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# Experience in using Low-Cost Sensors under ADB TA 9608

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# AQ Mesh Technical and Financial details

**Technical specification**

- 24 month maintenance package and 12 – 24 month warranty
- Power supply (solar array; battery; mains electricity)
- Data storage (1 – 60 minute average minimum) and connectivity (local download vs SIM card)
- Documentation including Standard Operating Procedures; preventive/routine/corrective maintenance procedures
- Provision of training and support
- City-specific requirements (climate; likely sources of air pollution)

**Price**

- 16 sensors measuring $PM_{2.5}$, $PM_{10}$, $NO_2$, $SO_2$, CO
  - (Not all sensors measured all parameters)
  - (Including 5 units measuring wind speed and direction)
- Provision of maintenance support/data for 2 years
- Approximately USD $60,000

# AQ Mesh Technical and Financial details

| Pollutant | Range (mandatory) | Detection limit (mandatory) | Scoring |
|---|---|---|---|
| **Mandatory Items: Mandatory Pollutants** | | | |
| **$PM_{2.5}$** | 0 – 10,000 µg/m³ | 1 µg/m³ | Pass/fail |
| **$PM_{10}$** | 0 – 10,000 µg/m³ | 1 µg/m³ | Pass/fail |
| **Preferred Optional Items: Preferred Pollutants** | | | |
| **Carbon monoxide (CO)** | 0-5 ppm (0-6 mg/m³) | 0.05 ppm | Pass/fail |
| **Nitric oxide (NO)** | 0-1,000 ppb (0-1,200 µg/m³) | 5 ppb | Pass/fail |
| **Nitrogen dioxide ($NO_2$)** | 0-1,000 ppb (0-2,000 µg/m³) | 5 ppb | Pass/fail |
| **Sulphur dioxide ($SO_2$)** | 0-1,000 ppb (0-2,600 µg/m³) | 5 ppb | Pass/fail |
| **$PM_1$** | 0 – 10,000 µg/m³ | 1 µg/m³ | Pass/fail |
| **Total Suspended Particulates (TSP)** | 0 – 10,000 µg/m³ | 1 µg/m³ | Pass/fail |
| **Volatile organic compounds (VOC)** | No specific requirement | No specific requirement | Pass/fail |
| **Mandatory Items: Mandatory meteorological parameters (as part of an air quality sensor system/instrument)** | | | |
| **Temperature** | -10ºC to 50ºC | 0.1ºC | Pass/fail |
| **Relative humidity** | 0% to 100% | 1% | Pass/fail |
| **Preferred Optional Items: Preferred meteorological parameters (as part of an air quality sensor system/instrument)** | | | |
| **Wind speed** | 0 to 50 m/s | 0.1 m/s | Pass/fail |
| **Wind direction** | 0º to 359º | 0.5º | Pass/fail |
| **Additional Optional Items: GPS parameters (as part of an air quality sensor system/instrument)** | | | |
| **GPS requirements** | n/a | n/a | Pass/fail |

# Challenges faced with LCS

- Connectivity with mobile phone networks was challenging
- Faced challenges with faulty equipment and issues with functioning of some equipment (Having expert support available in each city was useful for troubleshooting)
- LCS instruments have a limited lifetime (typically 2 or 3 years), so data availability/formats etc change quite rapidly. Sensors need to be replaced after 3 years.
- LCS data comes in different forms e.g. may only be accessible via a proprietary website on payment of an annual fee

# Steps needed for using LCS for AQM

- Not all LCS are reliable. Refer to independent validation studies to confirm reliability of LCS
- Co-location studies with reference instruments is essential to ensure reliable data
- LCS networks should support a structured programme of air quality monitoring, assessment, analysis, options appraisal, and development/implementation of an action plan
- LCS data should be made widely available for use by stakeholders – e.g. Government departments, academia, civil society groups
- There is resistance to use of LCS data in some institutions. Need to raise awareness that if used properly LCS data can be a robust and valuable addition to measurements using reference techniques.

# Steps to build linkages between city, regional and national level monitoring

- LCS data quality and AQ monitoring system should be consistent with and contribute to national level AQM plan
- Need coordination between national level and city level or provincial level institutions buy-in from local government counterpart to identify and gain access to suitable monitoring locations
- LCS data should feed into an online database that can be accessed and managed by national level and local level agencies
- ADB's SPADE resource may be a useful platform for data sharing: https://spadegis.adb.org/

# THANK YOU!