FACTSHEET

EANET

ACID DEPOSITION MONITORING NETWORK IN EAST ASIA

THAILAND

Policies and Practices Concerning Acid Deposition

1. CURRENT SITUATION AND PROGRESS

General Evaluation

Thailand is facing a significant air pollution problem, particularly during winter when prolonged persistence of stagnant meteorological conditions such as low wind speed and lower planetary boundary layer blocked dispersion and mixing of polluted air with clean air. As a result, air pollutants accumulate in the atmosphere. The air quality of Bangkok Metropolitan Region (BMR) and other urban regions of Thailand has been reported as unhealthy on the scale of Air Quality Index (AQI) during air pollution episodes. The time series of the yearly averaged concentration levels of PM_{10} at EANET monitoring stations from 2000 to 2017 were between 40-50 μg/m^3 which was well within the prescribed National Ambient Air Quality Standards (NAAQS), however, about 2 times higher than WHO guideline of 20 μg/m^3. Similarly, the yearly averaged concentration level of $PM_{2.5}$ was 35 μg/m^3 in 2013 which was reduced to 24 μg/m^3 in 2017. The observed level of $PM_{2.5}$ was well within the prescribed NAAQS, but 2.5 times higher than WHO guideline of 10 μg/m^3. The consistent decrease of PM levels in the country could be a result of successful implementation of air pollution mitigation policies and efforts of the government.

Main Pollution Sources and Trends

The major source of air pollution in Thailand, in particular, in urban regions such as the Bangkok Metropolitan Region (BMR) is road transport. Recent emission inventory of $PM_{2.5}$ of BMR reveals that road transport accounts more than 50 percent of $PM_{2.5}$ emission, followed by open burning of agriculture residue and biomass which contribute more than 30 percent to $PM_{2.5}$ level. Air pollution sources such as industrial operations contribute a little to air pollution. High concentrations of SO_2 have been found in Thailand and levels of NO_x spiked in winter in urban regions of Thailand. In the last 17 years, however, urban regions such as BMR has seen a decreasing trend in the NO_x concentrations but recorded high and growing concentrations of ground-level ozone.

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

Air Pollutants	Average Time	NAAQS (μg/m^3)	WHO Guidelines (μg/m^3)
TSP	24-hr	330	-
	1-yr	100	-
PM_{10}	24-hr	120	50
	1-yr	50	20
$PM_{2.5}$	24-hr	50	25
	1-yr	25	10
SO_2	1-hr	786 (=0.3 ppm)	-
	24-hr	314.4 (=0.12 ppm)	20
	1-yr	104.8 (=0.04 ppm)	-
NO_2	1-hr	319.6 (=0.17 ppm)	200
	1-yr	56.4 (0.03 ppm)	40
O_3	1-hr	200 (=0.1 ppm)	-
	8-hr	140 (0.07 ppm)	100

EANET

UN environment programme

ACAP

Participation in EANET

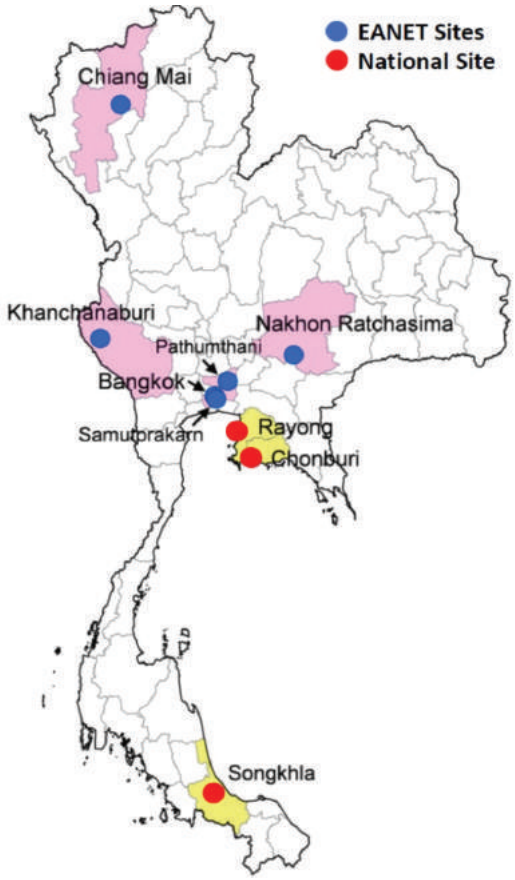
Thailand took part in EANET since its inception during 1998-2000 and established the acid deposition monitoring programme in the country. Following is the institutional arrangement for the implementation of EANET activities:

