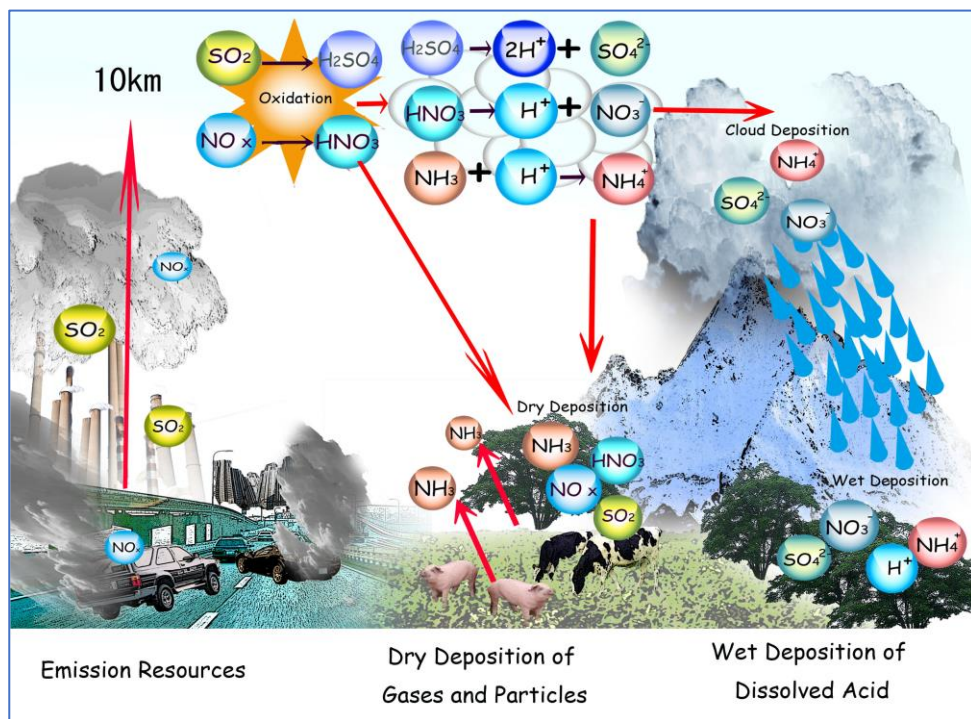


**30 Years of Acid  
Deposition  
Monitoring  
Network in East  
Asia (EANET) and  
Its Future Direction**



# Background



Need for regional cooperation



Air pollution including acid deposition **negatively impacts ecosystems** and **health** and **needs regional cooperation** to strengthen national and local actions.

What is **EANET**?



# Establishment of EANET – an Intergovernmental Initiative

The Acid Deposition Monitoring Network in East Asia (EANET) was established in 2001 as an intergovernmental initiative with the following objectives:

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



**13 Participating Countries**

# History of Acid Deposition Monitoring Network in East Asia (EANET)

1993

~

1997

1998

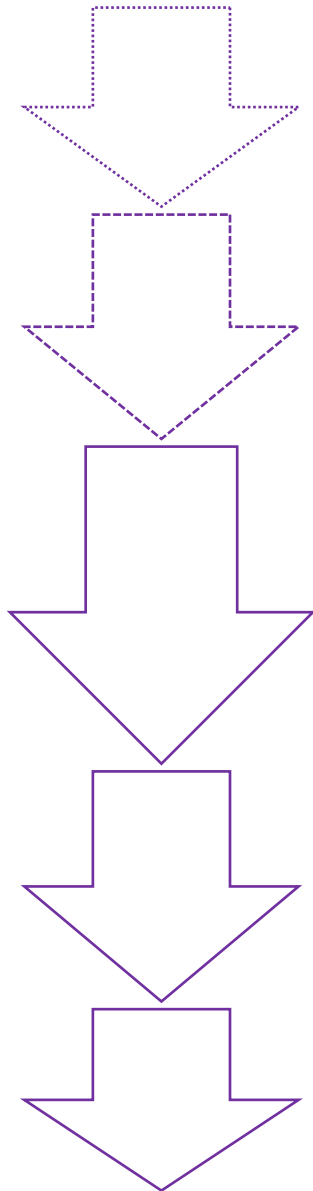
~

2000

2001

2012

2021



Expert Meetings of EANET were held for 4 times

## *Preparatory Phase*

The 1<sup>st</sup> Intergovernmental Meeting of EANET (IG1:1998)

Prepared the tentative Design of EANET

Ten countries in East Asia participated in EANET

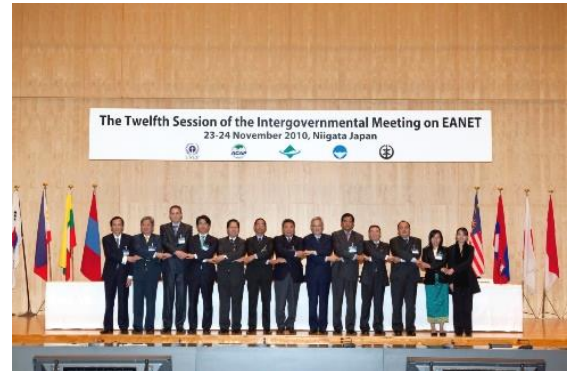
## *Regular Phase*

IG2(2000) Adoption of “**Joint Announcement on the Implementation of EANET**” and “**Tentative Design of EANET**”

