Monitoring of PM$_{2.5}$ Concentration in Yangon City, Myanmar: Collaborative Research between NIES and University of Medicine (1), Yangon, Myanmar

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Background and Aim

- Air pollution is a worldwide environmental health problem.
- There is limited study assessing PM$_{2.5}$ in Yangon city, Myanmar.
- Previous local studies performed were concerned about PM$_{10}$ and used fixed monitoring. It is essential to do research on air pollution for air quality management improvement.
- The present study aimed to assess distribution of PM$_{2.5}$ in different Townships of Yangon.
- This study is a collaborative work between Department of Physiology, University of Medicine 1, Myanmar and National Institute for Environmental Studies (NIES), Tsukuba, Japan.

Method

- Pocket PM$_{2.5}$ Sensors (Yaguchi Electric Co., Ltd., Miyagi, Japan) were utilized for measurement of concentrations PM$_{2.5}$.

- generate log data in CSV (Comma-Separated Values) of Google KML Keyhole Markup Language) format, including GPS (Global Positioning System)
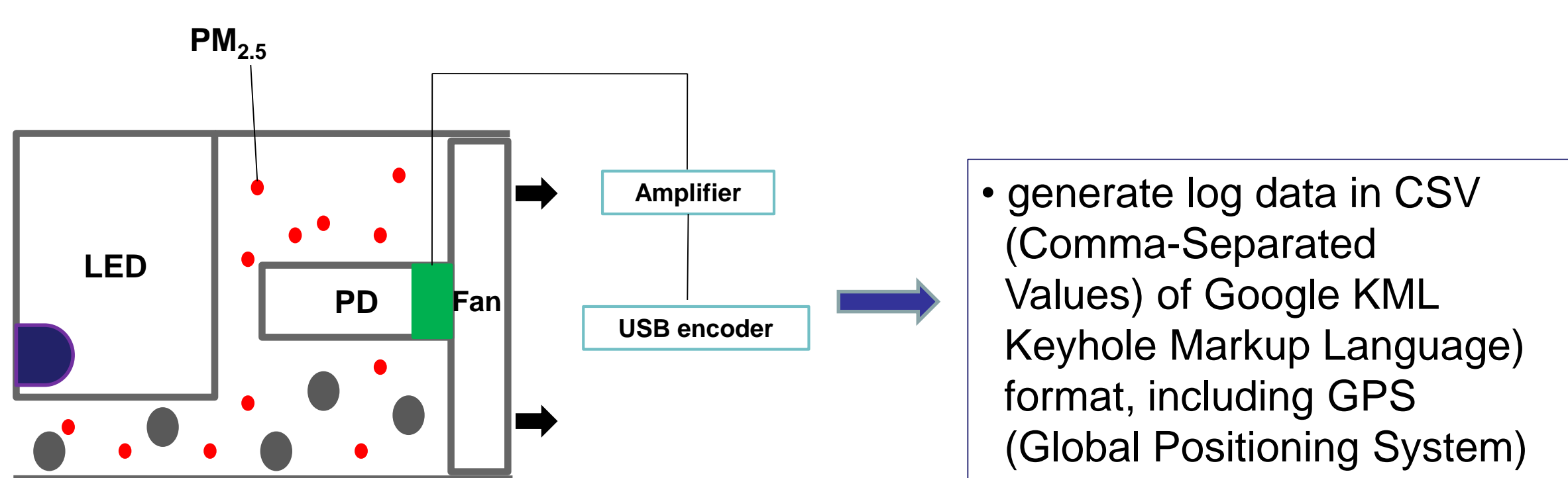
Fig 1. Principle of Pocket PM$_{2.5}$ Sensor Module (adapted from Yang et al., 2017) LED-Light Emitting Diode, PD-Photodiode, USB (Universal Serial Bus).

