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AIR QUALITY MONITORING SYSTEMS: INCREASING DATA COVERAGE AND ENSURING RELIABILITY

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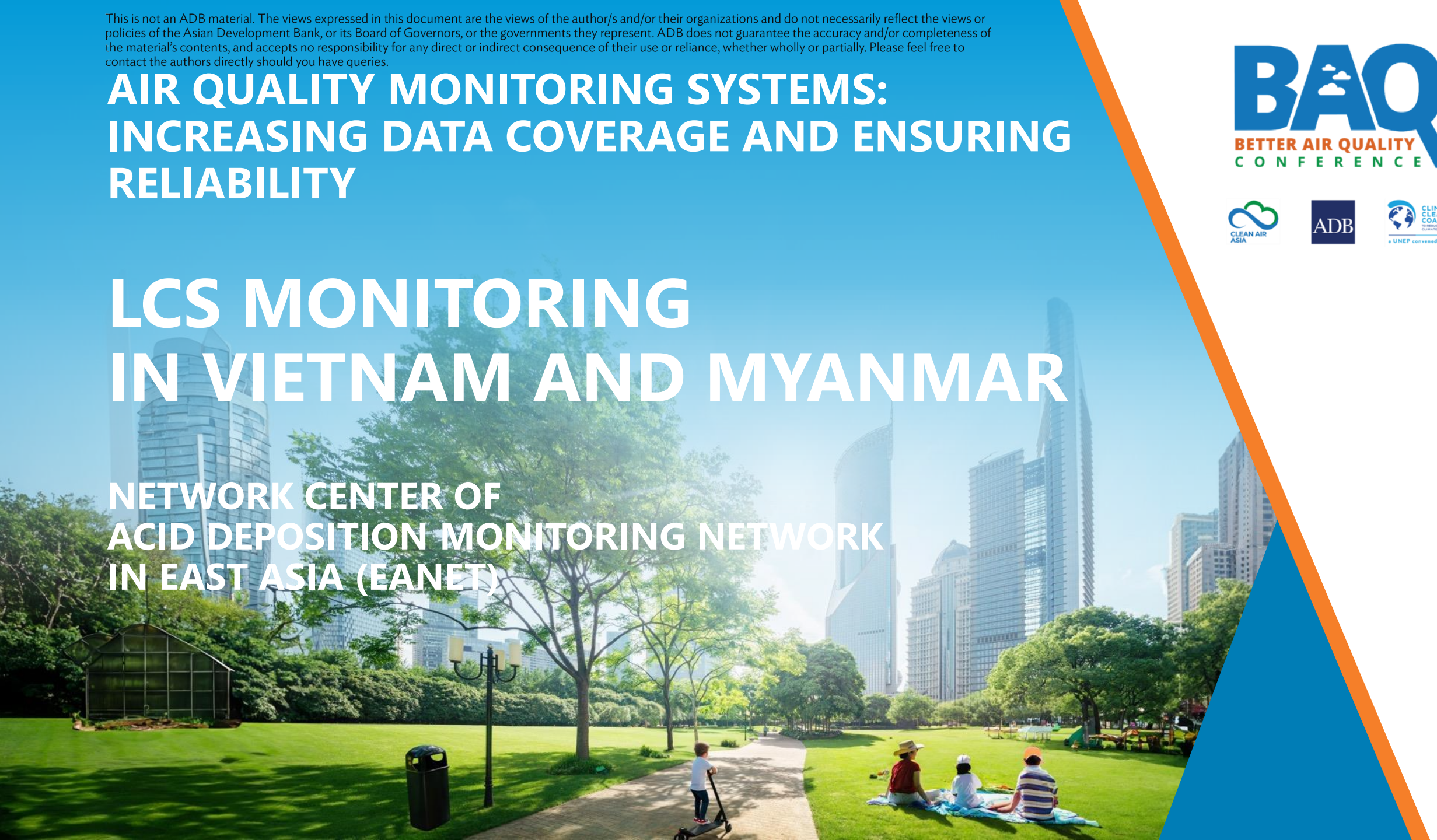
LCS MONITORING IN VIETNAM AND MYANMAR

NETWORK CENTER OF ACID DEPOSITION MONITORING NETWORK IN EAST ASIA (EANET)



Thank you for attending this event! Here are reminders and other announcements:

Keep your phones and other devices in silent mode.

Quietly leave the Auditorium to take a call

Wearing masks is optional. Attending sessions when sick is discouraged.

Raise your hand to ask a question during Q&A. You'll be acknowledged by our moderators.

Refreshments will be available at the Gallery. Food is not allowed inside the auditorium.

