

MEGACITIES PARTNERSHIP

Air Quality Monitoring Plan

Template

October 2022

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Executive Summary

*Include an executive summary of main findings here. This section may include information about project background, description of the overall effort, timeline, milestones, results, recommendations, and next steps.*

# Introduction

*With monitored data, agencies can understand real-world conditions, support compliance goals, track progress toward meeting air quality standards, better understand ambient conditions that lead to high concentrations, and provide useful data for policy makers and the general public.*

*Provide a brief history of air quality conditions (key pollutants, pollution sources) and air quality monitoring (current and past air quality measurements), challenges (population growth, gaps in network, lack of funding), relevant local and federal authorities, and why this plan was developed (monitoring to track progress in emissions reductions).*

# Overall Objective and Goals of the Air Quality Monitoring Plan

*The centerpiece of the Air Quality Monitoring Plan (AQ Monitoring Plan) is establishing overall objectives for the measurement of air quality in the megacity to meet the goals of the AQ Monitoring Plan. For example:*

“Ambient particulate matter is measured with sufficient spatial and temporal coverage, and quality, to compare to the national ambient air quality standards, to track progress in emissions reductions, and to provide information to the public to aid in reducing their exposure.”

*To meet this objective, this section should set forth actionable goals by which the objective will be fulfilled. For example:*

* ***Goal 1: The ambient air monitoring network complies with best practices for siting and pollutant measurement.***
* ***Goal 2: Measurements provide adequate spatial and temporal coverage using a mix of regulatory grade and low-cost sensors, as appropriate.***
* ***Goal 3: Air quality monitoring is supported by effective training, systems, quality assurance and control procedures, and tools to ensure high data quality.***
* ***Goal 4: Air quality information and data are provided to the public in a clear manner with guidance on actions that can be taken by individuals to reduce their potential exposure.***

# Air Quality Monitoring Plan Development Process

*Outline the various processes that contributed to the development of the AQ Monitoring Plan with more detail in the following sections.*

## Stakeholder Engagement in the Air Quality Monitoring Plan Development Process

*Summarize stakeholder engagement that has occurred both outside and within the relevant government agencies.*

## Current Monitoring Network or other Data Sources

*Discuss the current air monitoring network or past studies and air quality data considered. Include maps and summary statistics of the monitor data, such as comparisons of concentrations relative to levels of concern (e.g., World Health Organization guidelines, other relevant air quality standards).*

## Air Quality Monitoring Plan Development: Analytic Steps

*In the U.S., previous AQ Monitoring Plans have been developed through a process of collaboration and consultation with stakeholders in industry, non-governmental organizations, and state and local governments, with support from the U.S. EPA. The process typically includes the steps listed below. Megacity Partner organizations and the host cities should provide relevant details, analyses undertaken, and collaborators included in each step.*

1. ***Review of the AQ monitoring plan goals with regard to overall air quality management objectives***.
2. ***Design monitoring network to meet goals including where to monitor, what to monitor, how to monitor, and how often to monitor ambient air quality.***
3. ***Steps to ensure high data quality, including routine diagnostics of monitoring equipment and data handling procedures.***
4. ***Considerations and plan for sharing air quality information with the public.***
5. ***Establishment of goals and objectives for the air quality network.*** *Typical goals include assessing population exposure, assessing compliance with and/or progress toward meeting ambient air quality standards, activating emergency control procedures that prevent or alleviate air pollution episodes, tracking pollution trends, conducting source apportionment to determine potential control measures, providing data for research evaluation (e.g., air quality models, emission inventories, health and environmental effects), tracking specific sources (e.g., near roadway, point sources), and characterizing pollutant transport or background concentrations.*
6. ***Development of a detailed implementation plan.*** *Achieving the goals and objectives of the plan requires a detailed implementation plan. The plan will need to be routinely updated through stakeholder engagement and as part of the ongoing monitoring and evaluation of the plan’s effectiveness.*

# Summary of the Air Quality Monitoring Approach

*The size and components of an air quality monitoring network are dependent on the pollutants to be measured, measurement methods, operational considerations (e.g., staffing, training, access to power), and available funding.*

