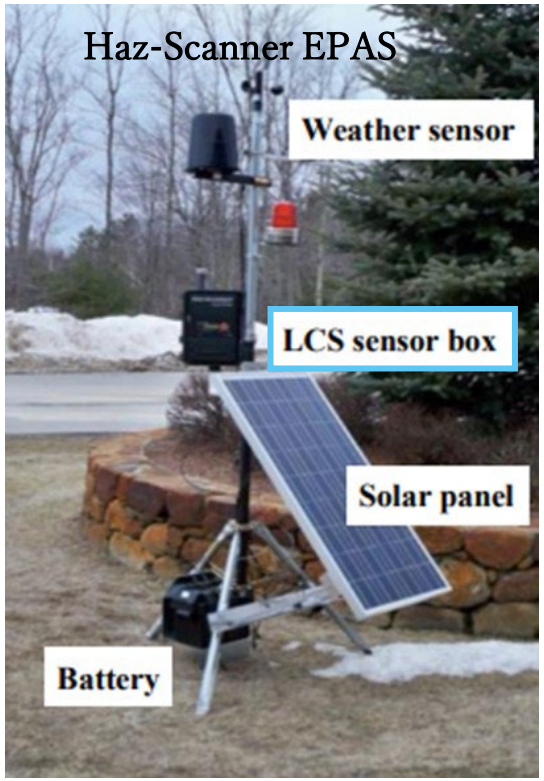
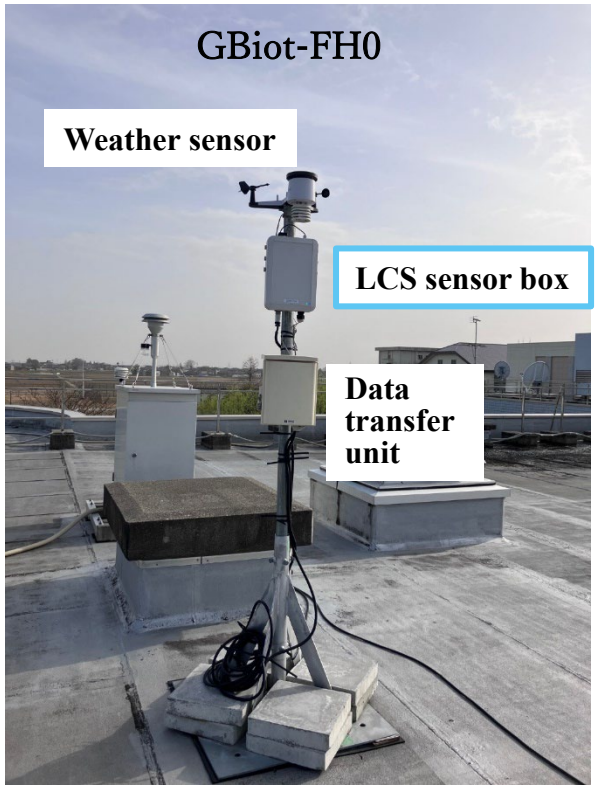
Session 3

Introduction on **LCS Technical studies** in **Vietnam** and **Myanmar**

EANET's approach to LCS

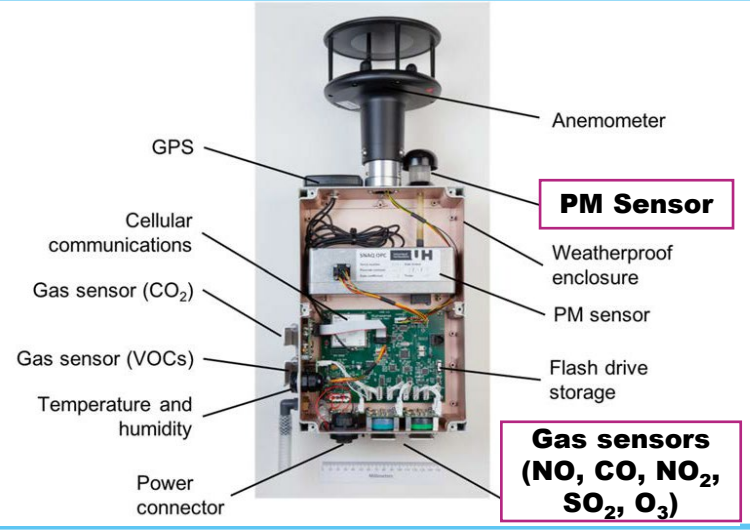
- LCS has been developed remarkably in recent years and is now widely used to provide information on the atmospheric environment to citizens with data communication networks.
- In most areas in the Asian region, air quality monitoring capacities of the national and local governments are still limited and need to be developed to improve their air quality.
- It is necessary for practitioners to consider how they can wisely select and use reliable LCS with the network of reference-level sensors in an integrated manner (HAQMN) for enhanced air quality monitoring.





