FORM – DPP
January, 2025

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

DEVELOPMENT PROJECT PROFORMA/PROPOSAL (DPP)

FOR

The Project for the Improvement of Equipment for Air Pollution Monitoring

DEPARTMENT OF ENVIRONMENT

DEVELOPMENT PROJECT PROPOSAL (DPP)
PART-A
Project Summary

1.	**Project Title**	:	The Project for the Improvement of Equipment for Air Pollution Monitoring
2.1	**Sponsoring Ministry/Division**	:	Ministry of Environment, Forest and Climate Change
2.2	**Implementing Agency (ies)**	:	Department of Environment
2.3	**Concerned Division of Planning Commission**	:	Agriculture, Water Resources and Rural Institutions Division
3.	**Objectives and Targets (of Beneficiaries) of the project**		Objective: To monitor roadside air quality and assess the contribution of road and transport-related pollution. Targets: • Identify key sources of air pollution related to road and transport activities. • Develop policies and actions to mitigate air pollution effectively. • Reduce adverse health impacts and socio-economic challenges associated with air pollution
4.	**Project Implementation Period**		
	(I) Date of Announcement	:	March 2025
	(II) Date of Completion	:	June 2028

Location of the project:

Sl. No	Division	District	City Corporation/ Pourashava / Upazilla
(1)	(2)	(3)	(4)
1	Dhaka	Dhaka	Dhaka North City Corporation (DNCC) & Dhaka South City Corporation (DSCC).
2	Chattogram	Chattogram	Chattogram City Corporation (CCC)

Justification of selecting the project area:

Initially, potential areas with significant air pollution caused by vehicle emissions were identified through desk studies and site surveys. Since the project will utilize government land, 24 sites—19 in Dhaka and 5 in Chattogram—were shortlisted as candidates for installing Roadside Continuous Air Monitoring Stations (CAMSs) within these areas. The selection process considered factors such as space availability, site security, and access to electricity and network connectivity. The accompanying table outlines the criteria considered during the site selection process.

Table: Factors Considered for Site Selection

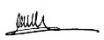
Items	Details
Distribution of the Existing CAMSs	To avoid installing new CAMSs in locations already covered by existing ones, it was verified whether any current CAMSs were already functioning as roadside monitoring stations.
Traffic Conditions	Potential areas likely to experience long-term air pollution from vehicle emissions were identified based on factors such as traffic volume, average speed, the percentage of heavy vehicles, and future transportation development plans.
Surroundings	Candidate sites were evaluated based on surrounding buildings (height, and the presence of schools and hospitals) and road structures (number of lanes and flyovers) to identify areas with high vehicle emissions and severe air pollution. Following this, the feasibility of installing roadside CAMSs was assessed by confirming space availability, site security, and access to electricity and network connectivity at the selected locations.
Air Pollution	Candidate sites were chosen based on desk surveys and preliminary air quality monitoring conducted to obtain reference values for NO_x and PM concentrations.

The Fixed CAMSs Installation Sites are shown below.

No.	City	Road	Address	Landowner	Ministry
1	Dhaka	Dhaka–Mymensingh Highway (N3)	Sector 8, Uttra, Dhaka - Mymensingh Hwy, Dhaka	SBC	FID
2		Bir Uttam Rafiqul Islam Avenue	Hatirjheel Bridge, Hatir Jheel Link Rd, Dhaka	DWASA	LGD
3		Dhaka–Mymensingh Highway (N3), Dhaka Elevated Expressway	Road No. 27, Block-A, Dhaka - Mymensingh Highway, Dhaka	RHD	RTHD
4		Mirpur Road, New Elephant Road	Dr. Qudrat-I-Khuda Road, Dhanmondi, Dhaka	BCSIR Dhaka	MoST
5		Jatrabari Road, Mayor Mohammed Hanif Flyover	Dhaka-Chattogram Highway, N1, Jatrabari Intersection	DSCC	LGD

6	Chattogram	M. A. Aziz Road	M. A. Aziz Road, Saltgola, Chattogram	CDA	MoHPW
7		Chittagong-Hathazari-Rangamati Road (N106)	Chattogram Cantonment, Chattogram-4220	BCSIR Chattogram	MoST

