ATMOSPHERIC DRIVERS OF PM2.5 VARIABILITY: RELATIVE HUMIDITY AND RAINFALL INFLUENCE

in Tha Sala, Nakhon Si Thammarat Province Srithammaratsuksa School

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Introduction

PM2.5 pollution affect 10 million people worldwide

Kill 30,000 people/year in Thailand

Thailand ranked 10th PM2.5 in Asia

PM2.5 and Diseases

NATURAL SOURCES

Dust Stomrs

Vocanic Eruptions

Forest Fires

MAN-MADE SOURCES

Burning Fossil Fuels

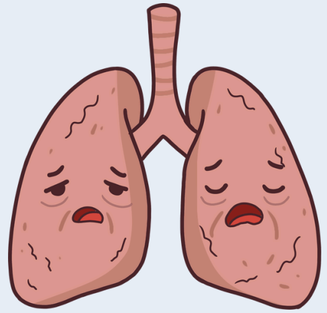
Industrial Activites

Constrution sites

Repiratory DISEASES

Asthma

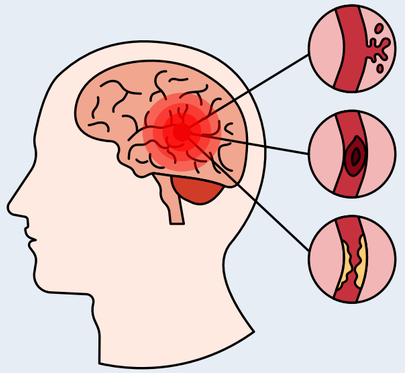
Chronic Bronchitis



Lung Cencer

Heart DISEASES

Heart Attacks



Stroke

Objectives

1. Compare PM1, 2.5, 10 measurement between low cost IoT sensor with Davis Airlink
2. Compare PM1, 2.5, 10 between high and low population density areas.
3. Investigate relationship between rainfall and relative hudimity with the amount of PM1, 2.5, 10

Experimental Design

Performamnce Evaluation of Low-Cost PM2.5 Sensors in Contrasting Environments: The Kraseo Dam and Thasala Case Studies

Pm IoT sensor

- Tha sala
- Walailak university
- Premium Hotel

Davis Airlink

- Tha sala
- Walailak university
- Premium Hotel

- PM1 , PM2.5 , PM10
- RH , Temp
- Rainfall
- 5 Min rieasurement
- 30 days data collection (14 Nov-14 Dec 2025)

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- RH , Temp
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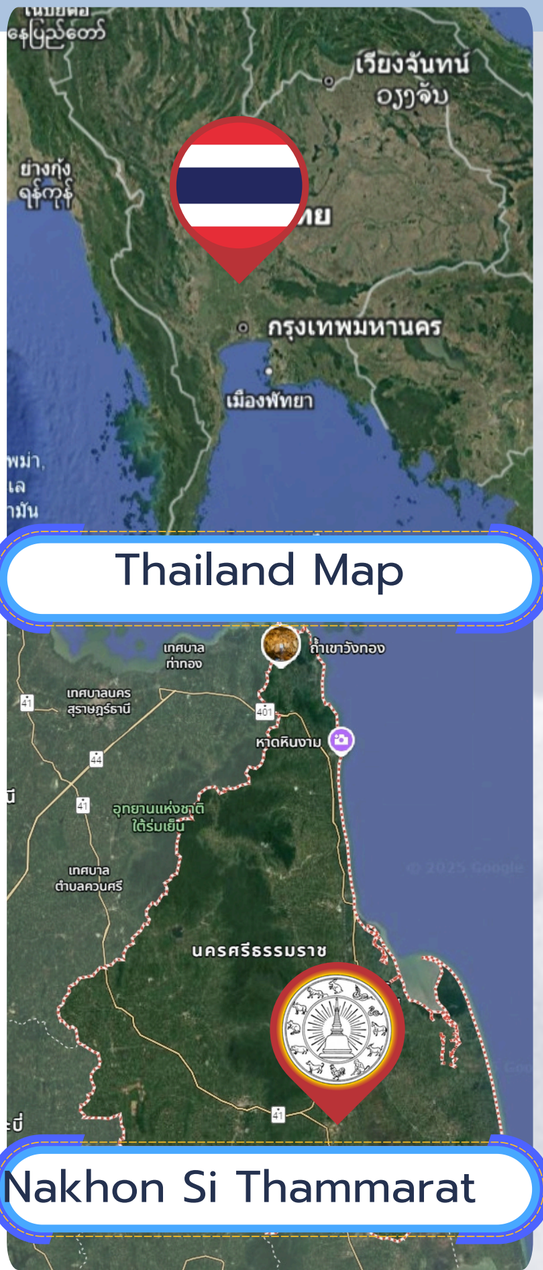
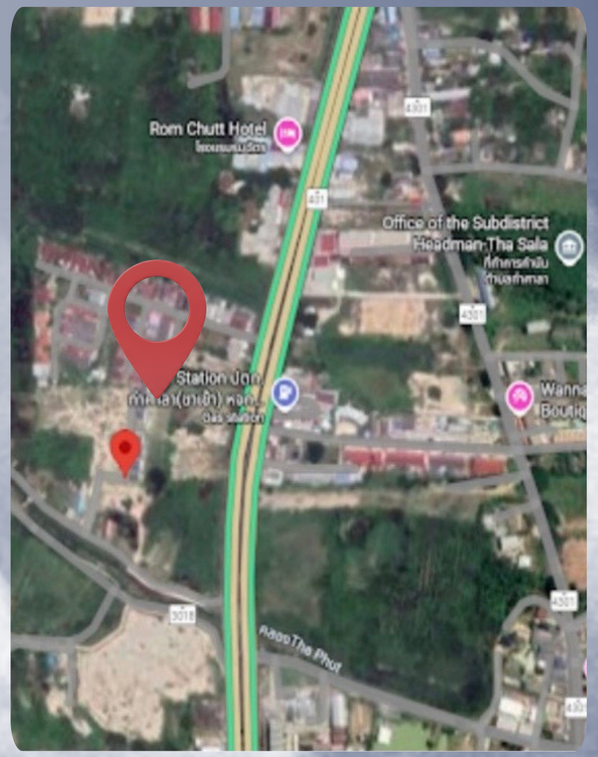
Data Analysis

