

TERMS OF REFERENCE

Technical support for providing complete assessment of EEAA existing air quality monitoring networks, and recommendations for establishing, deployment, operation, maintenance of new SLCP/ GHG monitoring network and its integration with the existing EEAA network

I. Background

As part of the “Sustainable Development Strategy (SDS): Egypt Vision 2030”,¹the country committed to halving its fine particulate matter (PM₁₀) air pollution by 2030. Significant improvements have been made towards that goal in recent years. In fact, Cairo’s PM₁₀ concentration fell by about 25 percent over the past decade. Despite these improvements, the city’s pollution levels are still several times higher than the WHO recommended concentrations and higher than national guidelines resulting in a significant public health toll and degradation of quality of life of the population, especially among the poor. Recently, the Greater Cairo (GC) Cost of Environmental Degradation (COED) attributed the highest environmental cost – by far – to air pollution, with a mean estimate equivalent to 1.35 percent of national GDP in 2017. Conversely, the GC COED attributed to waste (net of air pollution damages, via the burning of waste) is half that of air pollution’s COED equivalent to 0.68 percent of national GDP in 2017, which includes the opportunity losses from composting, recycling, methane capture, etc.^[00] Moreover, recent studies on COVID-19 show that there is an increased likelihood of contracting the disease in places with high levels of ambient pollutants.²

Climate change models project Egypt’s mean annual temperature to increase between 2 °C and 3 °C by 2050 and an increase in the duration of long-lasting heatwaves. Hot sandstorms known as khamsin blow millions of tons of grit from the Sahara to the North African coast and increases in local temperatures of up to 20 °C are projected to increase in frequency and intensity. By 2050 the intensity and seasonality of heavy rains, as well as the probability of droughts will increase. Long-lasting heatwaves likely will increase in duration of between 9 to 77 days by 2085. The GC area is vulnerable to each of these climate impacts, as well as to river and urban flooding, water scarcity and wildfires. The impacts can be severe, particularly for public health and agriculture. Climate change will put additional pressures on citizens’ health, in the form of increases in the prevalence and severity of cardiopulmonary conditions through heat and sandstorms, potential increases in

¹<http://www.cabinet.gov.eg/English/GovernmentStrategy/Pages/Egypt%E2%80%99sVision2030.aspx> and <https://www.greengrowthknowledge.org/sites/default/files/downloads/policy-database/Egypt%20Vision%202030%20%28English%29.pdf>.

² Larsen, Bjorn. 2019. Egypt: Cost of Environmental Degradation: Air and Water Pollution. The World Bank. Washington, D.C.; and Back of the envelop calculations for cost of solid waste environmental degradation performed by the Team.

GREATER CAIRO AIR POLLUTION MANAGEMENT AND CLIMATE CHANGE PROJECT

vector-borne diseases, through decreased nutrition and food security and reduced water quality. Further, it has been demonstrated that extreme heat events are linked to worsening air pollution.³

In response to this situation, the Government of Egypt (GOI) is implementing the Greater Cairo Air Pollution Management and Climate Change Project (hereafter “The Project”) financed by The World Bank. The Project seeks to reduce air and climate emissions from critical sectors and increase resilience to air pollution in Greater Cairo, i.e., Cairo, Giza and Qalyubia Governorates⁴, and is implemented by the Ministry of Environment through its Egyptian Environmental Affairs Agency (EEAA) and its Waste Management Regulatory Authority (WMRA) and in collaboration with other partners. A Project Coordination Unit oversees overall project implementation and ensures that fiduciary requirements are met.

The Project aims specifically to reduce emissions that contribute to air pollution concentrations, thus leading to air quality improvements, and to simultaneously mitigate climate change. Air pollutants include PM₁₀ and PM_{2.5}, while climate pollutants include both longer lived greenhouse gases (GHGs) such as CO₂, as well as Short-lived Climate Pollutants (SLCPs) that include black carbon, methane and several short-lived HFCs.

Successful Integrated Climate and Air Quality Management Planning (IC-AQMP) requires a comprehensive understanding of baseline ambient air concentrations, including Short-Lived Climate Pollutants (SLCPs) and greenhouse gases (GHGs).