Project Management	:	
Proposed Project management Setup	:	The project will be implemented by the Department of Environment (DoE) utilizing its existing manpower structure. A Grade 6 or Above officer will serve as the Project Director (PD), while a Grade 9 or Above officer will take on the role of Deputy Project Director (DPD)
Implementation Arrangement	:	Separate Project Implementation Units (PIUs), headed by the Director General of DoE, and Project Implementation Committees (PICs) will be institutionalized within the Department of Environment (DoE). The PICs will report to the Project Steering Committee (PSC), chaired by the Secretary of the Ministry of Environment, Forest, and Climate Change.
Financial and Procurement Plan	:	All financial rules and regulations of the Government of Bangladesh will apply to the execution of the project. Procurement activities will be conducted in accordance with JICA's procurement guidelines.
After completion, whether the output of the project needs to be transferred to the revenue budget	:	Yes, upon completion, the project's output will be handed over to the DoE and DoE will operate the stations with the government revenue budget for sustained operation and maintenance. DoE will be included in the TO&E to operate the stations along with the existing Air Quality Management wing structure.



The institutional arrangement and technical and financial requirements for operation and maintenance.	➢ The Department of Environment (DoE) will receive eight Continuous Air Monitoring Systems (CAMS): seven fixed CAMS units and one on-vehicle CAMS. ➢ The Air Quality Management Wing of the DoE will oversee the operation of the roadside CAMS alongside the existing 31 CAMS units. ➢ Funding from the Government of Bangladesh (GoB) will be essential to cover costs for spare parts, servicing, and all related expenses. ➢ Routine inspections will be conducted bi-weekly to verify that measurement equipment is functioning accurately, ensuring reliable data collection. ➢ Annual periodic inspections will be performed to maintain the equipment's measurement performance and prevent potential malfunctions. ➢ Emergency inspections, typically conducted by the manufacturer, will be arranged to identify and address causes of any abnormalities or equipment failures. ➢ Performance tests will be conducted to confirm the accuracy of measurement equipment and the reliability of recorded data.

PART B

Project Details

Background Information:

Background with Problem Statement

Over the past decade, Bangladesh has undergone rapid urbanization, industrial growth, and extensive infrastructure development. This transformation, while crucial for economic progress, has brought significant environmental challenges, with air pollution emerging as one of the most pressing issues. This surge in pollution is especially acute in major urban areas, where a combination of factors contributes to deteriorating air quality. Sources such as brick kilns, construction-related road and soil dust, vehicle emissions, industrial pollutants, and the burning of waste and biomass have all played significant roles in this escalating crisis. Additionally, the problem is compounded by transboundary pollution, which introduces pollutants from neighboring regions and heightens the overall pollution load.

The trends in air quality across Bangladesh reveal that pollution levels are heavily influenced by meteorological patterns and seasonal changes. The situation is particularly severe in urban centers, where concentrations of particulate matter (PM), specifically PM2.5 and PM10, peak during the dry season. This period is marked by minimal rainfall, northwesterly winds, and low humidity, conditions that facilitate the suspension and spread of airborne particles. Data indicates that PM2.5 and PM10 levels often surpass the standards set by the Bangladesh Ambient Air Quality Standards (BAAQS), which are 65 $\mu g/m^3$ and 150 $\mu g/m^3$, respectively. In many instances, these levels double the acceptable limit, posing severe health risks. Conversely, during the wet season, rainfall significantly mitigates air pollution, clearing particles from the air and providing temporary relief from high PM concentrations. Other gaseous pollutants, including sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), and ozone (O_3), usually remain within national air quality standards, though occasional spikes are observed.

A critical aspect of managing air quality effectively is the availability of reliable, real-time data. The existence of a robust and consistent air quality monitoring network is essential for gathering such data and supporting government and stakeholder efforts. This infrastructure allows for the tracking of diurnal, seasonal, and long-term variations in air quality, the identification of pollution sources and hotspots, the monitoring of pollution events, and the validation of atmospheric models. Additionally, a well-maintained network provides the foundation for making informed policy decisions, assessing the effectiveness of mitigation measures, and taking action during pollution emergencies. By making air quality data publicly available, the government fosters public awareness, supports academic research, and promotes citizen-driven accountability.

