						✓	
Los Baños College							✓	
U.P. Quezon Laguna Land Grant							✓	
Boneco Long Term Ecological Research							✓	
La Mesa Watershed Area							✓	
Pandin Lake	Rural							✓
Ambulalakao Lake	Remote							✓

### Monitoring Parameters

Monitoring Type	Parameters	Frequency
Wet Deposition	pH, conductivity, anions (SO <sub>4</sub> <sup>2-</sup> , NO <sub>3</sub> <sup>-</sup> , Cl <sup>-</sup> , organic acids) and cations (Na <sup>+</sup> , K <sup>+</sup> , Mg <sup>2+</sup> , Ca <sup>2+</sup> , NH <sub>4</sub> <sup>+</sup> )	Weekly
Dry Deposition	PM (FP): SO <sub>4</sub> <sup>2-</sup> , NO <sub>3</sub> <sup>-</sup> , Cl <sup>-</sup> , Na <sup>+</sup> , K <sup>+</sup> , Mg <sup>2+</sup> , Ca <sup>2+</sup> , NH <sub>4</sub> <sup>+</sup>	Weekly
	Gases (FP): SO <sub>2</sub> , HCl, HNO <sub>3</sub> , NH <sub>3</sub> Gases • PM (Auto): O <sub>3</sub> , PM <sub>10</sub> , PM <sub>2.5</sub>	Hourly
Inland Aquatic Environment	pH, EC, Alkalinity, NO <sub>3</sub> <sup>-</sup> , Cl <sup>-</sup> , PO <sub>4</sub> <sup>3-</sup> , SO <sub>4</sub> <sup>2-</sup> , NO <sub>2</sub> <sup>-</sup> , NH <sub>4</sub> <sup>+</sup> , Na <sup>+</sup> , K <sup>+</sup> , Ca <sup>2+</sup> , Mg <sup>2+</sup>	4 times per year
Soil and Vegetation	pH (H <sub>2</sub> O), pH (KCl), exchangeable base cations (Na <sup>+</sup> , K <sup>+</sup> , Ca <sup>2+</sup> , & Mg <sup>2+</sup> ), exchangeable acidity, exchangeable acid cations (Al, H), ECEC, Total Carbon	3-5 years