- National Focal Point: Pollution Control Department, Ministry of Natural Resources and Environment
- Scientific Advisory Committee Members: Pollution Control Department and Department of Environmental Quality Promotion, Ministry of Natural Resources and Environment
- National QA/QC Manager: Pollution Control Department, Ministry of Natural Resources and Environment
- National Center: Pollution Control Department, Ministry of Natural Resources and Environment

2. SITE INFORMATION

At present, there are 114 national ambient air quality monitoring stations, covering 29 provinces of Thailand, including 6 EANET monitoring sites.

Monitoring Sites	Site Classification	Location			Parameters Measured			
		Latitude	Longitude	Altitude(m)	Wet Dep.	Dry Dep.	Soil & Veg.	Inland Water
Bangkok	Urban	13°47′04″N	100°32′22″E	5	✓	✓		
Samutprakarn	Urban	13°39′58″N	100°36′21″E	4	✓	✓		
Pathumthani	Rural	14°02′46″N	100°42′43″E	6	✓	✓		
Kanchanaburi	Remote	14°47′05″N	98°36′05″E	130	✓	✓	✓	✓
Chiang Mai - Mae Hia	Rural	18°45′40″N	98°55′54″E	349	✓	✓		
Chiang Mai - Chang Phueak	Urban	18°50′26″N	98°58′11″E	329		✓		
Chiang Mai - Si Phum	Urban	18°47′27″N	98°59′24″E	313		✓		
Nakhon Ratchasima - Sakaerat	Rural	14°28′04″N	101°54′05″E	409	✓	✓		
Nakhon Ratchasima - Nai Mueang	Urban	14°58′46″N	102°05′53″E	184		✓		