Bangladesh's air quality monitoring network has evolved gradually since 2001, comprising 31 monitoring stations managed by the Department of Environment (DoE). Sixteen of these are Continuous Air Monitoring Stations (CAMS) that provide hourly measurements of PM2.5 and PM10, as well as readings for ozone, CO, SO_2, and NO_x. These stations are also equipped with meteorological sensors that gather data on weather conditions to help contextualize pollution levels. Data from these monitoring stations are logged and transmitted to a central server at the DoE. In addition to CAMS, 15 compact monitoring stations are distributed across the country, capturing similar data. However, the data from these compact stations have yet to be included in public reports, indicating an area for potential improvement.

The DoE's strategy to enhance the air quality monitoring network includes expanding the scope and functionality of existing infrastructure. This plan involves evaluating current monitoring locations and identifying sites for future stations based on a decade-long expansion blueprint. The expansion will integrate a combination of CAMS, compact monitoring stations, mobile units, and other sensors as resources permit. This strategic location of new monitoring units will include rural and border areas, which currently have limited monitoring coverage. Enhancing rural monitoring capabilities is vital for obtaining a comprehensive understanding of background air quality and assessing the influx of transboundary pollutants, particularly from the western border.

Modernizing the technical capabilities of monitoring stations is another priority. Current PM monitoring instruments, such as Beta

Attenuation Mass Monitors (BAMM), operate effectively but are limited in their data resolution, often producing data at intervals that do not support detailed process studies. The DoE plans to assess newer technologies for potential upgrades, drawing insights from the experiences of neighboring countries that have adopted alternative methods. This approach aims to maintain the reliability of data while improving the overall quality and resolution. Alongside equipment upgrades, the DoE will replace aging computers and the central data server to enhance data management capabilities and support long-term data storage and analysis. This modernization will include software updates and devices to enable continuous data backups, improving data security and availability.

The DoE also plans to address data accuracy through the implementation of daily validation checks. This will involve flagging anomalies and suspicious data points according to a standard protocol, with final validation conducted as part of a secondary review process. To improve response times and data accuracy, station staff will receive targeted training and be encouraged to resolve smaller technical issues promptly. Maintaining a detailed station log system and instituting communication protocols for data anomalies will contribute to a higher standard of data quality.

Operational challenges such as data gaps and equipment failures will be mitigated through enhanced maintenance protocols and investments in a centralized repair facility. Regular procurement of spare parts and consumables, combined with partnerships with academic institutions, will help ensure swift repairs. Continuous electricity and internet connectivity at all monitoring sites will be prioritized to minimize data loss. Additionally, plans to increase the number of high-quality data points from each station will be supported by maintaining continuous oversight, training staff, and encouraging proactive problem-solving.

The comprehensive monitoring network not only serves immediate operational needs but also plays a role in policy development. Access to accurate and comprehensive data allows policymakers to evaluate the impacts of existing air pollution control measures and develop new strategies to meet national and international targets. The government has set air quality improvement as a strategic goal within its 8th Five-Year Plan (2020/21-2024/25), aiming to reduce the annual average PM2.5 concentration to 60 $\mu g/m^3$ by 2025. This ambitious target reflects Bangladesh's recognition of the health implications of air pollution and the importance of proactive measures. With PM2.5 concentrations averaging 79.9 $\mu g/m^3$ in 2023, far exceeding the World Health Organization's (WHO) guideline of 5 $\mu g/m^3$, the urgency to act is evident. The adverse health impacts are significant; in 2019, air pollution was associated with approximately 159,000 deaths due to respiratory and cardiovascular conditions (World Bank, 2023). Additionally, black carbon, a component of PM2.5, has been identified as a powerful greenhouse agent, with a warming potential 460-1,500 times greater than that of CO_2.

The Government of Bangladesh's collaboration with international partners is pivotal for addressing these challenges. One notable initiative is the proposed grant aid project from the Japan International Cooperation Agency (JICA). This project aims to establish specialized Roadside CAMSs to monitor and analyze the impact of vehicle emissions, a significant source of urban pollution. Vehicle emissions are a critical concern as they contribute to both PM2.5 levels and other pollutants that impact public health. The "Project for the Improvement of Equipment of Air Pollution Monitoring" focuses on equipping the country with the tools needed to measure and address vehicle-derived air pollution, ultimately enhancing overall air quality management.

