

1. Introduction

1.1 Background

Air pollutants and their deposition cause harmful effects to the human health, plants, animals, materials, and cultural heritage. Over the last couple of decades, there are various arising risks in the East Asian region due to fast-growing economies and fossil fuel consumption. Air pollution include local and regional problems.

Regional air pollution, especially O₃ and PM_{2.5}, and acid deposition problems can affect the areas far from the emission sources as results of long-range transport and complicated chemical transformations of the emissions of primary air pollutants. Primary air pollutants such as sulfur dioxide (SO₂), nitrogen oxides (NO_x), VOCs, that can be transformed into O₃, secondary components of particulate matter (PM) such as sulfate and nitrate, as well as acid deposition of sulfuric acid (H₂SO₄) and nitric acid (HNO₃) in precipitation. O₃, PM_{2.5} and acid deposition are related to smog and visibility/regional haze.

The Acid Deposition Monitoring Network in East Asia (EANET) is an intergovernmental regional network established for promoting cooperation among countries in East Asia to address acid deposition problem. EANET has gained international recognition for its success in promoting regional cooperation on acid deposition monitoring in East Asia and facilitating inter-regional exchange on data measurement and assessments of the state of acid deposition. In 2021, EANET expanded its scope to address both air pollution problem and acid deposition.

The Periodic Report on the State of Acid Deposition in East Asia (PRSD), one of the most important publications of EANET, has been published four times to date. The target audience of this publication is government officials, researchers, and the general public. The objective of issuing the Periodic Report is to provide rigorous information to the international community on long-term trends and regional distribution of acid deposition and air concentration in East Asia.

1.1.1 Preparation of the fifth periodic report

The EANET published the PRSD in 2006, 2011, 2016, and 2021 based on the EANET monitoring data accumulated from 2000-2004, 2005-2009, 2010-2014, and 2015-2019, respectively. This report is the fifth periodic report, and the title has been changed to the Periodic Report on the State of Atmospheric Environment (PRSAE) as the scope of the EANET has been expanded to both air pollution problem and acid deposition. The Fifth PRSAE (PRSAE5) is based on the monitoring data from 2000 to 2024 (Twenty five years), focusing on spatial distribution, trend analysis and, possibly, impact assessment of acid deposition and air pollution in the region. The data 2020-2024 is also utilized for evaluating the current status of the environment in the EANET region, following the first, second, third and fourth periodic reports to share the results of the past five years provided by the EANET in its regular phase, as well as to evaluate scientifically the monitoring data generated.

The Twenty-Fourth Session of the Scientific Advisory Committee (SAC24) in October 2024 approved the establishment of the Drafting Committee (DC) for the PRSAE5 to prepare the implementation plan and other related works. The Twenty-Sixth Session of the Intergovernmental Meeting (IG26) in November 2024, Kuala Lumpur, Malaysia agreed to initiate the preparation of the PRSAE5 in 2025, with the process to be approved by Participating Countries by email in the first quarter of 2025. After the process of the preparation of PRSAE5 was reviewed and approved by PCs on 7 February 2025 by email, the DC for the PRSAE5 has been established. The first DC meeting for the PRSAE5 was held virtually on 24 June 2025. It was organized by the Network Center for the

EANET in Niigata, Japan. The DC members from 13 participating countries of the EANET participated in the meeting. Prof. Taehyoung Lee, Hankuk University of Foreign Studies, Republic of Korea was elected as the Chairperson of the DC.

The DC developed the format and contents of the PRSAE5. The PRSAE5 consists of three parts: Part I: Regional Assessment, Part II: National Assessment, and Executive Summary. The DC also nominated the Lead Authors and Contributors to draft the report. The contents of the PRSAE5 are as follows:

- Chapter 1: Introduction
- Chapter 2: Monitoring Data Quality
- Chapter 3: Gas and Aerosol Concentration in East Asia
- Chapter 4: Wet and Dry Deposition in East Asia
- Chapter 5: Impacts on Ecosystems in East Asia
- Chapter 6: Summary and Recommendations for Future Activities

The report was prepared as a scientific assessment of the state of acid deposition and air pollution in East Asia based on the data accumulated in the EANET. A trend analysis was also implemented to investigate the long-term variation in acid deposition using data prior to 2019 in addition to the data from 2020-2024 for this report.

1.2 Brief introduction of the EANET

Acid deposition and air pollution are the national and the regional or hemispherical problems affecting human health and the environment. Since 1993, expert meetings were held to discuss the state of acid deposition in the East Asian region, impacts on ecosystems, and future efforts toward regional cooperation on this issue. The experts recommended that acid deposition monitoring should be improved and strengthened. Thus, the expert meetings contributed the necessary knowledge for establishing a regional collaborative monitoring network. Therefore, multilevel bilateral and multilateral environmental cooperation is being actively conducted to discuss air pollution mitigation. In response to the growing concern on the adverse effects of acid deposition, countries in East Asia have established a coordinated monitoring network on acid deposition in the region using the knowledge and experiences from other similar regional and international networks.

The EANET is a regional intergovernmental network established for promoting cooperation among countries in East Asia to address acid deposition and other related atmospheric pollutants. The EANET has made progress and important achievements in the understanding the state of air pollution and acid deposition in East Asian region by monitoring acidic pollutants and compilation, evaluation, and storage of the relevant data. The EANET has been conducting monitoring, analysis, and evaluation of data and information from several dozen monitoring sites in the 13 participating countries, namely, Cambodia, China, Indonesia, Japan, Lao PDR, Malaysia, Mongolia, Myanmar, Philippines, Republic of Korea, Russia, Thailand, and Vietnam, as well as periodic assessment of the state of acid deposition for the whole region. The network also conducts capacity building and promotes scientific research and public awareness on acid deposition and related air pollution problems with relevant efforts to assist policymakers in decision making to mitigate atmospheric pollution and its impacts based on scientifically assessed information.