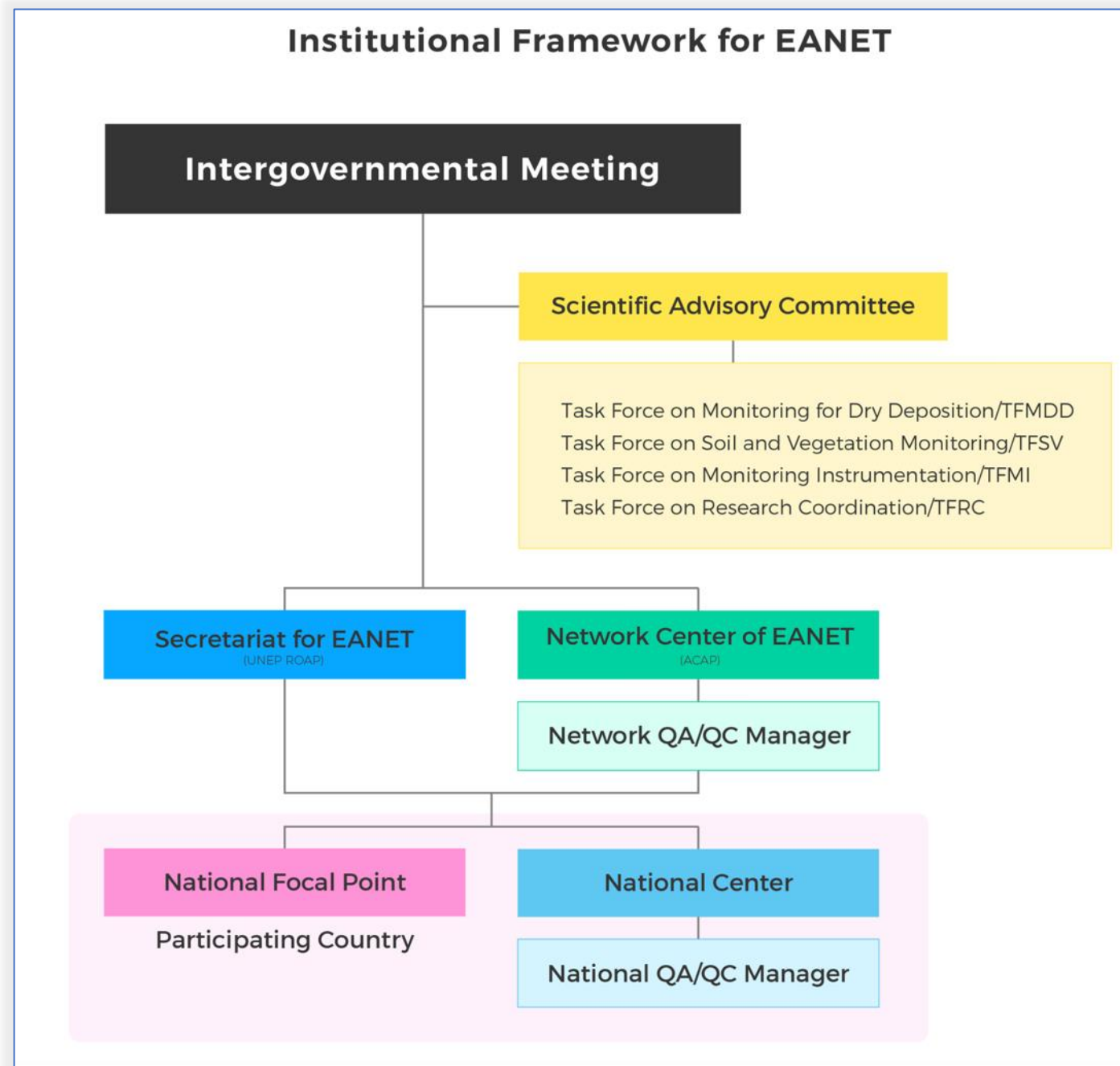
Cambodia(2001)、Lao(2002)、Myanmar(2005) joined

IG12(2010) Adoption of “**Instrument for Strengthening the EANET**”

IG23(2021) Adoption of “**The Supplementary Document (Annex) to the Instrument for Strengthening the EANET**” and establishment of **Project Fund**



# Organizational Structure of the EANET





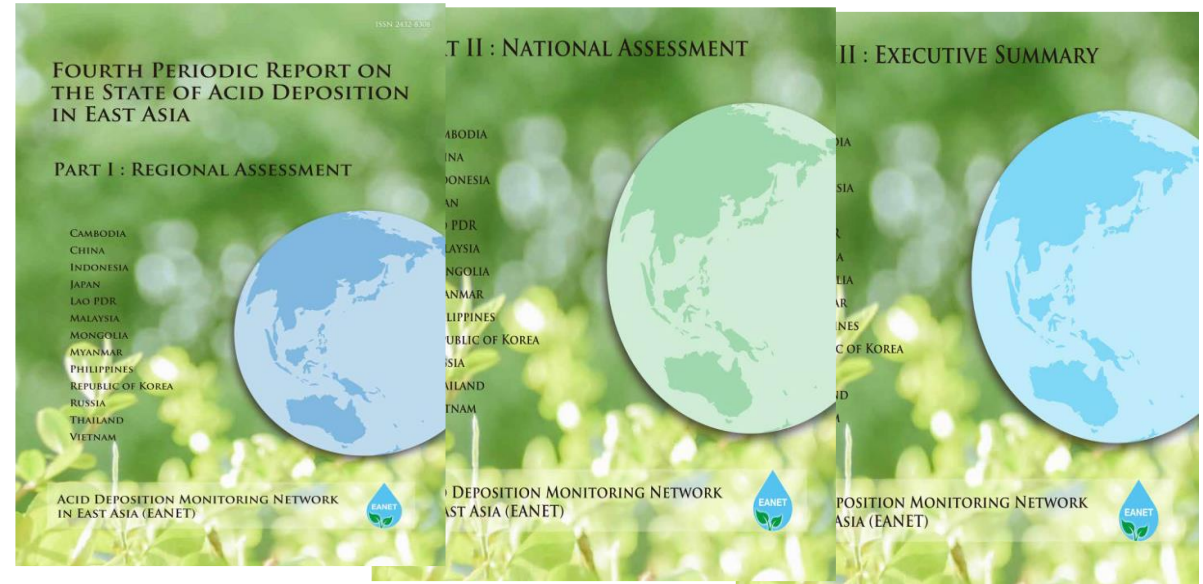
# From Data to Policy: EANET Data and Report Annual Data Report and Periodic Report (PRSAD)



## Monitoring Data:

- **Dry dep/air pollutants:**
  - 66 sites: 26 urban, 19 rural, and 21 remote; 61 wet deposition, 54 dry deposition.
  - Item: SO<sub>2</sub>, NO, NO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub>/PM<sub>2.5</sub>, O<sub>3</sub>, **HNO<sub>3</sub>, HCl, NH<sub>3</sub>, and PM components**
- **Wet Dep:** precipitation concentrations.
- **Eco-impacts: totally 19 sites;** 16 soil and vegetation sites; 6 inland aquatic sites; 2 catchment;
- **Inter-laboratory comparison** projects for QA/QC