The preparatory survey conducted for this project by JICA highlighted the necessity and potential benefits of implementing roadside monitoring stations. The survey team developed a detailed design and project plan, estimating costs and establishing the validity of the grant aid initiative. This strategic move aims to strengthen Bangladesh's capacity to understand and combat vehicle emissions' impact on urban air quality, laying the foundation for targeted policies and measures to improve urban environmental health.

Efforts to expand and upgrade the monitoring network also include providing existing DoE offices with advanced monitoring and laboratory equipment, IT tools, and other resources to bolster their capabilities. Enhanced analytical, monitoring, and enforcement capacities will enable the DoE to better respond to air quality issues and ensure compliance with environmental standards.

Bangladesh's journey toward improved air quality management reflects a blend of modern technology, international collaboration, and strategic policy efforts. The development of a decade-scale monitoring expansion plan as part of the National Air Quality Management Plan (NAQMP) exemplifies a forward-thinking approach that aims to integrate both urban and rural data for comprehensive insights. The plan's components, including improved data validation protocols and training for station personnel, highlight the DoE's commitment to operational excellence.

In summary, air pollution in Bangladesh is a multifaceted challenge that requires coordinated efforts to mitigate. While urbanization and industrial growth that fuel the country's economy contribute to rising pollution levels, a combination of advanced technology, international support, and effective policymaking can pave the way for meaningful improvements. The ongoing initiatives led by the Department of Environment, supported by development partners and aligned with national plans, are crucial for creating a healthier, more sustainable environment for all citizens.

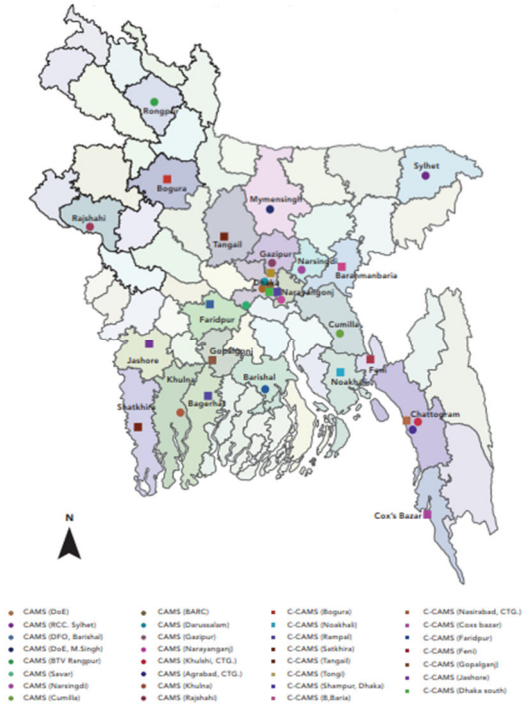
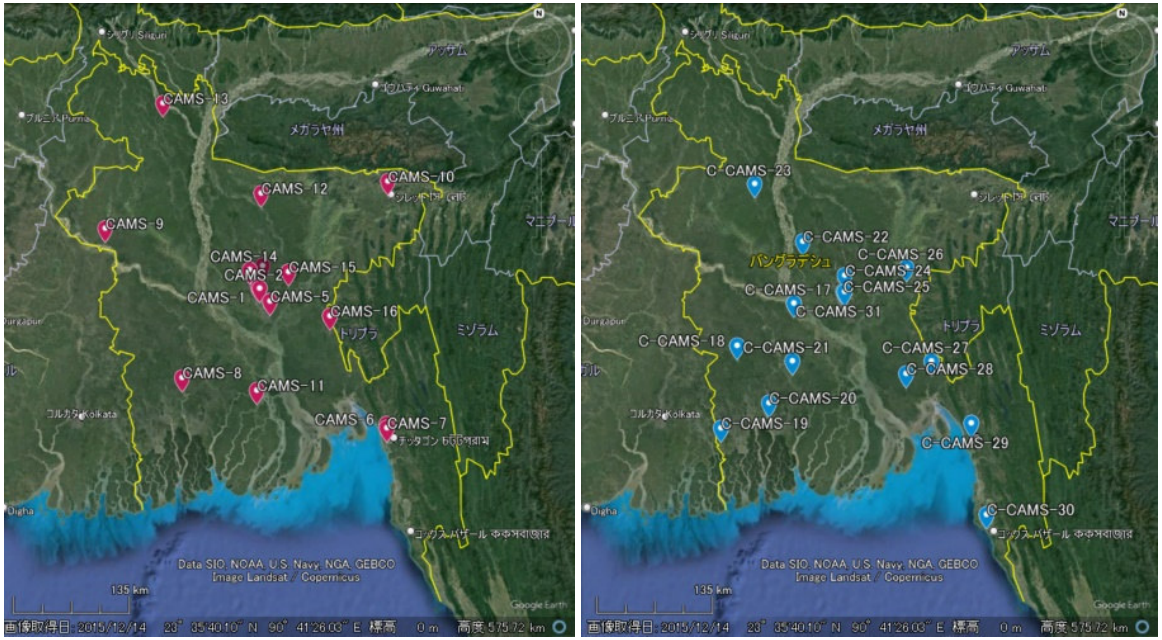


