



INTERNET OF THINGS FOR AIR QUALITY COMMUNITY MONITORING DURING HAZE EPISODES IN SINGAPORE

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SINGAPORE HAZE 2015

TODAY

PM_{2.5} levels hit 471 as haze situation worsens

- **From September until November**
- **Prevailing S-SE winds**
- **Unhealthy range of PSI**
- **Some of the 2015 FINA Swimming World Cup's events on 3 October 2015 were cancelled**



Haze as seen from Teban Gardens on Oct 20, 2015. One-hour PM_{2.5} levels reached 471 in the west at 11pm yesterday (Oct 19). Photo: Wee Teck Hian

Daily or shorter averages?

- **Regulatory standards** for PM10 and PM2.5 refer to **24h** average concentrations
- **Temporal patterns** of haze events may be characterized by very high concentrations covering **only few hours**.
- **Spatial variation** of PM concentrations can also be relevant within a large city like Singapore due to local wind circulation.

Neighbourhood Monitor by Met One

A trial unit was installed in a residential neighborhood of Singapore and monitored data published on the web

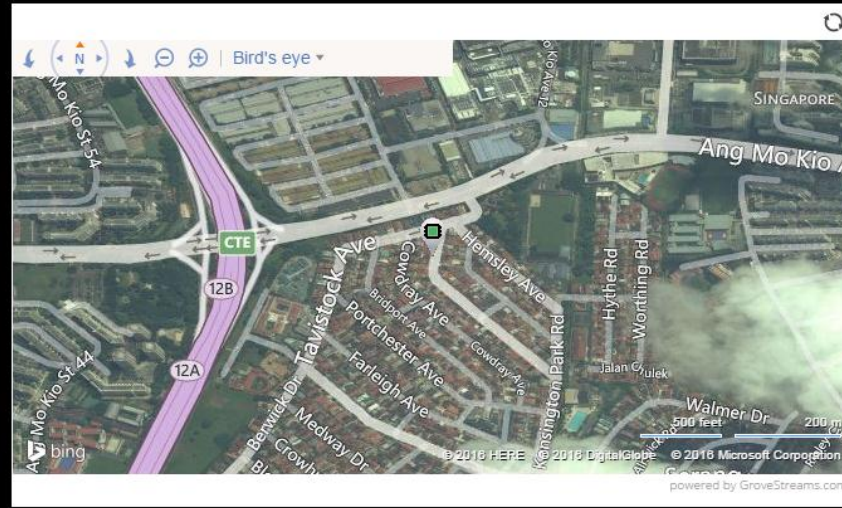
QUALITY MATTERS

- Same engine as the E-Sampler, used by Universities like NUS for research purposes
- PM2.5 cyclone with NIST calibration certification
- Heated sampling to maintain temp/RH and reduce moisture influence



Data on mobile/laptop

Asia Pacific Air Quality Neighborhood Monitor T16956



Time	T16956 (Conc)
2016-08-24 22:45:00	0.0ug
2016-08-24 22:40:00	0.0ug
2016-08-24 22:35:00	1.0ug
2016-08-24 22:30:00	0.0ug
2016-08-24 22:25:00	1.0ug
2016-08-24 22:20:00	0.0ug
2016-08-24 22:15:00	1.0ug
2016-08-24 22:10:00	0.0ug
2016-08-24 22:05:00	1.0ug
2016-08-24 22:00:00	0.0ug
2016-08-24 21:55:00	0.0ug