The participating countries have participated in monitoring acid deposition as part of EANET since its initial period. In addition, EANET has successfully promoted the cooperation with other regional initiatives, including with the Convention on Long- Range Transboundary Air Pollution (CLRTAP), and established strong links with international organizations such as the World Meteorological

Organization (WMO) and World Health Organization (WHO). The experts from these initiatives have been regularly invited to attend EANET meetings and contributed in enhancing the collective efforts.

The technical capabilities and skills of those involved in managing acid deposition in the participating countries were significantly enhanced through a number of EANET activities. Technical missions were dispatched annually to selected participating countries to monitor performance, laboratory operations, data management and other procedures. Other activities to enhance the skills and knowledge of personnel include national workshops, scientific workshops, individual training courses at the Network Center, and annual expert meetings.

Numerous EANET publications (technical manuals, monitoring guidelines, data publications, QA/QC programs, training materials, etc.) have been disseminated to EANET countries. They will continue to be produced by countries to enhance further capabilities of personnel in monitoring, assessment, and management of acid deposition.

Furthermore, EANET have organized various workshops to raise awareness of the public on acid deposition problems and the importance of community support to improve the environment. The target audience of the awareness activities includes general public, including government officials, monitoring officers, academia, students, and teachers. In addition, several publications and video promotional have been developed in collaboration with the participating countries. The countries in collaboration with EANET organized national workshops on acid deposition problems.

Many scientific research projects on acid deposition and its effects as well as air concentration were conducted by EANET in collaboration with scientists from the participating countries. The projects were conducted in countries with diverse natural environments and climatic conditions in the East Asian region to obtain a better understanding of the processes involved.

1.3 Objectives

The objectives of the EANET based on the "Instrument for Strengthening the Acid Deposition Monitoring Network in East Asia (EANET)" and the "Supplementary document (Annex) to the Instrument for the Acid Deposition Monitoring Network in East Asia (EANET)" are:

- Create a common understanding of the state of the acid deposition and air pollution problems in East Asia;
- useful inputs for decision making at local, national and regional levels aimed at preventing or reducing adverse impacts on the environment caused by acid deposition and air pollution; and
- Contribute to cooperation on the issues related to acid deposition and air pollution among the Participating Countries.

To achieve the above objectives, EANET has conducted the following major activities:

- Monitoring air concentration and acid deposition in the participating countries uses common methodologies in five areas: air concentration/dry deposition, wet deposition, soil/vegetation, inland aquatic environment, and catchment-scale monitoring.
- Compilation, evaluation, storage, and provision of the data obtained through monitoring.
- Promotion of QA/QC activities to obtain high-quality monitoring data.
- Enhancement of data analysis and assessment.
- Capacity building of monitoring capabilities in participating countries including the implementation of training programs.
- Promotion of research, studies, and public awareness activities related to acid deposition.

1.4 Institutional arrangement

The EANET was established in 2001 to support participating countries in achieving the objectives to tackle acid deposition problems.

As the institutional framework for EANET, the Intergovernmental Meeting is the decision-making body of EANET. The Scientific Advisory Committee was established under the Intergovernmental Meeting, and the Secretariat and the Network Center were designated to support the network. These organizations promote the network activities in close communication, coordination and collaboration with the national focal points, national centers and national QA/QC managers in the participating countries.

