Enhancing Air Quality Monitoring in Rio de Janeiro

1. Background

Programme: The Breathe Cities Programme is a global partnership initiative between C40 Cities, the Clean Air Fund, and Bloomberg Philanthropies. By working with cities and coalitions to advance urban clean air action, the Programme will save lives, improve health, and reduce air pollution and climate emissions, aiming for a 30% reduction by 2030. It promotes collaboration among data experts, local communities and policymakers to implement impactful policies that enhance public health, accelerate decarbonization and create greener, healthier urban environments. The program provides cities with the necessary tools and support through data-driven research, technical policy assistance, community engagement, and the exchange of successful strategies across urban centres globally.

Project: Rio de Janeiro is one of the cities of the Breathe Cities initiative. The Rio program aims to implement strategic actions targeting the transportation sector, which accounts for 51% of PM2.5 emissions in the city. The initiative will also prioritize improving air quality monitoring and data collection, developing technical studies, raising public awareness and sharing lessons learned. This project will be key to achieving the Data Pillar policy objective within Breathe Rio's greater strategy.

Currently in the city, the MonitorAr Rio program operates 8 automatic stations measuring CO, PM10, and O3; 4 stations measure SO2 and NO2, and only 1 station measures PM2.5. The State's network adds 13 more stations, but data availability is limited, with PM10 and SO2 data from only 3 stations, PM2.5 from 1, and NO2 from 2. In this context, this RfP is structured to enhance air quality monitoring and data in the city.

Through the procurement and deployment of 10 low cost sensors with a high-degree of data quality (also known as compact sensors) to measure PM10, PM2.5 and PM1 this intervention aims to strengthen the city's air quality monitoring system. By installing air quality sensors in key regions connected with the initiatives of Breathe Rio, particularly in Downtown and Madureira neighbourhoods, the project will establish air quality baseline data, measure pre- and post- intervention to assess

health, economic, and air quality benefits that will be used to inform decision making to ensure the sustainability of these interventions.

2. Scope

The selected service provider will be responsible for conducting a location analysis for sensor placement, procuring monitoring sensors using the funds from this call, and providing services for sensor installation, calibration, data integration, maintenance, as well as data analysis and reporting.

The expected start date for the project is **December 3rd, 2024 and end date is June 15th, 2026 (18 months)**

3. Project Activities, Deliverables and Timeline

Activities

Activity 1. Prepare a report outlining key recommendations, including the location of the 10 sensors in the city centre and Madureira zone

The Service Provider will conduct desktop research and engage with staff in the Environment & Planning Secretariats to produce a report outlining recommendations for the deployment of PM2.5 air quality sensors, based on existing monitoring infrastructure and the city's goals, etc. It will serve as the foundation for identifying gaps and best locations to implement the sensors. One of the sensors must be positioned next to an existing reference station in the city. This placement is intended to assess the accuracy of the data produced by the sensors relative to the highly reliable data from the reference stations.

Throughout this activity, meetings will be held with the municipal teams from the Municipal Environment Secretariat (SMAC) and the Planning Secretariat to ensure alignment with the needs of the municipality. The study will be presented to Breathe Cities team and the municipality and the locations should be validated by both.

Deliverable 1: A report detailing the specific sites to allocate the sensors.

Activity 2. Deploy the air quality sensors in the specified locations

The Service Provider will oversee the purchase and delivery of air quality monitoring sensors for Rio de Janeiro, considering the specifications given (Annex 1).

Prior to purchase, the Service Provider will produce a report comprising specifications, quality standards, vendor evaluation, and compliance requirements to ensure the sensors meet project needs and budget constraints.

All costs for the acquisition of the sensors should be included in this proposal and must be covered by the Service Provider.

The Service Provider will also present a detailed deployment plan for the sensors, including the steps, timeline and roles involved. This plan will be presented to and aligned with the municipality needs.

Following approval, the Service Provider will work with the project team to install the air quality sensors at strategic locations recommended and approved by the Breathe Cities Team and the municipality.

With support from the municipality, the Service Provider will manage the logistics of the installation. Please note that all associated costs are to be covered by the budget allocated for this proposal.

