

Terms of Reference

**Air Quality Environmental Expert:
Integrated Air Pollution Management, Short Lived Climate Pollutants & GHG Emissions
Inventory**

I. Background

As part of the “Sustainable Development Strategy (SDS): Egypt Vision 2030”,¹ the 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 the WHO recommended concentrations and higher than national guidelines taking as these high levels are taking their toll on the health and quality of life of the population, in particular poor people. Subsequently, the Greater Cairo (GC) Cost of Environmental Degradation (COED) attributed to air pollution is by far the highest in the country, 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 the air pollution’s COED and results in a mean estimate equivalent to 0.68 percent of national GDP in 2017 which includes the opportunity losses from composting, recycling, methane capture, etc.² Moreover, recent studies on the COVID-19 show that there is an increased likelihood of contracting the disease with high levels of ambient pollutants.³

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 all of these, as well as to river and urban flooding, water scarcity and wildfires. The impacts are 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 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

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.

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.

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In response to this situation, the Government of Egypt (GOI) is seeking to reduce air and climate emissions from critical sectors and increase resilience to air pollution in Greater Cairo. The Ministry of Environment is in that respect implementing, with the support of the World Bank, the “Greater Cairo Air Pollution Management and Climate Change Project”.

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 Project is composed of the following components:

Component 1: Enhancing the Air Quality Management (AQM) & Response System.

Component 2: Support the operationalization of SWM Master Plans in GC.

Component 3 Vehicle Emission Reduction.

Component 4 Communication & Stakeholders Engagement.

Component 5: Project Management and Monitoring & Evaluation.

Project implementation arrangements:

A Project Coordination Unit (PCU) has been established at the MoE. The PCU ensures that the Project is implemented in accordance with the Legal Agreement signed between the GoE and the World Bank, the Project Appraisal Document (PAD), the Project Implementation Manuals (Project Operational Manual, M&E Manual, etc.).

Four Technical Implementation Units (TIUs) have also been established to oversee the implementation of all components. The TIU for Component 1 is chaired by the Head of the Environmental Quality Sector of the Egyptian Environmental Affairs Agency (EEAA) and includes members of the different departments of the sector (Ambient Air Quality, Vehicle Emissions, Early Warning, Industrial Facilities Emission)

(For more information: <https://projects.worldbank.org/en/projects-operations/project-detail/P172548>)

This assignment is requested in the context of **Component 1: Enhancing the Air Quality Management & Response System:**

This component will support the enhancement of the Air Quality Management (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 # 1 comprises two subcomponents:

- Subcomponent 1.1: Reduction of air pollution and GHGs.
- Subcomponent 1.2: Strengthening resilience to air pollution.

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These two subcomponents are to be achieved through several “Sub-tasks” (bundled into fewer subcontracts that achieve the same intent).

Detailed information on the 2 Subcomponents, and the Sub-tasks is mentioned in **Annex # 1**.

The Consultant’s assignment is related to the following Sub-task under Component # 1:

Establishment of an integrated Emission Inventory Database for GCA and Egypt – to provide operational support in refining the existing emission inventory consisting of a point and area source inventory for GCA, a biogenic and geogenic inventory for Egypt and a UNFCCC compliant GHG inventory for Egypt to create a unified and comprehensive national inventory database that includes a mobile source inventory per the existing mobile source inventory development roadmap. The resulting unified database should enable policy tracking, international reporting, and chemical transport modeling. The data base structure should enable reporting interfaces that enable data reporting from various users (e.g., governorate level reporting of traffic and vehicle registration data, industrial reporting of point source emission data, etc.) to report data into the national system.

The Project shall contract a Consulting Firm to conduct the following assignment: “Developing mobile source emissions inventory & emissions inventory integration.

ToR for hiring that Consulting Firm is attached as **Annex # 2**.

II. Objective of the Assignment:

The Project is seeking to hire an Environmental Expert (individual consultant) for Component 1 of the Project referred to hereafter as “the Consultant” to assist the Environment Quality Sector, EEAA and TIU of Component 1 in managing the development of a mobile source emissions inventory, and establishing an integrated emission inventory database for GCA and Egypt for the emissions inventories from all sources of air pollution and climate change.