## The Fourth Periodic Report on the State of Acid Deposition in East Asia (PRSAD4)



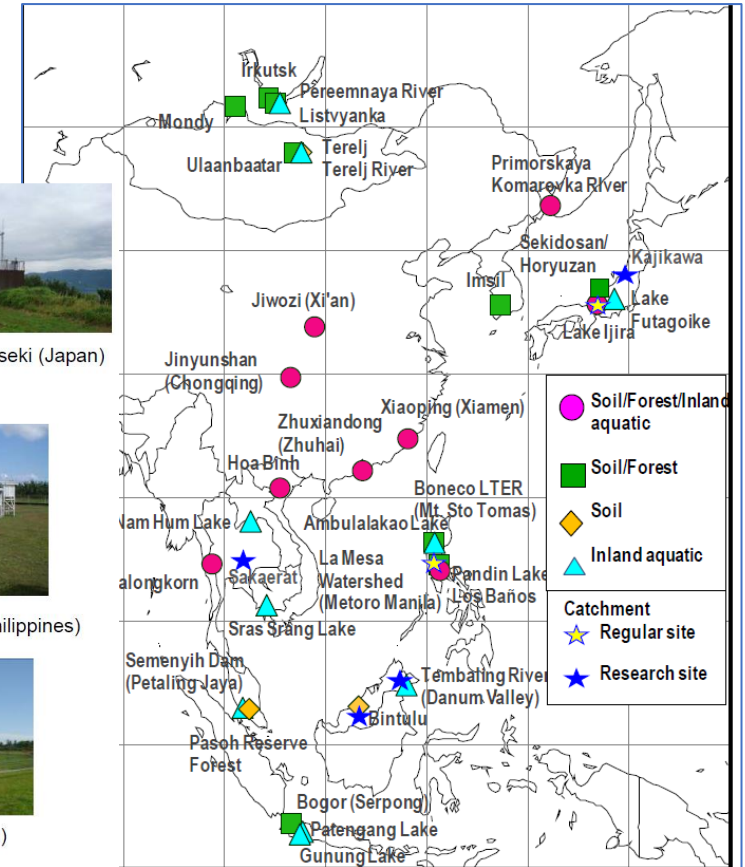
# Achievements: Coordinated Monitoring Network

## Deposition Monitoring Sites



Successfully established and operating monitoring network in the region for more than 20 years

## Ecological Impacts Monitoring Sites



- Wet deposition: 61 sites
- Dry deposition: 54 sites

- Soil and vegetation monitoring: 20 areas
- Inland aquatic environment: 19 lakes/ rivers
- Catchment: 2 sites



Primorskaya (Russia)



Terej (Mongolia)



Xiamen (China)



Imsil (R. of Korea)



Sado-seki (Japan)



Phnom Penh (Cambodia)



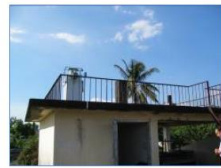
Vientiane (Lao PDR)



Hoa Binh (Viet Nam)



Los Baños (Philippines)



Yangon (Myanmar)



Bangkok (Thailand)



Tanah Rata (Malaysia)



Maros (Indonesia)

## EANET: Science and Data

### **EANET Monitoring Activities(Surface and mountain):**

#### Air Pollutants:

- $\text{SO}_2$ ,  $\text{NO}_2$  ( $\text{NO}_x$ ),  $\text{O}_3$ , (CO),  $\text{PM}_{10}$ ,  $\text{PM}_{2.5}$
- $\text{PM}_{2.5}$  components:  $\text{NH}_4^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ , EC(BC), OC, (Crustal and trace elements)
- $\text{HNO}_3$ , HCl,  $\text{NH}_3$

#### Dry deposition:

- $\text{SO}_2$ ,  $\text{NO}_x$ ,  $\text{O}_3$
- $\text{PM}_{2.5}$ ( $\text{NH}_4^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ )

#### Wet deposition (rain water):

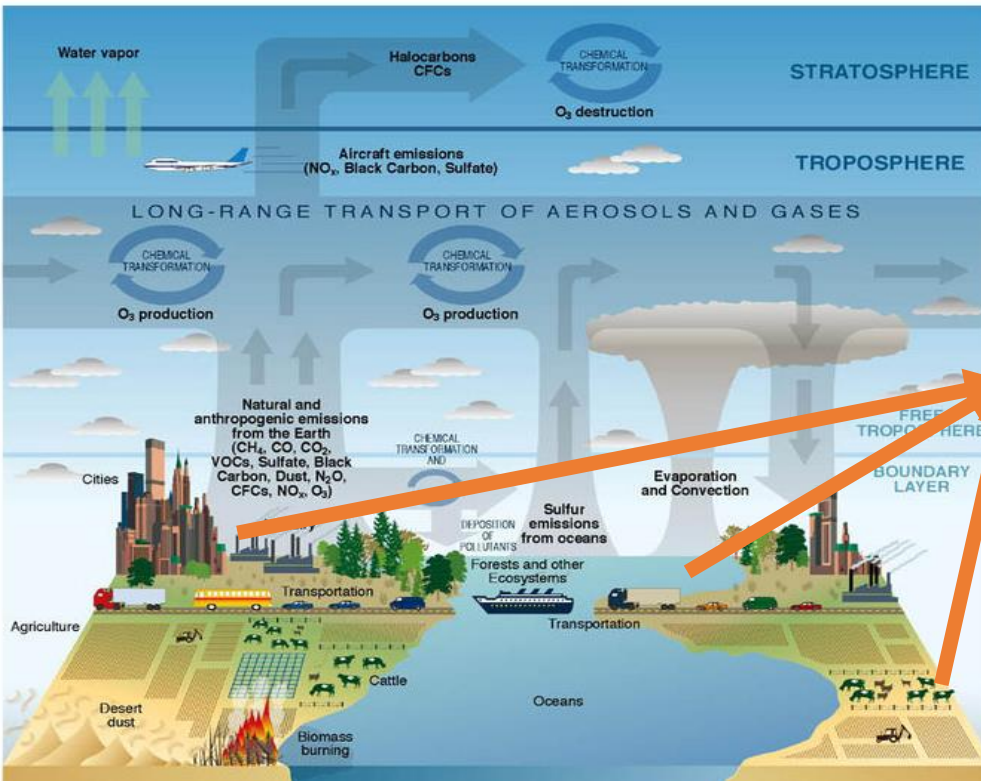
- $\text{NH}_4^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$
- pH, EC

