

Government of the People's Republic of Bangladesh
Ministry of Local Government, Rural Development and Cooperatives
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Terms of Reference (TOR)

for

**Need Assessment for Setting Up Equipment and Real-time Monitoring & Forecasting
System for Air and Sound Pollution in City Corporation and Pourashava.**
(Package No: IUPHPSP-SD - 13)

1. Background and justification

Rapid urbanization, high traffic congestion, industrial activities, traditional brick-kilns, construction activities and inadequate urban governance create persistent air and noise pollution hot spots across Bangladesh's major urban areas. There is a significant lack of, or deficiency in, real-time monitoring systems for air and noise pollution in Bangladesh is supported by evidence highlighting both infrastructural gaps and enforcement challenges, despite some recent improvements in monitoring capacity.

While the Department of Environment (DoE) operates 31 Continuous Air Monitoring Stations (CAMS) across the country to track PM10, PM2.5, NO2, CO, SO2, and Ozone, this number is widely considered insufficient for a country with high pollution levels and rapid urbanization.

Data, particularly during the dry season (November–March), frequently shows Dhaka to be among the most polluted cities globally, indicating that existing, limited monitoring is sufficient to show a crisis, but perhaps not granular enough for localized, real-time mitigation.

Noise monitoring is less developed than air monitoring. Studies indicate that noise levels, especially in Dhaka, regularly exceed 100 dB against a 55 dB limit for residential areas, yet there is a lack of continuous, widespread, and publicly accessible real-time noise tracking.

In conclusion, the situation is evolving from a near-total lack of data to a nascent network, but the current infrastructure still falls short of providing the necessary real-time coverage required for a country with such severe pollution levels.

As a result of these limitations, Real-time monitoring and short-term forecasting are essential to: (a) protect public health; (b) inform early-warning and advisories; (c) support enforcement; and (d) guide investments and planning in Dhaka South City Corporation

(DSCC), Dhak North City Corporation (DNCC) & Chattogram City Corporation (CCC) and the fast-growing peri-urban Pourashava, Savar and Tarabo represent priority jurisdictions with high population exposure and important industrial/transport nodes.

A need assessment will identify technical, institutional, financial and operational requirements to install and sustain a system of fixed, mobile and low-cost sensors and equipment plus a data/forecasts platform integrated with health and city management systems. This will also be helpful in determining the equipment specifications and probable locations for installation of the equipment.

2. Overall objective

The primary objective of this assignment is to conduct a detailed need assessment to assess needs and provide a prioritized, costed, and implementable and sustainable plan for installing and operating an integrated real-time air quality and sound (noise) monitoring and short-term forecasting system across the five target areas.

2.1 Specific objectives

1. Assess existing monitoring infrastructure (DoE, city corporations, pauroshva's, academic institutions, etc.) of air & noise
2. Identify gaps in monitoring coverage and technical capacity.
3. Identify priority monitoring sites and no. of monitoring stations (fixed stations, mobile routes, sentinel locations) and technical specifications for equipment (high-grade reference monitors and calibrated low-cost sensors).
4. Recommend appropriate technology and system infrastructure including following: Assess data management, forecasting model needs, cleaning/calibration protocols, and IT/telecom requirements.
5. Propose institutional and operational arrangement (evaluate institutional roles, staffing, O&M capacity, procurement & maintenance systems, and training requirements).
6. Provide specifications and cost estimates (CAPEX/OPEX) for equipment, installation, maintenance, calibration, and operations (e.g., 5-year projection).
7. Recommend governance arrangements, SOPs, QA/QC, public data dissemination and health-alert protocols.
8. Propose a prioritized phased implementation plan (pilot → scale) with monitoring & evaluation indicators.

3. Scope of work

The research team will conduct a comprehensive, multidisciplinary assessment covering:

A. Desk review & baseline

- Current air quality & noise monitoring practices of DoE and others
- Functionality of existing air quality & noise monitoring System
- Data Management, calibration, maintenance and reporting

- Collect existing datasets, maps, DoE and other city reports, published national and international journals, known source inventories, health data, meteorological records, previous monitoring studies and relevant policies.
- Current air quality and noise monitoring practices of DoE and others
- Review transboundary influences and location -specific factors that may affect pollution levels
- Review international best practices (WHO, UNEP, WMO, WB examples from cities with similar conditions) for integrated air/noise monitoring and forecasting.