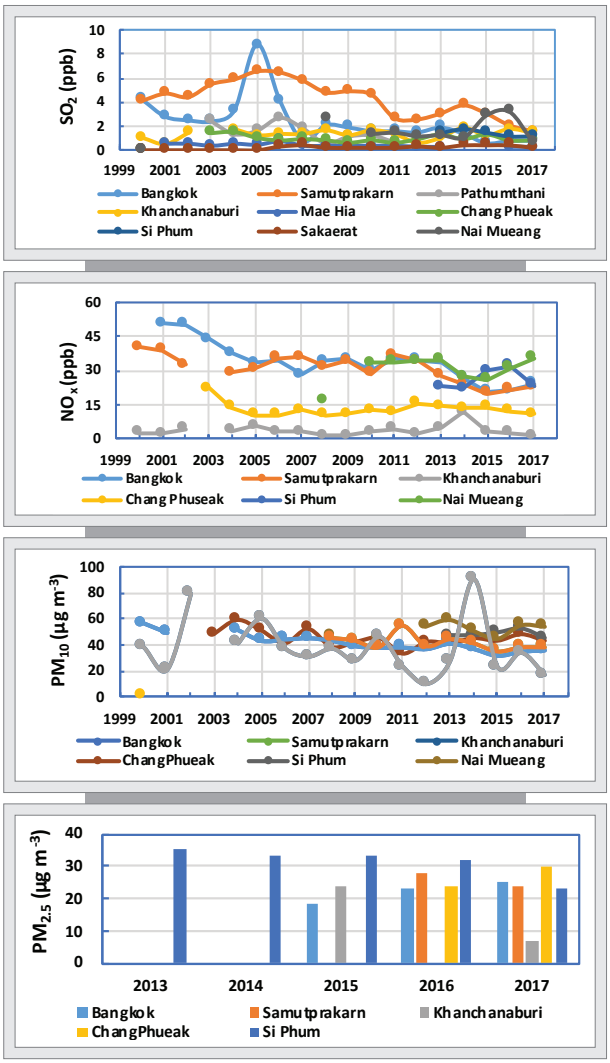
Monitoring Parameters

Monitoring Type	Parameters	Frequency
Wet Deposition	pH, EC, NH_4^+ Na^+, K^+, Ca^{2+}, Mg^{2+}, SO_4^{2-},NO_3^-, Cl^-, Amount of precipitation, CH_3COO^-, $HCOO^-$, PO_4^{3-}	Daily
Dry Deposition	SO_2, NO_2, NO, O_3, Particulate Matters (PM_{10}, $PM_{2.5}$) and others (aerosols)	Hourly, daily (gases) Every 10 days
Soil & Vegetation	pH (H_2O), pH (KCl), exchangeable (Na^+,K^+, Ca^{2+}, Mg^{2+}, Exchangeable acidity, ECEC, Moisture content, tree decline, description of trees	Soil (3-5 years) Vegetation (Once or twice in a year)
Inland Aquatic Environment	temperature, pH, EC, alkalinity, NH_4^+, Na^+, K^+, Ca^{2+}, Mg^{2+}, SO_4^{2-}, NO_3^-, Cl^-, NO_2^- ,PO_4^{3-}, COD, transparency	4 times in a year

3. HIGHLIGHTS OF MONITORING RESULTS

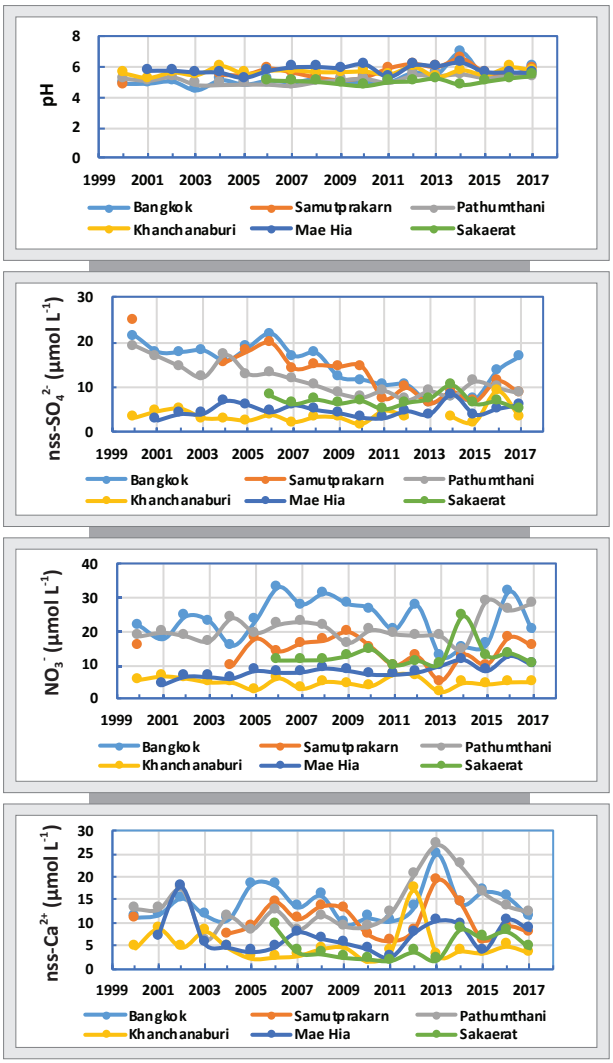
Following figures shows the time-series trend of the annual average of important acid deposition parameters in the dry deposition, wet deposition, and inland water quality of Thailand.