### **Future expectation:**

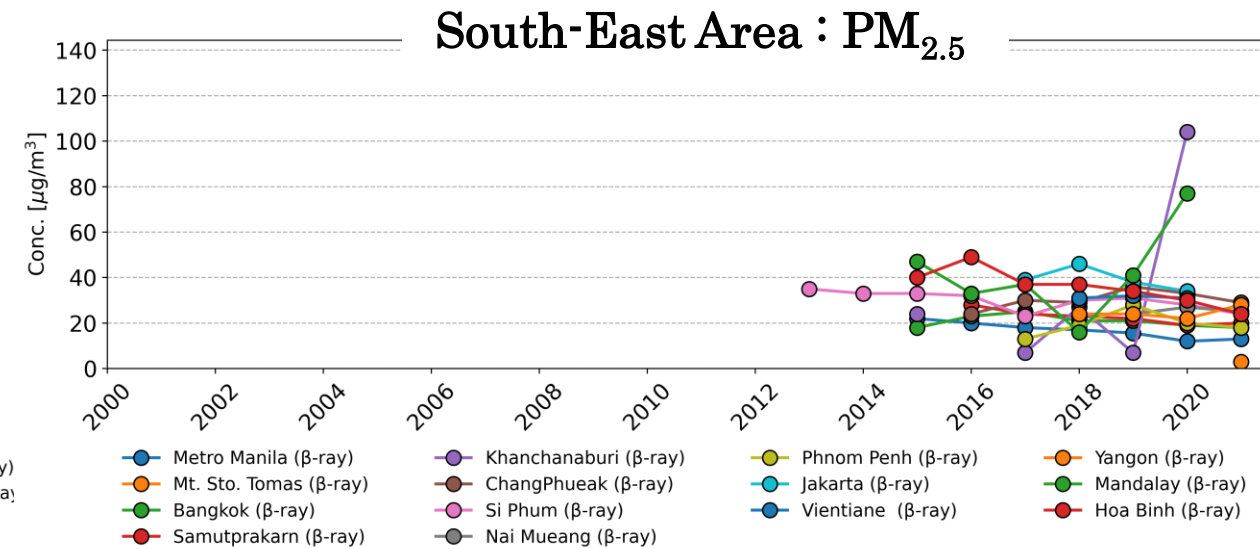
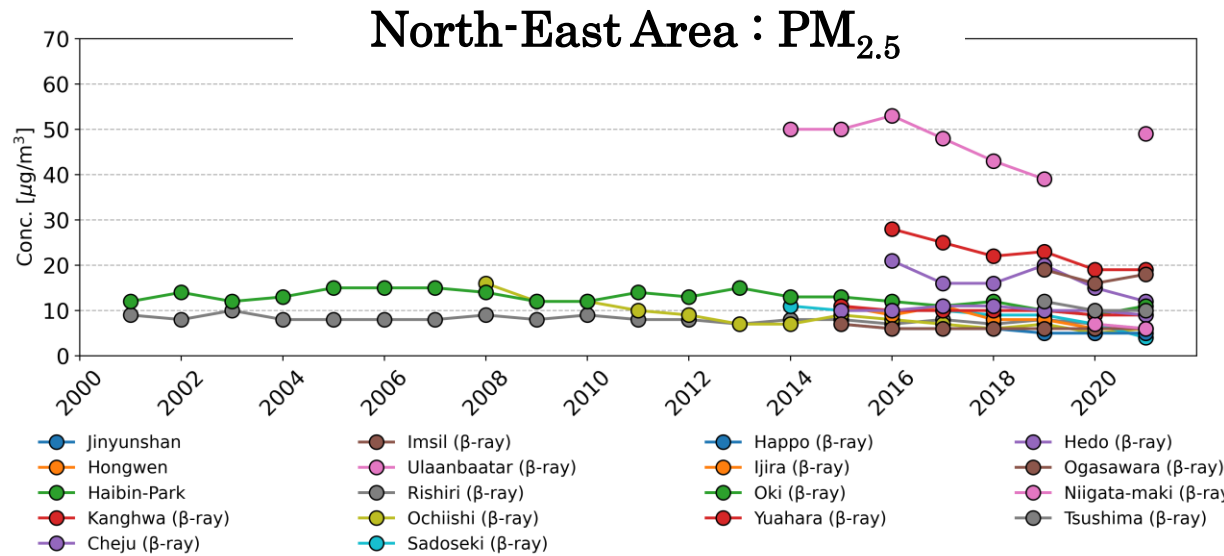
AQ: CO, VOC,  $\text{PM}_{2.5}$  components, other pollutants such as toxic, POPs; more emis inv. and modeling

Acid dep: relatively complete

Climate: relate AQ and climate (SLCP: BC,  $\text{PM}_{2.5}$ ,  $\text{O}_3$  )



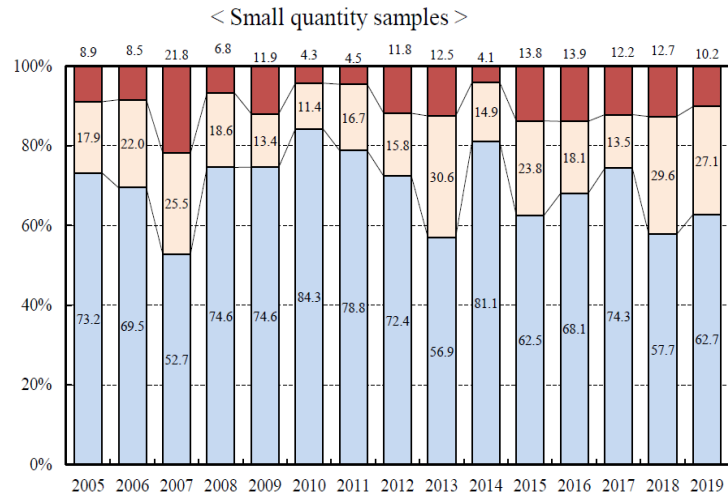
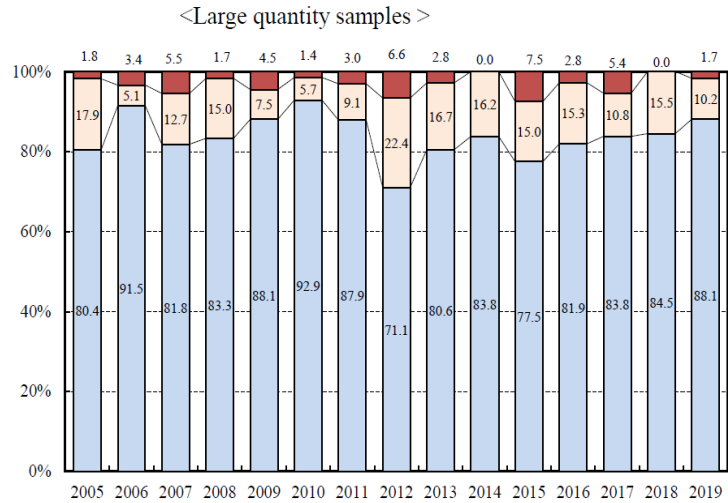
# Ambient Concentration of PM<sub>2.5</sub> (2000-2021)



- **SO<sub>2</sub> related air pollution and acid deposition improved**, especially in NEA and China. PM and sulfur problems in SEA may need more attention.
- **No declining trend of PM<sub>10</sub> and PM<sub>2.5</sub>** in some countries. Ulaanbaatar of Mongolia, Jakarta of Indonesia, Hoa Binh of Vietnam reported the high PM<sub>10</sub> concentrations.
- **NO<sub>x</sub> and O<sub>3</sub> pollution still at high level.**
- **Trend of increasing O<sub>3</sub> concentration in some countries.**
- Sites of the Republic of Korea and Japan had the highest O<sub>3</sub> concentration (Complicated process). Thailand had a increasing trend.
- Mongolia had the highest NO<sub>x</sub> average concentration, and Philippines reported the next highest NO<sub>x</sub>.
- Monitoring item and sites are increasing. Long-term monitoring at more sites, of more item for air quality, climate change and impact are needed for assessment.

# Achievements: Development of High-Quality Datasets

**High-quality datasets** have been developed through the implementation of QA/QC measures at the national levels and in the Inter-laboratory Comparison Projects. **Over 20 years of data are available for download on EANET website** (<https://www.eanet.asia>).