The requested services covered by these terms of reference are **to support implementation of Component # 1 of the Project, on Enhancing the Air Quality Management (AQM) and Response System, implemented by EEAA.** This component aims to support the enhancement of the AQM decision support system in GC through a strengthened AQM infrastructure (monitoring and analytical), capacity building activities, developing emergency response plans and raising public awareness through information dissemination.

II. Objective of the Assignment

The objective of this assignment is to hire a qualified consulting firm, referred to hereafter as “the Consultant” to evaluate existing AQ monitoring networks in GC with respect to current and new monitoring objectives, and to assist EEAA in procuring, siting, deploying, calibrating, operating and maintaining additional instruments for monitoring greenhouse gases (GHGs) and short-lived climate pollutants (SLCPs).

The consultant will also work with EEAA to establish a data management system to validate and quality assure these data, and incorporate into the larger EEAA data management framework allowing them to jointly address air pollution and climate mitigation in GC and Egypt.

³Markandya and Chiabai, Valuing Climate Change Impacts on Human Health: Empirical Evidence from the Literature, Int. J. Environ. Res. Public Health, 6, 759–86, 2009.

⁴ More details on the Project Components are provided in Annex 1.

III. Scope of Work and Detailed Tasks:

The Consultant is requested to conduct the following tasks:

Complete assessment of EEAA existing air quality monitoring networks, and

Recommendations and supervision support for establishing, deployment, operation, maintenance of new SLCP/ GHG monitoring network and its integration with the existing EEAA network as follows:

Detailed Tasks:

1. Review and Assessment of EEAA Existing Air Quality Monitoring Network:

The existing EEAA monitoring networks include routine PM_{2.5/10} monitoring sites for compliance purposes that also measure NO_x, O₃, Pb, NH₃, SO₂, and other gaseous species. EEAA and partners also maintain a recently established PM Source Apportionment network. Also, EEAA has a unique network for monitoring the industrial facilities emission from stacks (telemetry system). Under the current assignment, EEAA also would like to identify opportunities for adding SLCP and GHG monitoring capacity, besides helping EEAA in formulating the basic guidelines for fence monitoring for fugitive emission from major sources especially industrial facilities. The consultant will work with EEAA teams (both within the Agency and at Center for Environmental Hazards Mitigation of Cairo University (CU-CEHM)) that are currently monitoring several criteria air pollutants in and around GC and implementing a source apportionment Roadmap to conduct speciated chemical measurements of fine particle pollution.

EEAA has a robust, existing AQ monitoring network that includes numerous continuous and gravimetric PM₁₀ monitoring sites with several gaseous pollutant monitors as well as a few PM_{2.5} monitoring sites. Recently, 4 sites at Kaha, El Tahrir Square, El Sheikh Zayed and Misr El Gedida have been outfitted with pairs of samplers for source apportionment sample collection. The network review will consider the expanding range of AQ monitoring objectives (including SLCP/GHG monitoring), and develop recommendations for a revised network monitoring strategy that enables streamlined and efficient monitoring (e.g. through a “core” supersite network supplemented with a constellation of compliance monitoring sites or alternative strategies).

The review shall also include assessment of the sites, the labs, assessment of the IT infrastructure, and Quality Control & Quality Assurance protocols.

Review shall include the assessment of the existing telemetry emissions monitoring network, site visiting, assessment of the IT infrastructure, and market research, and Quality Control & Quality Assurance protocols.

Review shall include the assessment of the existing air quality early warning system, and the IT infrastructure of the system, market research, and Quality Control & Quality Assurance protocols, and developing Terms of Reference (ToR) for advanced early warning system according to EEAA requirement.

2. Add SLCP/GHG Monitoring Capacity to the Network:

Through this project, EEAA intends to add a number of sites (in consultation with the Consultant) that will continuously monitor the black carbon fraction of PM_{2.5}(through siting of paired aethalometers collocated with continuous regulatory grade PM_{2.5/10} monitors) as well as basic meteorological measurements. The typical multi-wavelength aethalometers used to measure BC are also able to detect CO₂, so plans should include that addition. The consultant will need to work with EEAA to understand existing gaps in PM_{2.5} monitoring, understand key sources of black carbon and CO₂ and design a siting plan and monitoring strategy that will enhance the existing monitoring network (including the recent Source Apportionment samplers and any proposed additions to that network) to provide the most robust information on baseline concentrations of SLCPs and GHGs in and around GC.