## Pollutants to be Measured

*Describe the pollutants of interest and their priority. Discuss the set of sources including point sources (e.g., industrial sites), mobile sources (vehicles), and area sources, both from naturally occurring (e.g., wind-blown dust) and man-made (e.g., cook stoves, open burning of waste) sources. Include information regarding relevant meteorological conditions affecting air quality. Discuss the need for meteorological measurements as well.*

## Measurement Methods

*For the priority pollutants, discuss the measurement method options (e.g., low-cost sensors or regulatory grade instruments) and the pros and cons of each. Consider sampling frequency, ease-of-use so that data capture is high, data quality, and goals for data use (e.g., obtaining baseline concentrations, tracking emissions changes, understanding emissions source contributions). If low-cost sensors are used, describe the calibration procedures used at the beginning and during monitoring, e.g., collocation with reference-grade instrumentation.*

## Operations Assessment

*Provide information on operational needs and capabilities including monitor siting, instrument operations and maintenance, parts and supplies, logistical considerations (e.g., site access, power, security), and ongoing training of site operators.*

## Data Sharing

*Provide information on how data will be collected, quality assured, and shared. Describe messaging to the public related to pollutant concentration levels. Related resource, communication template: https://www.epa.gov/air-quality-management-process/communications-plan-template*

## Capacity Assessment

*Provide an analysis of the governmental, academic, research, and local resources available to design, install, and operate an air quality monitoring network.* ***Table 1*** *below can be used to provide a summary of capabilities for each major component of an air quality monitoring network. For each component listed in* ***Table 1****, an initial status assessment and any potential capacity gaps should be documented in the corresponding columns.*

Table 1. Status of Air Quality Monitoring Network Capabilities

| COMPONENT | INITIAL ASSESSMENT OF STATUS | POTENTIAL CAPACITY GAPS |
| --- | --- | --- |
| *Network design* |  |  |
| *Measurement methodology* |  |  |
| *Operations and maintenance* |  |  |
| *Data quality assurance/quality control* |  |  |
| *Data dissemination and visualization* |  |  |
| *Data messaging* |  |  |
| *Data Interpretation* |  |  |
| *Public Participation and Environmental Justice* |  |  |
| *Network management* |  |  |

# Challenges

*Identify and address the unique challenges faced in developing and implementing an air monitoring network. List and describe major areas where capacity limitations can and should be addressed to further enhance the ability of the network, collect policy-relevant data, and share the data with the public. The examples should be specific to the megacity and may include:*

## Infrastructure and Resources (e.g., funding)

## Institutional Capacity (e.g., air quality monitoring capabilities and support)

## Training and Capacity Building (e.g., education and outreach on air pollution issues)

# Air Quality Monitoring Network Design

*Discuss pollutants, measurement methods selection, site selection, and other considerations.*

## Methods Selection

*Provide detailed discussion of pollutants to be measured, detection limits, operating conditions, data collection (e.g., need for Wi-Fi or internet), environmental requirements (e.g., conditioned air), power requirements, reliability, costs to purchase, consumables, maintenance needs, calibration needs, sensor evaluation results, etc. Include discussion of lower cost sensor systems compared to regulatory grade instrumentation. Summarize the instruments to be used and why they were selected.*

## Site Selection

*Provide a discussion of site selection. Consider*

* *a mix of siting objectives such as high population density, near-source, and background.*
* *monitoring scale (micro/near-source, middle/gradient from sources, urban, or regional)*
* *influence of nearby emission sources, buildings or trees, population density, terrain, meteorology, existing air quality and meteorological measurements.*
* *Long-term site commitment – sufficient operating space, accessibility, security, safety, power, and environmental control.*
* *Collocation of low-cost sensors with regulatory grade instruments for calibration and assessment of low-cost sensor precision and accuracy.*
* *Development of communication materials to help explain the type of equipment and rationale for monitoring to local officials as well as community members and business owners near the instrument or sensor*

## Network

*Include a table listing measurements (e.g., pollutant, instrument, concentration units, sample frequency, detection limit) to be made at each site. Include a map of all sites including roadways, major industrial sources, and other details that will aid in data interpretation (e.g., background site, near-road site). It is helpful to have photos of each monitoring site and the surroundings.*