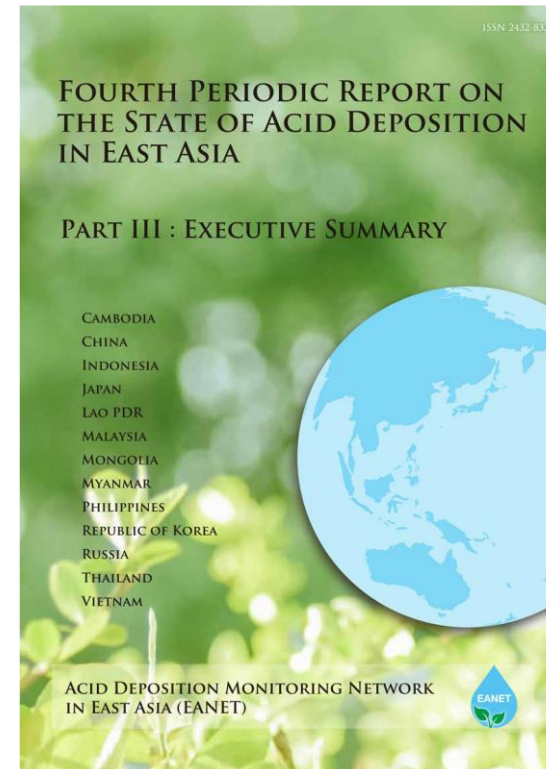
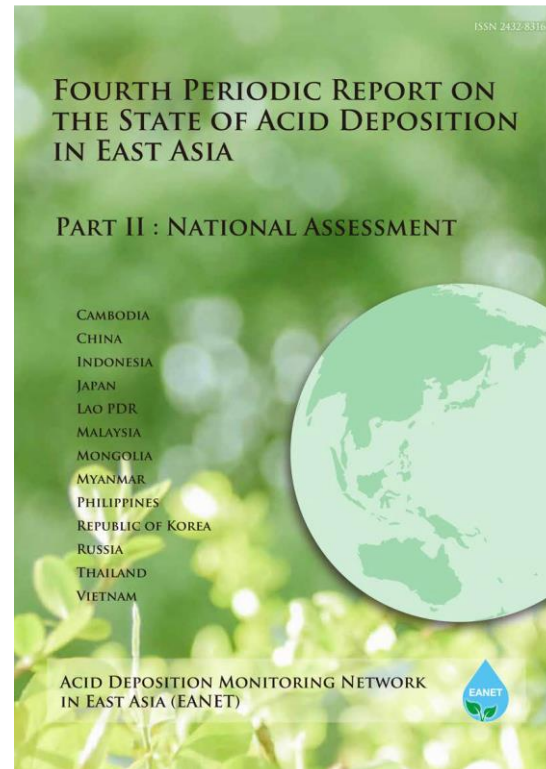
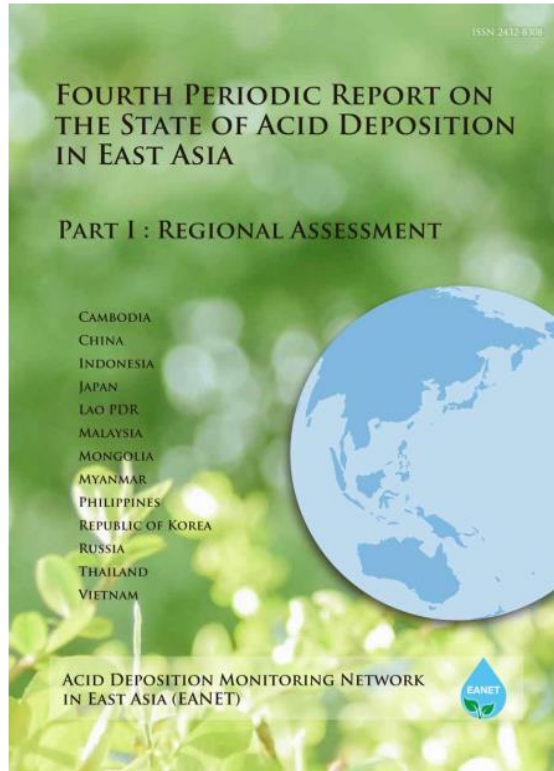
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Title																					
Update																					
Size																					
Kind																					
Downloads																					
Dry Monthly 2020																					
Catchment 2020																					
Data Report 2020																					
Dry Deposition Amounts 2020																					



 EANET Data Report

# Achievements: PRSAD

Periodic Reports on the State of Acid Deposition in East Asia (PRSAD) were published by EANET in 2006, 2011, 2016, and 2021 respectively as a comprehensive scientific assessment report describing the outcome of EANET's monitoring activities

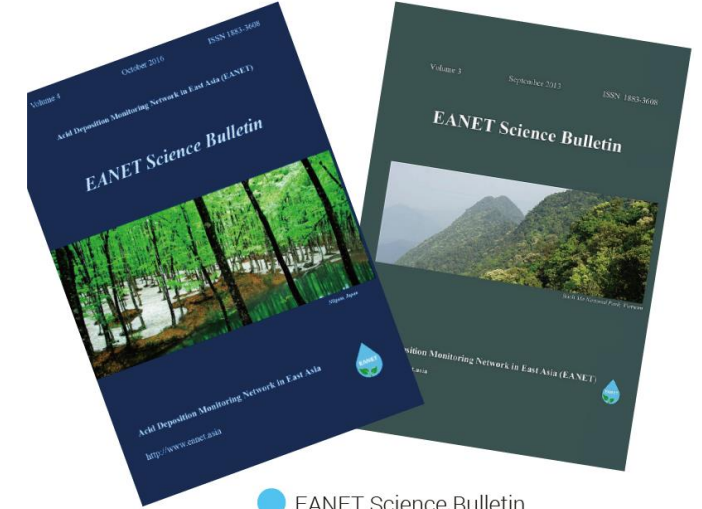


**The understanding of acid deposition in the region has been increased significantly**

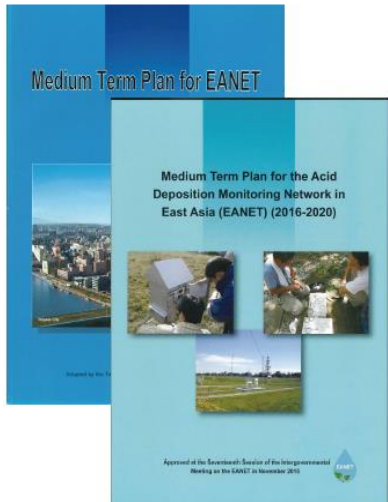
# Achievements: Policy Support and Knowledge Products