3. Provide support on the procurement, deployment, calibration and testing of new SLCP (i.e. black carbon) monitors:

The consultant will support EEAA to select and procure appropriate equipment; develop a deployment plan consistent with the siting plan developed under Task 1; supervise and assist in deployment, set up and testing of equipment; develop SOPs including calibration, operation and maintenance of equipment and ensure that initial data collection occurs per SOP.

The Consultant shall be responsible for preparing the technical specifications, and help with the preparation of the bidding documents that will satisfy the requirements of EEAA and following the World Bank Procurement Regulations, assist the Project Coordination Unit and EEAA in responding to bidders, support the evaluation process, equipment receipt and testing. He shall supervise the installation process, and the integration with the existing network infrastructure.

4. Establish a quality management system (QMS) for the new equipment:

The consultant will work with EEAA to establish data quality objectives, quality assurance and quality control procedures for the new equipment to ensure that observations meet international best practice, resulting in high quality repeatable measurements of black carbon, PM_{2.5}, PM₁₀, CO₂ and basic meteorological parameters at each site. The Consultant shall also supervise implementation of the QC/QA system.

5. Support a data management system for EEAA monitoring data:

The consultant will work with EEAA to support establishing a system that will accept real-time data from the sites monitoring SLCPs and GHGs; enable data analysts at EEAA or their subcontracted vendors to validate and quality assure the data, and then archive the data with an interface giving the option of public access to real-time data or a calculated air quality index (AQI) as well as for input into AQ forecasting systems being developed by another vendor. The Consultant shall also supervise implementing the data management system.

6. Knowledge transfer, and train EEAA and their partners in the use, operation, maintenance of monitoring equipment:

The consultant will work with EEAA and the relevant partners (e.g., Cairo University's CEHM) to ensure that at the conclusion of the contract, their staffs are able to continue all SLCP and GHG monitoring sites selection, operations, including calibration of instruments,

GREATER CAIRO AIR POLLUTION MANAGEMENT AND CLIMATE CHANGE PROJECT

collection of data, validation and analysis of data, routine maintenance of instruments, reporting of data into AQI and forecasting systems.

Administrative and Reporting Arrangements

The Consultant will work under the supervision of and report to the Head of the Environmental Quality Department, in his capacity as the Head of the Technical Implementation Unit of Component 1 of the Project, and/or his designee and with the Lead Advisor of the Component. Contract management and other administrative responsibilities are overseen by the Project Coordinator of the Greater Cairo Air Pollution Management and Climate Change Project, or his designee.

The consultant will closely work with EEAA staff members of the TIU, and will collaborate as needed with other partners that are also supporting EEAA staff with AQM planning such as Cairo University. The Consultant will also liaise, in consultation with EEAA, with other consulting firms to perform meteorological modeling and with other ministries/agencies that may be able to host monitoring sites.

III. Duration of the Assignment

The consultant will work to complete deliverables between **August 1, 2023 and September 30, 2024** within 14 months of the start of contract. This work will require reporting to the EEAA as outlined above.

IV. Deliverables

Serial No.	Deliverable	Time from Contract Signature
1	Inception Report	1 month
2	Roadmap Report	3 months
3	Reports on assessment of EEAA Networks & Data Management Plan & SLCP/GHG network Specs development & Plan for development, procurement, deployment and operation of SLCP/GHG network including QMS	3 months
4	Training Plan	4 months
5	Supporting the Tendering process: Documents including technical specifications for procuring the new monitoring equipment, evaluation and selection of vendors	5 months

GREATER CAIRO AIR POLLUTION MANAGEMENT AND CLIMATE CHANGE PROJECT

6	Provide support to the PCU for finalizing procurement of the new monitoring equipment	9 months
7	Deployment of all monitoring equipment. Network operational and streaming data to operational data management system & Conduct training sessions according to the training plan	10 months
8	Data Report including quality assurance results	12 months
9	Final Report	14 months