Figure 1-1 Location of DoE's Air Quality Monitoring Stations in Bangladesh.



Note: Left: CAMSs, Right: C-CAMS

Figure 1-2 Location of DoE's Air Quality Monitoring Stations in Bangladesh.

Figure 1-3 and Figure 1-4 show the traffic conditions in Dhaka and Chattogram. Some vehicles emitting black smoke were observed during this survey in Dhaka and Chattogram as shown in Figure 1-.

Figure 1-3 Traffic Conditions in Dhaka

Figure 1-4 Traffic Conditions in Chattogram

Figure 1-5 Black Smoke Emissions from Vehicles (Left: Dhaka, Right: Chattogram)

Under these conditions, the Government of Bangladesh requested to JICA for a grant aid project, where CAMSs will be installed on the roadsides (hereinafter referred to as "Roadside CAMSs") to monitor the ambient air quality and understand the level of impacts of vehicle emissions. Therefore, "the Project for the Improvement of Equipment of Air Pollution Monitoring" (hereinafter referred to as "the project") is intended to address the development agenda mentioned above by contributing to the enhancement of the capacity in measuring and analyzing air pollutants derived from vehicle emissions. Ultimately, it will contribute to the enhancement of air pollution control capacity, through the

development of the Roadside CAMSs for understanding the effects of vehicle emissions.

In the Preparatory Survey for the Project for the Improvement of Equipment of Air Pollution Monitoring (hereinafter referred to as "the survey"), the JICA Survey Team examined the validity and effectiveness of the grant aid project, created appropriate detailed design and plans for the grant aid project, and estimated the project costs.

Linkages (to other projects and institutions)

The Clean Air and Sustainable Environment (CASE) Project significantly advanced air quality management in Bangladesh through various initiatives. Under this project, a total of 11 Continuous Air Monitoring Stations (CAMS) and 15 Compact Continuous Air Monitoring Stations (C-CAMS) were installed, providing critical infrastructure for ambient air quality monitoring. Additionally, vehicular emission inspection equipment was collected to address transport-related pollution, while piloting the conversion of traditional Fixed Chimney Kilns (FCKs) to energy-efficient improved zigzag kilns contributed to reducing industrial emissions. The project also supported the establishment of a Central Air Quality Laboratory and procured stack emission monitoring equipment, enhancing the country's capacity to analyze emissions and implement mitigation strategies comprehensively. However, the absence of roadside CAMS in the CASE project left a crucial gap in monitoring and assessing air pollution caused specifically by road and transport activities. To fill this gap, the Project for the Improvement of Equipment for Air Pollution Monitoring focuses on roadside air quality, aiming to identify the key sources of transport-related pollution. This initiative complements the groundwork laid by CASE, enabling targeted interventions and comprehensive policy development to tackle air pollution effectively and sustainably.

Poverty Situation

Despite significant progress in poverty reduction, with the rate declining from over 40% in 2000 to approximately 20% by 2022, poverty remains a persistent challenge in Bangladesh. Vulnerability to climate change and frequent natural disasters, including floods, cyclones, and riverbank erosion, disproportionately impacts impoverished communities, often destroying homes, livelihoods, and infrastructure, and trapping vulnerable populations in cycles of poverty.