III. Scope of Work and Specific Tasks:

The Consultant shall assist the Environment Quality Sector, EEAA and TIU of Component 1 in supervising a consulting firm to be contracted by the Project to develop a mobile source emissions inventory, and establish a comprehensive integrated emission inventory database for GCA and Egypt, and that includes refining of the existing emission inventory consisting of a point and area source inventory for GCA, a biogenic and geogenic inventory for Egypt and a UNFCCC compliant GHG inventory for Egypt to create a unified and comprehensive national inventory database that also includes a mobile source inventory.

The Consultant will be part of a multidisciplinary team of consultants providing technical assistance to EEAA and the TIU for the implementation of Component 1, with the necessary mix of skills needed to ensure complementarity and integration of the different activities and related tasks.

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The scope of work of the Consultant includes the following tasks:

1. Assist in supervising/managing the consulting firm that shall be contracted by the Project to develop a mobile source emissions inventory, and a comprehensive integrated emissions inventory for all sources of air pollution and climate change.
2. Assist in supporting EEAA, and TIU of Component # 1 with contract coordination of the contracted consulting firm related to the Task mentioned above under Component # 1. This includes close supervision and follow-up on contract implementation with the contracted consulting firm to ensure that all deliverables are in accordance with the TOR and of acceptable quality, implemented on schedule as per the agreed work plan and milestones, and within approved budget.
3. Preparation, as needed, of briefing notes and summary reports for Ministry of Environment and EEAA management.
4. Support in capacity building of the concerned staff in the Environmental Quality Sector, Climate Change Department / EEAA in areas of relevance to the assignment.
5. Support in coordinating Component 1 activities of relevance to the assignment with the multidisciplinary team of experts of Component 1 and with EEAA/PCU/World Bank, and other project team members.
6. Any other tasks relevant to the assignment as requested by the Head of the Component 1 Technical Implementation Unit, and the Lead Advisor.

The Consultant will work closely with Component 1 Technical Implementation Unit, and shall be available for meetings and appointments as requested by the Head of the Component 1 Technical Implementation Unit, and the Lead Advisor.

The Consultant will be expected to assist in presenting results to the project management and stakeholders during the contract period.

IV. Qualifications:

- Master's degree or above in environment science, or engineering.
- At least 10 years of relevant work experience in emissions inventory development, inventory verification system, and establishing ongoing reporting mechanisms.
- Experience in air dispersion modeling and preparation of gridded emissions inputs (i.e., emissions modeling).
- Experience in international GHG reporting.
- Experience in developing vehicle emissions factors, and establishing ongoing reporting mechanisms.
- Experience in the use, updating and processing of the emissions data for policy tracking, air dispersion modeling and international reporting, and in undertaking complex data analysis.
- Knowledge of best practice in database design.
- Previous working experience with international or regional specialized consultancy firms working in the field of air emissions inventory development.
- Good written communication skills.
- Good knowledge of computer proficiency, including MS Office products (Word, Excel, PowerPoint) and web-based management systems.
- Fluency in written and spoken English required.

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V. REPORTING

The Consultant will report to the Lead Advisor of TIU for Component 1 and work under his supervision.

VI. Level of Effort and Contract duration

Level of effort is 144 Business Days. The duration of the assignment is 12 months. The assignment may require occasional travel inside Egypt.

Annex # 1

Greater Cairo Air Pollution Management and Climate Change Project

Brief on the 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.

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

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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”.

Brief on Component 1: Enhancing the Air Quality Management & Response System.

This component comprises two subcomponents:

- **Subcomponent 1.1:** Reduction of air pollution and GHGs. This subcomponent will support the carrying out of a program of TA activities on reduction of air pollution and GHGs, namely: (a) development of an Integrated Climate and Air Quality Management Plan (IC-AQMP) including a time-bound action plan for its implementation; (b) strengthening Air Quality Management (AQM) regulatory and policy tools through (i) developing a mobile source emissions inventory including road and nonroad sources, and integrating it with existing inventories and (ii) continuous monitoring of short lived climate pollutants, greenhouse gases, and carbon dioxide monitoring; (c) development and rolling out of a specialized AQM and green jobs skills training program in universities and ministries including curricula such as chemical engineering, atmospheric science, environmental economics and environmental health, renewable energy interventions, energy efficiency and environmental economics, and resource efficiency/circular economy interventions; and (d) strengthening policy dialogue by carrying out assessments of the environmental health and the economic benefits of priority climate and air quality interventions, including cost-benefit and cost-effectiveness of emission abatement investments and capacity-building initiatives such as the trainings program.
- **Subcomponent 1.2:** Strengthening resilience to air pollution. This subcomponent will strengthen resilience to air pollution through: (a) improving air quality forecasting tools through development of a chemical transport model-based approach and its integration with local air quality monitoring data and dissemination of the forecasting information; (b) establishing institutional response mechanisms for high pollution days such as definition of criteria and protocols for identification of air quality action days and development of emergency plans and applicable decision protocols for said air quality action days; and (c) strengthening the technical capacity of the National Committee for Crisis Management and Risk Reduction for implementation and enforcement of the protocols.