V. The Consultant Qualifications and Experience

- Experience in air quality management planning and air quality monitoring including ambient and emission networks.
- Experience in the procurement, deployment, calibration and testing of monitoring equipment.
- Experience in establishing quality management system (QMS) for monitoring equipment.
- Experience in establishing data management system for monitoring data.
- Broad access to both academic and private sector expertise that can contribute knowledge to Egyptian agencies, institutions and personnel.
- Experience in capacity building in the use, operation, maintenance of monitoring equipment,
- and in undertaking complex data analysis and environmental assessments in low- and middle-income countries.

The consultants responsible for assessment should be present in Cairo during the assessment process. The consultant staff will be available for meetings and appointments per the schedule of the EEAA. The consultant will be expected to present results to multi-stakeholders in GCA every 3 months during the contract period.

Annex 1: Greater Cairo Air Pollution Management and Climate Change Project

The Government of Egypt (GoE) is currently implementing **Greater Cairo Air Pollution Management and Climate Change Project** (the Project) financed by The World Bank. The Project seeks to reduce air and climate emissions from critical sectors and increase resilience to air pollution in GC, i.e., Cairo, Giza and Qalyubia Governorates and is being implemented with Ministry of Environment (MoE) in close collaboration with Ministry of Local Development (MoLD), Qalyubia Governorate, Cairo Transport Authority (CTA) and other stakeholder agencies. The Project focuses on two main sources of air pollution: solid waste management and vehicle emissions in GC region and includes the following five main components:

Component 1: Enhancing the Air Quality Management (AQM) and Response System: This component aims to support the enhancement of the AQM decision support system in GC through a strengthened AQM infrastructure (monitoring and analytical), capacity building activities, developing emergency response plans and raising public awareness through information dissemination.

Component 2: Support the Operationalization of Solid Waste Management (SWM) Master Plans in GC: This component aims to support operationalization of Governorate SWM master plans, which lay down the full range of necessary actions and investments needed for each governorate to improve SWM services in accordance with the specificity of each Governorate. In view of the complexity and magnitude of SWM system in GC, the Project follows a phased and gradual approach to achieve tangible results on the ground. This approach involves providing technical support at the central level to the Waste Management Regulatory Authority (WMRA) and the MoLD and specific investments, technical, financial and project development support to SWM actions at the local level to the Qalyubia Governorate.

Component 3: Vehicle Emission Reduction: This component aims to support activities aimed at reducing vehicle emissions from public transport sector. This shall be achieved through procurement of about 100 electric buses and the infrastructure required to operate and maintain these buses. The component will also support the CTA in acquiring the needed knowledge and experience in operating and scaling up electric bus fleet in Cairo. The Project will also upgrade facilities at CTA, including retrofitting existing bus depots with electric charging stations, power supply and related safety equipment; training CTA staff such as bus drivers and mechanics on operating and maintaining the new e-equipment.

Component 4: Communication and Stakeholders Engagement: This component aims at ensuring that all stakeholders, in an inclusive manner, are actively involved in the design, implementation and monitoring of all Project activities and the Project is implemented following a full consultative participatory approach that is meant to build a constructive relationship between the stakeholders and the GoE. This component is complementary to the comprehensive Stakeholders Engagement Plan (SEP) developed as part of the environmental and social risk management.

GREATER CAIRO AIR POLLUTION MANAGEMENT AND CLIMATE CHANGE PROJECT

Component 5: Project Management and Monitoring and Evaluation (M&E): This component will support the establishment of Project Coordination Unit (PCU) at MoE and four Technical Implementation Units (TIU) for each of the first four components.

Component 6: Enhanced E-Waste and HCW management for Reduction of uPOPs: It is an additional finance (AF) to the parent project, this new activity focuses on reduction of unintended persistent organic pollutants (uPOPs) aligns with the “GEF Project Design and Review Considerations in Response to the COVID-19 Crisis and the Mitigation of Future Pandemics”.