B. Pollution profile Assessment

- Analyze historical air quality & noise monitoring data
- Identify pollution hotspots
- Relevant stack register

C. Field reconnaissance, data collection & technical survey

- Develop scientific criteria for site selection
- Visit candidate sites across the five jurisdictions
- Air and Noise data collection to examine sources of air and noise pollution
- Propose optimal number and type of solutions
- Inspect existing monitoring equipment (if any), shelters, power/internet, siting constraints, security and access.
- Short-term spot monitoring (where gaps exist) using portable reference instruments to validate hotspot selection.

D. Stakeholder consultation

- Consult LGD, DoE, city/pourashava authorities, MoHFW, meteorological office (BMD), hospitals, universities (academicians, researchers), industry representatives, telecom providers, and civil society, etc.
- Organize multi-stakeholder workshop(s) for needs validation and buy-in.

E. Technical design and options analysis

- Recommend specification for:
 - Reference (regulatory-grade) continuous (Real time) ambient air monitoring stations (measuring PM_{2.5}, PM₁₀, NO₂, SO₂, O₃, CO, meteorological parameters).
 - Continuous sound level meters and noise loggers at selected urban locations.
 - Network of calibrated low-cost PM sensors for spatial coverage and mobile monitoring units (vehicle-mounted).
- Define siting rules, number of stations per city, spacing, and high-priority locations (marketplaces, traffic corridors, industrial clusters, schools, hospitals and clinics, architecture: ingestion, validation, storage, API, dashboards, public portal, and integration with local health surveillance and weather forecasts.

- Recommend short-term forecasting approach: statistical models (e.g., persistence, regression), machine learning models, or other model depending on data availability; use of meteorological forecasts from BMD.

F. institutional and Capacity Assessment (Operational considerations)

- Detailed staffing plan: roles for installation, operations, calibration, data analysts, IT support, and communications.
- SOPs for instrument calibration, QA/QC, downtime reporting, maintenance, data validation and archiving.
- Training needs assessment and a training plan (onsite + remote modules)
- Assess integration with DoE's data system

G. Costing & procurement

- Provide itemized CAPEX and OPEX estimates (procurement, site prep, instrument cost, installation, calibration equipment, 3–5-year maintenance & consumables, data platform, training).
- Procurement options (national vendors), spare parts, warranty, and SLAs.

H. Governance, policy & sustainability

- Recommend institutional arrangements for ownership (LGD/City Corporation/Pourashava/DoE, MoHFW), data stewardship, MOUs, and cost recovery or financing mechanisms.
- Propose mechanisms for public information, health alert triggers, and legal/regulatory compliance.

I. Phased implementation roadmap & M&E

- Prioritize pilot sites, timeline for roll-out, milestones, deliverables, and indicators for measuring success.

4. Methodology

- **Mixed methods:** desk review, technical field assessment, spot monitoring (if feasible), stakeholder interviews, focus group discussions, and workshops.
- **GIS mapping:** produce maps of candidate sites and pollution hotspots combining population density, land use, traffic, industrial facilities, and health facilities.
- **Data analysis:** analyze existing air/noise/meteorological/health datasets to quantify trends and exposure.
- **Options appraisal:** compare alternatives (e.g., fewer high-grade stations vs. wider low-cost network) using cost-benefit and feasibility criteria.
- **Validation:** circulate draft technical and costing recommendations to stakeholders and incorporate feedback in final deliverables.

5. Deliverables

Deliverable No.	Deliverable Title	Description / Key Contents	Timeline (Month)
D1	Inception Report (Through a workshop)	• Understanding of the ToR and project objectives • Detailed methodology, data sources, and survey plan • Work plan with milestones and Gantt chart • Stakeholder and institutional mapping • Quality assurance plan, etc. (Inception plan must be verified through a workshop)	Month 1–2 (From the date of contract signing)
D2	Baseline Review Report	• Review of existing air and noise monitoring infrastructure • Assessment of available data from DoE, BMD, and city corporations • Gap analysis in equipment, data quality, and institutional capacities • International best practices for forecasting systems	Month 3–4 (From the date of contract signing)
D3	Field Data Collection & Site Assessment Report	• Site visits and assessments for suitable monitoring station locations • Air and Noise data collection Mapping of emission and noise hotspots • Evaluation of power, communication, and security conditions • Preliminary recommendations on sensor types and placement	Month 5–7 (From the date of contract signing)
D4	Technical Specification and Equipment Requirement Report	• Definition of specifications for reference-grade and low-cost sensors • Equipment for air quality, noise, meteorological, and calibration units • Communication, data storage, and dashboard design parameters • Procurement strategy recommendations, etc.	Month 8–10
D5	Real-Time Data Management and Forecasting Framework	• Design of a data flow architecture and integration system • Model framework for short-term forecasting (based on meteorology and emission trends) • Calibration, validation, and QA/QC plan for data management • Early warning system design for pollution alerts, etc.	Month 9–12
D6	Institutional & Capacity Assessment Report	• Evaluation of existing technical and human capacity within city corporations/municipalities • Institutional responsibilities for data operation, analysis, and reporting • Capacity gap analysis and training plan • Proposed	Month 10–11