- Two way ANOVA tests
  - Daris Vs PMsensor
  - 3 study sites

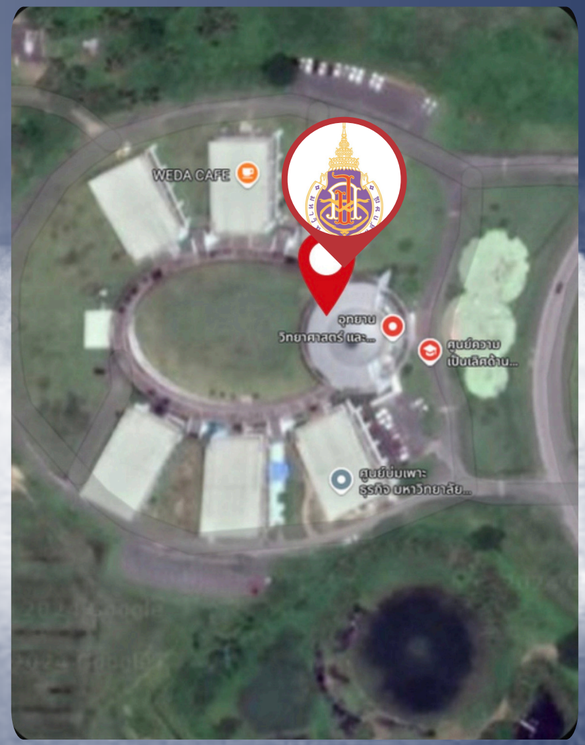
3 study sites



(a)

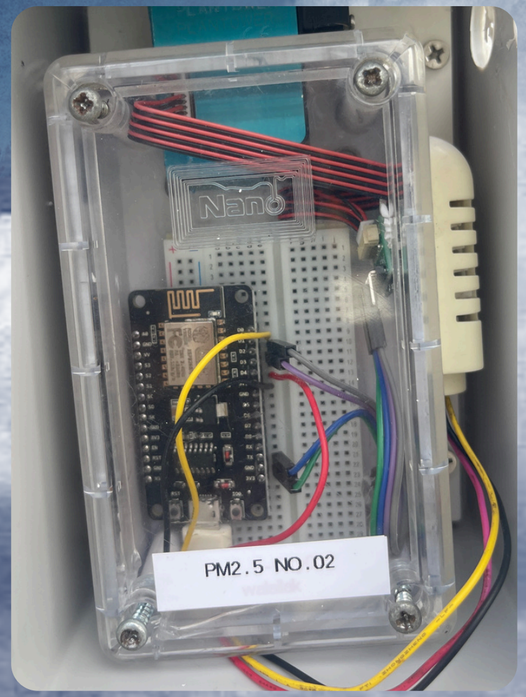


(b)



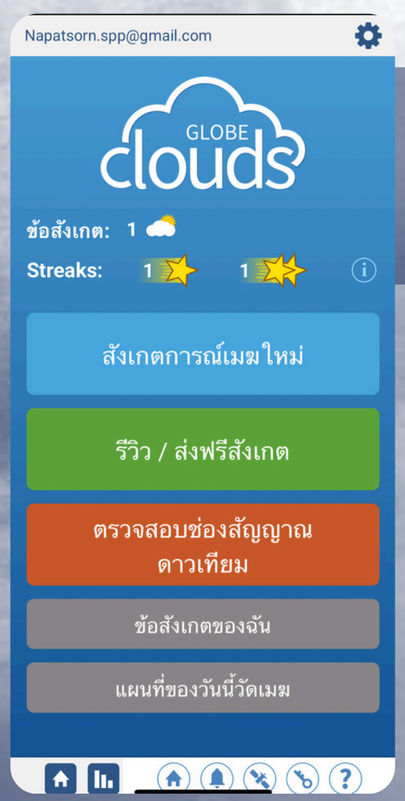
(c)

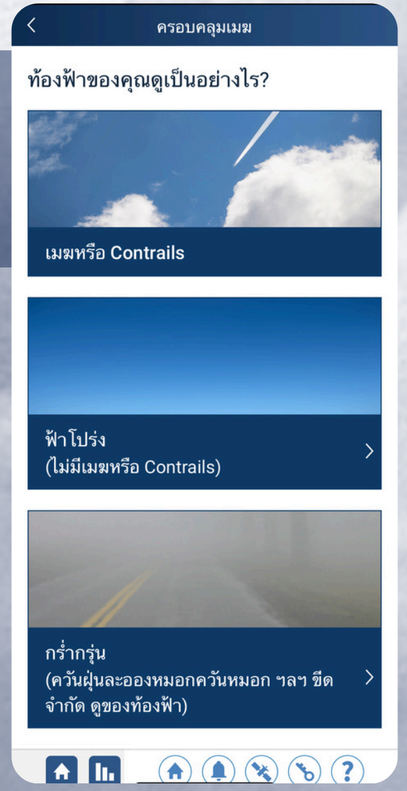
PM2.5 Measurements: low cost sensors vs Davis airlink