Fig 2 (a). Pocket PM$_{2.5}$ Sensor, a smart phone with android system, (b) color variations for level of PM$_{2.5}$ concentration and (c) recording PM$_{2.5}$ at the starting point for 8 tracks.
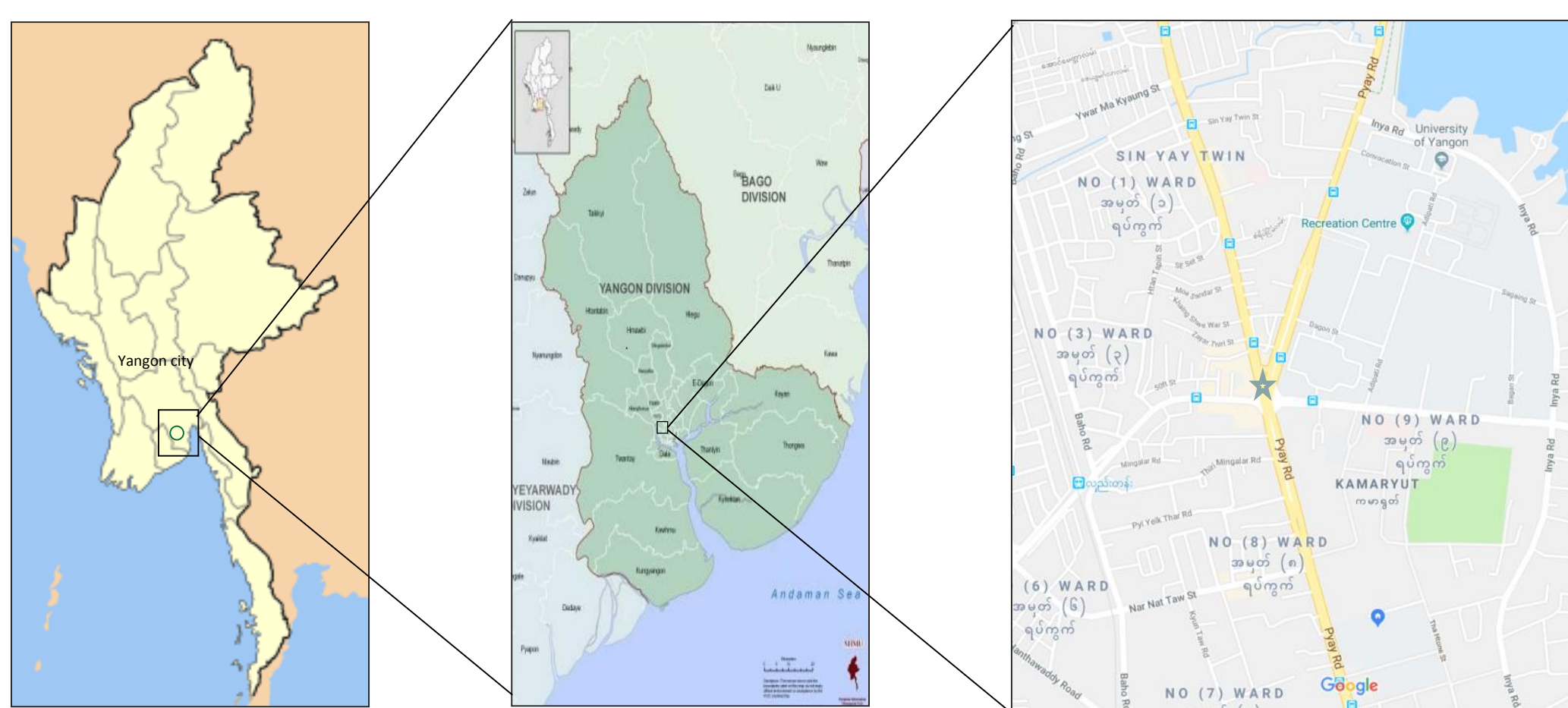

Fig 3. Location of Kamaryut Township, Yangon, Myanmar

Results and Discussion

Table 1. PM$_{2.5}$ concentrations of seven Townships

Township	Morning (7:00 h) (μg/m^3)	Afternoon (13:00 h) (μg/m^3)	Evening (19:00 h) (μg/m^3)	Population	Remark
Hlaing	117 ± 38$^\Delta$	38 ± 11*	94 ± 35$^\bullet$	160,307	Residential area
Hlaingtharyar	164 ± 52$^\Delta$	31 ± 15*	100 ± 35$^\bullet$	687,867	Industrial area
Kyimyindine	104 ± 69$^\Delta$	31 ± 12*	71 ± 27$^\bullet$	111,514	Semi-residential area
Kamaryut	91 ± 37$^\Delta$	30 ± 14*	60 ± 22$^\bullet$	84,569	Semi-residential area
Pazundaung	78 ± 29$^\Delta$	35 ± 23*	67 ± 30$^\bullet$	48,455	Residential area
South Okkalapa	121 ± 35$^\Delta$	66 ± 48*	77 ± 29$^\bullet$	161,126	Commercial area
Tamwe	130 ± 102$^\Delta$	39 ± 21*	69 ± 27$^\bullet$	165,313	Residential area