Exacerbating these challenges, severe air pollution, with PM2.5 levels exceeding WHO Air Quality Guidelines by a factor of 10 or more, further undermines public health and economic stability. Pollutants from sources such as power plants, industries, vehicles, and waste burning contribute to over 159,000 deaths annually and 2.5 billion illness days, as recorded in 2019. The economic burden of these health impacts is immense, equivalent to 8.3% of GDP (World Bank 2023a). Poor communities are disproportionately affected by air pollution's morbidity and mortality impacts, including premature births and underweight infants (Ghosh et al. 2021; HEI 2021). These dual crises of environmental degradation and poverty reinforce each other, demanding urgent and integrated action to break the cycle and improve lives.

Poor communities are disproportionately exposed to pollution, which harms their health and reduces economic opportunities, trapping them in poverty. Poor populations in Bangladesh are more likely to live in highly polluted areas, such as industrial zones, near brick kilns, or along

busy roads, where air quality is worse. Slums in cities like Dhaka experience higher levels of air pollution due to the proximity to factories and unregulated emissions.

This project will help DoE monitor and analyze air quality to create reasonable environmental standards and policies regarding gas emissions from vehicles, which will lead to an improvement of the air quality in Bangladesh.

Project Description:

Objectives

The project aims to monitor roadside air quality and evaluate the impact of road and transport-related pollution. By identifying key sources of emissions from transport activities, it provides critical data to design effective mitigation strategies. These efforts support the development of targeted policies and actions to address air pollution comprehensively. The outcome of the project also seeks to reduce the adverse health effects caused by poor air quality, including respiratory and cardiovascular diseases, while minimizing the socio-economic challenges associated with pollution. Overall, it contributes to creating a healthier and more sustainable urban environment through improved air quality management and evidence-based decision-making.

Outcomes

Table 1-1 shows the expected outcomes of the projects. The outlined measures will enable the Department of Environment (DoE) to monitor and analyze air quality effectively, facilitating the development of appropriate environmental standards and policies to regulate vehicle emissions. These efforts are anticipated to significantly enhance air quality across Bangladesh, underscoring the project's high relevance and effectiveness. Additionally, the project aims to mitigate the negative health impacts of poor air quality, such as respiratory and cardiovascular diseases, while addressing the socio-economic challenges posed by pollution.

Table 1-1 Projected outcomes

Effects	Details
Enhancement of the roadside CAMSs monitoring data quality	Effective operation and maintenance will enhance the quality of monitoring data from the roadside CAMSs.
Strengthening DoE's capacity to analyze monitoring data from the roadside CAMSs	The soft components will strengthen DoE's ability to interpret and analyze monitoring data.
To effectively devise countermeasures against air pollution from vehicle emissions using the monitoring data from roadside CAMSs	Using the monitoring data from the roadside CAMSs, DoE will be better equipped to identify high-priority roads and implement effective countermeasures against air pollution caused by vehicle emissions.

Outputs

The air quality measurement instruments to be provided for this project are designed to measure seven air pollutants, six for which, environmental standards for air quality have been established in the country, namely: NO_2, SO_2, $PM_{2.5}$, PM_{10}, O_3, and CO, plus NO, which are particularly affected by automobiles. In addition, the measurement equipment used for meteorological observation is five elements: wind direction and speed, temperature, humidity, and precipitation.

The selected measurement items for air quality are the same as those in the existing CAMS and C-CAMS. For meteorological items, the items are those commonly measured in existing CAMS and C-CAMS (wind direction and speed, temperature, humidity, precipitation, and solar radiation), except solar radiation, which could be substituted with measurement data from other CAMS.

Table 1-2 shows the expected quantitative outputs of the projects.

Table 1-2 Expected outputs

Effects	Current Situation (in 2024)	Target (in 2029/in three years after project completion)
Roadside CAMS development (Number of stations)	0	8
Annual hourly data acquisition rate for each pollutant by the roadside CAMS (hour/year)	0	≧ 6,000
Publish an annual report of the data monitored with the roadside CAMSs on the DoE website (times/year)	0	1

Activities

Key activities of this project include:

i. Construction of 7 (Seven) Road Site Continuous Air Quality Monitoring Stations (CAMS) and 1(one) Vehicle Mountains Continuous Air Quality Monitoring Stations (CAMS.

ii. Supply of Equipment for Air Pollution Monitoring with accessories, Supporting, essential items for setting the equipment, boundary wall and land development.