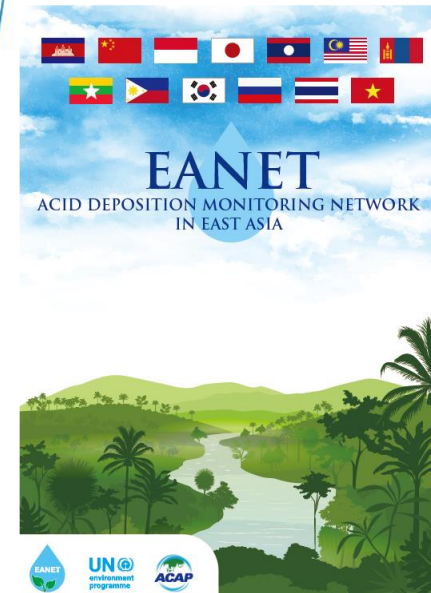
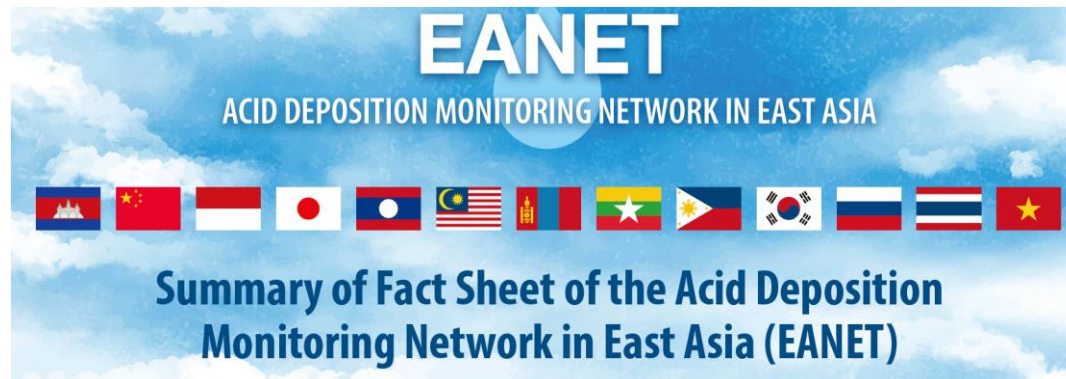
● Guideline, Technical Manuals and Training materials



● EANET Science Bulletin



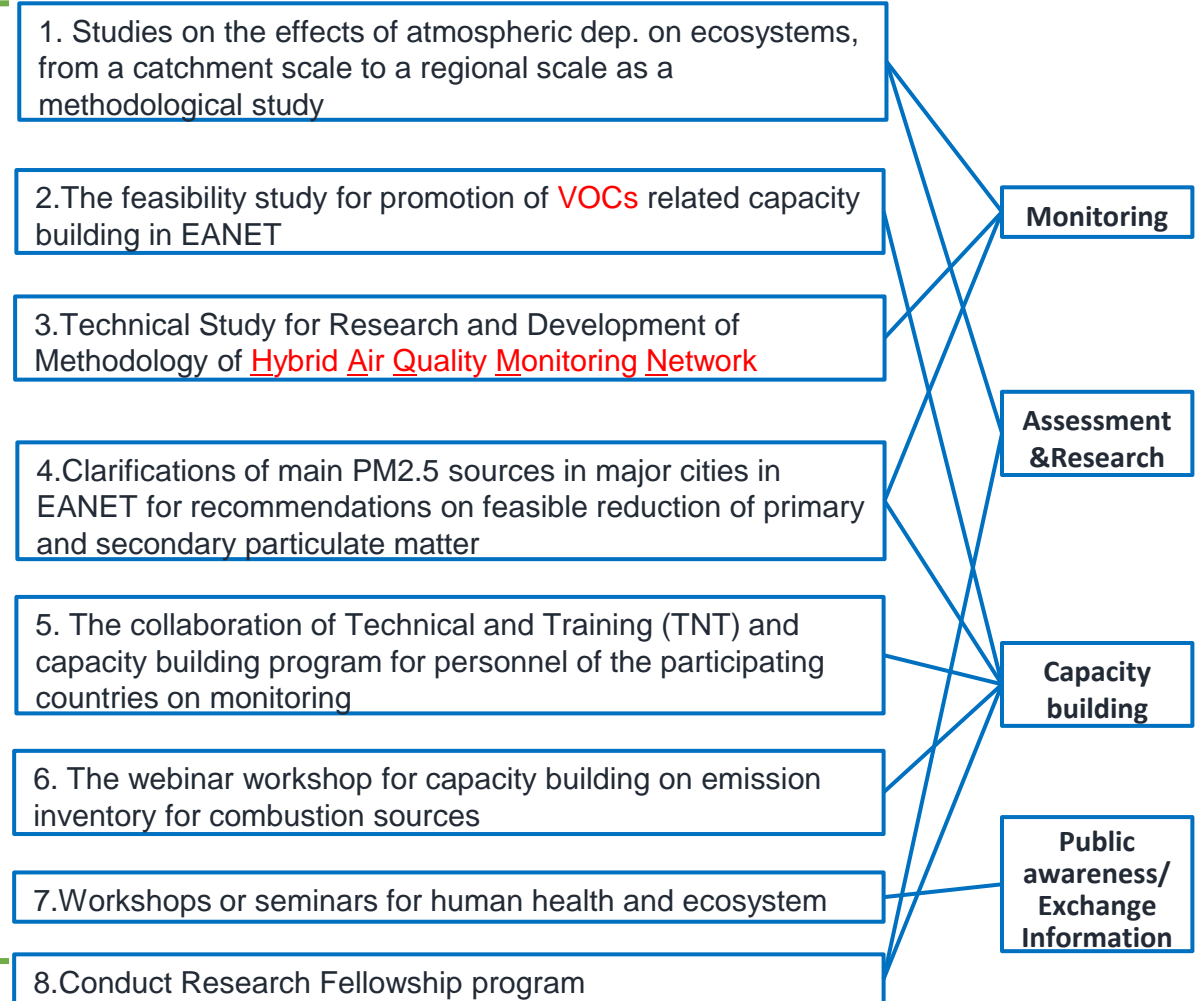
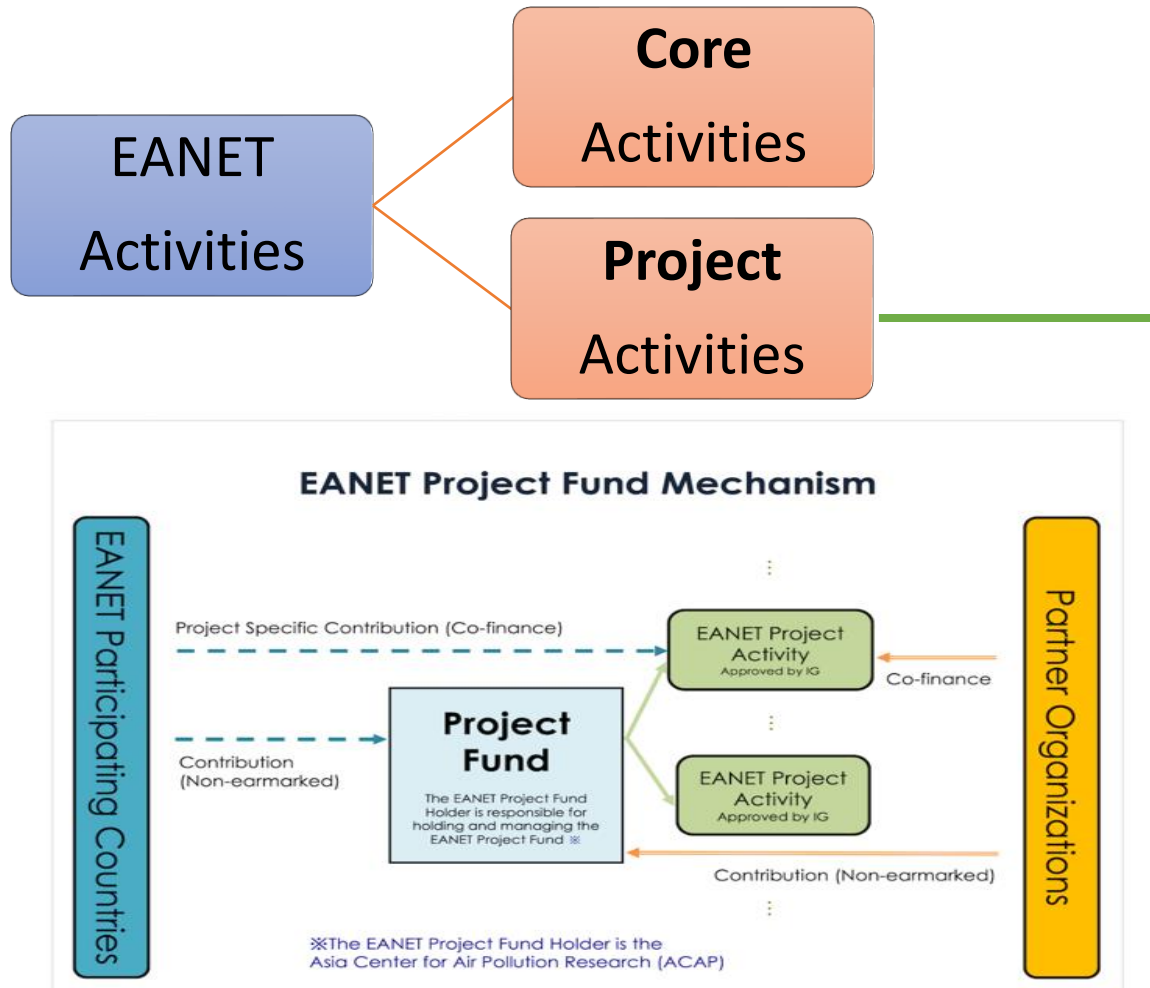
● Medium Term Plan for the EANET