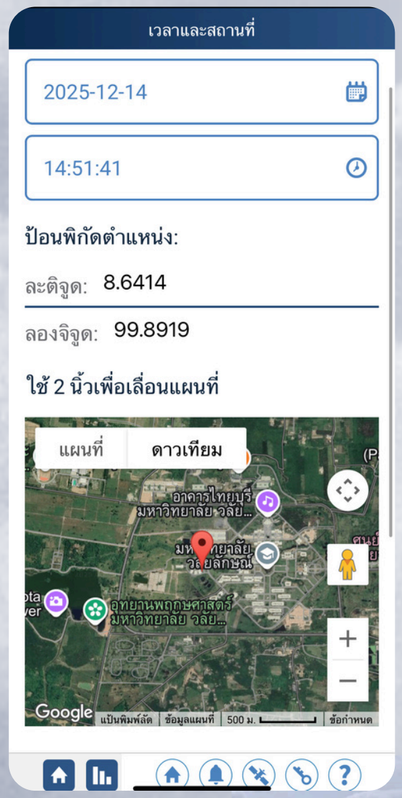


PM2.5 and IoT Davis PM2.5 AirLink

GLOBE Cloud App





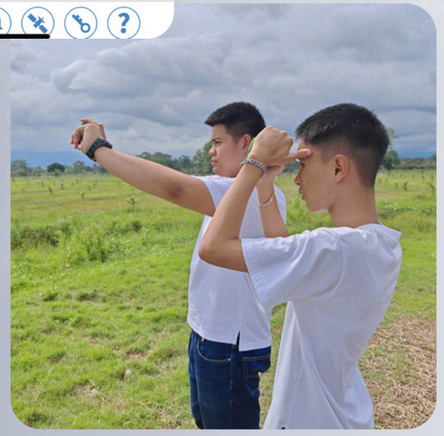


1. Choose Cloud App

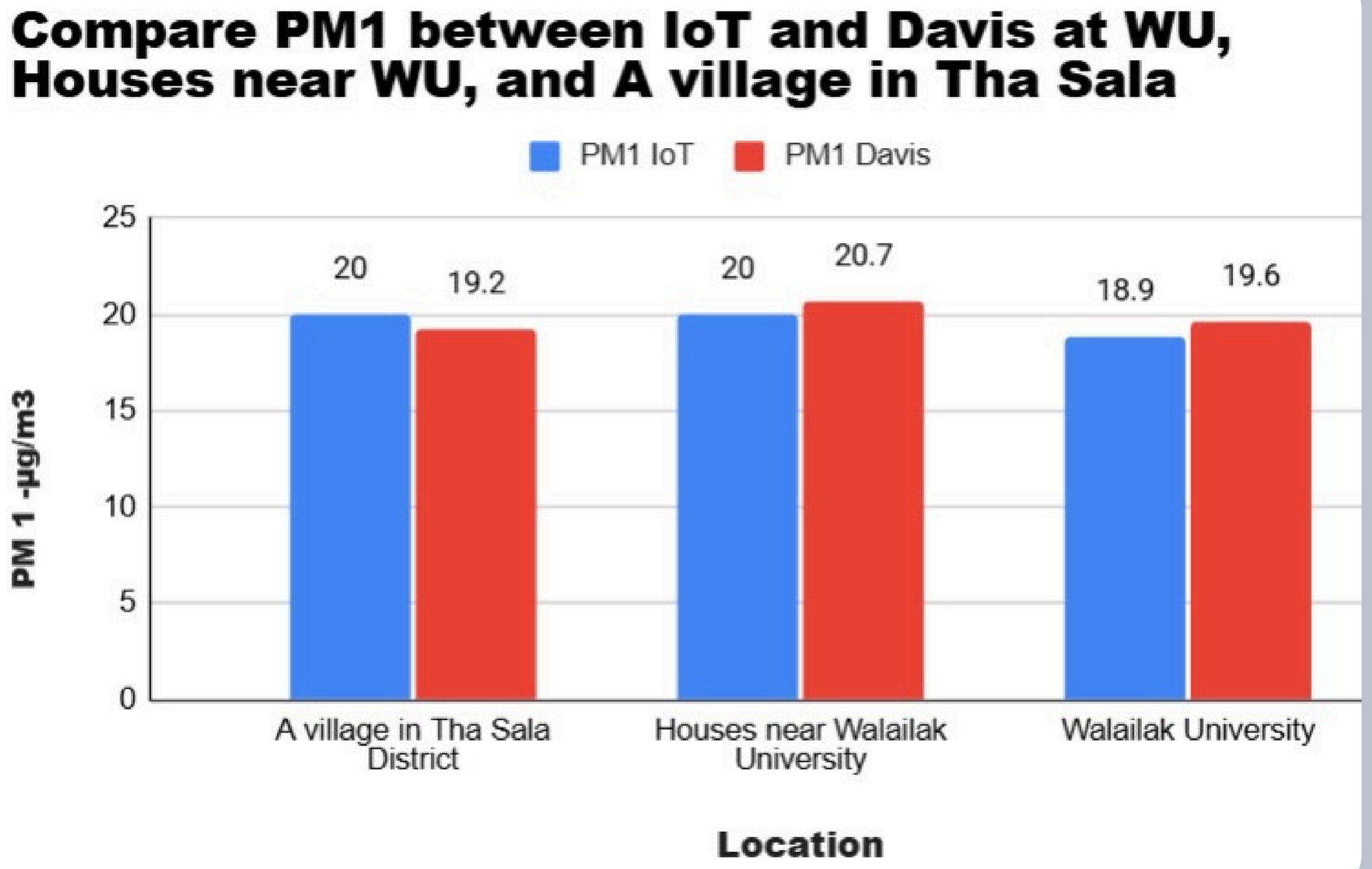
2. Choose New Cloud Observation

3. Observe the sky , the cloud