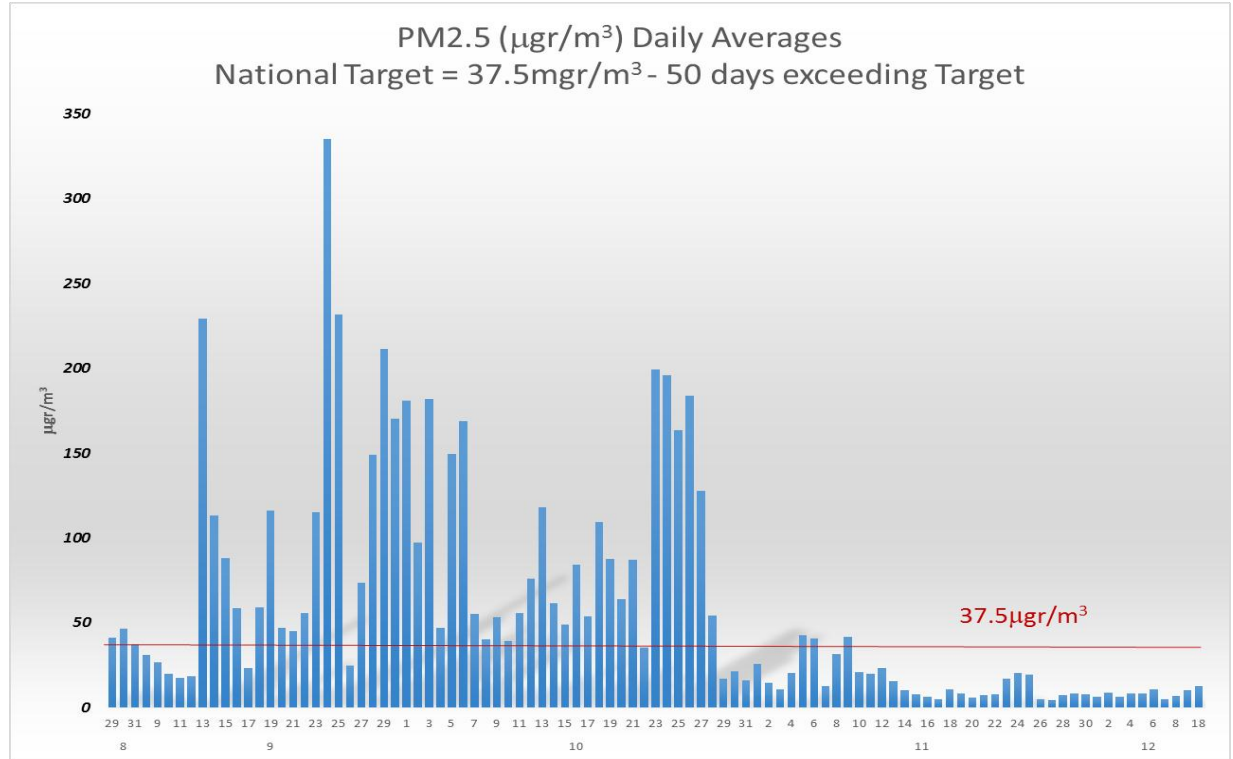
Internet Of Things (IOT)

- Allows citizens to do their own consultation
- People can adjust the schedule of their outdoor activities to match safe periods of the day.
- Reasonable costs.



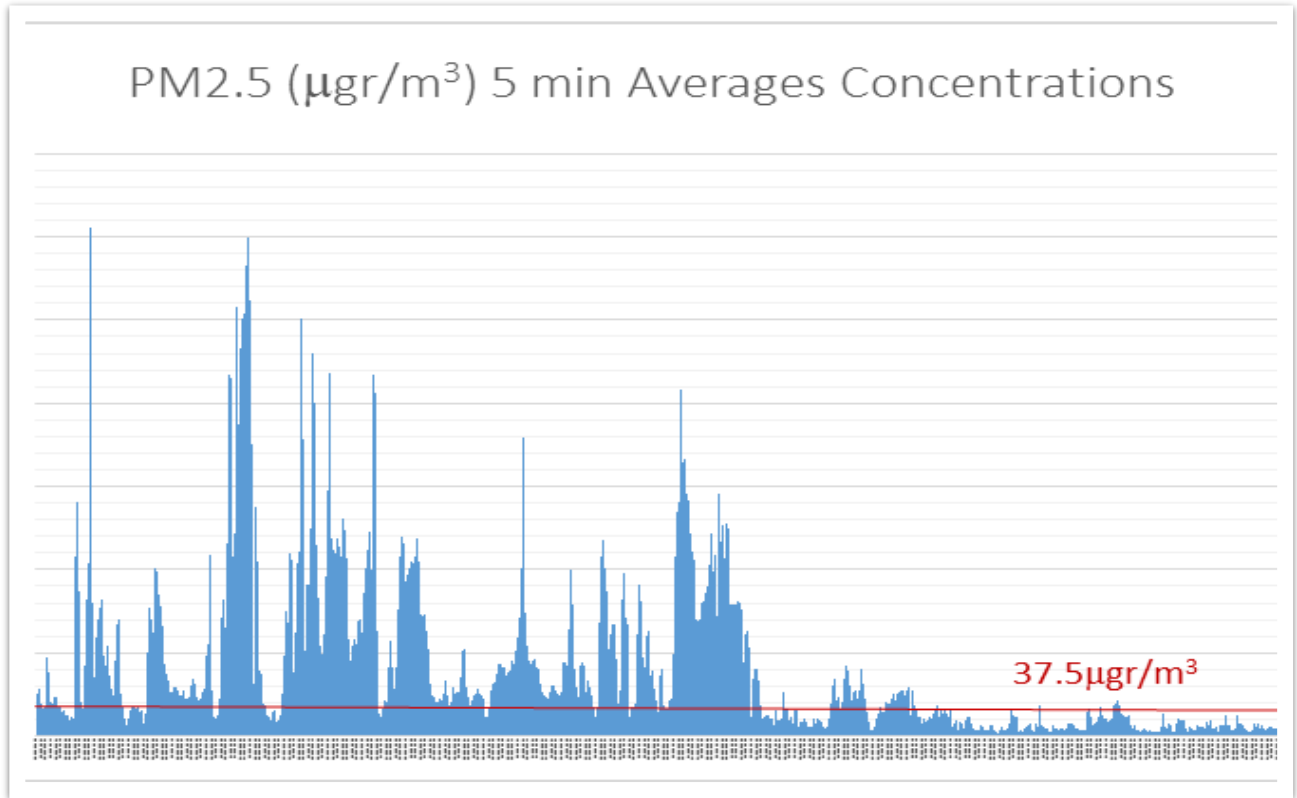
24 hours PM2.5 Conc.