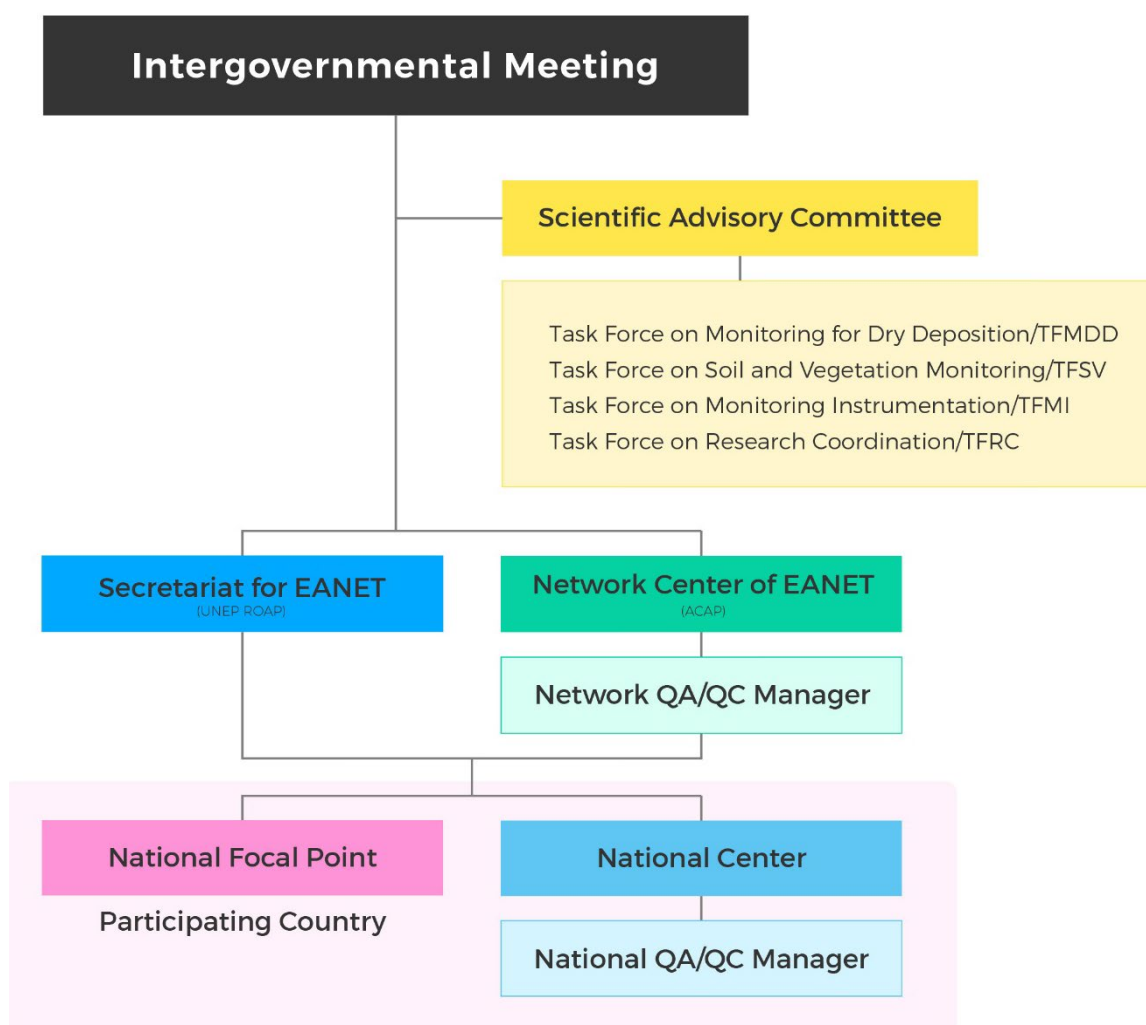


Figure 1.4.1. Institutional Framework for EANET.

The Intergovernmental Meeting, Scientific Advisory Committee, Secretariat and Network Center are described in the "Tentative Design of the Acid Deposition Monitoring Network in East Asia (EANET)" (EANET/IG 2/5/3) as institutional bodies for implementing the EANET activities on a regular basis.

Intergovernmental Meeting

The Intergovernmental Meeting (IG), composed of the representatives of the participating countries, is the decision-making body of EANET and deals with the matters related to the management of the Network and implementation of the work program.

Scientific Advisory Committee

The Scientific Advisory Committee (SAC) incorporated scientific and technical experts from the participating countries and have responsibilities to advise and assist the Intergovernmental Meeting with various scientific and technical matters related to the EANET activities.

Secretariat

The Secretariat ensures the effective management of the EANET and facilitates cooperation among Participating Countries in a transparent manner and carries out the following task under the guidance of the IG.

- 1) Communicate and coordinate with the participating countries concerning the network; Prepare for the EANET meetings such as the Intergovernmental Meeting, Scientific Advisory Committee Meeting, and Working Group Meeting;
- 2) Conduct necessary administrative and financial arrangements for the network;
- 3) Promote cooperation among participating countries and other initiatives; and Promotion of public awareness.

United Nations Environment Programme (UNEP) was designated as the Secretariat for EANET located in Bangkok, Thailand.

Network Center

The Network Center for EANET handles scientific and technical matters of the EANET activities and facilitates cooperation among the Participating Countries in a transparent manner. It carries out the following tasks under the guidance of the IG:

- 1) Central compilation, evaluation, and storage of monitoring data and related information;
- 2) Preparation of data reports on air concentration and acid deposition in East Asia;
- 3) Dissemination of monitoring data and other relevant information;
- 4) Provision of technical assistance to the participating countries in implementing the network activities;
- 5) Implementation and coordination of QA/QC activities;
- 6) Development and implementation of education/training programs for those engaged in the network activities;
- 7) Implementation of research activities on air pollution and acid deposition;
- 8) Provision of scientific and technical support for the Intergovernmental Meeting, Scientific Advisory Committee, and other subsidiary bodies; and
- 9) Other tasks as requested by the Intergovernmental Meeting.

The Asia Center for Air Pollution Research (ACAP) is designated as the Network Center for the EANET located in Niigata, Japan.

Task Forces

Task Forces of Dry Deposition Monitoring, Soil and Vegetation Monitoring, Instrumentation Monitoring, and Research Coordination were established under the SAC until 2022, which assisted in the development of a strategy for vital directions of monitoring as well as four Expert Groups of the Dry Deposition Flux Estimation, Technical Manual on Wet Deposition Monitoring, Technical Manual on Air Concentration Monitoring, and Technical Manual on Inland Aquatic Environment Monitoring. In 2022, new Task Force on Monitoring and Assessment of Atmospheric Environment, Task Force on Monitoring and Assessment of Environmental Effects and Task Force on Atmospheric Environmental Management were established, suggested by the Twenty-Second Session of the Scientific Advisory Committee (SAC22) and approved by the Twenty-Fourth Session of the Intergovernmental Meeting (IG24).

Organizations in the participating countries

- **National Focal Points**

National Focal Point is a representative of the participating country responsible for communicating with the Secretariat and Network Center for EANET concerning the implementation of the network activities.

- **National Centers**

National Center is responsible for developing and implementing the national monitoring plan; collecting the national monitoring data and submitting them to the Network Center; promoting national QA/QC activities; and dealing with technical matters on the network activities in the country.

- **National QA/QC Managers**

National QA/QC Manager is responsible for developing the national monitoring plan and submitting it to the Network Center; promoting national QA/QC activities in cooperation and coordination with the national centers.

1.5 EANET activities in 2000-2024

1.5.1 Main activities of the EANET

The EANET was established as an important initiative for regional cooperation among the participating countries to create a common understanding of the state of acid deposition problems and provide useful inputs to policymakers at various levels.