iii. Customs duty and Clearing forwarding agent
iv. Develop electricity/internet Communication Line
v. Consultancy on the project for the improvement of Equipment for Air pollution Monitoring
vi. Develop Initial technical guidelines
vii. Develop Operating Guidelines on the handling of the measurement equipment
viii. Computer, Computer consumable, and other stationary
ix. Car rent, Internship, and MS Scholarship

Population Statistics	:	
Population Coverage	:	The project will cover the Dhaka and Chattogram cities
Population disaggregated data by women, senior citizens, children, physically and mentally challenged etc.	:	The project will have no adverse impact on women, senior citizens, individuals with physical or mental disabilities, or children, as it aims to improve the overall environment. Moreover, the entire society, including women and children, will benefit significantly from the project's activities and outcomes.
Whether any pre-appraisal/feasibility study/pre-investment study was done before formulation of this project? If so, attach summary of findings & recommendations	:	Yes, a feasibility study has been accomplished (Appendix-Z) The qualitative effects of this project will help DoE monitor and analyze air quality to create reasonable environmental standards and policies regarding gas emissions from vehicles, which will lead to an improvement of the air quality in Bangladesh. Therefore, it is expected that the project will have high validity and effectiveness.

Financial & Economic Analysis:

Net Present Value (NPV), considering 12% discount rate
(i) Financial: The benefit of this project is intangible, So the NPV could not be conducted.
(ii) Economic: Since the benefit of this project is not calculated, the NPV is not applicable to this project.

Benefit-Cost Ratio (BCR), considering 12% discount rate

(i) Financial: The benefit of this project is intangible, So the FBCR could not be conducted.

(ii) Economic: Since, the benefit of this project is not calculated, so the BCR is not applicable to this project.

Internal Rate of Return (IRR)

(i) Financial: The benefit of this project is intangible, So the FIRR could not be conducted.

(ii) Economic: As this project deals with the data collection of air quality data. The benefit of this project is intangible. So, IRR calculation is not applicable to this project.

Lessons Learnt from Similar Nature of Project(s):

The Clean Air and Sustainable Environment (CASE) Project significantly advanced air quality management in Bangladesh through various initiatives. Under this project, a total of 11 Continuous Air Monitoring Stations (CAMS) and 15 Compact Continuous Air Monitoring Stations (C-CAMS) were installed, providing critical infrastructure for ambient air quality monitoring.

The absence of roadside CAMS in the CASE project left a crucial gap in monitoring and assessing air pollution caused specifically by road and transport activities. To fill this gap, the Project for the Improvement of Equipment for Air Pollution Monitoring focuses on roadside air quality, aiming to identify the key sources of transport-related pollution. This initiative complements the groundwork laid by CASE, enabling targeted interventions and comprehensive policy development to tackle air pollution effectively and sustainably.

Indicate which issues lead to make project successful

Proper planning, work plan, timely release of funds etc. have contributed to the successful implementation of various construction projects of DoE already implemented. Moreover, the timely approval of the design has played a good role. Timely recruitment of Consulting firm and involving them in work was better for policy formulation.

Indicate which issues did not work well.

The slow response of the landowners was a major issue in obtaining the land use permission. Besides the MoU for land use is under process.

The effect/impact, adaptation and specific mitigation measures thereof, if any, on:

Other projects/existing installations	:	A total of 11 Continuous Air Monitoring Stations (CAMS) and 15 Compact Continuous Air Monitoring Stations (C-CAMS) were installed, providing critical infrastructure for ambient air quality monitoring. The proposed Project for the Improvement of Equipment for Air Pollution Monitoring is different in nature from the projects usually implemented by DoE. Also, the major activities related to each of the implementing