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INTRODUCTION OF LCS PROJECT

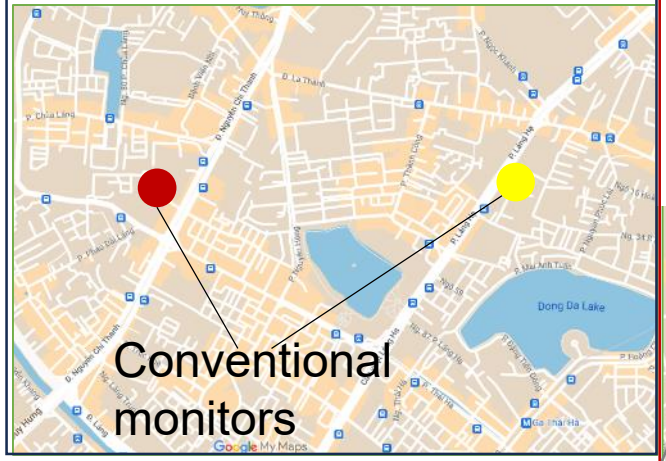
EANET Project of HAQMN

EANET expanded the scope and PM2.5 and Ozone (Surface Ozone) were chosen as the target substance.

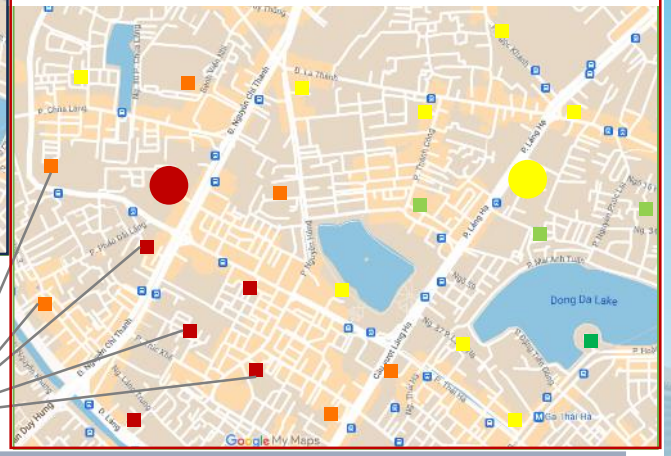
Low-cost sensor (LCS) help to overcome the challenges to expand the monitoring network such as costs and skills.

EANET project will provide the knowledge how the practitioners can wisely select and use reliable LCS with the network of reference-level monitors in an integrated manner (HAQMN)

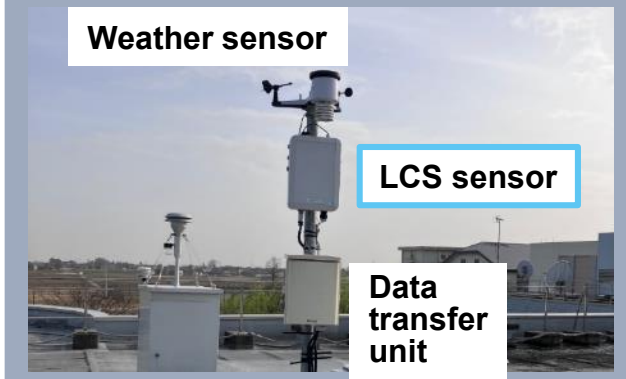
Conventional monitoring network

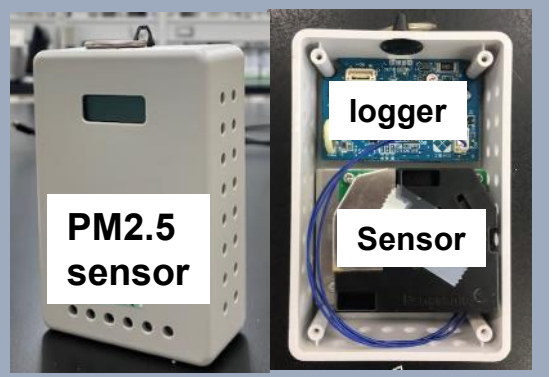


Hybrid Air Quality Monitoring Network (HAQMN)



Low-cost sensor





Objectives of HAQMN project

Objectives	Implementation plan	Outputs
Demonstration of HAQMN concept	Launch of HAQMN in selected cities - Parallel monitoring test - Small-scale HAQMN	**The reliable air quality in selected city**
Developing knowledge products of HAQMN and LCS	Developing technical documents	**Guidelines on establishing HAQMN** **Manual for Low-cost Sensor Systems Operation** **Training Curriculum and Instructional Materials for Establishing and Running HAQMN**
Building capacity	HAQMN seminar and onsite training Disseminating the deliverables to EANET PCs.	