Air concentration and acid deposition monitoring

- Review and revision/establishment of the national monitoring plans where appropriate
- Implementation of monitoring using common methodologies air concentration/dry deposition, wet deposition, soil/vegetation, inland aquatic environment, and catchment-scale monitoring

Compilation, evaluation, storage, and provision of data

- Submission of monitoring data to the Network Center
- Issuing of annual data report
- Preparation and publication of a periodic report on the state of atmospheric environment
- Dissemination of relevant information through the EANET website

Promotion of quality assurance and quality control (QA/QC) activities

- Development of QA/QC programs
- Development of Standard Operational Procedures (SOPs)
- Implementation of Inter-laboratory comparison projects

Implementation of technical support and capacity building activities

- Dispatch of technical missions
- Identification of training needs
- Individual training at the Network Center
- National training
- Utilization of existing training programs and others

Promotion of research and studies related to air pollution and atmospheric deposition problems

- Joint studies on air pollution, atmospheric deposition, catchment analysis, etc.

Promotion of public awareness activities

- Development of reports for policymakers, web-stories, factsheets, policy briefs, brochures, videos
- National and Regional Workshops
- e-Learning and webinars

Other relevant activities

- Cooperation and exchange of information and experiences with other regional and global networks/initiatives by Participating Countries

1.5.2 EANET meetings

The Fifth Session of the Intergovernmental Meeting (IG5) held in November 2003 in Pattaya, Thailand decided to establish a Working Group on Future Development of EANET to review the performance of the Secretariat and Network Center and develop guidelines on the administrative and financial management of the Secretariat and Network Center. In later years the functions of this Working Group were expanded to develop a five-year medium-term plan for EANET.

A High-Level Segment was held with the Seventh Session of the Intergovernmental Meeting (IG7) in November 2005 in Niigata, Japan at which the *Report for Policy Makers: Goals, Achievements and Way Forward* was launched. The IG7 also adopted Decision 1/IG7 (Niigata Decision) which decided that the participating countries of EANET should begin a process to discuss an appropriate instrument and legal status to provide a sound basis for a financial contribution to EANET.

The Strategy on EANET Development (2006-2010), which was approved by the Eighth Session of the Intergovernmental Meeting (IG8) in November 2006, focused on the whole activities of EANET with clearly stated targets, activities to be undertaken, and expected results. The implementation of the Strategy activities since 2006 and the regular activities of the Secretariat and the Network Center since the start of EANET, have brought EANET closer towards achieving its objectives.

The Twelfth Session of the Intergovernmental Meeting on EANET (IG12), held in November 2010 in Niigata, Japan adopted the Decision 1/IG12 on "Instrument for Strengthening the Acid Deposition Monitoring Network in East Asia (EANET)". Based on the performance review of the Strategy on

EANET Development (2006-2010), the "Medium Term Plan for EANET (MTP) (2011-2015)" was adopted at the IG12 in 2010. The MTP for the EANET (2016-2020) and the MTP (2021-2025) were adopted at the IG18 in 2016, and IG22 in 2020, respectively. The MTP (2021-2025) was revised and adopted at the IG 23 in 2021.

In November 2021, the Twenty-third Session of the Intergovernmental Meeting on EANET (IG23) was held virtually. During the session, the Participating Countries adopted the "Supplementary document (Annex) to the Instrument for the Acid Deposition Monitoring Network in East Asia (EANET)", which expanded the scope of EANET to address broader air quality issues in addition to acid deposition.

1.5.3 Monitoring activities

The EANET monitoring covers five environmental media, air concentration/dry deposition, wet deposition, soil/vegetation, inland aquatic environment, and catchment-scale monitoring. The monitoring activities have been conducted following a set of monitoring guidelines and technical manuals of the EANET (EANET 2010a, 2010b, 2010c, 2010d, 2010e, and 2022). Monitoring for wet and dry deposition is implemented to measure concentrations and fluxes of acidic and other substances to the ground. In addition, monitoring soil/vegetation, inland aquatic environment, and catchment are being implemented to assess adverse impacts on terrestrial and aquatic ecosystems. All the sites follow a standardized set of methodologies for site selection, sampling, and chemical analyses to ensure technical conformity within the network.

1. Air Concentration/Dry Deposition

- Monitoring Interval
 - every day to two weeks, or every hour when measured by automatic instruments
- Major Measurements
 - Gases: concentrations of ozone (O₃), sulfur dioxide (SO₂), nitrogen oxides (NO, NO₂, and NO_x), nitric acid (HNO₃), hydrogen chloride (HCl), ammonia (NH₃), and others
 - Particulate matter (PM_{2.5} and PM₁₀), and particulate components (SO₄²⁻, NO₃⁻, etc.). etc.

2. Wet Deposition

- Monitoring Interval
 - every 24 hours or every precipitation event for an urban, rural or remote site
- Major Parameters
 - Precipitation analysis: pH, electrical conductivity (EC), concentrations of sulfate (SO₄²⁻), nitrate (NO₃⁻), ammonium (NH₄⁺), and other ions

3. Soil and Vegetation

- Monitoring Interval
 - once three to five years
- Major Parameters
 - Soil: pH, concentrations of exchangeable ions and effective cation exchange capacity (ECEC)
 - Vegetation (forest): survey of tree decline, and general description of a forest

4. Inland Aquatic Environment

- Monitoring Interval
 - More than four times a year
- Major Parameters
 - Inland water: pH, electrical conductivity (EC), alkalinity and cations such as ammonium (NH₄⁺), and anions such as nitrate (NO₃⁻)

5. Catchment

- Monitoring Interval
 - continuously (precipitation and discharge), every week to 2 weeks (chemical components)
- Major Parameters
 - Rainwater and stream water: Precipitation amount, discharge from the stream, major cations (Ca^{2+} , NH_4^+ , etc.) and anions (SO_4^{2-} , NO_3^- , etc.), estimation of total deposition (wet + dry), etc.