4. Latitue and L:ongitude of Study Site

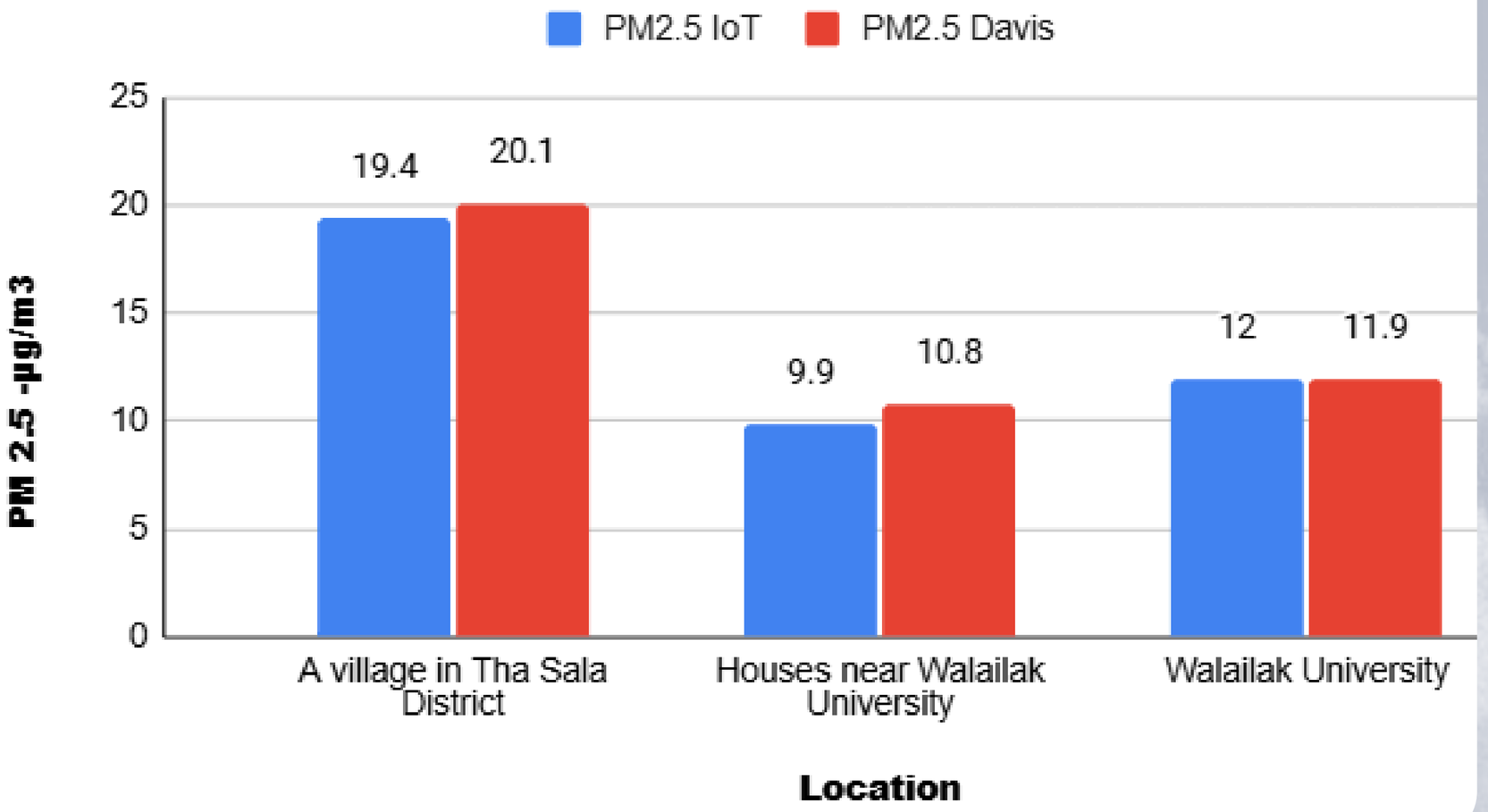


RESULTS AND DISCUSSION



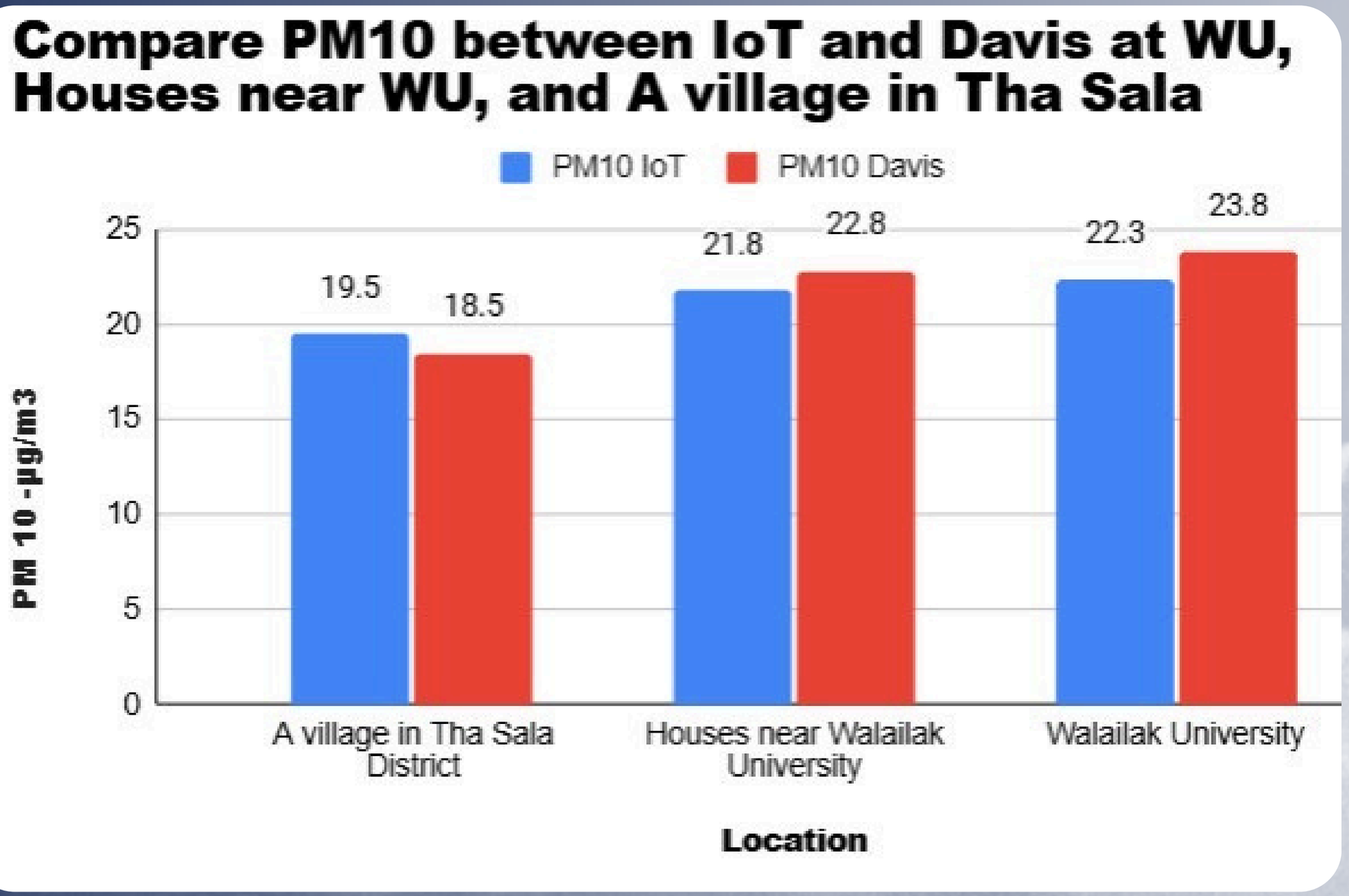
- PM1 were similar between Low cost sensors IoT and Davis Airlink
- PM1 were similar in all sites at 18.9-20.7 micrograms/ cubic meter