These two subcomponents are to be achieved through ten “Sub-tasks” (bundled into fewer subcontracts that achieve the same intent):

1. Establishment of a SLCP/GHG Monitoring Network for GCA—to support in providing recommendations on the deployment, operation and maintenance of proposed network, (structured in a scoping and subsequent implementation phase). This network should integrate seamlessly with and support existing AQ monitoring networks (ambient & industrial) in GCA (including routine AQ monitoring sites in GCA as well as the recently designed source apportionment network and the telemetry monitoring system for point source of industrial facilities), thus an initial step shall involve conducting a network assessment to review EEAA’s comprehensive AQ monitoring objectives and, QC/QA and requirement for enhancement road map. Implementation activities will include design and deployment of network components (including source apportionment and PM2.5/BC/CO2

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monitoring components), but also analysis, data management, and quality assurance of GCA monitoring program.

2. Establishment of an integrated Emission Inventory Database for GCA and Egypt – to provide operational support in refining the existing emission inventory consisting of a point and area source inventory for GCA, a biogenic and geogenic inventory for Egypt and a UNFCCC compliant GHG inventory for Egypt to create a unified and comprehensive national inventory database that includes a mobile source inventory per the existing mobile source inventory development roadmap. The resulting unified database should enable policy tracking, international reporting, and chemical transport modeling. The data base structure should enable reporting interfaces that enable data reporting from various users (e.g., governorate level reporting of traffic and vehicle registration data, industrial reporting of point source emission data, etc.) to report data into the national system.
3. Development of an Integrated Climate and Air Quality Management Plan (IC-AQMP “Action” Plan)– to provide operational support to develop, assess, and evaluate policy options under a multi-level governance process to identify and justify elements of the GC Action Plan (including technical analysis, economic assessment and facilitation of consensus building process).
4. Development Curricula , Sustainable training at Local Universities and license system – to provide operational support for the development and roll-out of a new environmental resource management curriculum at GCA universities. The outcome should result in enhanced training and knowledge – at both the undergraduate and graduate level – around principles, basics and updates of environmental science, and AQM planning specifically, to ensure a pipeline of trained professionals for EEAA, as well as better prepared students to address other green skills development needed for Egypt as a whole. This should be planned in collaboration with University of Cairo, either alone or in partnership with Helwan University, and Aim-shams University, to ensure that Cairo is producing a steady supply of students with skills needed for environmental management and the green economy. In order to enhance the quality of the professional market of skilled professionals within Egypt, the Consultant should propose a rigorous international license and accreditation process.
5. Support Sustainable Development Within the Egyptian Government– to provide operational support to improve capacity of ministry staffs and sustainable development units - via executive skills training - to undertake integrated climate and air quality management planning and implementation of mitigation actions.
6. Implementation of Micro- and Macroeconomic Assessment of Action Plan– to provide operational support to provide a sector-specific detailed economic analysis of actions identified by IC-AQMP working group (see III above) comparing implementation costs against health, agriculture, and energy benefits of interventions, as well as macroeconomic benefits of reduced health spending, alternative patterns of investment and quality of life improvements, for labor force, tourism, recreation, etc.