Example of the inside of LCS sensor box

(WMO-No. 1215, An Update on Low-cost Sensors for the Measurement of Atmospheric Composition)



Objective of EANET Project (HAQMN)

1. Demonstration of HAQMN concept

- To demonstrate the effectiveness of the HAQMN concept in the EANET areas where resource to develop an air quality monitoring network is limited.
- Operating a small-sized HAQMN to collect technical knowledge and evaluate the reliabilities of LCS.

2. Developing knowledge products of HAQMN and LCS

- Technical knowledge products such as technical manuals for LCS will be developed for the policymakers, experts, and practitioners in the air quality monitoring field.

3. Building capacity

- Two capacity-building programs will be implemented for the policymakers, experts, and practitioners in the air quality monitoring field.

Steps and Implementation Plan

Disseminating the deliverables to EANET PCs

HAQMN seminar and onsite training for capacity building

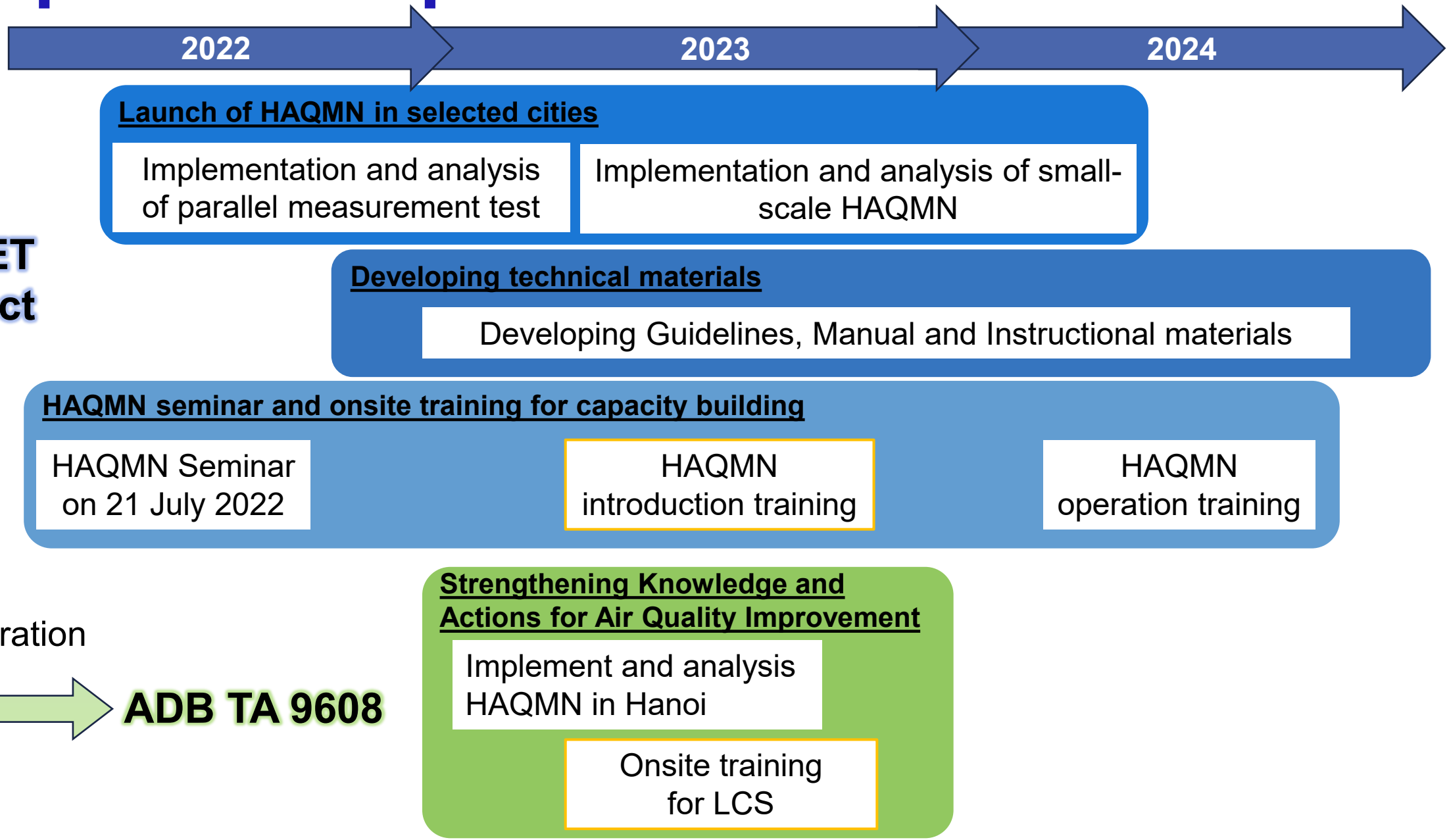
Developing technical materials

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

Disseminating the deliverables to EANET PCs

- **Guidelines on establishing HAQMN**
- **Manual for Low-cost Sensor Systems Operation**
- **Training Curriculum and Instructional Materials for Establishing and Running HAQMN**