RESULTS AND DISCUSSION



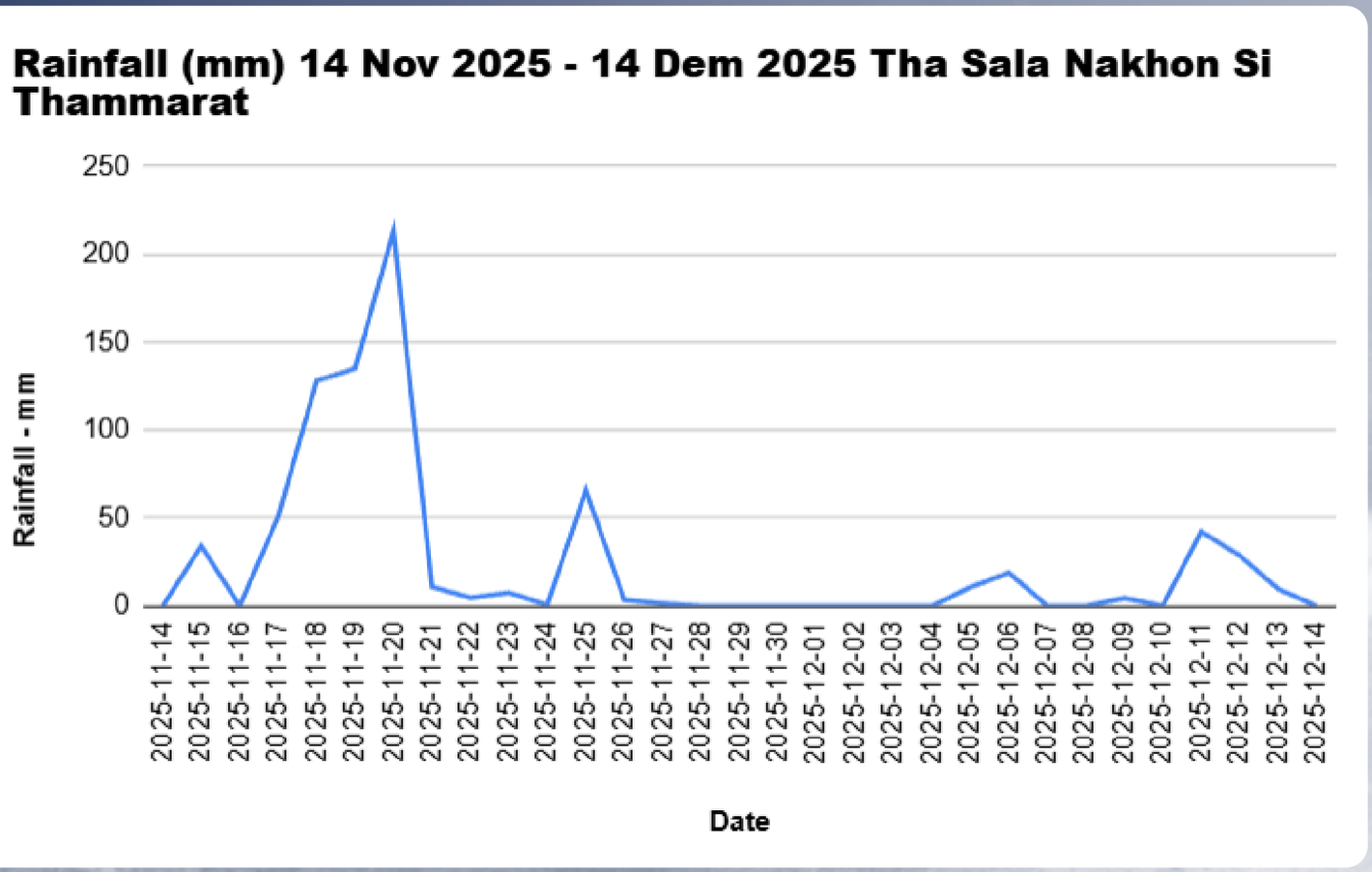
- PM2.5 were similar between Low cost sensors IoT and Davis Airlink
- High population density area (Village: 20) had higher PM2.5 than low pop area (WU: 10).

RESULTS AND DISCUSSION



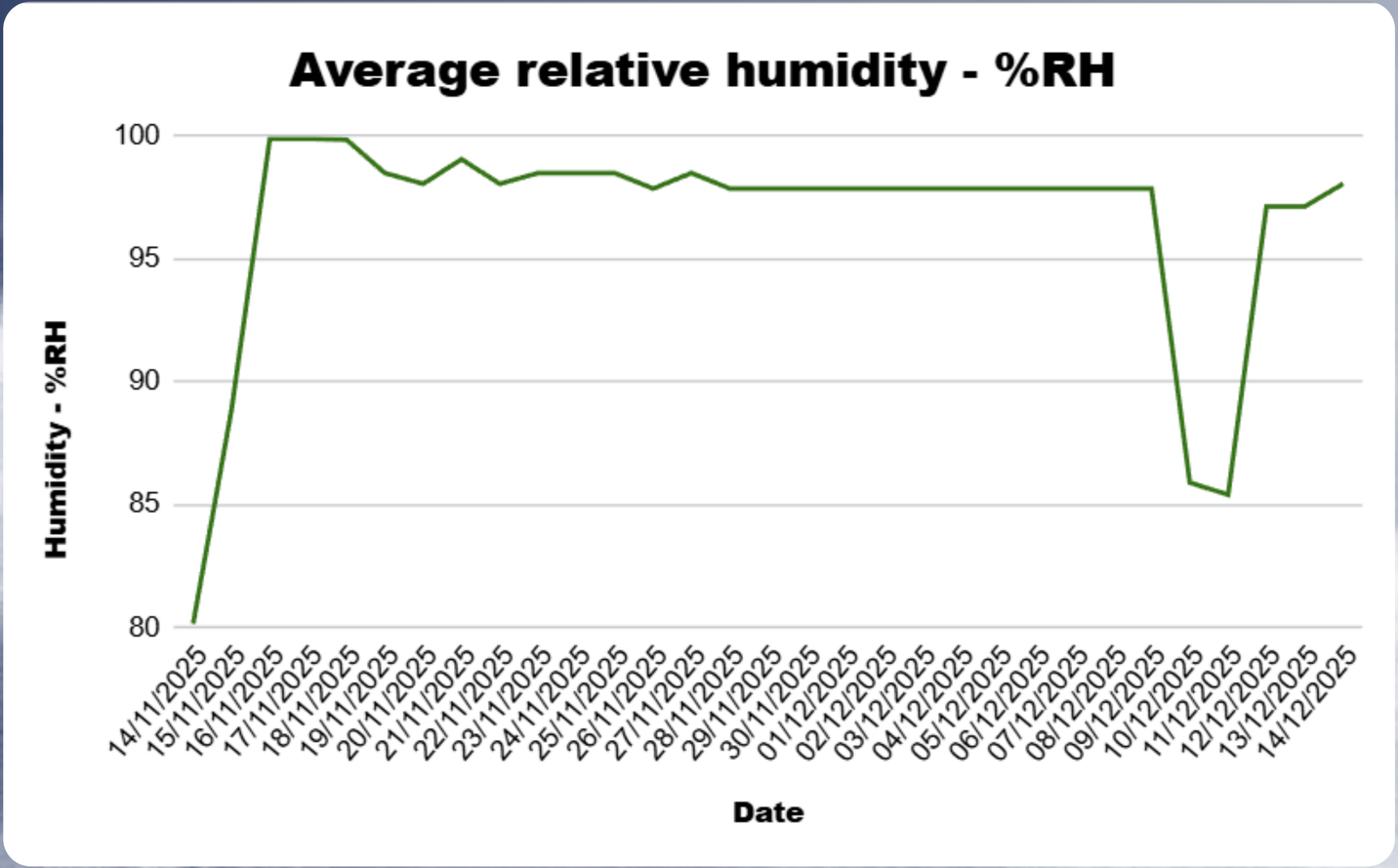
- PM10 were similar between Low cost sensors IoT and Davis Airlink
- PM10 were similar in all sites (18.5-23.8 micrograms/ cubic meter)