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7. Development of advanced Air Quality Forecasting system—to provide operational support to develop an enhanced AQ forecasting program (structured into a scoping and subsequent implementation phase) that builds on existing forecasting capacity for both poor air quality days and climatically extreme events. This work would likely involve an international vendor to provide support and training with local implementation partners who might carry on forecasting work at conclusion of project.
8. Development of AQ Public Awareness Website– to provide operational support to create a public information portal that provides access to information on (a) general background on air pollution/ public action (b) current conditions/AQ index and local observations and data and (c) forecasts with self-protective actions for public/ sensitive populations.
9. Establishment and Implementation Support for an Institutional Response Mechanism-to provide operational support to facilitate an intra-governmental stakeholder process to identify appropriate responses to declared “AQ Action Days” and implementation arrangements to be carried out by various government and private stakeholders (e.g., industries, schools, public health authorities, media, sensitive populations, etc.)
10. Provision of operational support for the newly developed source apportion (SA) monitoring network and chemical speciation analysis operated by EEAA/Cairo University -including knowledge transfer and capacity building for Egyptian colleagues as appropriate. This includes aspects of manual sampling, collection, transfer and storage, chemical speciation analysis, receptor modeling and reporting over calendar years 2023-2025, inclusive.

Annex # 2
TERMS OF REFERENCE

**Developing mobile source emissions inventory &
emissions inventory integration**

I. Background

As part of the “Sustainable Development Strategy (SDS): Egypt Vision 2030”,⁴ the 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 the WHO recommended concentrations and higher than national guidelines taking as these high levels are taking their toll on the health and quality of life of the population, in particular poor people. Subsequently, the Greater Cairo (GC) Cost of Environmental Degradation (COED) attributed to air pollution is by far the highest in the country, 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 the air pollution’s COED and results in a mean estimate equivalent to 0.68 percent of national GDP in 2017 which includes the opportunity losses from composting, recycling, methane capture, etc.⁵ Moreover, recent studies on the COVID-19 show that there is an increased likelihood of contracting the disease with high levels of ambient pollutants.⁵

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 all of these, as well as to river and urban flooding, water scarcity and wildfires. The impacts are 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 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.⁶

In response to this situation, the Government of Egypt (GOI) is seeking to reduce air and climate emissions from critical sectors and increase resilience to air pollution in Greater Cairo. The project

⁴<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>.

⁵ 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.

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

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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 Air Quality Management (AQM) planning requires a detailed assessment of these emissions in ways that enable decision makers to (i) understand the many sectors that contribute to a city's air pollution problems, (ii) track the effectiveness of policies and strategies over time to establish an accountability framework for both climate mitigation and AQM planning and (iii) utilize these data to conduct periodic international reporting and to process emissions estimates for dispersion modeling, critical to AQ forecasting.

This solicitation seeks a consulting firm, referred to hereafter as “the consultant” to evaluate existing emission inventories for criteria air pollutants, greenhouse gases (GHGs) and short-lived climate pollutants (SLCPs), fill any gaps in these existing inventories (e.g. mobile sources) and integrate each of these (including a completed mobile source inventory) into a single unified database useful for policy tracking, international reporting, and dispersion modeling/forecasting to address air pollution and climate mitigation in GC and Egypt.

II. Statement of Consulting Firm Task

Overall Task:

This procurement opportunity seeks to establish a contract between the GoE and a consulting firm to provide support to the Egyptian Environmental Affairs Agency (EEAA) and World Bank through the Greater Cairo Air Pollution and Climate Change Project (hereafter “The Project”) to advance existing integrated climate and AQM planning (IC-AQMP) for the tri-city GC area as well as the country of Egypt as a whole, with a specific focus on reviewing existing emission inventory data products for GHGs, SLCPs and criteria air pollutants and synthesizing these with other information, including the development of a mobile source emission inventory resulting in an integrated database that can be utilized and continually updated.

Specific Tasks:

The consultant is requested to conduct the following tasks:

7. Review, refine, enhance and consolidate existing emission inventories:

The consultant will work with EEAA teams that are currently updating emission inventory databases for Egypt to obtain the best available data. EEAA has recently completed an inventory for point sources, area, biogenic and geogenic sources and has developed a “Roadmap” report for developing a mobile source inventory. The consultant will refine/review and assess the existing system

The consultant will need to work with EEAA to understand existing gaps and align the available information with best practices to develop a comprehensive inventory⁷ for the

⁷ For example, the mobile source inventory roadmap describes steps to be taken and data to be used, but has not yet used this information to develop the emissions estimates. Similarly, the biogenic and geogenic inventory that has been developed by another vendor does not include the relatively small contribution to NO_x from lightning or GHG emissions due to vegetation and land-use changes but may need to be completed (guidance has already been developed for both of these tasks) and integrated into this emissions framework.