Steps and Implementation Plan



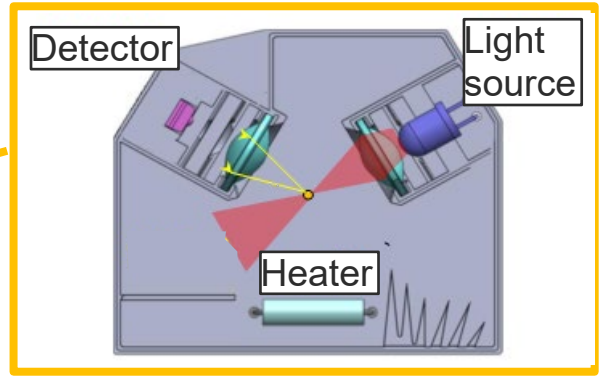
HAQMN project in 2022

Monitoring at Hoa Binh, Vietnam

Target: PM2.5

LCS can obtain PM2.5 concentration with 1-min time resolution based on light scattering method.

Data can be download manually.



Parallel monitoring was conducted at EANET Hoa Binh, LCS was relocated in five sites inside the city for small scale HAQMN.

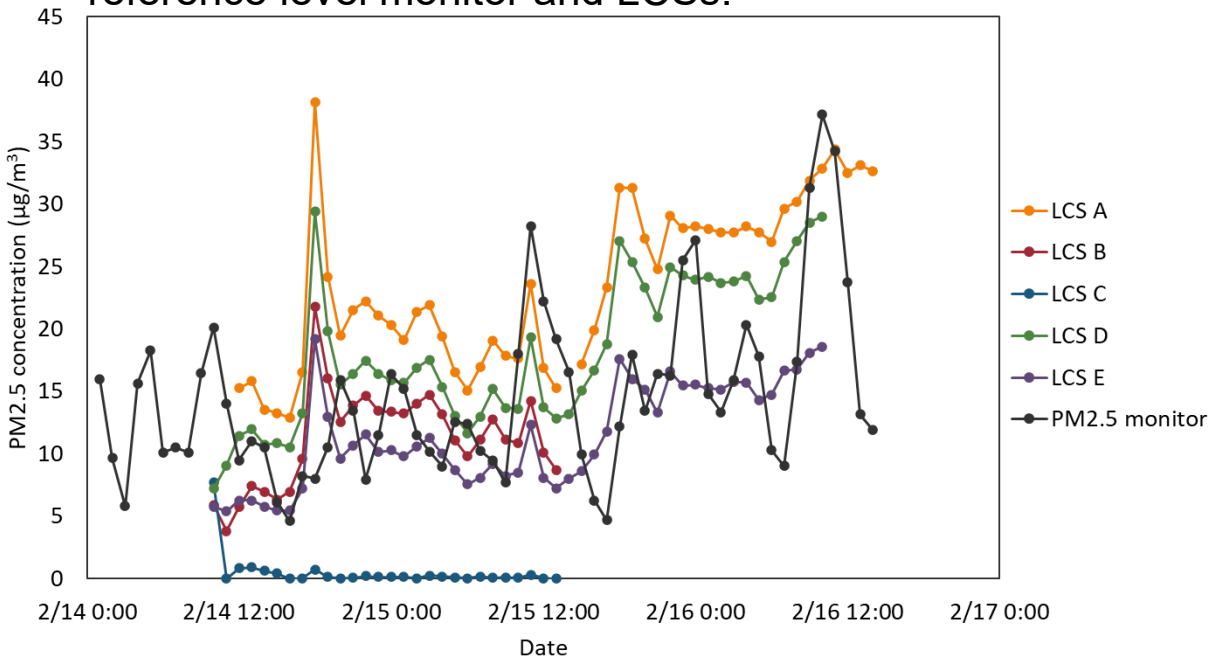
Station name	Management organization
EANET Hoa Binh	Mid- Central Regional Hydro Meteorological Center, National Hydro-Meteorological Service of Vietnam (NHMS), MoNRE
Meteorological station	
Hydrological station	
DONRE office	Department of natural Resource and Environment (DONRE)
CEM office	Center of Environmental Monitoring (CEM)
(National focal point of EANET Vietnam)	Vietnam Institute of Meteorology, Hydrology and Climate Change (IMHEN)