ADB Technical assistance

Objectives

- Strengthening knowledge and actions for air quality improvement
- Enhancing the knowledge and capacity to develop policy actions and technical solutions for air quality management
- Building the business case through the preparation of city level clean air action plans

Implementation plan	Outputs
Technical study in the candidate city in the collaboration with EANET LCS project.	Technical knowledge through HAQMN monitoring
Organizing on-site training for the effective use of LCS	Elaborating training materials

Steps and Implementation Plan

Launch of HAQMN in selected cities

- Implementation and analysis of parallel measurement test
- Implementation and analysis of small-scale HAQMN

EANET Project Fund

Developing technical materials

- Developing Guidelines, Manual and Instructional materials

HAQMN seminar and onsite training for capacity building

- HAQMN Seminar on 21 July 2022
- HAQMN introduction training
- HAQMN operation training

Collaboration

ADB TA 9608

Strengthening Knowledge and Actions for Air Quality Improvement

- Implement and analysis HAQMN in Hanoi
- Onsite training for LCS

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HYBRID AIR QUALITY MONITORING NETWORK

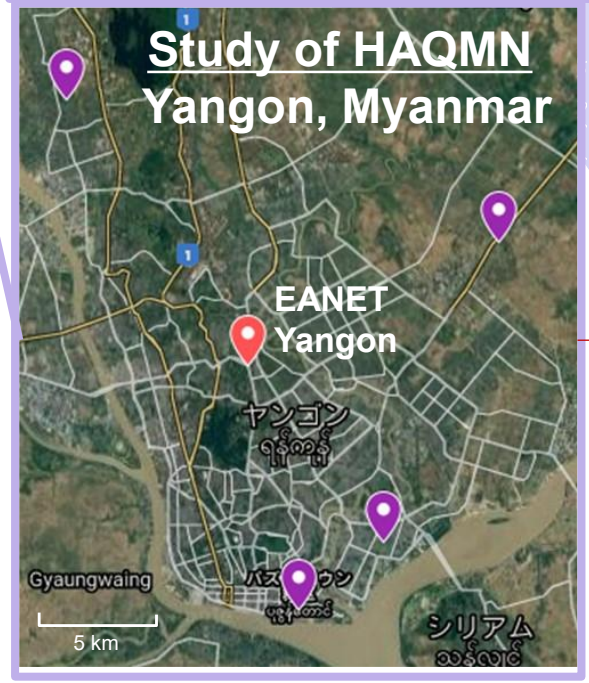
PROJECT PROGRESS AND RESULTS

Parallel monitoring and HAQMN test

PM2.5, O_3, NO_2 sensor

Green Blue

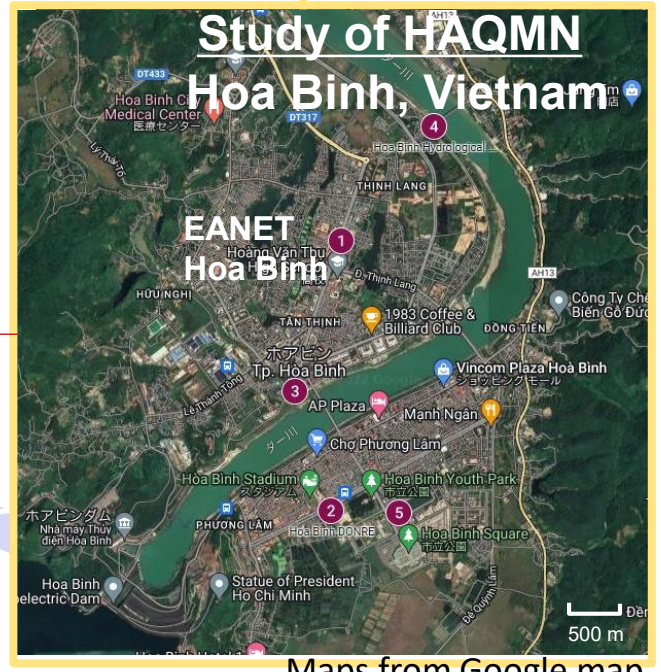
Model: Gbiot-FH0



PM2.5 sensor

Sibata Science Technologies

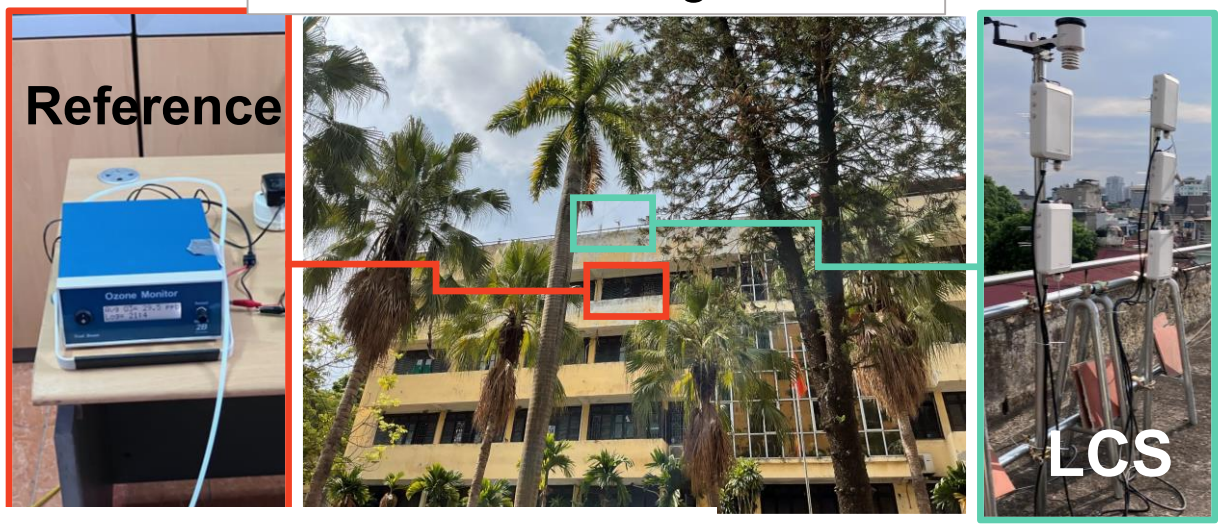
Model: P-sensor

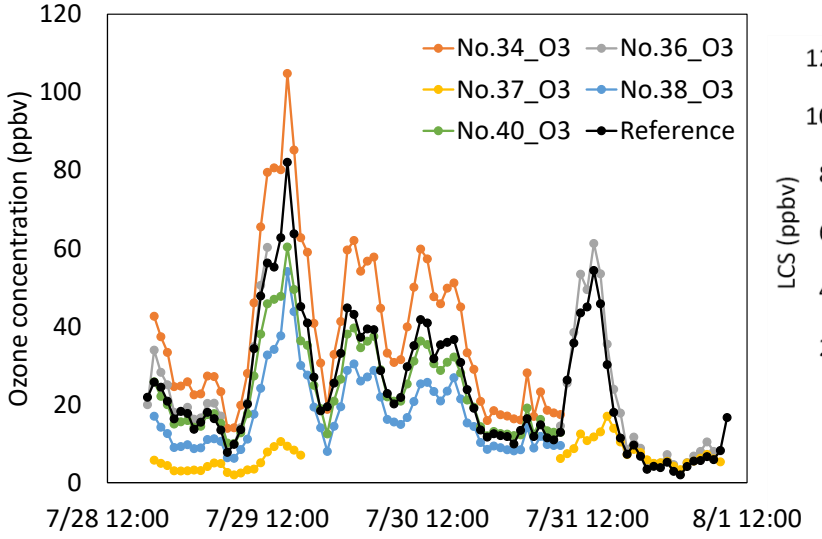


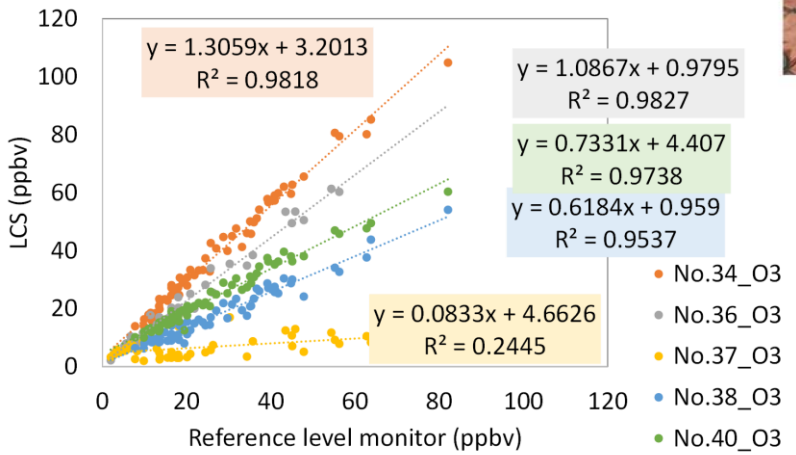
Maps from Google map

Parallel monitoring and HAQMN test

Parallel monitoring in Hanoi





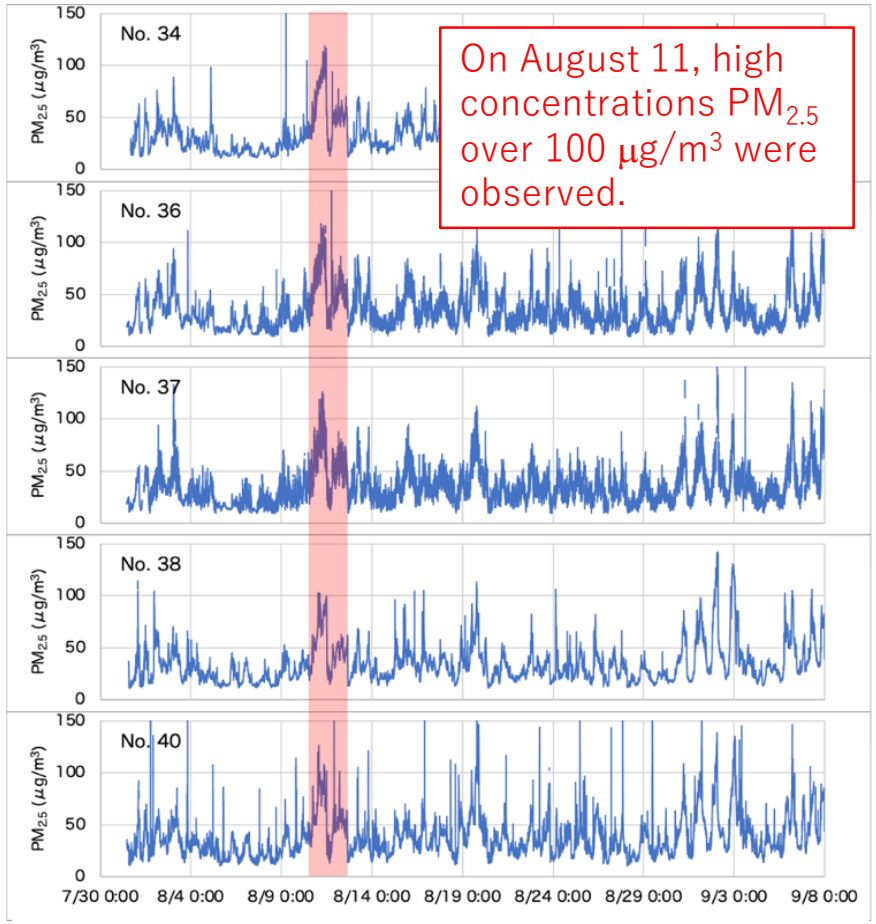


HAQMN test

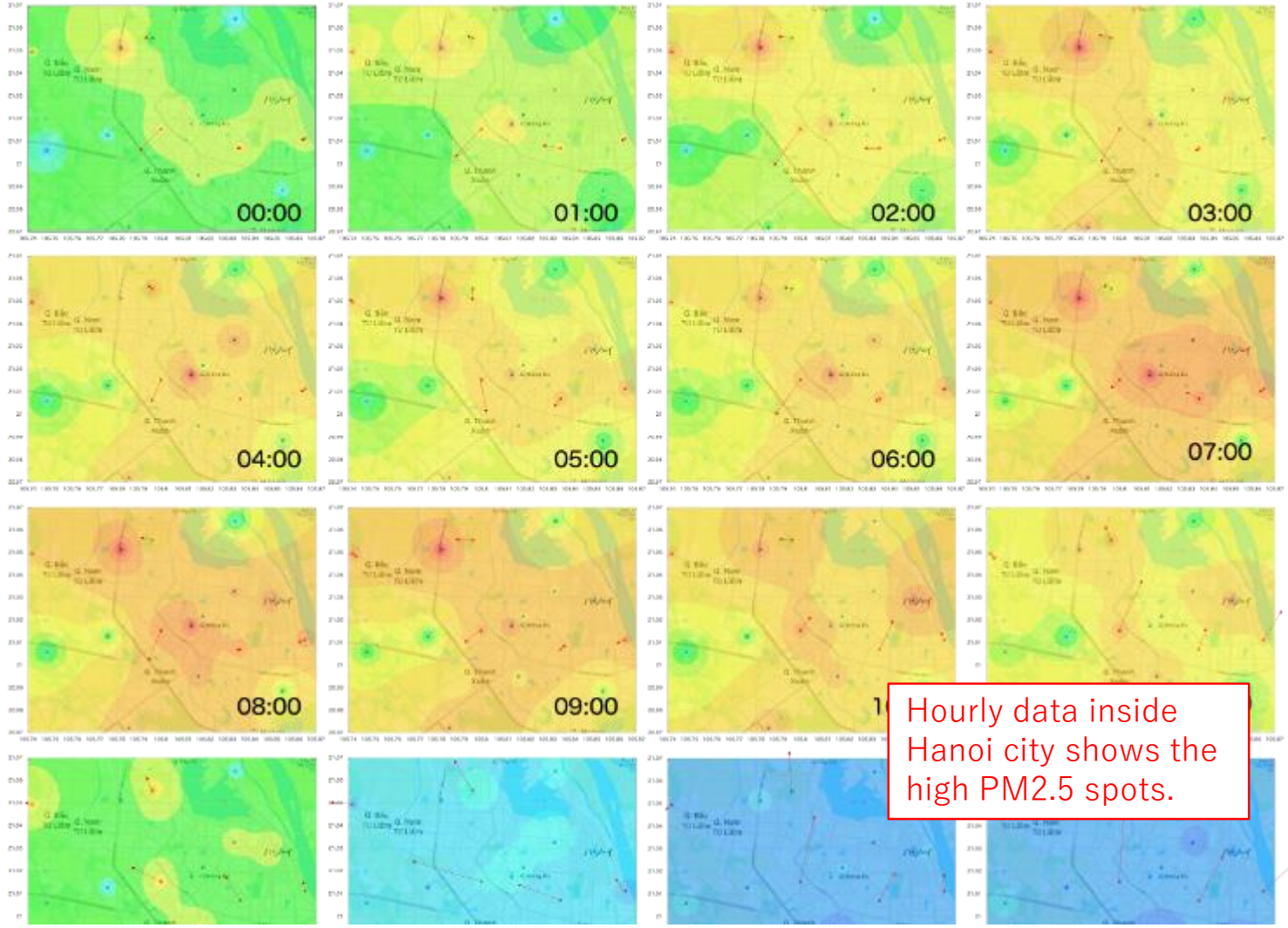
Monitoring duration:
July 31 – September 8.