Deliverable 2.1: A Plan for strategic sensor placement

Deliverable 2.2: Deployment of 10 air quality monitoring sensors

Activity 3. Connect new sensors to the city's existing air quality management framework for seamless data integration.

The Service Provider will carry out the necessary configurations to integrate the sensor-generated data into the municipality's platforms and software, in collaboration with the designated technical team from the city. This process must ensure that the generated data will continuously feed into the pre-existing system in the long term.

All generated data must be provided to the municipality, which will make it available on the Data.Rio platform. This activity will be carried out with the designated team from the municipality.

Regarding data transmission, the data must have their own connection for transmission (4G, 5G, LoRa).

The sensor data must be integrated into the city's existing systems (API). The API data updates should have a frequency between 5 and 15 minutes. The minimum percentage of operability to be met by the supplier is 90%.

The service provider will be responsible for data storage during the project, and upon its completion (up the 12 months), all data must be delivered to the City of Rio in an offline format.

Deliverable 3: Integration of data in the city air quality monitoring system placement.

Activity 4. Conduct regular calibration and develop a maintenance plan for the sensors

The Service Provider will conduct the maintenance process of the sensors for a period of at least 12 months, including:

- Conducting regular checks and calibrations to ensure the accuracy of the sensors.
- Performing maintenance and repairs as needed to keep the sensors in optimal condition.

The Service Provider will produce a maintenance plan and guidance, documenting risk assessment, common operational failures, vandalization, etc. This plan will be integrated into the municipality's existing maintenance infrastructure.

Deliverable 4.1: Regular calibration reports

Deliverable 4.2: Risk mitigation and Maintenance Plan

Activity 5. Air quality reporting and analysis

The service provider will be responsible for data storage during the project, and upon its completion (up the 12 months), all data must be delivered to the City of Rio in an offline format. The Service Provider will implement a comprehensive process for regular air quality reporting and analysis. This includes:

- Collecting and analysing data from the 10 sensors to track air quality trends.

- Generating and distributing detailed monthly reports on air quality trends and metrics based on the data provided by 10 sensors.

This activity will be conducted in coordination with the designated team from the municipality to ensure alignment with municipal standards.

Deliverable 5.1: Monthly reports - Detailed reports outlining the maintenance and calibration activities conducted on the 10 sensors in addition to analysis of air quality trends for the first 11 months.

Deliverable 5.2: A 12-month Report - A comprehensive report produced after 12 months of operation, including in-depth information on sensor performance, the data collected, the results observed. It is essential to analyse the data from the sensor positioned next to the reference station to verify its accuracy.

Activity 6. PM 2.5 emission analysis and target setting

This activity involves review existing sources of data (including data from a station that currently measures $PM_{2.5}$), identifying them and constructing a historical series of $PM_{2.5}$ emissions in the priority regions outlined in the BC Rio strategy, specifically Centro and Madureira/North Zone. Additionally, it includes developing parameters based on historical data for establishing new $PM_{2.5}$ targets for the city of Rio in collaboration with the Municipal Department of the Environment.

Deliverable 6: A report with the analysis and the $PM_{2.5}$ parameters

Activity 7. Publish the Data

Ensure the data collected from the sensors and the accompanying report are made widely accessible to the public by working with the municipality to integrate this information into existing public platforms, such as Data.Rio.

Deliverable 7: Data generated is publicly available

Activity 8. Project close-out and evaluation

The service provider will be responsible for coordinating and finalising an asset transfer agreement of the sensors from CAF to municipality. At the end of the project, it must be ensured that the sensors are under the ownership of the city hall.

The project will be finalized upon the delivery of the mentioned deliverables and a final meeting with the Breathe Cities team and the municipality, where the service provider will give a brief presentation, including an assessment of the project's success, any unforeseen issues that arose during the project and recommendations.