Results from parallel monitoring at Hoa Binh

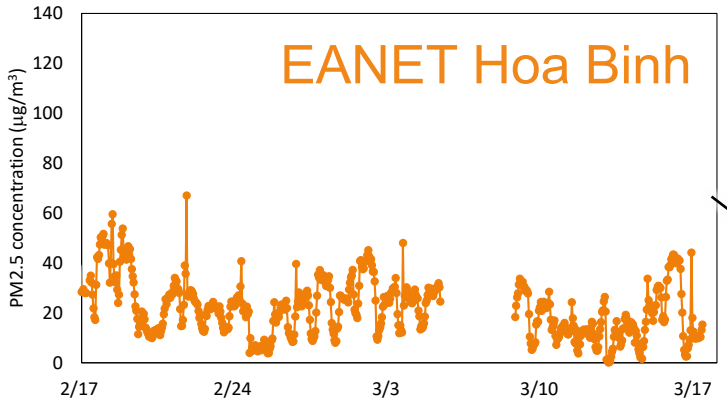
The results of LCSs have similar temporal variation but, PM2.5 monitor has the different variation.

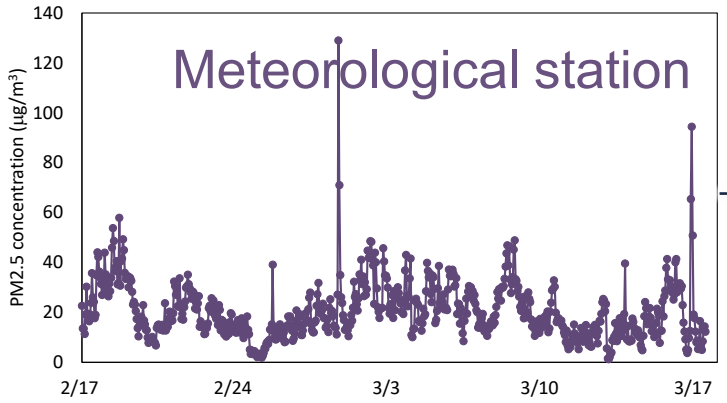
One LCS had the trouble on the mobile battery.

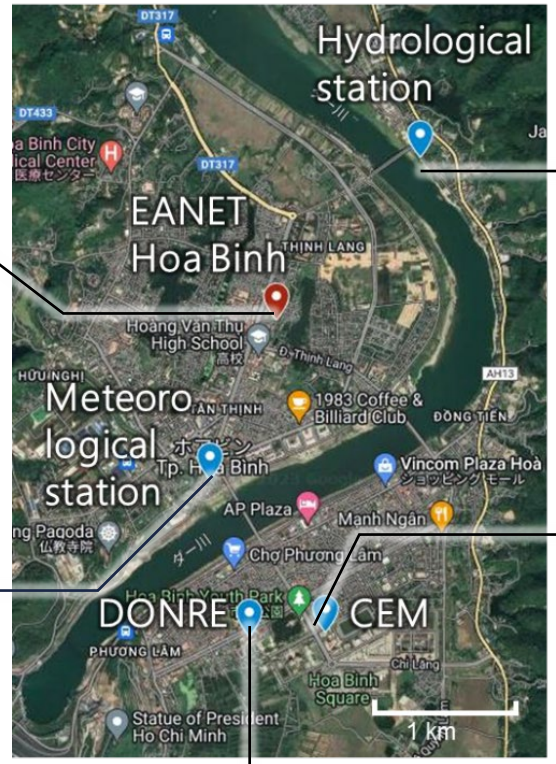
Temporal variations of PM2.5 obtained by reference level monitor and LCSs.