		institutional setup for system maintenance	
D7	Draft Needs Assessment & Investment Plan	- Comprehensive needs assessment for each city corporation/pourashava - Proposed monitoring network layout (location, number, type of equipment) - Cost estimation (CAPEX and OPEX) - Implementation phasing and operational plan	Month 8–10
D8	Stakeholder Consultation Workshops on draft report	- Consultation with DoE, BMD, LGD, and city corporation/pourashava officials and others - Validation of technical findings and costed investment plan - Incorporation of feedback and recommendations	Month 8-10
D9	Final Report & Implementation Roadmap	- Consolidated report covering all assessments and findings - Technical specifications, site selection, forecasting model, and data system design - Institutional and capacity-building recommendations - Final costed and phased implementation roadmap, etc.	Month 12
D10	Dissemination & Capacity Building through a Workshop	- A national dissemination workshop and technical training sessions - Handover of datasets, maps, and system design tools - Awareness and communication materials for key stakeholders, etc.	Month 12

6. Implementation Timeline

Activity / Deliverable	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12
Inception Report (D1) through a workshop	■	■										
Baseline Review (D2)			■	■	■							
Field Data Collection and Site Assessment (D3)					■	■	■					
Technical Specifications (D4)								■	■	■		

Forecasting Framework (D5)									■	■	■	■
Institutional Assessment (D6)										■	■	■
Needs Assessment & Investment Plan (D7)								■	■	■		
Stakeholder Consultations (D8)								■	■	■	■	■
Final Report (D9)												■
Dissemination & Capacity Building (D10) through a workshop												■

7. Qualification and Experience of the Consultant

The consulting firm/research institution/university shall be legally established and have a minimum of 10 (ten) years of general experience in environmental research, environmental monitoring, urban environmental management, air quality assessment, noise pollution assessment, environmental health, climate and meteorological studies, GIS-based analysis, or related fields.

The firm shall have at least 7 (seven) years of specific experience in planning, design, assessment, installation, operation, evaluation, or technical studies related to air quality monitoring systems, noise monitoring systems, environmental sensor networks, real-time monitoring and forecasting systems, environmental data management platforms, or similar assignments.

The firm shall have successfully completed at least 2 (two) similar assignments during the last 7 (seven) years involving environmental monitoring, pollution assessment, monitoring network design, GIS-based analysis, forecasting systems, equipment specification development, institutional assessment, cost estimation, investment planning, or implementation roadmap preparation.

The firm shall possess adequate managerial, technical, financial, and logistical capacity to undertake multidisciplinary studies, field investigations, stakeholder consultations, GIS mapping, data analysis, technical design, equipment specification, costing, implementation planning, and capacity-building activities. The firm shall demonstrate access to qualified

professionals in environmental monitoring, air quality and instrumentation, noise assessment, ICT and real-time data systems, environmental modelling and forecasting, GIS and spatial analysis, institutional assessment, and project management.

Interested firms shall submit: (i) Certificate of Incorporation/Registration or equivalent legal document; (ii) valid Trade License (where applicable); (iii) valid TIN and VAT/BIN Registration Certificate (where applicable); (iv) company/institution profile and organizational structure; (v) audited financial statements or audit reports for the last three (3) financial years; (vi) details of similar assignments completed during the last seven (7) years, including client references and contract values; and (vii) evidence of relevant technical, managerial, and logistical resources.

A firm may apply individually or in association with other firms. In case of a Joint Venture (JV), the application shall clearly identify the Lead Partner and specify the roles and responsibilities of each member. A Letter of Intent to form a JV or a signed JV Agreement shall be submitted with the EOI. Qualifications and experience of JV members will be considered collectively in accordance with the REOI requirements.

Experience in assignments financed by the Government of Bangladesh, World Bank, ADB, JICA, UN Agencies, or other development partners will be considered an advantage.