Project Timeline

Activity	Deliverable	Description	Timeframe
1	1	Report: Siting Recommendations	Week 4
2	2	Report: Sensor Specifications	Week 6
2	2.1	Sensor Deployment Plan	Week 8
2	2.2	Documentation: Summary of Sensor Deployment	March - May 2025
3	3	Integration of data in the city air quality monitoring system placement.	May-September 2025
4	4.1	Regular calibration reports	June 2025 – May 2026 (monthly)
4	4.2	Risk mitigation and Maintenance Plan	June 2025
5	5.1	Monthly maintenance and air quality assessment reports	June 2025 – May 2026 (monthly)
5	5.2	A 12-month Report	June 2026
6	6	A report with the analysis and the $PM_{2.5}$ parameters	May 2026
7	7	Data generated is publicly available	May 2026

Note: all deliverables submitted are expected to be in both English and Portuguese

4. Obligations of the Service Provider

The service provider will develop all the activities indicated in section 3 in collaboration with the Breathe Cities team and the designated city officials, with the goal of achieving the initiative's outcomes. Therefore, the provider is expected to

hold bi-weekly meetings with the team to provide project updates and ensure alignment on progress.

Faithfully execute the service specified in this RfP and the supply, delivering the products in the agreed quantities, in accordance with the requirements specified in this RfP, and Clean Air Fund's sensor procurement guidelines (to be provided at project start or upon previous request).

Have accreditation to commercialize the equipment indicated in this RfP in Brazil.

Replace the products, if proven to be unusable or defective due to manufacturing faults, at no cost to the Municipality, within one year.

Provide new, first-use equipment that is from the manufacturer's current production line, including the most recent and updated models. The equipment should also incorporate all improvements in design and material.

Supply, along with the equipment, all related manuals in Portuguese/Brazilian.

Provide with all necessary means to verify the quality and operational functionality of the supplied equipment, allowing for the verification of compliance with the specifications in this Request for Proposals.

5. Proposal Guidelines

This Request for Proposal represents the requirements for an open and competitive process. Proposals will be accepted until 5pm Brasilia Time (BRT) November 15th, 2024. Any proposals received after this date and time will not be accepted and will be returned to the sender.

Proposals should be limited to 20 single pages, not including a cover page/letter and attachments. All applications must be submitted in both PDF and Microsoft Word formats with margins not less than once inch. Text type must be 11 point or larger.

Proposals should be organised accordingly:

1. Organisational Profile & Key Staff

- Details of the organisation and proposed project team – please include number of hours/days allocated to each team member, relevant experience and expertise, limiting CVs to two pages per person.

2. Work Plan & Timeline

- A timeline, indicating the different stages, milestones, and contact moments with Breathe Cities team– adequate review periods should be included.
- Please include a detailed Gantt chart outlining activities.

3. Management Plan

- How the bidders will meet the project scope and deliverables.

4. Risk Management Approach

- Description of any risks and assumptions made in planning this work along with appropriate management and mitigation strategies. Details on how a risk assessment would be completed and what that would include.

5. Budget

- An itemised breakdown of costs in USD for each project task.

If the organisation submitting a proposal must outsource or contract any work to meet the requirements contained herein, this must be clearly stated in the proposal. Additionally, all costs included in proposals must be all-inclusive to include any outsourced or contracted work. Any proposals which call for outsourcing or contracting work must include a name and description of the organisations being contracted.

Contract terms and conditions will be negotiated upon selection of the winning bidder for this RfP. All contractual terms and conditions will be subject to review by the Clean Air Fund legal department and will include scope, budget, schedule and other necessary items pertaining to the project.

RfP Timeline

Description	Date
Request for Proposals sent out	October 3rd, 2024
Deadline for questions	October 9th, 2024
Deadline for proposals	October 28th, 2024 (deadline extended)
Review of written proposals	October 30th, 2024
Deadline for CAF decision on proposal to contract	October 30th, 2024
Deadline for contracting	November 20th, 2024
All bidders notified of outcome	November 23rd, 2024
Project start	December 3rd, 2024

Project Budget

The total contract amount for this project will be no more than USD 130,000 including applicable taxes.