# Implementation Plan

*Provide an implementation plan that aims to fulfill the air monitoring goals and objectives. The plan should be detailed and specific, and include the fundamentals of program execution, oversight, and evaluation – concrete activities, responsible agencies, accountable timelines, and performance indicators to track progress over time. The objectives below are examples of what might be included. (Goals are from Section 2).*

TAble 2. Outline of action items to meet AQMONP goals.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Goal 1: The ambient air monitoring network complies with best practices for siting and pollutant measurement** | | | | | |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** |
| Effectively collect, manage, and disseminate air quality data to partners | - | - | - | - | - |
| Establish air monitoring network that supports air quality management plan | - | - | - | - | - |
| Network will provide high quality and actionable data for decision makers | - | - | - | - | - |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Goal 2: Measurements provide adequate spatial and temporal coverage using a mix of regulatory grade and low-cost sensors, as appropriate** | | | | | |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** |
| Collect air quality data from a range of site types to best support policy making | - | - | - | - | - |
| Collect high quality air monitoring data on intervals to best support policy making, e.g., every-3rd or 6th-day for speciated measurements, or hourly for criteria pollutants | - | - | - | - | - |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Goal 3: Air quality monitoring is supported by effective training, systems, and tools to ensure high data quality** | | | | | |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** |
| Develop local and external capabilities to perform analysis, including Standard Operating Procedures (SOPs) and supporting data systems | - | - | - | - | - |
| Data completeness of data that pass standard quality control checks better than 75% | - | - | - | - | - |
| Enhance institutional monitoring capabilities | - | - | - | - | - |
|  | - | - | - | - | - |
| **Goal 4: Air quality information and data are provided to the public in a clear manner with guidance on actions that can be taken by individuals to reduce their exposure** | | | | | |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** |
| Enhance understanding among general public | - | - | - | - | - |
| Inform decision makers about air quality conditions, sources, and actions that can be taken to reduce emissions and protect public health | - | - | - | - | - |
| Assist stakeholders and the regulated community to understand and comply with regulations |  |  |  |  |  |

# Monitoring Network Operations

*Describe how the monitoring network will be operated to meet objectives. Include installation, operations and maintenance activity schedule, technician training and oversight, quality assurance oversight and goals. Roles, responsibilities, and flow of data should be clearly outlined.*

## Site preparation and installation

*Describe how sites will be prepared and installation performed. Discuss any ongoing site maintenance that is needed.*

## Quality Assurance Planning

*Develop a quality assurance project plan (QAPP) and standard operating procedures (SOPs). A quality manager provides oversight to ensure the QAPP and SOPs are followed and updated as needed. Resource: https://www.epa.gov/amtic/ambient-air-monitoring-quality-assurance#documents*

## Daily Operations

*Daily data review ensures that instruments are op­erating properly. Describe the people responsible for daily review, who will address issues, and who will follow up to ensure issues were addressed. Describe site logs and how they will be used, reviewed, and accessed for the data validation and analysis processes. Discuss how data will be summarized (e.g., monthly reports, which may include site visit summaries, instrument performance, data completeness and metrics [maximum, minimum, mean, standard deviation, outliers], highlights of high concentrations detection, etc.). Discuss the process for reviewing any automated flags generated by the instrument/sensor and how to document with any necessary additional information about the cause of the flag (for example, equipment malfunction, power outage, extreme events such as wildfire or fireworks, etc.).*

# Data Management and Quality Assurance

## Data management overview

*Describe the data management system including the flow of data.*

## Data quality assurance and control

*Describe the data QC and QA steps that will be taken (e.g., will an automated data screening or alerting system be used?), flow of data, and any redundancies to ensure minimal data loss. Describe data checks and data quality objectives.*

## Data presentation, display, and visualization

*Describe how data will be visualized for internal, operational review, and to share with the public. This may include graphs, reports, public website, online data display tools.*

## Data messaging and communication to the public

*Describe the levels of concern for pollutants (e.g., air quality index, air quality advisories), actions the public can take, and health messaging. Discuss plans to reach out to media and the public (e.g., website, mobile application, social media campaigns, flyers, and toolkits).*

# Conclusions

*Include final conclusions and next steps for the Air Quality Monitoring Plan, for example, implementation of additional monitoring (sites, pollutants, types of instruments). Describe current and upcoming air monitoring challenges that are unique to the region and potential solutions associated with local needs and requirements.*

Citations