RESULTS AND DISCUSSION



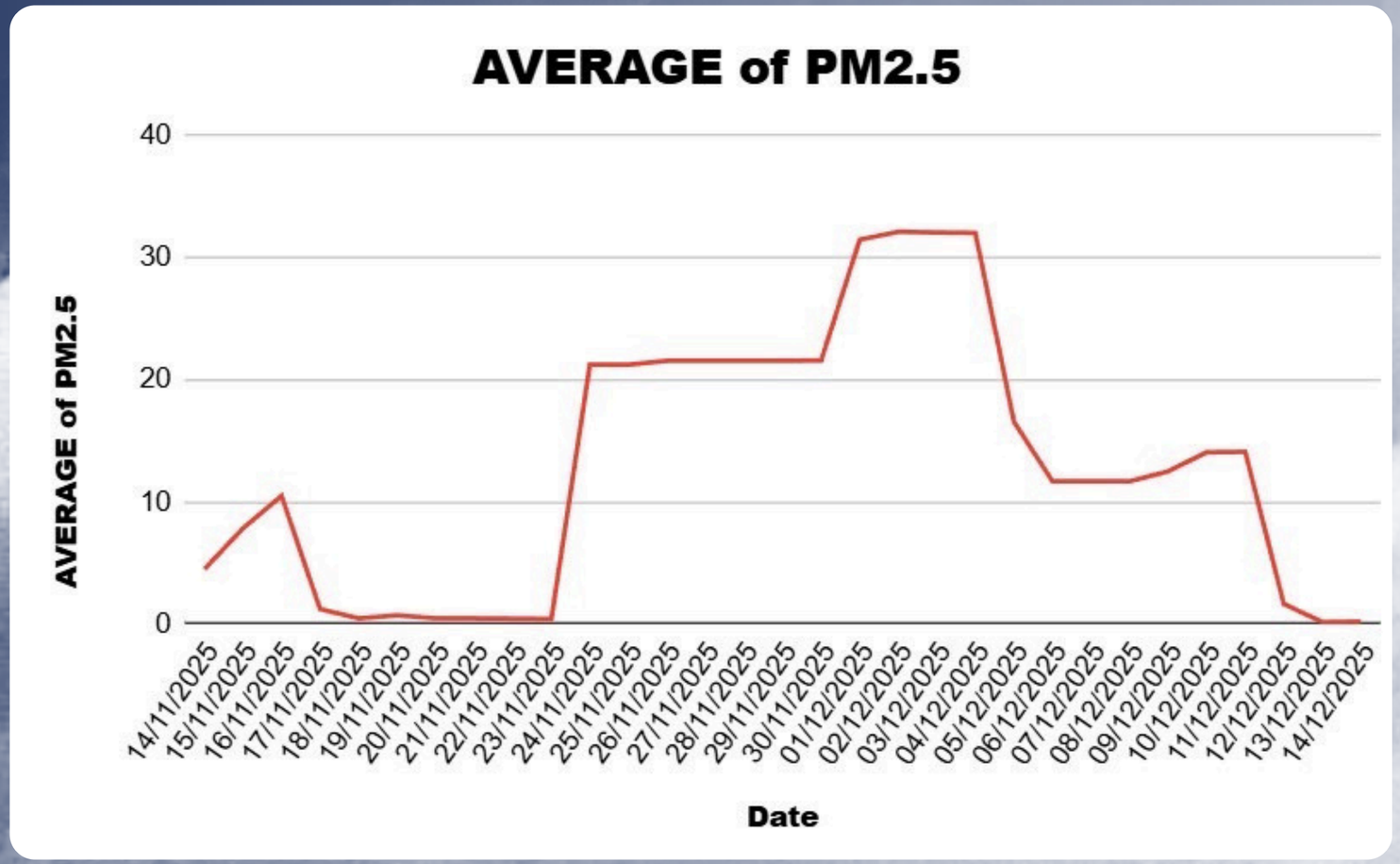
Average Rain rate during 14 Nov -14 Dec 2025 were between 0-25 mm/hr

RESULTS AND DISCUSSION



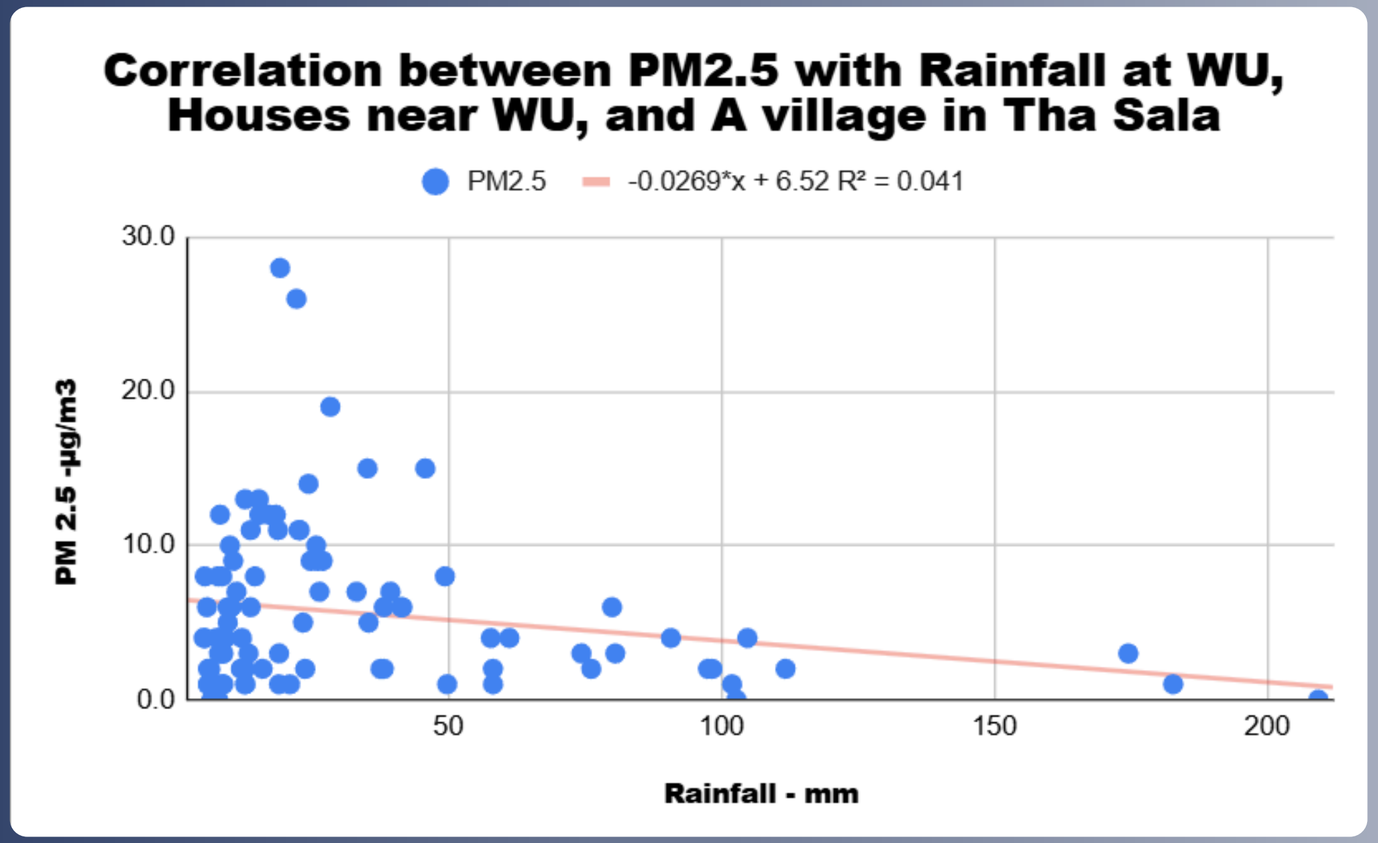
Average relative humidity during 14 Nov - 14 Dec 2025 were between 85-100%