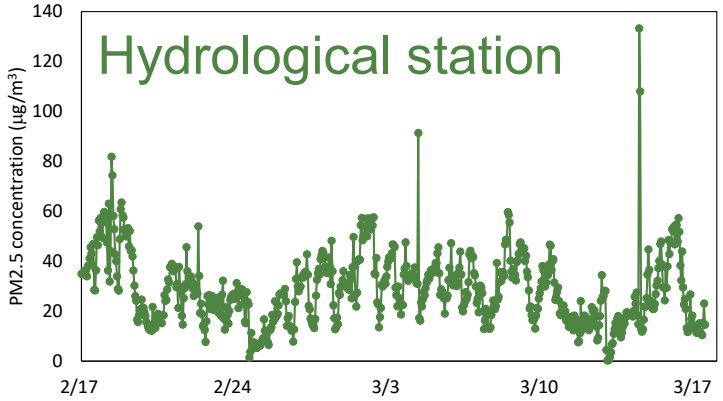


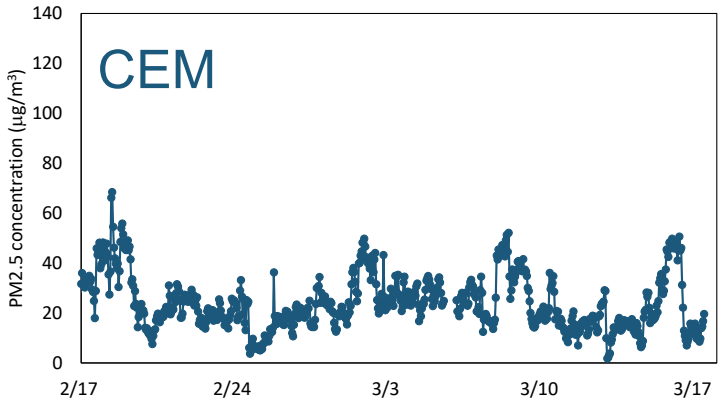
Small scale HAQMN at Hoa Binh

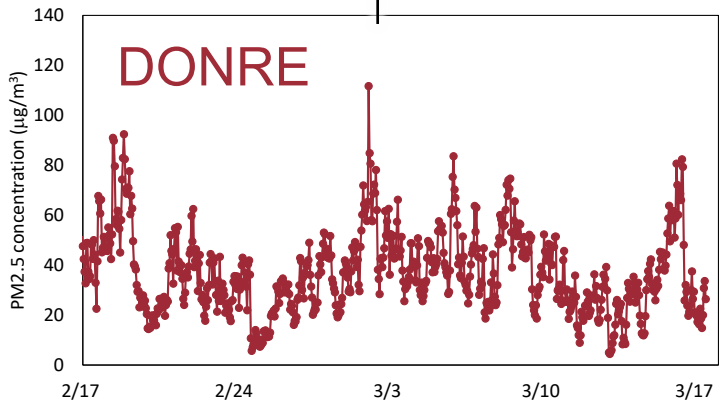












The spikes was obtained in Meteorological station and Hydrological station. It is due to some kind of noise from LCS.

Those spikes should be removed before analyzing the data.

Monitoring at Yangon, Myanmar

Target: PM2.5, O_3, NO_2, meteorological parameters (WS, WD, Temp, RH)

GBiot-FH0

With internet connection

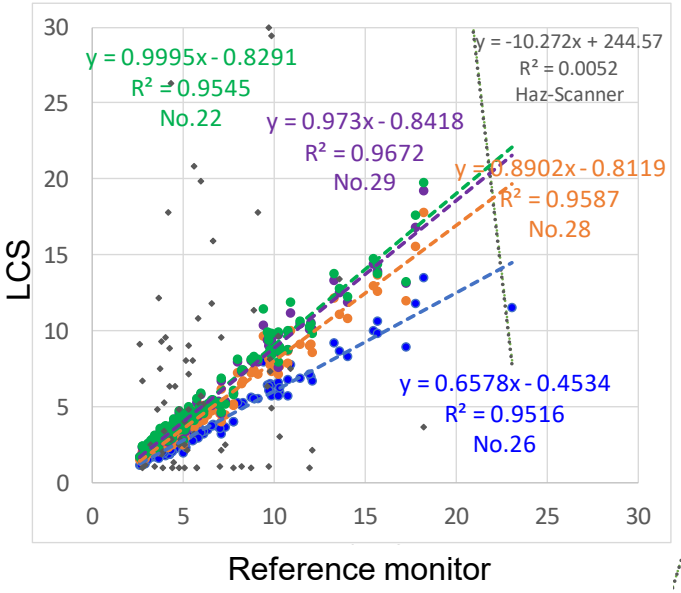
Haz Scanner

Parallel monitoring was conducted at EANET Yangon, LCS was relocated in five sites inside the city for small scale HAQMN.

Station name	Management organization
EANET Yangon	Department of Meteorology and Hydrology (DMH), Ministry of Transport and Communication (MOTC)
Central Yangon	
Shwe Pyi Thar	Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC)
Ywar Thar Gui	
ECD Staff Housing	

Results from parallel monitoring

Parallel monitoring tests were conducted at EANET station of Yangon, Myanmar (rain and dry seasons) and Hoa Binh, Vietnam (dry season).



