

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

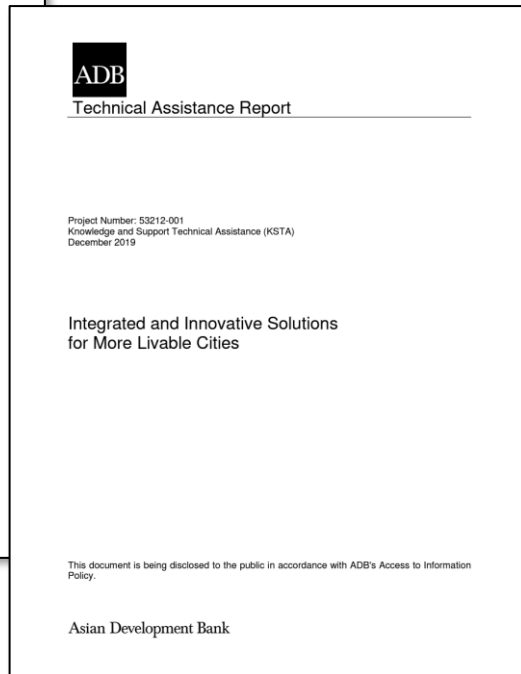
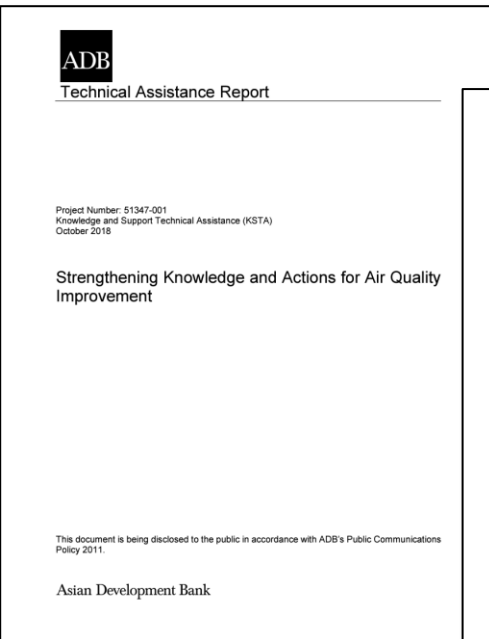


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Use of Air Quality sensors in ADB Projects

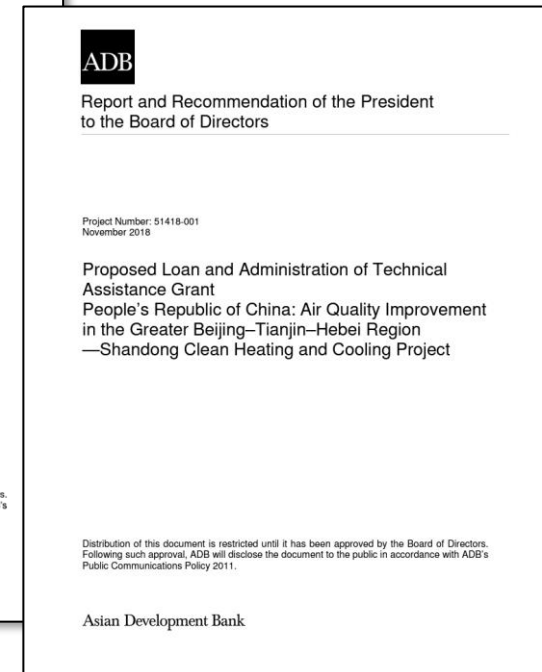
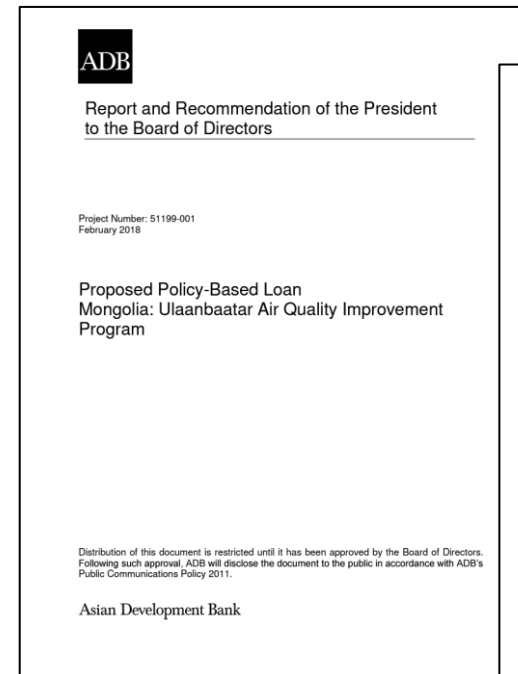
Technical Assistance (TA) Projects

- TAs with scope of conducting air quality studies for purposes of project or program design or provision of policy support



Investment Projects (Loans or Grants)

- Baseline air quality data collection as part of environment safeguard assessment
- Air quality monitoring as part of environment safeguard monitoring activities including post project air quality
- Technical studies as part of project design





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}, PM₁₀, NO₂, SO₂, 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 for 16 units or about \$4000 per unit (not including local taxes and duties)

AQ Mesh Technical and Financial details

Pollutant	Range (mandatory)	Detection limit (mandatory)	Scoring
Mandatory Items: Mandatory Pollutants			
PM _{2.5}	0 – 10,000 µg/m ³	1 µg/m ³	Pass/fail
PM ₁₀	0 – 10,000 µg/m ³	1 µg/m ³	Pass/fail
Preferred Optional Items: Preferred Pollutants			
Carbon monoxide (CO)	0-5 ppm (0-6 mg/m ³)	0.05 ppm	Pass/fail
Nitric oxide (NO)	0-1,000 ppb (0-1,200 µg/m ³)	5 ppb	Pass/fail
Nitrogen dioxide (NO ₂)	0-1,000 ppb (0-2,000 µg/m ³)	5 ppb	Pass/fail
Sulphur dioxide (SO ₂)	0-1,000 ppb (0-2,600 µg/m ³)	5 ppb	Pass/fail
PM ₁	0 – 10,000 µg/m ³	1 µg/m ³	Pass/fail
Total Suspended Particulates (TSP)	0 – 10,000 µg/m ³	1 µg/m ³	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	-10°C to 50°C	0.1°C	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	0° to 359°	0.5°	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

THANK YOU!