EANET monitoring sites are classified into two basic categories: air concentration/acid deposition monitoring sites and ecological survey sites. Air concentration/acid deposition monitoring sites are sites for collecting fundamental data on the temporal and spatial distribution of air pollution and acid deposition. They are further classified into three sub-categories: remote sites, rural sites, and urban sites for specific objectives of the monitoring. Ecological survey sites provide basic data for assessing the effects of acidification on terrestrial ecosystems. They are further classified into two sub-categories: basic survey sites and ecosystem analysis sites.

1.5.4 Current status of monitoring activities as 2024

Thirteen EANET countries, namely Cambodia, China, Indonesia, Japan, Lao PDR, Malaysia, Mongolia, Myanmar, Philippines, Republic of Korea, Russia, Thailand, and Vietnam participated in air concentration and acid deposition monitoring in 2024. A total of sixty-five sites were nominated for the monitoring, including 26 urban, 19 rural, and 20 remote sites. The map showing the locations of these sites with the classification information is provided in Figure 1.5.1. The details on the locations of the acid deposition monitoring sites are presented in Table 1.5.1



Figure 1.5.1. Locations of air concentration/acid deposition monitoring sites in 2024.

Table 1.5.1 Locations of air concentration/acid deposition monitoring sites.

Country	Site	Code* ¹	Class.	Latitude* ²	Longitude* ²	Altitude /m
Cambodia	Phnom Penh	KHA001	Urban	11°33'18"N	104°56'20"E	15
China	Chongqing - Haifu	CNA003	Urban	29°37'30"N	106°30'34"E	317
	- Jinyunshan	CNA004	Rural	29°49'42"N	106°22'43"E	871
	Xi'an - Shizhan	CNA005	Urban	34°14'33"N	108°57'10"E	415
	- Jiwozi	CNA007	Remote	33°51'06"N	108°48'52"E	1,837
	Xiamen - Hongwen	CNA008	Urban	24°28'47"N	118°09'47"E	39
	- Xiaoping	CNA009	Remote	24°51'23"N	118°02'55"E	530
	Zhuhai - Xiang Zhou	CNA010	Urban	22°16'22"N	113°31'46"E	29
	- Zhuxiandong	CNA011	Urban	22°12'24"N	113°31'00"E	18
	- Haibin-Park	CNA012	Urban	22°15'40"N	113°34'25"E	10
	Wuzhishan - Wuzhishan	CNA013	Remote	18°50'11"N	109°29'26"E	958
	Lijiang - Lijiang	CNA014	Remote	27°13'38"N	100°14'48"E	3410
Indonesia	Jakarta	IDA001	Urban	06°09'22"S	106°50'32"E	7
	Kototabang	IDA003	Remote	00°12'08"S	100°19'05"E	845
	Maros	IDA005	Rural	04°59'50"S	119°34'17"E	1
	Jembrana	IDA006	Rural	08°20'27"S	114°37'02"E	24
	Lombok	IDA007	Rural	08°38'10"S	116°10'15"E	52
Japan	Rishiri	JPA001	Remote	45°07'30"N	141°14'30"E	40
	Ochiishi	JPA002	Remote	43°09'43"N	145°29'50"E	49
	Sado-seki	JPA004	Remote	38°15'02"N	138°24'01"E	129
	Happo	JPA005	Remote	36°41'48"N	137°47'53"E	1,850
	Ijira	JPA006	Rural	35°34'14"N	136°41'51"E	140
	Oki	JPA007	Remote	36°17'19"N	133°11'06"E	90
	Yusuhara	JPA009	Remote	33°22'46"N	132°56'06"E	790
	Hedo	JPA010	Remote	26°51'58"N	128°14'55"E	60
	Ogasawara	JPA011	Remote	27°05'32"N	142°13'02"E	212
	Tokyo	JPA012	Urban	35°41'30"N	139°45'10"E	26
	Niigata-maki* ³	JPA013	Rural	37°48'33"N	138°51'09"E	47
	Tsushima	JPA014	Remote	34°14'48"N	129°17'17"E	390
Lao PDR	Vientiane	LAA001	Urban	17°59'53"N	102°34'56"E	175
Malaysia	Petaling Jaya	MYA001	Urban	03°06'07"N	101°38'42"E	46
	Tanah Rata	MYA002	Rural	04°29'03"N	101°22'17"E	1,545
	Danum Valley	MYA003	Remote	04°58'53"N	117°50'37"E	426
	Kuching	MYA004	Urban	01°29'25"N	101°21'09"E	22
	Gunung Brinchang	MYA005	Remote	04°31'22"N	101°23'17"E	2,012
Mongolia	Ulaanbaatar* ⁴	MNA001	Urban	47°53'39.54"N	106°52'57.19"E	1,275
	Bayanzurkh* ⁴	MNA003	Urban	47°55'03.25"N	106°56'15.44"E	1,301
	Khan-Uul* ⁴	MNA004	Urban	47°53'39.54"N	106°52'57.19"E	1,284
	Terelj	MNA002	Remote	47°59'7.65"N	107°27'30.41"E	1,550
Myanmar	Yangon	MMA001	Urban	16°51'53"N	96°09'13"E	21

Table 1.5.1 Locations of air concentration/acid deposition monitoring sites (continued).