RESULTS AND DISCUSSION



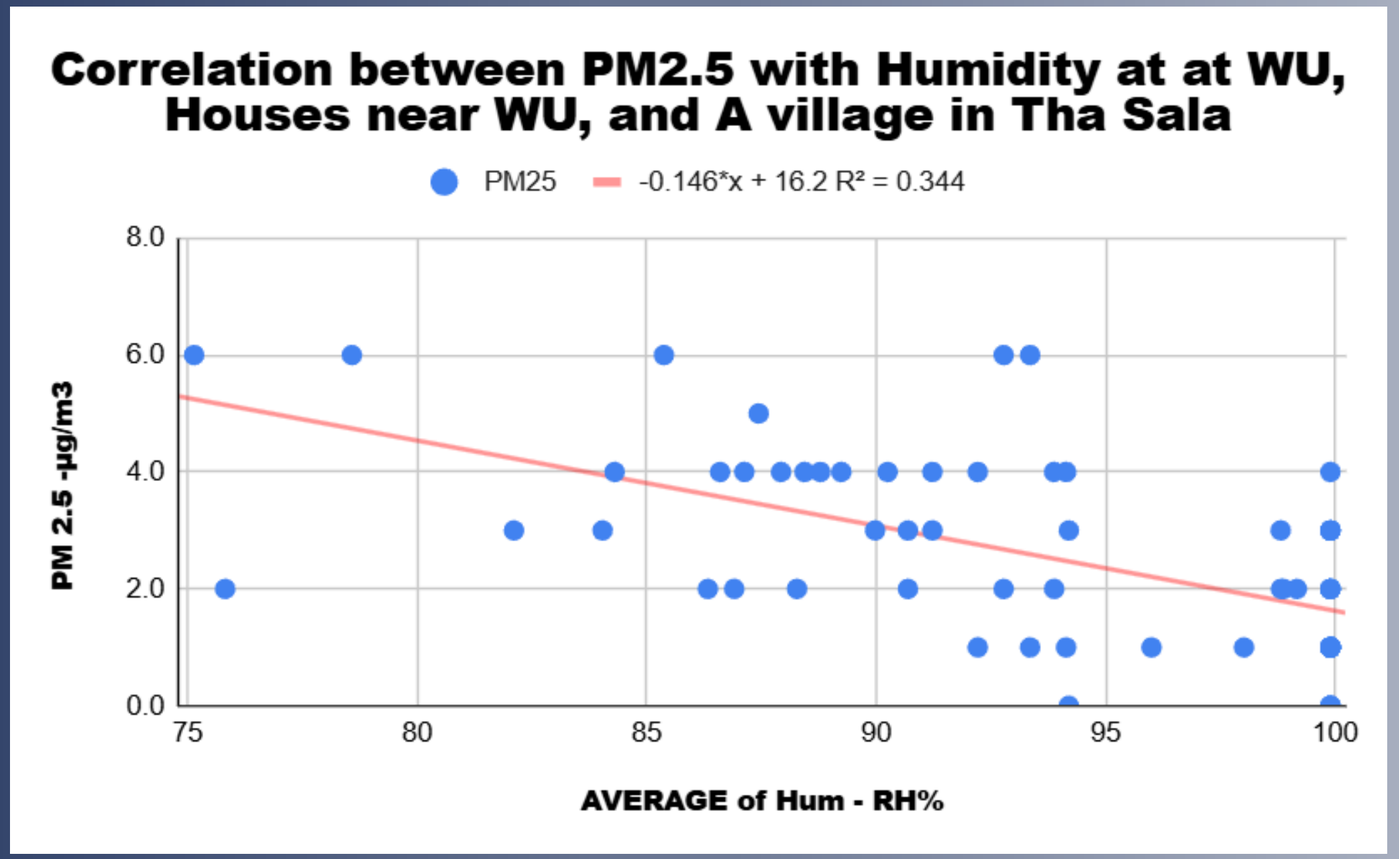
Average PM2.5 during November 14 Nov - 14 Dec 2025 were between 0-33 micrograms/ cubic meter.