- The highest values in the morning might be due to the smog since the study period was winter and the smoke from burning dried leaves, from tea/food shop using log/charcoal stove.
- The lowest concentrations in the afternoon might be due to loss of semivolatile PM due to higher temperature.
- The evening rise may be due to smoke from vehicle exhaust from higher traffic flows.
- The highest concentration in Hlaingtharyar Township could be due to emission from factories and vehicles from highway roads.
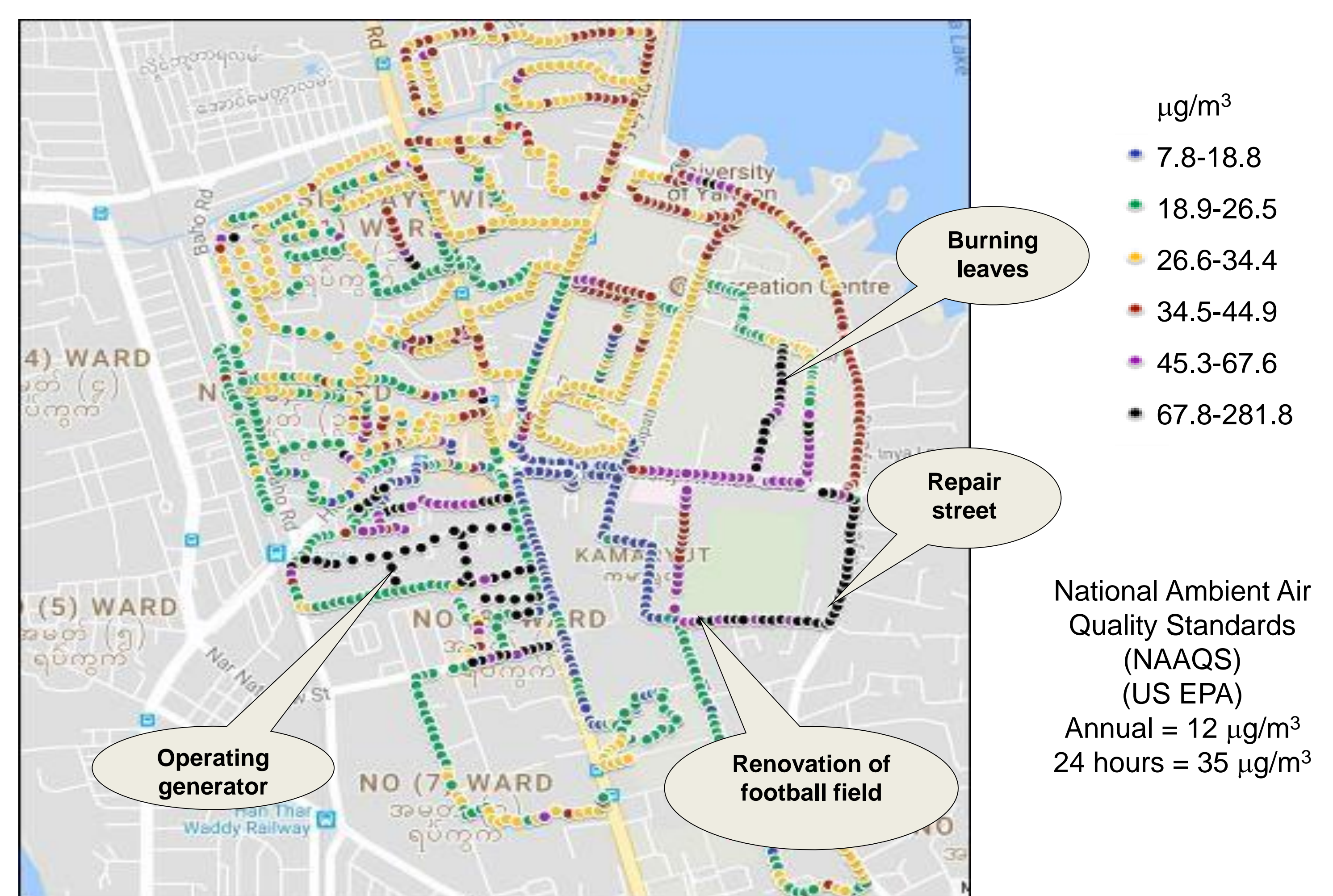

μg/m^3
- 7.8-18.8
- 18.9-26.5
- 26.6-34.4
- 34.5-44.9
- 45.3-67.6
- 67.8-281.8

National Ambient Air Quality Standards (NAAQS) (US EPA)
Annual = 12 μg/m^3
24 hours = 35 μg/m^3

Fig 4. Mapping of PM$_{2.5}$ concentration in Kamaryut Township, Yangon.

- Regarding 8 tracks within Kamaryut Township, PM$_{2.5}$ values varied along with the immediate environment where the investigators walked.
- The highest range of 67.8 - 281.8 μg/m^3 was recorded at the site of road repairs were being made, areas where dried leaves were being burned, generator operating and renovation of football field.

Conclusion

- This is the first study to quantify the regional distribution of PM$_{2.5}$.
- The PM$_{2.5}$ level in Yangon city has reached the noticeable level.
- PM$_{2.5}$ concentrations tends to be worse at places close to busy roads, and food shops and vary between different areas with different conditions of the same Township at the same time.
- Pocket PM$_{2.5}$ Sensor was found able to record the real time PM$_{2.5}$ concentration and used for evaluation of distribution of PM$_{2.5}$ in local or specific areas easily and effectively.

Future Plan

- Our future plan is to detect individual exposure screening of PM$_{2.5}$ concentration in highly contaminated area using pocket PM$_{2.5}$ sensor and to investigate whether association exists between PM$_{2.5}$ concentration and health risk in Myanmar.

Data are presented as mean ± SD, ANOVA with post-hoc: $^\Delta$ morning *Vs* afternoon, $^\bullet$ morning *Vs* evening, *afternoon *Vs* evening, significant level (p < 0.001)

No conflict of interest