Country	Site	Code* ¹	Class.	Latitude* ²	Longitude* ²	Altitude /m
Philippines	Metoro Manila					
	- Manila Observatory	PHA001	Urban	14°38'09"N	121°04'43"E	55
	- North Caloocan	PHA004	Urban	14°44'59.95"N	121°3'45.35"E	76
	Laguna - Los Baños	PHA002	Rural	14°09'53"N	121°15'00"E	25
	- Sta Rosa	PHA005	Rural	14°18'57.88"N	121°6'37.85"E	8
	Benguet					
	- Mt. Sto. Tomas	PHA003	Rural	16°21'23" N	120°33'33"E	1,500
	- Lower Session Road	PHA006	Rural	16°24'41.1" N	120°35'55.38" E	1,473
Republic of Korea	Ganghwa	KRA001	Rural	37°42'32"N	126°16'26"E	60
	Jeju	KRA002	Remot	33°17'32"N	126°09'43"E	37
	Imsil	KRA003	e Rural	35°36'09"N	127°10'53"E	217
Russia	Listvyanka	RUA002	Rural	51°50'47"N	104°53'34"E	646
	Irkutsk	RUA003	Urban	52°14'53"N	104°15'33"E	495
	Primorskaya	RUA004	Rural	43°37'45"N	132°14'13"E	85
Thailand	Bangkok	THA001	Urban	13°47'04"N	100°32'22"E	5
	Samutprakarn	THA002	Urban	13°39'58"N	100°36'21"E	4
	Pathumthani	THA003	Rural	14°02'46"N	100°42'43"E	6
	Khanchanaburi	THA004	Remot	14°47'05"N	98°36'05"E	130
	(Vajiralongkorn Dam)		e			
	Chiang Mai					
	- Chang Phueak	THA006		18°50'26"N	98°58'11"E	329
	- Si Phum	THA007	Urban	18°47'27"N	98°59'24"E	313
	Nakhon Ratchasima		Urban			
	- Nai Mueang	THA009		14°58'46"N	102°05'53"E	184
			Urban			
Vietnam	Hanoi	VNA001	Urban	21°03'24"N	105°43'36"E	6
	Hoa Binh	VNA002	Rural	20°50'12"N	105°20'32"E	23
	Cuc Phuong	VNA003	Remot	20°18'01"N	105°41'38"E	155
	Da Nang	VNA004	e	16°02'35"N	108°12'24"E	5
	Can Tho	VNA005	Urban	10°05'18"N	105°41'45"E	2
	Ho Chi Minh	VNA006	Rural	10°47'04"N	106°42'00"E	5
	Yen Bai	VNA007	Urban	21°42'28"N	104°52'29"E	56
			Rural			

*1 Codes for the air concentration/acid deposition monitoring sites are assigned according to the following rules.

e.g.) KH A 0 01

(a) (b) (c) (d)

(a): country code (2 digits)

(b): item code ("A" : air concentration/acid deposition monitoring)

(c): sub-serial number for ecological monitoring

(d): serial number for each country (2 digits)

*2 Coordinates are shown according to the World Geodetic System (WGS)

*3 Niigata-maki has been discontinued since April 2024 due to the change in the National Monitoring Plan of Japan.

*4 It was proven that the Ulaanbaatar site (MNA001) had been relocated and split into two monitoring sites, Bayanzurkh (MNA003) and Khan-Uul (MNA004), in June 2020 due to new building construction. The monitoring data relating to wet deposition, air concentration and dry deposition were revised accordingly (see Cpt. 3 and 4). For further details, please refer to Appendices 4 and 5.

The current situation on basic survey sites for ecological monitoring and their nearest acid deposition monitoring sites are shown in Table 1.5.2. The map showing the locations of these sites with the classification information is provided in Figure 1.5.2. Soil and vegetation monitoring and inland aquatic environment monitoring are conducted at 33 plots in 10 countries and 19 lakes/ivers in 11 countries. Most of the ecological monitoring sites correspond to the acid deposition monitoring sites. Moreover, both soil and vegetation monitoring and inland aquatic environment monitoring are conducted in the vicinity of four acid deposition monitoring sites in China, two sites in Japan, one site in Malaysia, one site in Mongolia, two sites in Philippines, two sites in Russia, one site in Thailand, and one site in Viet Nam. It is expected that the acid deposition monitoring data collected in their nearest monitoring sites will be used for the interpretation of the data on ecological monitoring in these sites.