Target:
PM2.5, Ozone, NO_2, WD, WS, Temp, RH, Rain

Air Quality Analysis using LCS data



On August 11, high concentrations $PM_{2.5}$ over 100 μg/m³ were observed.



Hourly data inside Hanoi city shows the high PM2.5 spots.

Temporal and spatial distribution of PM2.5 can be obtained from LCS data.

Capacity building

EANET Training on Air Quality Monitoring Systems Using Low-Cost Sensors

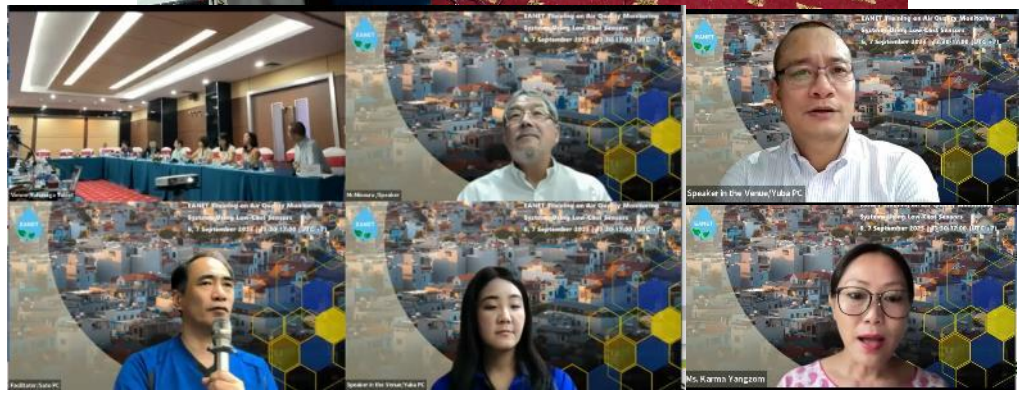
September 6 and 7, 2023 (on-site and online)

By the collaboration of ADB and EANET

Contents:

- Status and effort of LCS
- Introduction of Technical study
- Demonstration on LCS operation
- Data screening and analysis obtained by LCS

Participants:
91 (9 countries) on Sep. 6
135 (12 countries) on Sep. 7



https://www.eanet.asia/eanet-training-on-air-quality-monitoring-systems-using-low-cost-sensors-lcs/

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HYBRID AIR QUALITY MONITORING NETWORK

FUTURE UPDATE - GUIDELINE AND TECHNICAL MANUAL OF LCS -

Guidelines on establishing Hybrid Air Quality Monitoring Network (HAQMN)

What is HAQMN:

Air quality monitoring network consisting of conventional monitoring equipment and a highly reliable LCS to ascertain the special and temporal air pollution in an area with the lower cost.

Utility of LCS:

LCS data is used as the supportive data of conventional monitoring equipment.

Draft contents:

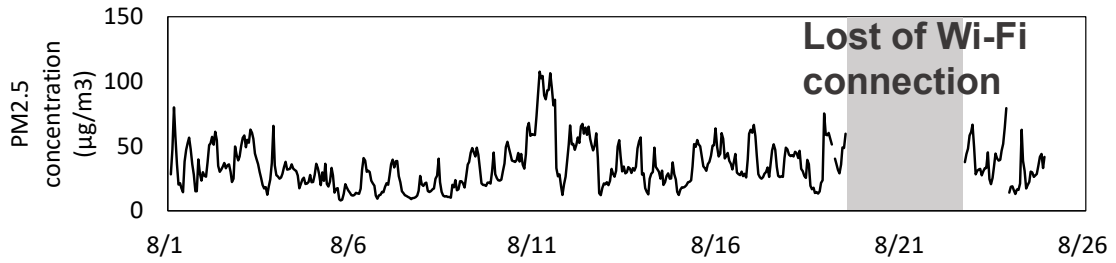
- Goals and definition of HAQMN
- Target substances
- Criteria for the establishment of monitoring stations
- Principles of measurement
- Time resolution of monitoring data
- Management of precision and maintenance
- Evaluation of data