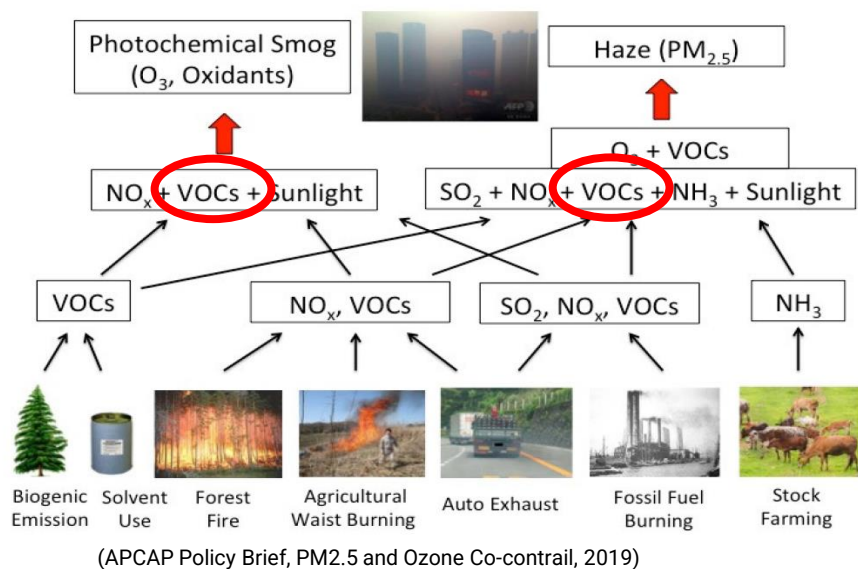
# Scope Expansion and EANET Projects: New Directions

- **Scope expansion: air pollution + acid deposition**, co-benefit to climate change
- Science and new technology
- **Cooperation**