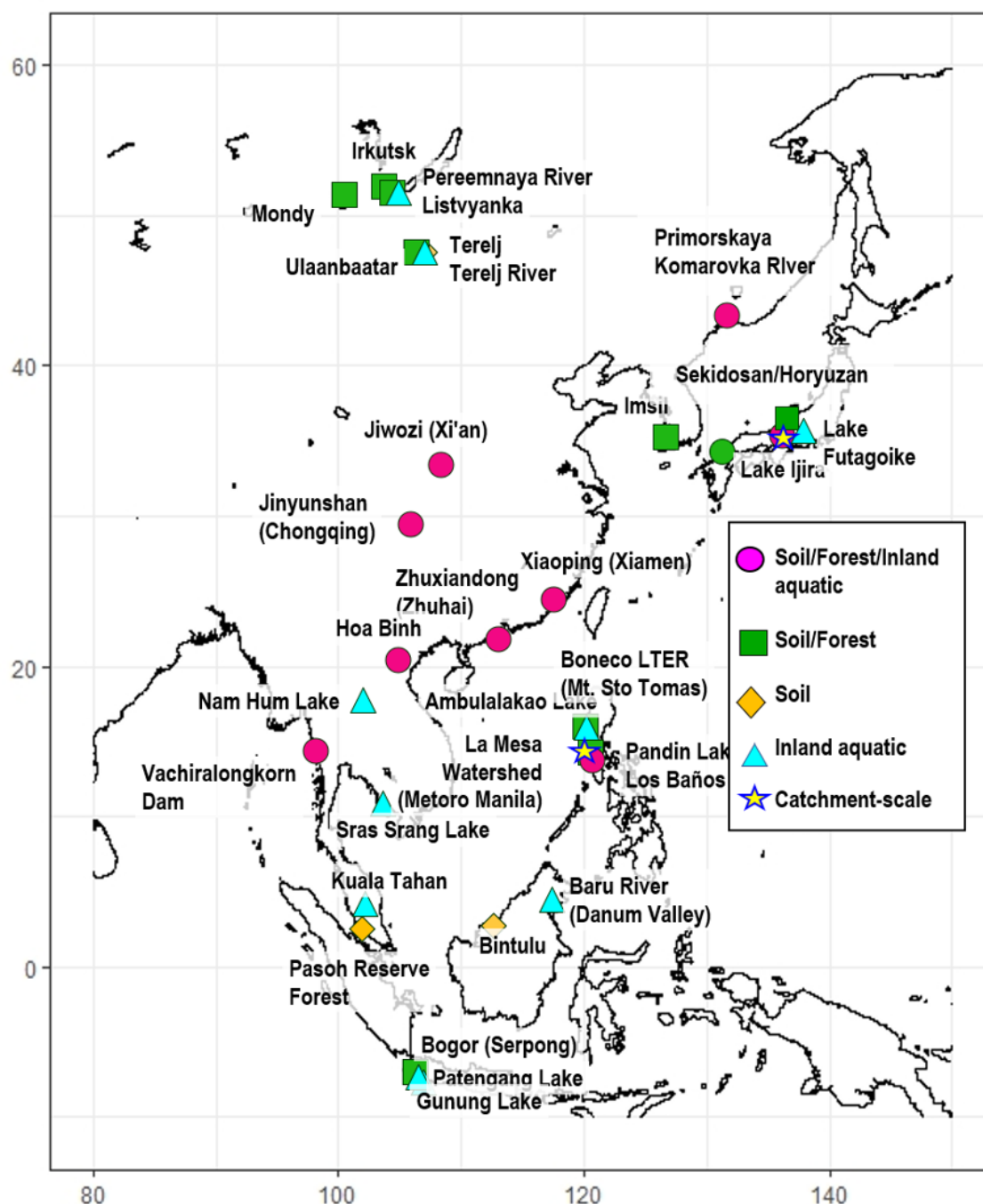


Figure 1.5.2. Locations of basic survey sites for ecological monitoring in 2024.

Table 1.5.2 Basic survey sites for ecological monitoring and their nearest acid deposition monitoring sites.

Country	Site for air concentration/ acid deposition monitoring	Plot for soil and vegetation monitoring	Code for soil and vegetation monitoring ^{*1}	Site for inland aquatic environment monitoring	Code for inland aquatic environment monitoring ^{*1}
Cambodia	-	-	-	Sras Srang Lake	KHI002
China	Chongqing - Jinyunshan	Jinyunshan	CNS004	Jinyunshan Lake	CNI004
	Xi'an - Jiwozi	Dabagou	CNS007	Jiwozi River	CNI007
	Xiamen - Xiaoping	Xiaoping	CNS009	Xiaoping Dam	CNI209
	Zhuhai - Zhuxiandong	Zhuxiandong	CNS011	Zhuxiandong Stream	CNI111
Indonesia	Serpong	Bogor Research Forest (Dramaga Experimental Forest)	IDS002	-	-
	Bandung	-	-	Patengang Lake	IDI004
	-	-	-	Gunung Lake	IDI006
Japan	Happo	Sekido-san	JPS005	Futago-ike Lake	JPI005
		Horyu-zan	JPS105		
	Ijira	Ijira	JPS006	Ijira Lake	JPI006
		Yamato	JPS106		
Lao PDR	Vientiane	-		Nam Houm Lake	LAI001

Table 1.5.2 Basic survey sites for ecological monitoring and their nearest acid deposition monitoring sites (continued).

Country	Site for air concentration/acid deposition monitoring	Plot for soil and vegetation monitoring	Code for soil and vegetation monitoring* ¹	Site for inland aquatic environment monitoring	Code for inland aquatic environment monitoring* ¹
Malaysia	Petaling Jaya	Pasoh TEAM Plot 1	MYS201	-	-
		Pasoh TEAM Plot 8	MYS202	-	-
	Danum Valley	-	-	Baru River	MYI103
	-	UPMKB Rehabilitated Forest Planted in 1991	MYS005	-	-
	-	UPMKB Rehabilitated Forest Planted in 2008	MYS105	-	-
	-	-	-	Kuala Tahan	MYI006
Mongolia	Ulaanbaatar	Bogdkhan Mountain	MNS001	-	-
	Terelj	Terelj Mountain	MNS002	Terelj River	MNI002
Philippines	Manila Observatory	La Mesa Watershed	PHS001		
	Los Baños	Mt. Makiling	PHS002	Pandin Lake	PHI102
		UP Quezon, Land Grant	PHS102		
	Mt. Sto Tomas	Boneco Long Term Ecological Research Site	PHS003	Ambulalakaw Lake	PHI003
Republic of Korea	Imsil	Mt. Naejang	KRS003	-	-
Russia	Irkutsk	Irkutsk	RUS003	-	-
	Listvyanka	Bolshie Koty	RUS002		
		Pereemnaya river catchment	RUS102	Pereemnaya River	RUI102
	Mondy	Ilchir Lake	RUS001	-	-
		Okinskoe Lake	RUS101		
		Solar Observatory	RUS201		
	Primorskaya	Primorskaya	RUS004	Komarovka River	RUI004
Thailand	Khanchanaburi (Vajiralongkorn Dam)	Vajiralongkorn Dam	THS004	Vajiralongkorn Dam	THI004
		Vajiralongkorn Puye	THS104		
Vietnam	Hoa Binh	Cave of Heaven	VNS002	Hoa Binh Reservoir	VNI002
		Thang Ranh	VNS102		

*1 Each code of ecological monitoring sites is assigned in accordance with the following rules.

e.g.) CN S 0 04

(a) (b) (c) (d)

(a): country code (2 digits) (b): item code ("S": soil and vegetation monitoring, "I": inland aquatic environment monitoring)

(c): sub-serial number when there are multiple ecological monitoring sites in the nearest air concentration/acid deposition monitoring site

(d): 2-digit serial number corresponding to its nearest air concentration/acid deposition monitoring site

(If there is no nearest air concentration/acid deposition monitoring site within 50 km, another new serial number is assigned after the existing air concentration/acid deposition monitoring site in its country.)