Manual for Low-cost Sensor Systems Operation

Example of contents:

- Monitoring design
  - Site criteria
  - Site facilities and Instrumentation
- Monitoring using low-cost sensors
  - Method (PM, Gaseous species, Meteorological factors)
- Maintenance
- Data reporting and validation
- QA/QC

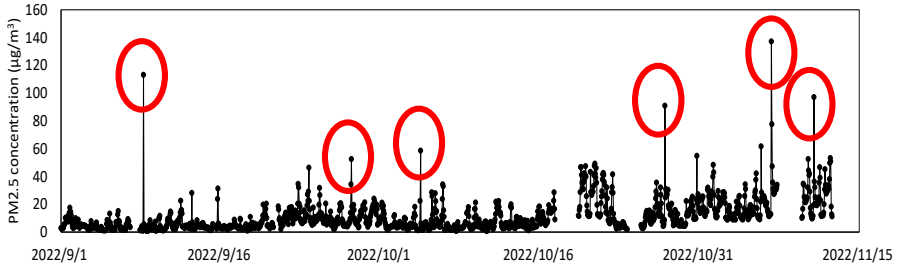
Internet connection



Data is transferred using the internet.
The stability of the internet is considered when the installation.

Data screening

Data of LCS has the spikes due to the noise of sensors or local emission.



Need to check the reason and remove the unrealistic noise before the analysis.

Manual for Low-cost Sensor Systems Operation

Example of contents:

- Monitoring design
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  - Site facilities and Instrumentation
- Monitoring using low-cost sensors
  - Method (PM, Gaseous species, Meteorological factors)
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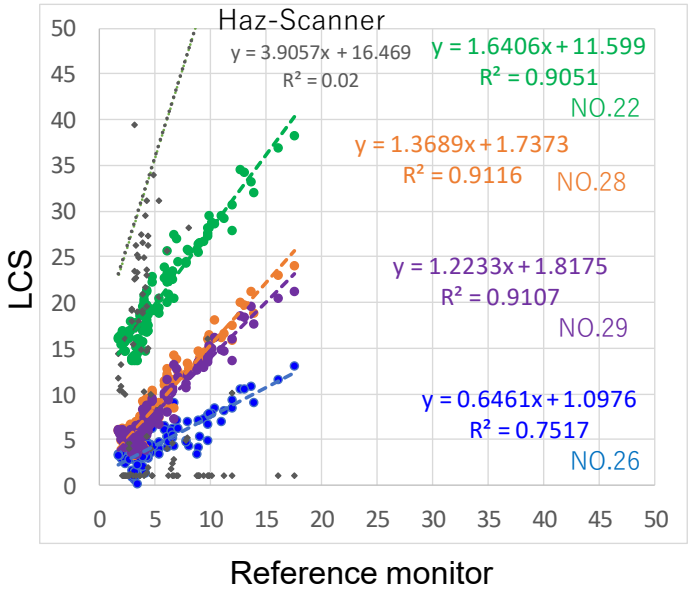
- QA/QC

Data correcting

Sensor of LCS has the different sensitivity according to the result of comparison in same site.



Comparison of O_3 concentration in rain season of Myanmar

LCS data should be corrected using the results of periodical parallel monitoring between LCS and conventional monitors.

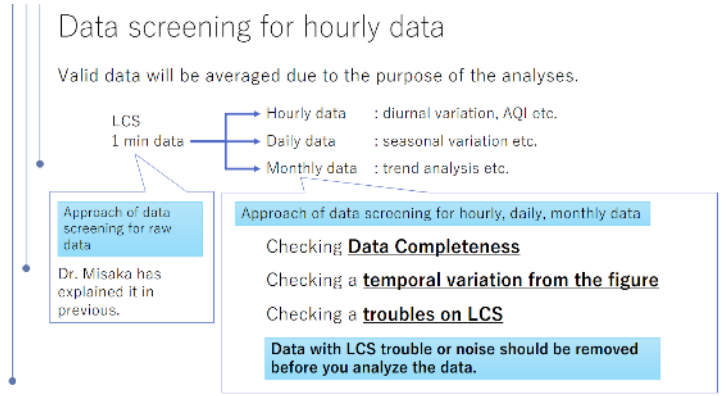
Training Curriculum and Instructional Materials

Example of training curriculum and materials:

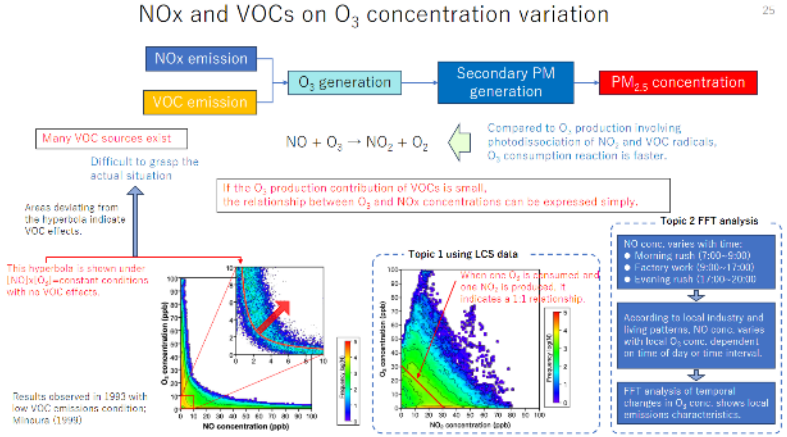
- Videos of LCS installation guide
- PPT of the explanation pf data screening, data analysis, QA/QC procedure etc.

Training video of LCS installation

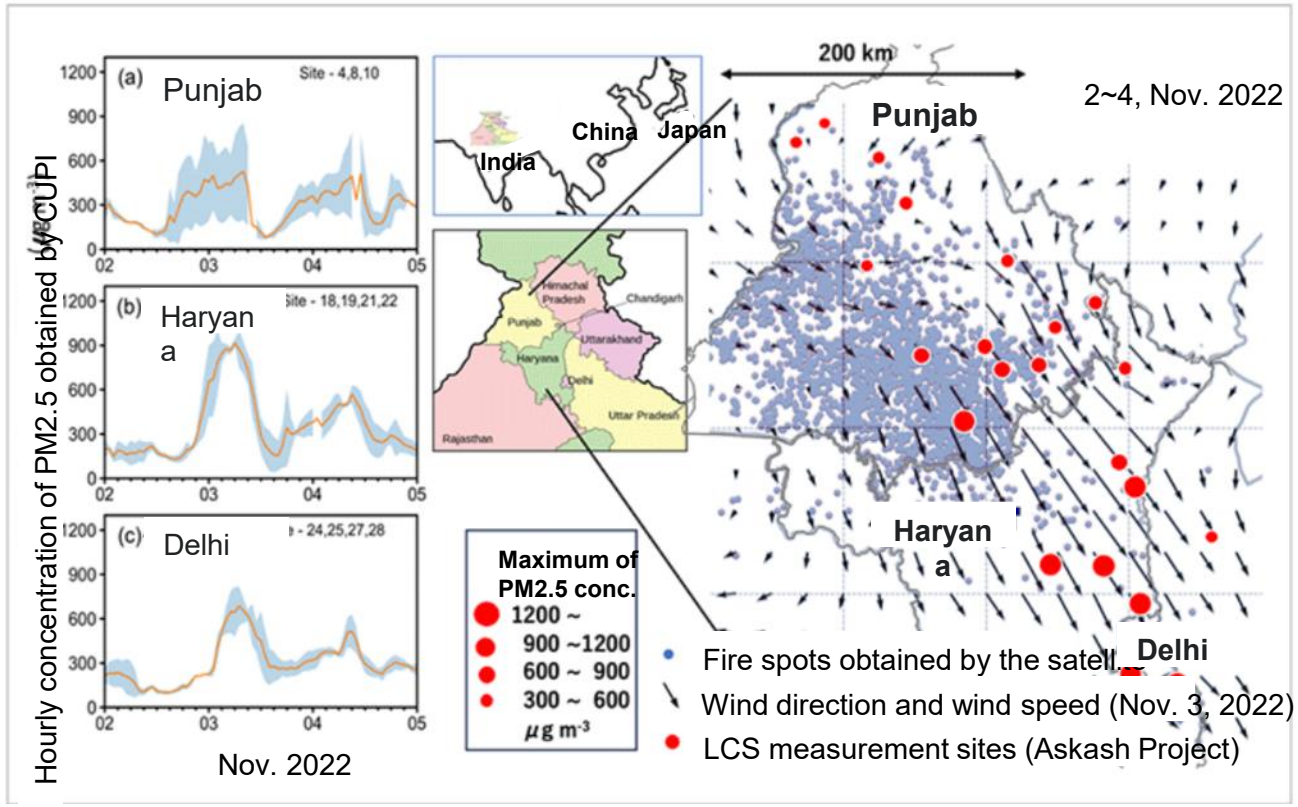
Explanation of Data screening



Explanation of Data Analysis



Future possibility of HAQMN



LCS data is used as the supportive data of official monitoring data.

The huge number of monitoring data by LCS can visualize the spatial distribution, transport from the source area to other regions etc.

Big data of LCS gives us the new insight to clean air action plans.

Reference: Research News of Kobe University https://www.kobe-u.ac.jp/research_at_kobe/NEWS/news/2023_10_02_01.html

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