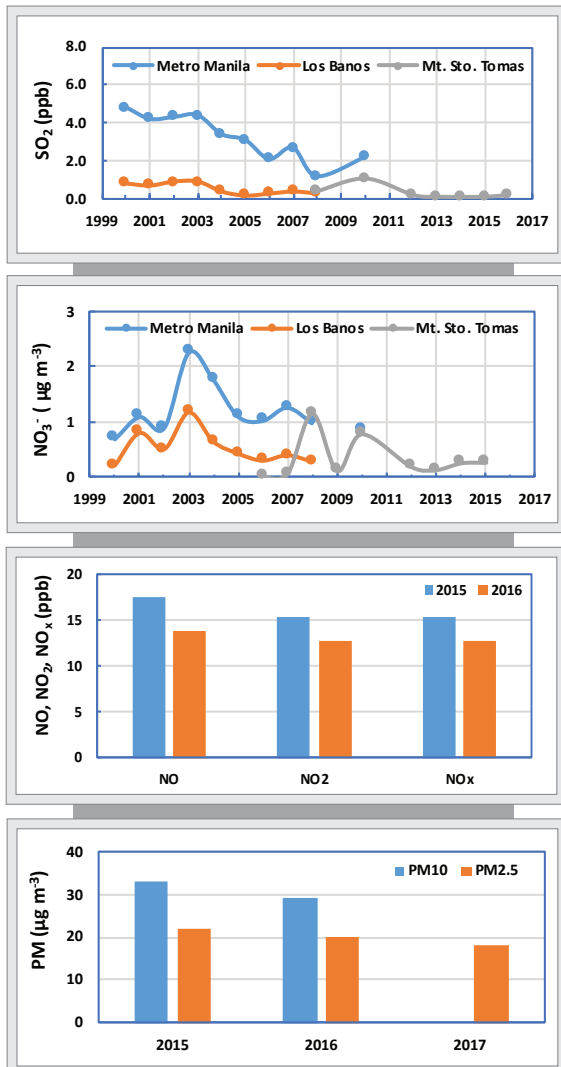




### 3. HIGHLIGHTS OF MONITORING RESULTS

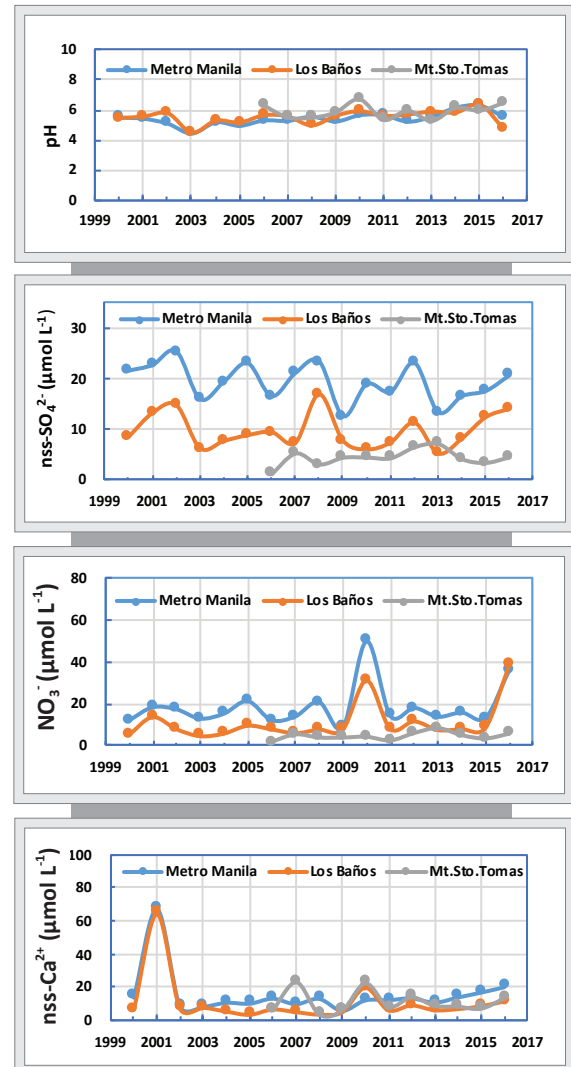
The following figures show the time-series trend of the annual average of important acid deposition parameters in the dry deposition, wet deposition, and inland water quality of Philippines.

#### Dry Deposition



- SO<sub>2</sub>, NO<sub>x</sub>, PM, and NO<sub>3</sub><sup>-</sup> are showing decreasing trends.
- SO<sub>2</sub> and PM are well below the prescribed NAAQS.
- PM is higher than WHO guidelines.

#### Wet Deposition



- pH is acidic at all monitoring stations.
- nss-SO<sub>4</sub><sup>2-</sup> is showing a net decreasing trend.
- NO<sub>3</sub><sup>-</sup> is stable, except few years.

#### Inland Water



- Water of Ambulakao Lake is slightly acidic whereas water of Pandin Lake is neutral or slight alkaline.

## 4. AWARENESS ACTIVITIES, RELEVANT POLICIES AND FUTURE PLAN

- Establishment of PM<sub>2.5</sub> AQI.
- Revised Guidelines on the Requirements for the Continuous Emissions Monitoring Systems (CEMS).
- Guidelines on Oxygen Correction Factor for Stack Emission Test.
- Guidelines on the Conduct of Stack Emission Testing of Tapering Stacks.
- Guidelines on the Implementation of Online Permit to Operate.
- Policy Review and Update on Stationary Source Mass Emission Rate Standards (MERS).
- Air quality management system data access object (AQMS DAO) on CCTV.
- Guidelines on the Operationalization of the Air Quality Management Fund (AQMF).
- Sitting Criteria of Ambient Air Quality Monitoring Stations.
- Review of Emission Standards for fuels and transport sector.
- Review of Guidelines on Airshed designation of attainment and non-attainment area.

### Policies and Practices Concerning Air Pollution

- The Philippine Clean Air Act of 1999 or the RA8749.
- Department Administrative Order (DAO) 2013-13 - Establishing the Provisional National Ambient Air Quality Guideline Values for PM<sub>2.5</sub>.
- Department Administrative Order (DAO) 2015-04 - Implementation of Vehicle Emission Limits for EURO 4/IV, and In-Use Vehicle Emission Standards.
- Department Memorandum Circular (DMC) 2005-13 - Guidelines for the Designation of Attainment and Non-attainment Areas in an Airshed.

### EANET Activities and Future Plan

- Regular monitoring of EANET parameters pertaining to dry deposition, wet deposition, and inland water at designated monitoring sites.
- Participation in the QA/QC activities including inter-laboratory comparison projects, namely, project on Wet Deposition, project on Soil, and project on Inland Aquatic Environment.
- Annual maintenance, calibration work, and visit to monitoring sites.
- Hands-on training on monitoring and analysis of acid deposition parameters.
- Continuous public awareness and education programs on air pollution and acid deposition issues are being pursued.
- Participation in the meeting of SAC, STM, and IG.
- Operation and maintenance of existing air quality monitoring network (102 stations).
- Procurement of additional air quality monitoring stations for the assessment of ambient air quality.
- Procurement of stack emission testing equipment for the monitoring of industrial emissions.
- Upgrading of shelters of current air quality monitoring network.
- Establishment of Air Quality Monitoring Network Operations Center (for Continuous Emissions Monitoring Systems (CEMS) and ambient air monitoring).
- Dispersion Modelling/Carrying Capacity of all Airsheds Nationwide.

#### National Focal Point

Environmental Quality Division – Air  
Quality Management Section  
Department of Environment and  
Natural Resources (DENR)  
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(EMB)

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