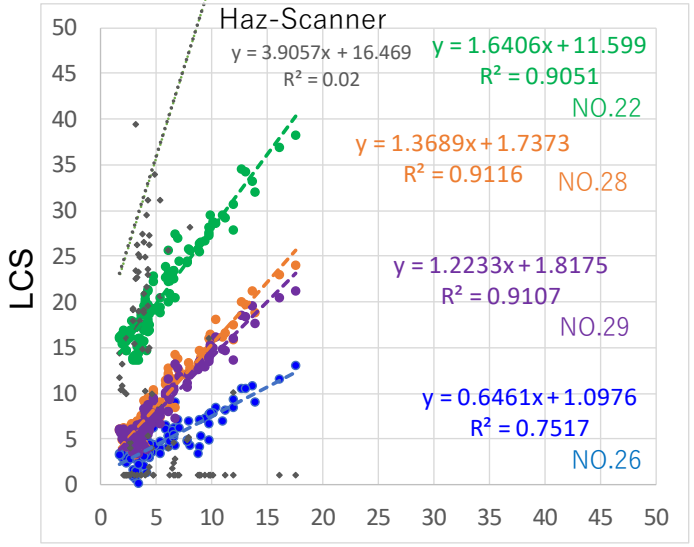
PM2.5

Comparison of PM2.5 concentration in rain season of Myanmar

Some LCSs show the good correlation with reference level monitor.

Ozone

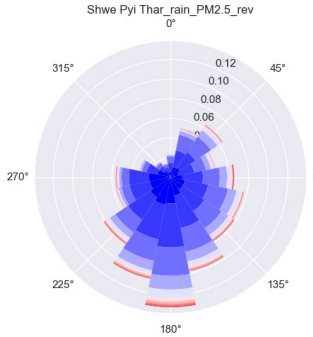
Comparison of O_3 concentration in rain season of Myanmar

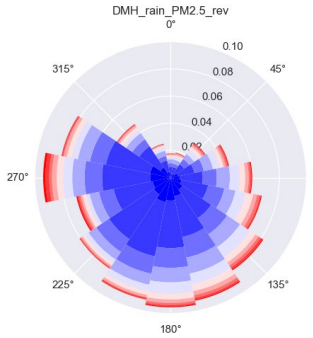


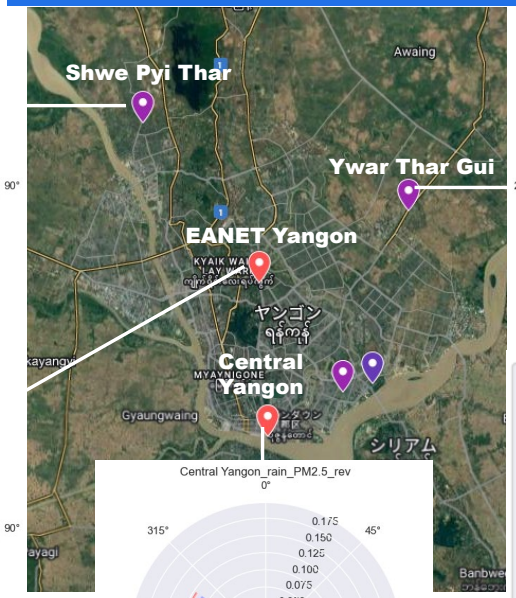
Small scale HAQMN at Yangon

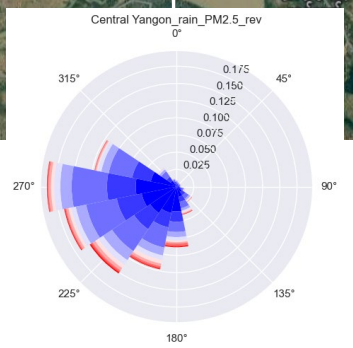
Frequency distribution of PM2.5 concentration by wind direction (Rain and dry season in Yangon, Myanmar)