8. Expert Team Composition and Minimum Qualification Requirements

The research institute/university/firm shall deploy a multidisciplinary team with proven experience in air quality monitoring, noise assessment, ICT systems, and urban governance. All key experts must have prior experience in similar studies, preferably in Bangladesh or comparable developing-country contexts.

Position of expert	Number	Qualification	Experiences
Team Leader / Environmental Monitoring Specialist (Key Expert) (Full Time)		Postgraduate degree (Master's or higher) in Environmental Engineering, Environmental Science, Atmospheric Science, or related discipline	Minimum 12 years of professional experience , including at least 7 years in air quality and/or environmental monitoring projects Proven experience in leading environmental monitoring or pollution management studies Experience in design or assessment of air and noise monitoring systems

			Familiarity with World Bank–funded or other development partner–funded projects preferred
Air Quality Monitoring & Instrumentation Expert (Key Expert) (Part Time)		Master’s degree in Environmental Engineering, Mechanical Engineering, Atmospheric Science, or relevant field	Minimum 8 years of experience in air quality monitoring Hands-on experience with continuous air monitoring stations (CAMS) and low-cost sensors Experience in equipment specification, siting, calibration, and maintenance planning
Sound / Noise Pollution Specialist (Key Expert) (Part Time)		Master’s degree in Environmental Engineering, Acoustics, Physics, or related discipline	Minimum 7 years of experience in noise measurement and assessment Experience in urban noise mapping and monitoring systems will be given preference
ICT / Real-Time Monitoring & Data Management Expert (Key Expert) (Part Time)		B.Sc./ Master’s degree in Computer Science, CSE, Information Technology, Electronics Engineering, MIS, Data Science, etc.	Minimum 7 years of experience in real-time data systems, IoT, or environmental data platforms Experience in data acquisition systems, dashboards, and cloud-based platforms
Climate Change, Air Quality Modelling & Forecasting Specialist (Part Time)		Master’s degree in Climate Science, Meteorology, Environmental Science, or related discipline	Minimum 6 years of experience in climate data analysis or forecasting Experience linking meteorological parameters with air pollution dispersion
Institutional & Policy Analyst (Part Time)		Master’s degree in Public Administration/Policy, Environmental Management, Urban Planning, or related field	Minimum 6 years of experience in institutional assessment or policy analysis Experience with urban governance and environmental regulation in Bangladesh preferred

GIS & Data Analyst (Part Time)		Bachelor's or Master's degree in GIS, Geography, Statistics, Environmental Science, MIS, Data Management, or related field	Minimum 5 years of experience in GIS-based spatial analysis Experience in pollution mapping and spatial visualization
Field Coordinator / Survey Specialist (Full Time)		Bachelor's or Master's degree in Environmental Science or Social Science	Minimum 5 years of experience in field coordination or surveys
Administrative & Finance Officer (Full Time)		Bachelor's degree in Business Administration, Accounting, or related field	Minimum 5 years of experience in project administration or financial management

9. Supporting documents to be submitted by the applicant:

- A short history of research institution/university/firm
- The mission statements
- The policy on research, if available
- The current strategic plan, if available
- The research mandate of the research institution/university/firm (as it relates to health, natural sciences and/or social sciences and humanities)
- A statement of Bangladesh incorporation or constitution, and information on governance structure such as mandate, and constitution of board of governors or equivalent; and
- The documentation describing the status of his/her research institution/university/firm, ie., agreement indicating whether or not the research institution/university/firm is affiliated to, or a constituent portion of another institution, if applicable.
- Last three fiscal years audit report of the research institute/university/firm
- Last five years research activities of the research institute/university/firm

10. Study eligibility

- The research cannot be currently funded or must be able to demonstrate insufficient funding
- The proposed budget must reasonably and feasibly cover the research
- The research must be biologically plausible and supported by current scientific evidence and understanding
- The study must be methodologically sound

11. Application Requirements

- An appropriate title of the research and sound methodology
- Complete a study profile summarizing the details of the proposed research including description, budget with justification, timeline, and study team
 - Details on research will be kept confidential and not disclosed to anyone outside the Research Lead
- Submit current curriculum vitae of all members of research team noting the affiliated research institution/university/firm
 - If the researcher is found to be using these funds for unintended use or research is not being performed as indicated, the Research Lead will request funds to be returned and the researcher may be disqualified from further use of the Research Lead platform
 - Payment system based on milestones

12. Research Proposal Outline

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13. Expert Panel

An Expert Panel of 3-5 members may be formed to review the research activities of the study. The Terms of Reference of the committee will be determined during formation of the committee.