GCA and surrounding area⁸. The consultant will be asked to fill gaps, improve and enhance available data resulting in a single, internally consistent comprehensive inventory (i.e. covering point, area, biogenic, geogenic, and mobile, sources) that will be available for photochemical and dispersion modeling.

8. Develop mobile sources Inventory:

The consultant will refine/ review and assess the existing system and develop the mobile source emission inventory (MEI), that includes local emission factors for mobile sources to be developed (Diesel, Gasoline and NG) via a new emission testing program.

9. Developing new comprehensive integrated modeling for the emission inventory from all sources of air pollution and climate change

The consultant will work with EEAA to develop and incorporate available emission inventory data, including the review, updating and utilization of new data provided by relevant ministries (e.g. see the roadmap report, but this will include vehicle registration data from Ministry of Interior, industrial activity data from Ministry of Industry, etc.) and integrate these data with the existing inventories. The creation of gridded emission files may include defining the airshed that affects air quality in GCA, applying land-use regression techniques to define sharp spatial gradients (e.g., via satellite-based methods) or identifying socio-economic indicators or technology distributions that can be used to improve spatial surrogates for emissions distributions, and potentially break out inventory data by socio-economic status.

The consultant may also propose the development of locally appropriate source characterizations/emission profiles for specific source categories known to affect GCA air quality or to identify and address weaknesses in the national GHG inventory. In this task, the consultant will develop an interface for data extraction and reporting.

10. Synthesize and integrate data in a single unified emission inventory for Egypt:

The resulting inventory will be presented in (a) a spreadsheet or database format as well as (b) gridded emission files (NetCDF format) appropriate for chemical transport modeling and finally (c) as a IPCC-compliant national GHG emission inventory useful for submission under the UNFCCC. The final products should include all pollutants as relevant (e.g., IPCC-compliant inventory should include the six Kyoto gases, black carbon, methane, short-lived HFCs and N₂O; the gridded emission files should include Pb, CO, primary PM_{2.5}, primary PM₁₀, NO_x, SO₂, VOC, ammonia and hazardous air pollutants; the database should include all of the above).

11. Training EEAA and their partners in the use, updating and processing of the emissions data for future policy tracking, air dispersion modeling and international reporting:

⁸ The entire country of Egypt will have to be covered to some degree both to satisfy the need to provide international reporting of GHGs at the national level under IPCC methodologies, and to include air pollution emissions from areas surrounding the tri-city area in so far as emissions from surrounding regions need to be included within larger nested modeling domains for GC AQ forecasting.

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The consultant will work with EEAA and the relevant partners to ensure that the final products are useful for Ministry staff, their vendors and their partners to achieve air quality and climate mitigation goals with the emissions database. This means identifying and training on aspects of inventory collection and refinement that may have come out during the course of the refinement process undertaken, ensuring that chemical transport modelers are able to process gridded emissions files in the future based on updated or refined inputs, and ensuring that members of the Egypt Climate Change Committee are able to generate new IPCC-compliant reports of GHG and/or SLCP emissions.

Institutional Arrangements

The consultant will work collaboratively in partnership with EEAA staff and with other development partners that are also supporting EEAA staff with AQM planning (including the World Bank). For example, the EEAA maintains a partnership with the Cairo University and has a contract with another consulting firm to perform meteorological modeling. The consultant will also need to liaise with other ministries that may be providing data inputs to the emissions estimation process, but this is to be coordinated through EEAA.

III. Timing and Human Resources

The consultant will work to complete deliverables between **August 1, 2023 and July 31, 2025** (within 24 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 laying out the work program.	1 month
2	Roadmap report for comprehensive inventory development and processing, and expected form of deliverables.	3 months
3	Training plan.	3months
4	Egyptian inventory for criteria air pollutants from mobile sources, including the real measurement and the developed local emission factors for (Diesel, Gasoline and NG) vehicles.	15 months
5	Egyptian inventory for criteria air pollutants (including point, area, biogenic, geogenic, and mobile sources), SLCPs and GHGs in database format (i.e. Comprehensive Emission Database).	20 months
6	Final emissions inventory in three formats.	24 months

The consultant will also work closely with other members of the Project team including TBD. The consultant staff will be available for meetings and appointments per the schedule of EEAA and the World Bank teams. The consultant will be expected to present results to multi-stakeholders in GCA every 6 months (3 times) during the contract period.