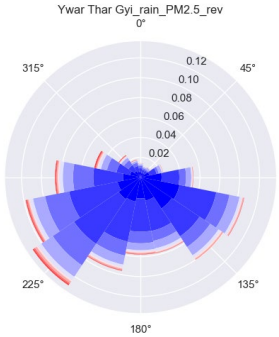
PM2.5 in rain season

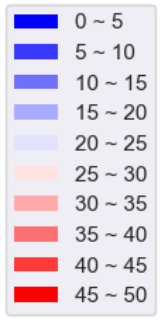






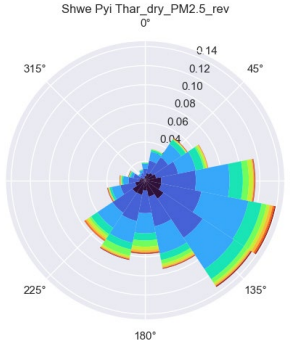


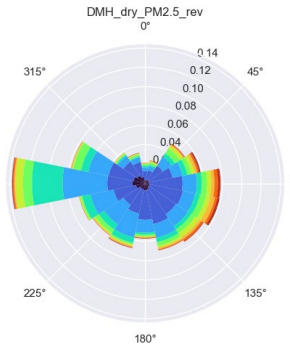


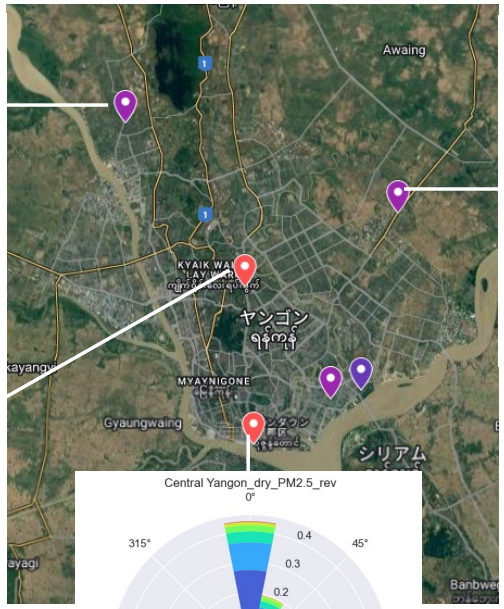


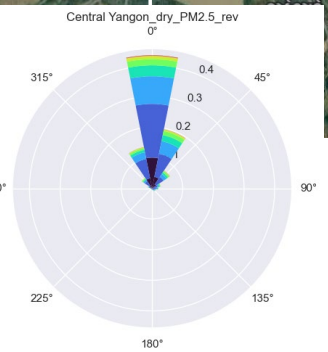
Range of PM2.5 concentration

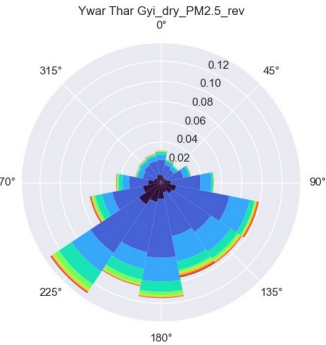
PM2.5 in dry season

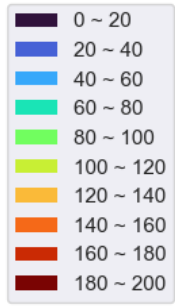










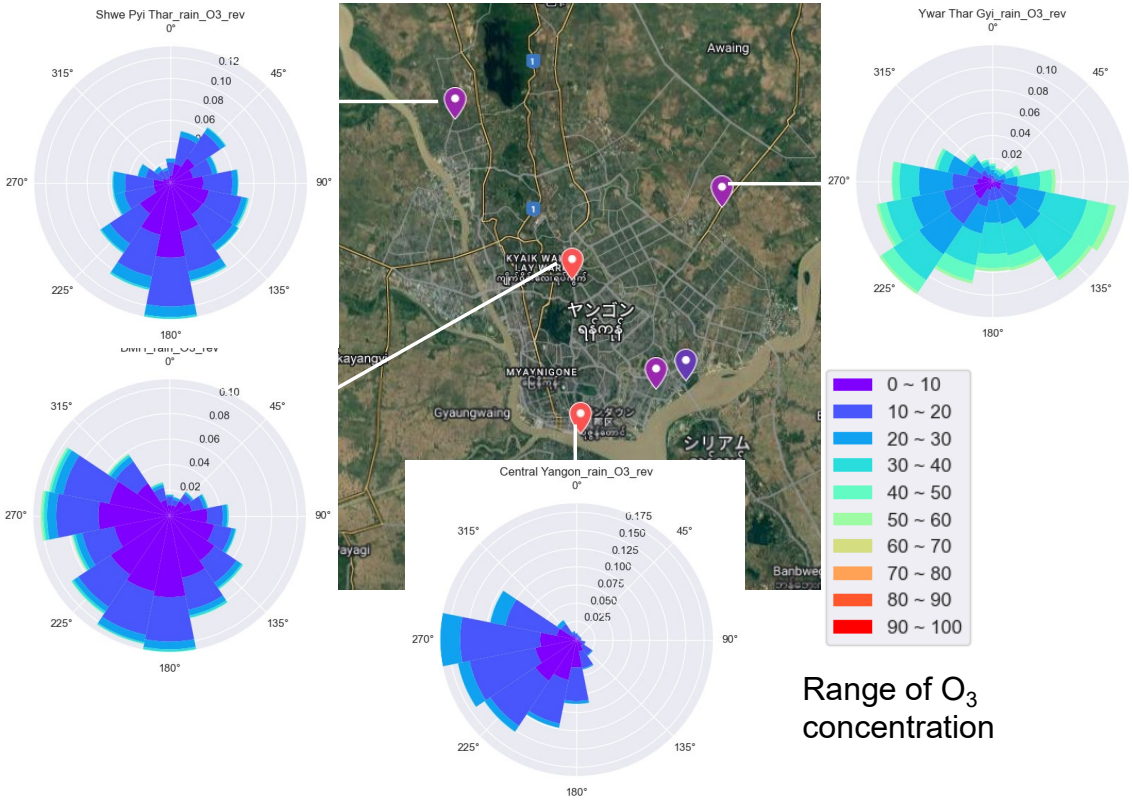


Range of PM2.5 concentration

Small scale HAQMN at Yangon

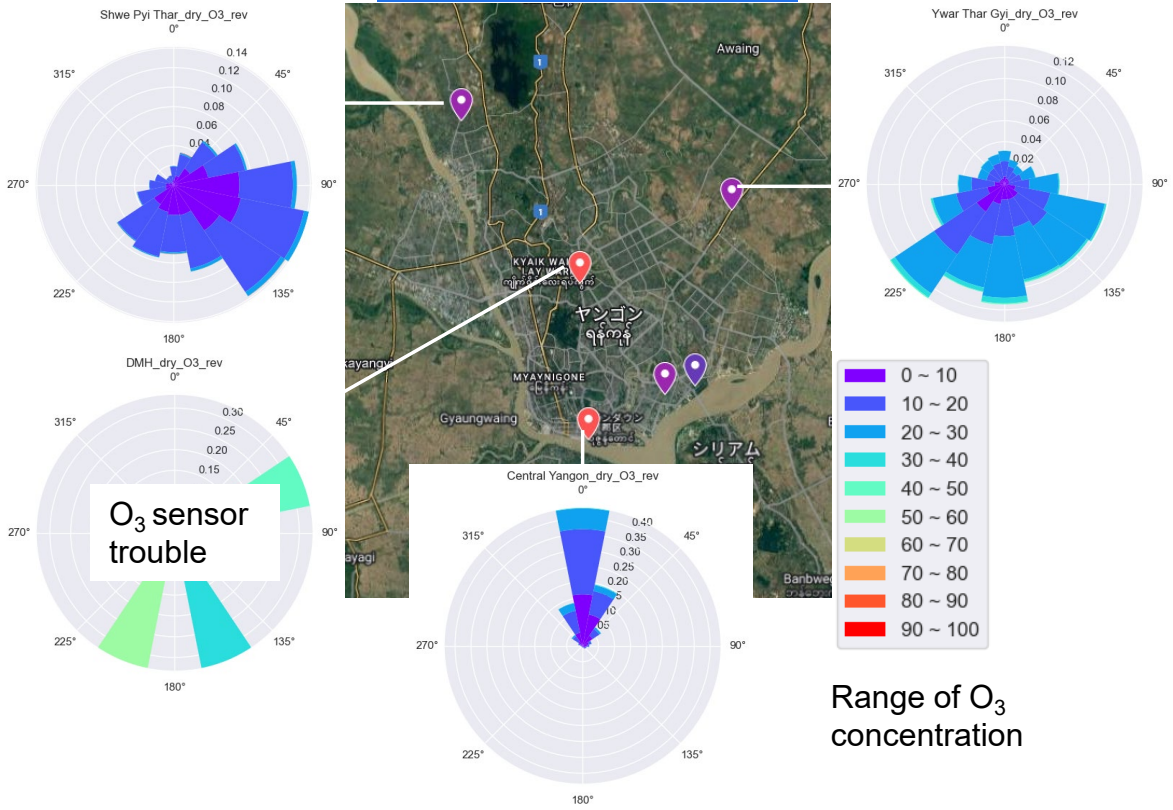
Frequency distribution of O_3 concentration by wind direction (Rain and dry season in Yangon, Myanmar)

O_3 in rain season



Range of O_3 concentration

O_3 in dry season



Range of O_3 concentration

Summary

- Japan-made LCS was introduced coordinating with related institutes in Myanmar and Vietnam and were used for the parallel monitoring and small scale HAQMN.

- Issues based on the infrastructure and environment in Southeast Asia was picked up.
  - Necessary to correct LCS data using the reference level monitor.
  - Necessary to prepare the blackout and internet connection lost.
  - Prevent the fluctuation of electricity voltage.