RESULTS AND DISCUSSION



As Rain rate increased, PM2.5 decreased (linear regression: y=-0.0269+6.52, R2=0.041, P<0.05)

RESULTS AND DISCUSSION



As RH increased, PM2.5 decreased (linear regression: $y=-0.146x+16.2$, $R2=0.344$, $P<0.05$)

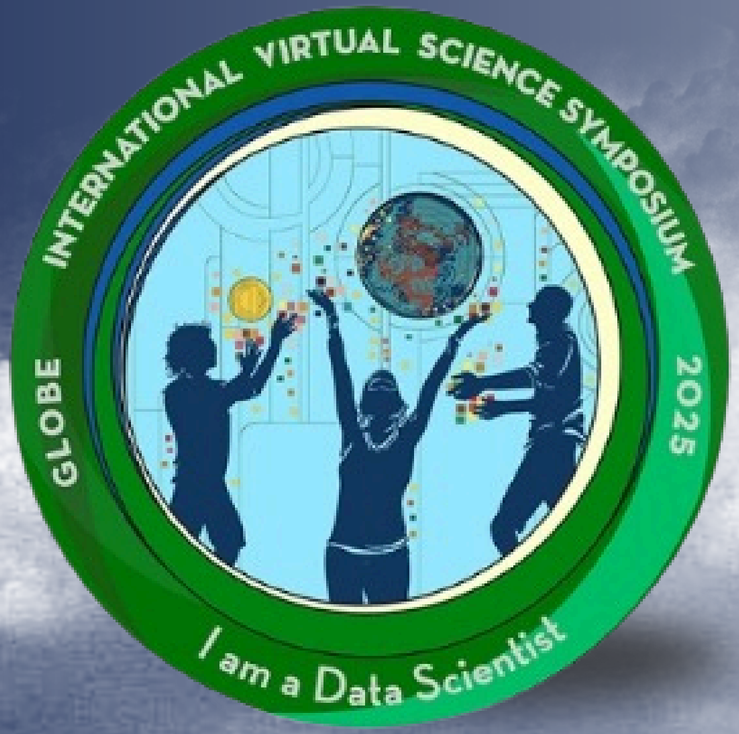
Conclusion

- Low cost sensors and IoT gives similar PM1, 2.5 and 10 readings to Davis Airlink.
- High population density area had higher PM2.5 than low population density area.
- This suggests that anthropogenic activity increases PM2.5 level.

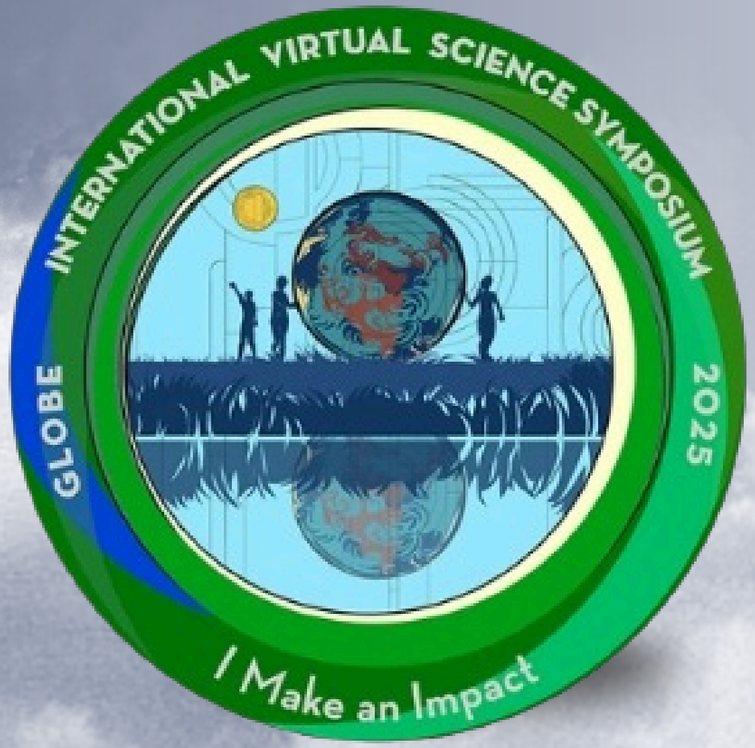
Conclusion

- Increasing in Rainfall and relative humidity reduced the amount of PM2.5.
- Observing GLOBE Cloud help us understand rainfall and relative humidity in the area.

VSS BADGES



I am a data scientist



I make an impact

I am a STEM professional

References

[1] Nakyai, T., Santasnachok, M., Thetkathuek, A., & Phatrabuddha, N. (2025). Influence of meteorological factors on air pollution and health risks: A comparative analysis of industrial and urban areas in Chonburi Province, Thailand. Environmental Advances, 19, 100608. https://doi.org/10.1016/j.envadv.2024.100608.

[2] Zalakeviciute, R., López-Villada, J., &. Rybarczyk, Y.. (2018). Contrasted effects of relative humidity and precipitation on urban PM2.5 pollution in high elevation urban areas. Sustainability, 10(6), 2064. https://doi.org/10.3390/SU10062064.

[3] Sirithian, D., & Thanatrakolsri, P. (2022). Relationships between Meteorological and Particulate Matter Concentrations (PM2.5 and PM10) during the Haze Period in Urban and Rural Areas, Northern Thailand. Air, Soil and Water Research, 2022, 15. https://doi.org/10.1177/11786221221117264

[4] Islam, N., Toha, T.R., Islam, M.Ma., & Ahmed, T. (2023). Spatio-temporal Variation of Meteorological Influence on PM2.5 and PM10 over Major Urban Cities of Bangladesh. Aerosol Air Qual. Res. 23, 220082. https://doi.org/10.4209/aaqr.220082

[5] Dejchanchaiwong, R., Tekasakul, P., Saejio, A., Limna, T., Le, T.-C., Tsai, C.-J., Lin, G.-Y., & Morris, J. (2023). Seasonal Field Calibration of Low-Cost PM2.5 Sensors in Different Locations with Different Sources in Thailand. Atmosphere, 14(3), 496. https://doi.org/10.3390/atmos14030496

[6] Wang, S., Gao, J., Guo, L., Nie, X., & Xiao, X. (2022). Meteorological Influences on Spatiotemporal Variation of PM2.5 Concentrations in Atmospheric Pollution Transmission Channel Cities of the Beijing–Tianjin–Hebei Region, China. International Journal of Environmental Research and Public Health, 19(3), 1607. https://doi.org/10.3390/ijerph19031607

[7] Bilal, M., Nichol, J. E., Nazeer, M., Shi, Y., Wang, L., Kumar, K. R., Ho, H. C., Mazhar, U., Bleiweiss, M. P., Qiu, Z., Khedher, K. M., & Lolli, S. (2019). Characteristics of Fine Particulate Matter (PM2.5) over Urban, Suburban, and Rural Areas of Hong Kong. Atmosphere, 10(9), 496. https://doi.org/10.3390/atmos10090496

[8] Lin, G., Fu, J., Jiang, D., Wang, J., Wang, Q., & Dong, D. (2015). Spatial Variation of the Relationship between PM2.5 Concentrations and Meteorological Parameters in China. Biological Medical Research International, 2015, 684618–684618. https://doi.org/10.1155/2015/684618.

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THANK YOU!

I do GLOBE