Table 1.5.3 shows the sites for catchment-scale monitoring.

Table 1.5.3 Site for catchment-scale monitoring.

Country	Site for air concentration /acid deposition monitoring	Site for catchment-scale monitoring	Code for catchment-scale monitoring ^{*1}
Japan	Ijira	Lake Ijira catchment	JPC006
Philippines	Manila Observatory	La Mesa Watershed	PHC001

*1 Each code of the catchment-scale monitoring sites is assigned in accordance with the following rules.

e.g.) JP C 0 06

(a) (b) (c) (d)

(a): country code (2 digits) (b): item code (“C”: catchment-scale monitoring)

(c): Sub-serial number when there are multiple ecological monitoring sites in the nearest air concentration/acid deposition monitoring site

(d): 2-digit number corresponding to its nearest air concentration/acid deposition monitoring site

(If there is no nearest air concentration/acid deposition monitoring site within 50 km, another new serial number is assigned after the existing air concentration/acid deposition monitoring site in its country.)

1.5.5 Research activities

As one of the activities of the EANET, EANET continued to promote research activities aimed at improving scientific understanding of air pollution, acid deposition, and their ecological impacts in East Asia. These activities made use of the long-term monitoring data accumulated through EANET and promoted collaboration among researchers and institutions in the Participating Countries. Research activities are also implemented to improve capacities for monitoring methodologies, deposition estimations, the development of emission inventories, and using air quality models to assess and analyze the trend of air pollution and atmospheric depositions at all scales.

Promotion of research activities related to air pollution and acid deposition problems includes the following:

- Promotion of research studies, particularly on the applicability of various methodologies for measurement of air concentrations in East Asia;
- Promotion of studies on the effects of air pollution, acid deposition and other priority chemical species on the ecosystem;
- Promotion of studies on methodologies of application of air quality models to assess and analyze the trend of national and regional air pollution, acid deposition and related chemical species in East Asia through workshops, training courses, etc.; and
- Promotion of research on methodologies to develop emission inventories through workshops, training courses, pilot studies, preparation of reference materials, etc.

The fellowship research program was also conducted. It has been promoted since 2005, which is an effective mechanism for encouraging young researchers from across the region to participate in air pollution research activities. Joint research projects conducted by the EANET participating countries were implemented as well.

Scientific findings from the research activities are shared with the scientists from participating countries and their scientific and technical research results are published in relevant international and national journals, including in the EANET Science Bulletin and the EANET Research Portal (<https://www.eanet.asia/eanet-research-portal>).

1.5.6 Capacity building activities

EANET continued to strengthen the technical and institutional capacities of its Participating Countries for air quality monitoring and management. A major component of EANET's capacity-building activities was technical training for government officials, researchers, and technical staff from the Participating Countries. The EANET individual training course at the Network Center has been implemented once or twice a year from the beginning of the EANET activities. Training covered fundamental aspects of acid deposition and air quality monitoring, including sampling and chemical analysis, operation and maintenance of monitoring equipment, data management, and quality assurance and quality control (QA/QC). During and after the COVID-19 pandemic, online training and lectures were also used for capacity-building activities. Practical training and knowledge sharing also contributed to improving the comparability and reliability of monitoring data across the EANET network.

The technical capabilities and skills of the participating countries for air concentration and acid deposition monitoring and assessment were significantly enhanced through a number of EANET activities. The Network Center dispatch technical missions annually to the participating countries to assist them in monitoring performance, laboratory operations, data management, and other procedures. Other activities to enhance the skills and knowledge of personnel included national workshops, annual expert meetings and scientific workshops on ecological impacts and other topics related to acid deposition. Numerous EANET publications (Technical Manuals and Guidelines, Data Report, Reports on QA/QC projects, Training materials, etc.) have been produced for use by technical staff, specialists and researchers involved in the EANET monitoring, data quality, and data management. All of these materials are available on the EANET website (<https://www.eanet.asia>).

Capacity-building activities also gradually expanded in response to the broader scope of EANET. In addition to conventional acid deposition monitoring, training and technical activities addressed wider air quality management issues, including PM_{2.5} and ozone, emission inventories, air quality modeling, and other emerging technical needs. EANET's capacity-building activities contributed to maintaining and improving technical expertise, strengthening monitoring and QA/QC capabilities, promoting the application of new approaches and technologies, and developing human resources for effective air quality management in East Asia.

1.5.7 Public awareness activities

The promotion of public awareness on air pollution and acid deposition and sharing a common understanding of atmospheric environmental issues is an important part of the EANET activities. During 2021–2024, EANET conducted a range of public awareness and outreach activities to increase understanding of air pollution issues in East Asia, disseminate the outcomes of EANET activities, and strengthen communication among policymakers, scientists, national stakeholders, and the wider public. These activities also supported the expansion of EANET's scope beyond acid deposition to address broader air quality issues.

Regional and national workshops were major components of EANET's public awareness activities. Regional Awareness Workshops provided opportunities to share scientific knowledge, monitoring results, and experiences related to air pollution and air quality management. Topics covered included particulate matter, ozone, atmospheric deposition, air quality monitoring technologies, and approaches to improving air quality management. National stakeholder workshops were also organized in several Participating Countries to introduce EANET activities and promote greater involvement of national institutions and stakeholders.

EANET increasingly used online and digital communication tools to disseminate information. The EANET website, newsletters, web stories, online workshops, and other communication materials were used to share information on EANET activities, scientific findings, and regional air pollution issues with a broader audience. By these public awareness activities, the EANET is increasing its

visibility and strengthening stakeholder engagement and promoting regional cooperation for improved air quality management in East Asia.

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