AIR QUALITY MONITORING

DEVELOPING AN AIR QUALITY MONITORING PROGRAM

SETTING THE OBJECTIVES

Air quality monitoring is an important component of an effective air quality management system carried out to have a better understanding of the status of air quality in a certain location (ADB & Clean Air Asia, 2014). The design and purpose of an air quality monitoring activity will determine: size and sophistication of the monitoring network (including equipment); location and number of sampling stations; duration and frequency of sampling; and, most importantly, the financial and manpower resources needed to operate and sustain the network (Clean Air Asia, 2016).

IDENTIFYING PARAMETERS FOR MONITORING

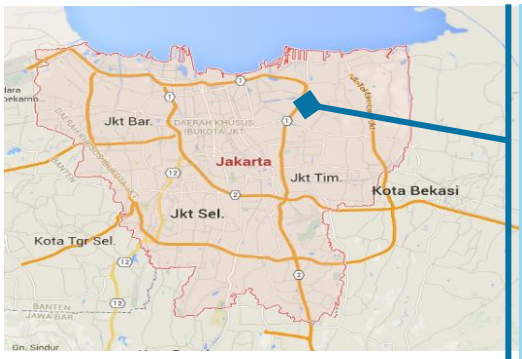
Pollutants for which standards or guideline values have been established are prioritized in monitoring. However, it is ideal to conduct a study to screen the pollutants that are relevant to the area (Schwela, 2010).

DKI Jakarta Air Quality Monitoring Sites (as of May 2015)

Station	Location	Station Type	Pollutants Monitored	Sampling Frequency	Ave Operation Days (per year)
DKI 1	Bundaran HI, Central Jakarta	Continuous, fixed	PM10, CO, O3, SO2, NO2, Met	30 minutes	356 days
DKI 2	Kelapa Gading, North Jakarta			30 minutes	356 days
DKI 3	Jagakarsa, South Jakarta			30 minutes	356 days
DKI 4	Museum Lubang Buaya, East Jakarta			30 minutes	356 days
DKI 5	Perumahan Kebon Jeruk, West Jakarta			30 minutes	356 days
JMS	BPLHD Office/ mobile	Mobile	PM10, CO, O3, SO2, NO2		
JIEP	Pt. Jiep, East Jakarta	Manual	TSP, SO2, NO2, Pb	24hrs/every 14 days	24 days
Ciracas	Ciracas, East Jakarta			24hrs/every 14 days	24 days
Kalideras	Kalideres, West Jakarta			24hrs/every 14 days	24 days
Istiqlal	Istiqlal, Central Jakarta			24hrs/every 14 days	24 days
Ancol	Dufan Ancol, North Jakarta			24hrs/every 14 days	24 days
KR Pela	Kr Pela, South Jakarta			24hrs/every 14 days	24 days
Cilingcing	Cilingcing, Central Jakarta			24hrs/twice a month	24 days
Kantor	Casablanca, South Jakarta			24hrs/twice a month	24 days
Tebet	Tebet, South Jakarta			24hrs/twice a month	24 days

IDENTIFYING SIZE AND LOCATION

Monitoring locations usually depend on the overall monitoring objectives, pollution sources and emissions, meteorology, topography, input from dispersion modeling and other inputs such as demographic and land use information. The size and location of monitor stations is important to ensure that the measurements taken are adequately representative of the air quality conditions of the area.



DKI 2in a residential area in North Jakarta

There are various technical guidelines for designing and operating an air quality monitoring program/network, including those from WHO, USEPA, and the EU (Clean Air Asia, 2016 – also see guidelines references below).

QUALITY ASSURANCE AND QUALITY CONTROL

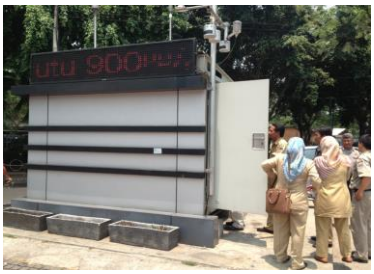
Quality assurance (QA) and quality control (QC) protocols and procedures are established to ensure that the entire process of data collection and management will ultimately lead to valid and reliable data.

Activities in a QA/QC process	*Elements covered*
Develop specifications for operating a monitoring network	▪ Data quality objectives ▪ Measurement methodology (reference methods) ▪ Equipment selection and operation ▪ Site selection (site classification, distribution and location) ▪ Sampling system (shelter requirements and probe siting)
Assess compliance to the developed guidelines (standard operating procedures and calibration)	▪ Station and analyzer operation (station visits, ensuring that operation procedures are followed, and preventive maintenance) ▪ Calibration (primary and secondary calibration standards, calibration frequency, calibration procedures, and zero and span verifications)
Implementing corrective actions to ensure compliance to the developed guidelines	▪ System audits and station performance (includes independent verifications) ▪ Data validation ▪ Documentation (log books and operation manuals) ▪ Personnel training and technical support

Source: USEPA, 2013 and Watson et al., 2013

Records for internal audit in all continuous monitoring stations are in place.

Tools, spare tubes and dried silica gel are available in case of immediate need for troubleshooting the analyzers.



Electronic boards that display recent air quality readings.

RECOMMENDATIONS FOR AIR QUALITY MONITORING IN DKI JAKARTA

ADDITION OF CONTINUOUS MONITORING STATIONS

DKI Jakarta's current air quality monitoring network five (5) continuous (monitoring PM_{10}, CO, O_3, SO_2, NO_2) and nine (9) manual monitoring stations are strategically situated in the different areas of the city: Central, North, East, and West Jakarta and represent traffic, residential, and industrial sites in the city.

Total land area of Jakarta: 664km²
Population: 9.6 million (2010 census)

Based on the National Technical Regulation on Selection of Ambient Air Quality Monitoring Stations in China (which considers both population and land area), the prescribed minimum number of monitoring stations for DKI Jakarta is 11 stations. If the city will move towards having the entire monitoring network with continuous stations, at least six (6) additional continuous monitoring stations are needed. The current siting already covers possible key sources of emissions and so manual sites can be converted to continuous monitoring stations.

ADDITION OF $PM_{2.5}$ MONITORS

Monitoring $PM_{2.5}$ is important because of its severe health impacts. Fine particulate matter is identified as the leading risk factor for non-communicable diseases (NCDs),in particular, cancers, chronic obstructive pulmonary disease (COPD), asthma, ischemia, myocardial infarction, and stroke (World Health Organization,2014).This is an important consideration because in recent years, air pollution-related diseases are among the top 10 leading causes of death and disability in the country (IHME, 2015).

$PM_{2.5}$ monitoring equipment at BPLHD office

DKI Jakarta recently added two $PM_{2.5}$ monitors to their air quality monitoring network and plans to gradually add more monitors following the results of the long-term analysis of PM_{10} from each existing continuous monitoring sites and site representativeness. In the assessment recommendations, the priority sites are DKI 4 (residential, highest PM_{10} design value), DKI 3 (residential/background), DKI 1 (roadside).

IMPROVEMENT OF QA/QC SYSTEM

Several improvements in QA/QC activities need to be implemented, such as: the protocol for procurement and maintenance of supply of calibration and span check gases to avoid the use of expired gases which may result in incorrect readings; an SOP for the calibration of O_3 analyzer using standard reference material is also necessary as the use of O_3 transfer standards may not give quantitative calibration information.

For more information on the assessment findings and recommendations, please refer to the full report:
Air Quality Monitoring System Assessment Report and Recommendations for DKI Jakarta

BREATHE EASY JAKARTA

Supported by: **United States Environmental Protection Agency**

Implementing partners:

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