Proposal Evaluation Criteria

All proposals will be evaluated by a selection panel comprising staff from Clean Air Fund, C40 and Rio de Janeiro City Hall based on the following criteria:

Criteria	Weighting
Methodology alignment with the RfP	30%
Expertise, Key staff & References **Note - organisations with staff based in Rio de Janeiro will be ranked highly**	40%
Budget/Value for money	30%

Each bidder must submit their proposal to the email addresses below by until 5pm Brasilia Time (BRT) October 28th, 2024 (deadline extended). The email should have the following subject line: "RfP: Enhancing Air Quality Monitoring in Rio de Janeiro".

Alexandre Batista - abatista@cleanairfund.org

Heloisa Ribeiro – hribeiro@cleanairfund.org

Annex 1. Technical specifications of the high-accuracy air quality low-cost sensors

All equipment must be the latest available models, utilizing laser particle counting technology to measure particulate matter, with capabilities to measure at least PM2.5 and PM10. The equipment should be suitable for continuous operation, 24 hours a day, and designed to ensure maximum efficiency with minimal maintenance.

According to the Technical Guide for Air Quality Monitoring and Evaluation from the Ministry of the Environment, it is recommended that air quality monitoring equipment be certified by a reputable institution in the field. Although certification by the U.S. Environmental Protection Agency (EPA) is recommended, environmental agencies have the autonomy to select equipment certified by other international institutions, provided it meets the characteristics described in item 8.1 of the Technical Guide.

The minimum characteristics, listed in Table 1, must be met for particulate matter measurement. Since there is no standard particulate matter atmosphere for calibrating the equipment, acceptance tests should be performed by comparing results with those obtained from equipment meeting reference methods or equivalents. The contractor must provide a technical report confirming the equivalence of results.

Table 1. Minimum Characteristics for Particulate Matter Samplers

Parameter	Purpose	Requirement
Flow Control Device	Flow Control Device	Flow Control Device
Flow Measurement	Measurement of flow	± 10% accuracy
Timer Device	Capable of starting and stopping the sampler as programmed	± 15 minutes accuracy

Reference: Technical Guide for Air Quality Monitoring and Evaluation, Ministry of the Environment.

All equipment must include sensors for temperature, relative humidity, wind speed, and wind direction, integrated into the compact station. The sensors must comply with the most recent standards from the following organizations:

- American Society for Testing and Materials (ASTM)
- American Society of Mechanical Engineers (ASME)
- Institute of Electrical and Electronics Engineers (IEEE)
- National Electrical Manufacturers Association (NEMA)
- International Organization for Standardization (ISO)
- Deutsche Industrie Normen (DIN)

The sensors should have long-term stability and meet the specifications outlined in Table 2.

Table 2. Minimum Characteristics for Temperature, Relative Humidity, Wind Speed, and Wind Direction Sensors

Parameter	Temperature	Relative Humidity	Wind Speed	Wind Direction
Method	Resistance Temperature Detector	Capacitive	Ultrasonic Transducer	
Operating Range	- 10 °C to + 60 °C	0 to 100	0 to 50 m/s	0 to 359°
Noise	± 0,3 for t > 0,0 °C	± 2% for < 80%	± 3% for < 50 m/s	± 3°
Detection Limit	± 0,4 p/ t> 40 °C	± 3% p/ > 80%	± 5% p/ > 50 m/s	1°

The equipment installation must be carried out with a shelter, on a support arm or tripod, at 2 meters above the ground. Where possible, the installation should be fixed to masonry, in agreement with the Contract Inspection.

The equipment must be delivered and installed at locations specified by the Contract Inspection, located in the city of Rio de Janeiro.

Data Transmission

The compact stations must have a system that allows the transmission of air quality and meteorological data via internet connection. It should support data transmission through URL (Uniform Resource Locator) or text file transfer.

Warranty

The warranty for the supplied equipment must be clearly stated in detail and cannot be less than 12 (twelve) months from the date of final receipt.

Warranty certificates must be provided either through specific documents or printed or stamped on the respective Invoice.

Replacing the sensors will renew the warranty for an additional 12 (twelve) months.

The warranty statement or equivalent must clearly outline its terms, including the form, duration, and location where the warranty can be exercised, at the supplier's expense. This document must be provided at the time of delivery, along with an installation and use manual for the product.