Dry Deposition



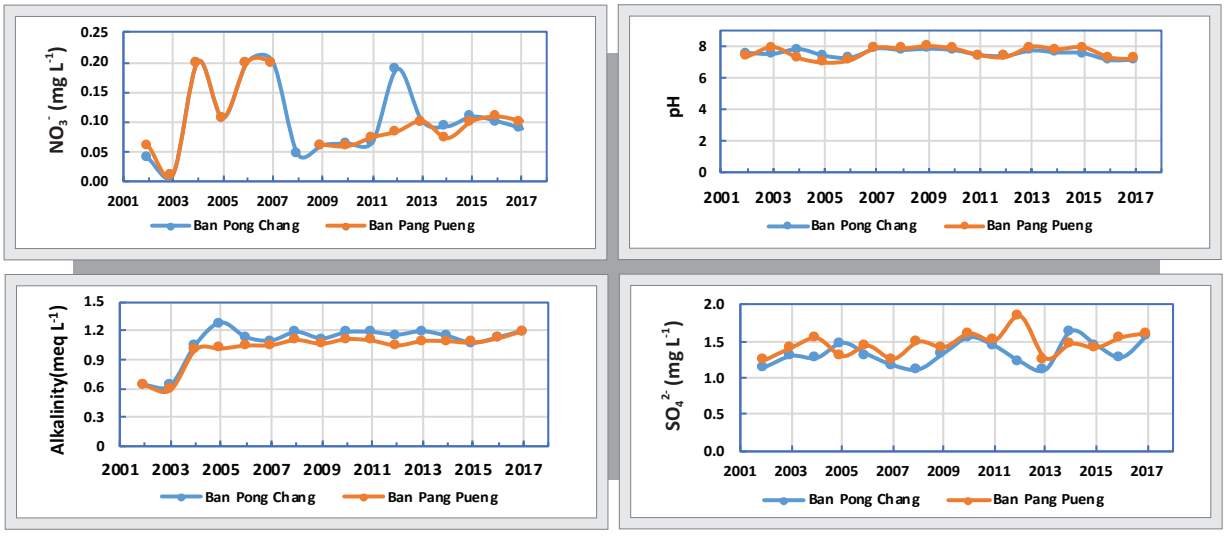
- SO_2, NO_x, PM (PM_{10}, $PM_{2.5}$) are showing decreasing trends.
- PM level are within the NAAQS but higher than WHO guidelines.

Wet Deposition



- pH values are slightly acidic.
- nss-SO_4^{2-} is showing decreasing trend.
- NO_3^- is fluctuating.

Inland Water



- pH values are almost neutral.
- SO_4^{2-} is fluctuating.
- NO_3^- is showing increasing trend.

4. AWARENESS ACTIVITIES, RELEVANT POLICIES AND FUTURE PLAN

- For raising public awareness on air pollution including acid deposition three versions of the brochure were published.
- Organizing workshops on technical problems and management activities.
- Production of video on the transboundary acid deposition.
- Enhance environmental education on acid deposition problems in Rayong Province Environmental Protection Volunteer Program.
- Focusing on source area-based management that includes source control strategies and pollution prevention approaches.
- National Master Plan on Open Burning Control for eliminating the burning of the agricultural waste.
- Thailand-Japan Clean Air Partnership Project (JTCAP) Particulate Matter Reduction Strategy and Measures Development Project.
- Air Quality Assessments for Health and Environment Policies in Thailand (UNEP, CRI, PCD, DOH).
- Using Emission Inventory Template to study major sources of $PM_{2.5}$ in Bangkok and Evaluate Control Strategies (AIT, PCD).

Policies and Practices Concerning Air Pollution

- Supporting community networks for sustainable forest management and reducing agricultural burning.
- Emission standards for factories; power plants, natural gas separation plants, petroleum refinery plants, waste incinerators; and bulk gasoline terminals.
- EURO 4 for gasoline and light-duty-diesel vehicle.
- Enhancement of the knowledge development for abilities and skills on sampling and analysis of acid deposition samples.
- Set up new EANET monitoring sites in Thailand particularly in remote areas by upgrading the national monitoring sites.
- Enforcement of monitor and control regulation on the major emission sources of SO_2 and NO_X such as the installation of Corporate Environmental Management(CEM) system; and Improvement of fuel quality and engine specification through a combination of new laws and regulations and imposed the higher emissions standards for new and in-use vehicles.
- Development of strategy and action plan for air quality management in Thailand including monitoring, source inventory, open burning control, emission control as well as broadening public awareness and participation program.

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.
- Hands-on training on monitoring and analysis of acid deposition parameters.
- Close cooperation with relevant organizations for soil and vegetation monitoring.
- Extend $PM_{2.5}$ monitoring.

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