- Daily averages
- 50 days above AQ target
- Up to 335 $\mu\text{gr}/\text{m}^3$



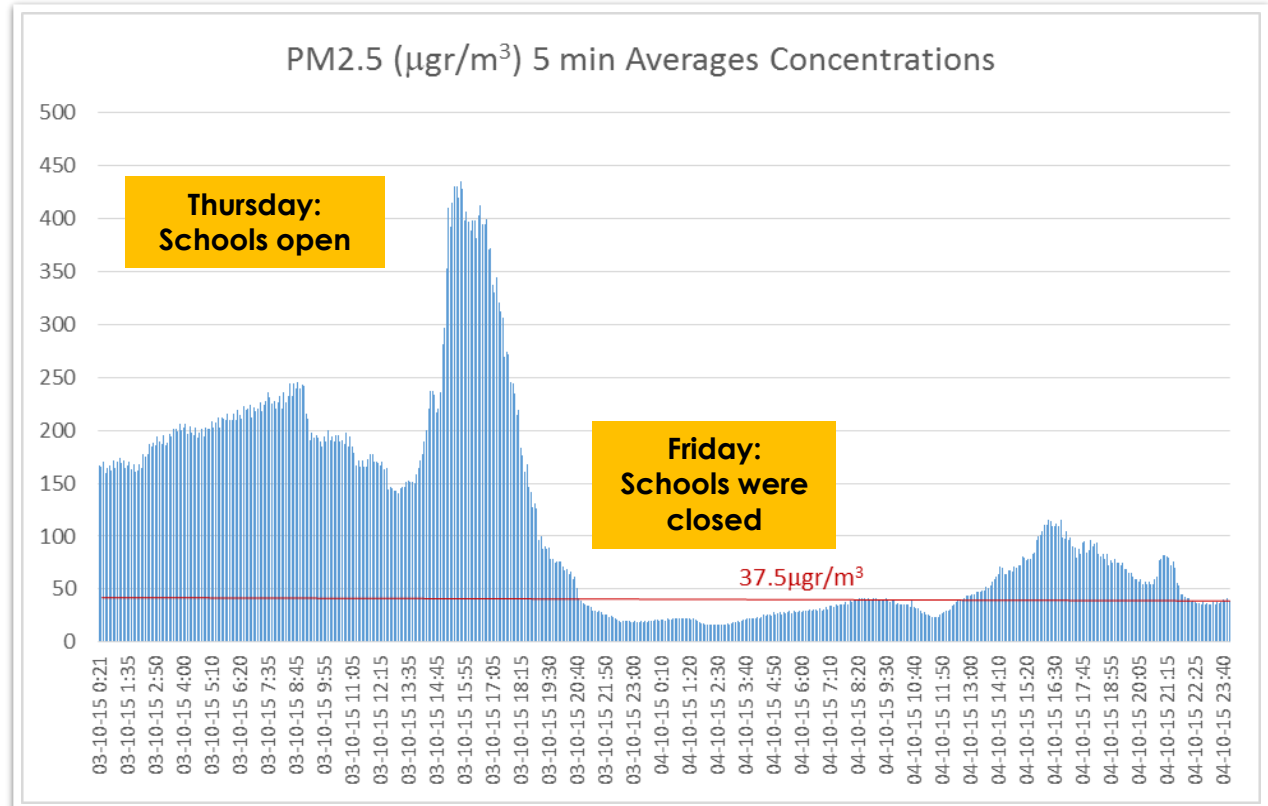
5 minutes PM2.5 Conc.

- Detailed information each 5 minutes
- Within 24 hours some hours are above, some are below the AQ target
- Up to 600 $\mu\text{gr}/\text{m}^3$



Is it OK to go for my football match?

- **Thursday:** playing indoor
- **Friday:** based on last 24 h no football match



Time & Location Matter

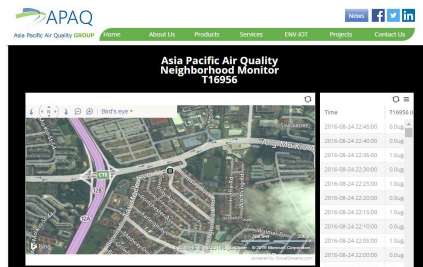
We want to know the quality of the air right now (**real-time**) and at specific locations (**spatial resolution**) to decide our near-future actions.

- Should I wear the mask on the way to **supermarket now**?
- Should I go for a jog in the **Park now**?
- Should I allow my kid to go outdoors and **play now**?



Feedback from users

- **Up to 2000 visitors per day** were checking the data to be timely informed of the haze levels
- Sharing on **Facebook, Twitter, LinkedIn**
- Direct **email** to APAQ Group



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AIR QUALITY, WE CARE.

Thank You For Your Attention

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