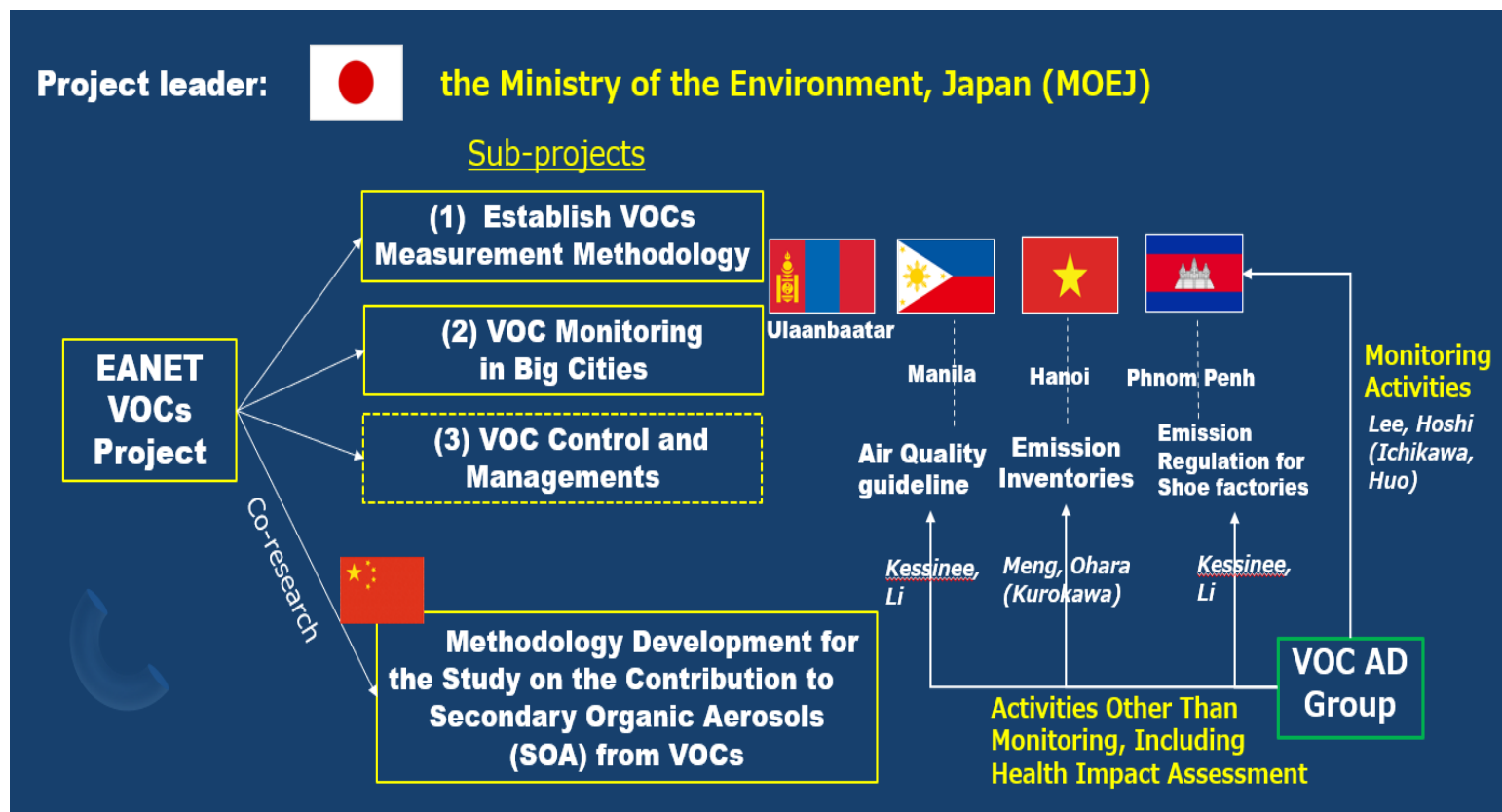




# The feasibility study for promotion of VOCs related capacity building in EANET (2024-2026)



- Precursors of PM<sub>2.5</sub> and O<sub>3</sub>;
- Involved in atmospheric chemistry and affect the formation and removal of other air pollutants.
- Some of VOCs has health impacts
- Measurement is challenging



# VOC Advisory Group Members

## Chair



Dr. Toshimasa Ohara,  
Research Director,  
Center for Environmental Science in Saitama (CESS),  
the SAC member of Japan for the EANET.

Covers Scientific research field of  
1) Monitoring, 2) Measurement,  
3) Atmospheric mechanism/process,  
4) Source Apportionment, 5) Inventory,  
6) Impact and control policy

## Members (ABC order)



Prof. Fan Meng, Deputy  
Director General, Asia  
Center for Air Pollution  
Research / Network  
Center for the EANET



Prof. Gangwoong Lee,  
Department of  
Environmental Science,  
HANKUK University of  
Foreign Studies, R. of  
Korea



Prof. Hong Li,  
Institute of Atmospheric  
Environment, Chinese  
Research Academy of  
Environmental Sciences,  
China



Dr. Junya Hoshi,  
Researcher Manager,  
Tokyo Metropolitan  
Institute of Environment  
Protection, Japan



Dr. Kessinee Unapumnak,  
Planning and Evaluation  
Subdivision, Air Quality  
and Noise Management  
Division, Pollution  
Control Department,  
Thailand



# EANET Project “Methodology study for development of LCS hybrid air quality monitoring network (HAQMN)”



STEP BY STEP SOLUTIONS

- **Data quality** is improving.
- **More sites and items** are desirable.
- **New technology** such as **low-cost** sensors, remote sensing: more coverage, higher resolution and at lower cost.



Disseminating the deliverables to EANET PCs



HAQMN seminar and onsite training for capacity building



Developing technical materials



Launch of HAQMN in selected cities:  
- Parallel measurement test  
- Small-scale HAQMN



# Capacity building: Training, Workshop and Technical Mission

EANET Individual Training in Nov. 2022



Workshop on Emission Inventory for the Transport Sector in Nov. 2022, Manila



# Technical support of EANET to Participating Countries

--Establishing capacity, solving problems, improving QA/QC

	Country	City	Institution	Produced by	Installation
PM2.5	Vietnam	HoaBinh	CENRE/ IMHEM	Environment S.A.	2015/2
	Myanmar	Mandala y	ECD	Environment S.A.	2015/5
	Mongolia	Ulanba ater	NAMEM	Environment S.A.	2015/10
	Indonesia	Jakarta	BMKG	Thermo	2016/7
	Cambodia	Phnom Penh	MOE	DKK-TOA	2017/4
	<b>Philippines</b>	<b>Metro Manilla</b>	<b>EMB</b>	<b>DKK-TOA</b>	<b>2017/10</b>
	Myanmar	Yangon	DMH	DKK-TOA	2018/3
	LAO PDR	Vientian e	NRERI	DKK-TOA	2018/11
Ozone	Cambodia	Phnom Penh	MOE GDEP	Dylec	2019/8



Installation of automatic PM2.5 monitoring equipment in the Philippines in 2017

# Technical support of EANET to Participating Countries --Establishing capacity, solving problems, improving QA/QC

## Technical support to the Philippines:

- ◆ 2007
- ◆ 2010
- ◆ 2011
- ◆ 2012
- ◆ 2014
- ◆ 2016
- ◆ 2017



# EANET – an Intergovernmental Initiative in Asia

**together**

with 13 of East Asia countries



- Monitoring together
- Analysis together
- Control pollution emission together
- Help together
- Learn together
- Increase the capacity and ability together



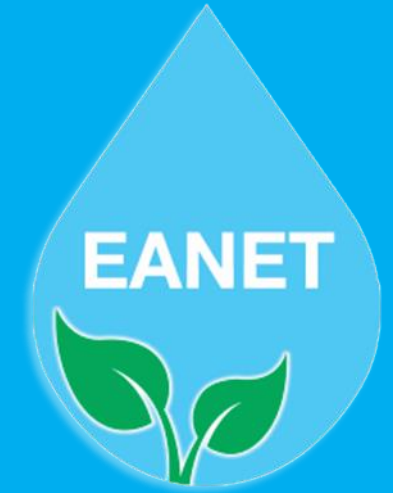
**For the Better Air Quality and for the Better life**

- Through together with 13 of East Asia countries
- Monitoring together
- Analysis together
- Control pollution emission together
- Help together
- Learn together
- Increase the capacity and ability together



# Thank you

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UN Environment Programme for Asia Pacific  
[eanetsecretariat@un.org](mailto:eanetsecretariat@un.org)  
[www.eanet.asia](http://www.eanet.asia)  
[www.unep.org](http://www.unep.org)

Network Center for the EANET  
Asia Center for Air Pollution Research  
<https://www.acap.asia/en/>  
[eanet@acap.asia](mailto:eanet@acap.asia)

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