		agencies are different in various aspect from the respective agencies rules of business. Nevertheless, all the components are directly linked to better environmental governance and management. The activities under the Project for the Improvement of Equipment for Air Pollution Monitoring project don't overlaps with other activities of the implementing agencies. Therefore, there won't be any duplication or overlapping impact on the existing rules of business.
Environmental sustainability like land, water, air, bio-diversity, ecosystem services	:	Under the Project for the Improvement of Equipment for Air Pollution Monitoring, the Department of Environment (DoE) will establish seven fixed Continuous Air Monitoring Stations (CAMS) and one on-vehicle CAMS. The project activities are not expected to pose any significant environmental concerns. On the contrary, the installation of these real-time monitoring systems will significantly enhance the DoE's capacity to monitor roadside air pollution from vehicles effectively.
Disaster management, climate change	:	The project will support efforts to mitigate and adapt to climate change by enhancing the capacity for monitoring and managing air pollution. This aligns closely with the objectives of the Project for the Improvement of Equipment for Air Pollution Monitoring, which focuses on strengthening real-time air quality monitoring systems to address roadside air pollution effectively.
Gender, women, children, person with special needs, excluded groups etc.	:	The implementation of the project is expected to focus on monitoring roadside air quality and assessing the contribution of vehicular emission. These efforts will lead to improved health outcomes for vulnerable groups, including infants and pregnant women. Additionally, it will contribute to creating a healthier urban environment, facilitating safer for children in city areas. This project will give priority to women employment and avoid child labor.
Employments	:	The project will create opportunities for the employment of a number of individuals during its implementation and management phases.
Poverty Situation	:	During the implementation of the project, women workers will have the opportunity to participate in construction activities, contributing to the improvement of their families' quality of life. Additionally, the employment opportunities created for construction

		workers will play a vital role in reducing poverty among the local population. The lower-income people are very much affected by air pollution. So, improvement of air quality will contribute directly to the well-being of lower-income people.
Organizational arrangement/setup	:	The major activities under the Project for the Improvement of Equipment for Air Pollution Monitoring will be carried out by the respective Project Implementation Units (PIUs), with the Department of Environment (DoE) acting as the lead agency. For each component, the intended activities will be organized and executed using the existing workforce of the respective agencies. For specialized services such as procurement, financial management, environmental and social safeguards, design, and supervision, the respective implementing partner agencies will provision or outsource relevant experts/consultants in accordance with the standard norms and regulations of the JICA and/or the Public Procurement Rules (PPR), whichever are applicable.
Institutional productivity	:	Database of roadside CAMS will be established when the project is completed.
Regional disparities	:	The project will focus on Dhaka and Chattogram cities.
Populations	:	The transformative change that the Project for the Improvement of Equipment for Air Pollution Monitoring will bring to environmental governance and management will benefit all citizens of Dhaka and Chattogram.
Environmental Clearance:	:	N/A
Environmental impact wise project category (Red/Orange/Green)	:	N/A
Whether environmental clearance under the Environmental Conservation Act, 1995	:	N/A

(Revised 2010) has been obtained?		
Specific linkage with	:	(i) Perspective Plan 2021-2041: PM2.5 concentration target of 40 µg/m³ (ii) 8th Five-Year Plan: Target for annual average PM2.5 concentration to be reduced to 60 µg/m³ (iii) SDG Targets: Goal 11, Target 11.6 (Indicator 11.6.2 – Annual mean level of particulate matter) (iv) Ministry/Sector Priority: • Air Quality Control Rules (Rules 13) • Air Quality Management Plan 2024 (Tables 6.1, 2.8, and 2.9 - Actions) These objectives align with the Project for the Improvement of Equipment for Air Pollution Monitoring, which aims to strengthen air quality monitoring and contribute to achieving these targets by improving data collection and management of air pollution, particularly PM2.5 concentrations in Dhaka and Chattogram.
Contribution of the Project in achieving the Vision, Mission of the Ministry/Division and Implementing Agency.	:	The Improvement of Equipment for Air Pollution Monitoring project will bring transformative changes to environmental governance, monitoring, and management by enhancing the monitoring of roadside air quality and assessing the contribution of road and transport-related pollution. The Ministry of Environment, Forest and Climate Change (MoEFCC) is the sponsoring ministry for the project. The Department of Environment (DoE) will thus contribute to MoEFCC's mission of ensuring a sustainable living environment for both the current and future population of the country through environmental protection and pollution control.
Alignment with the Allocation of Business of the Sponsoring Ministry/Division.	:	According to the Allocation of Business of the Ministry of Environment, Forests and Climate Change, (1) environmental matters and (2) all activities related to environmental pollution control fall under the scope of this ministry. If the project is implemented, it will enhance the institutional capacity of the Department of Environment (DoE) at both the departmental and district level. This will, in turn, make

a significant contribution to environmental protection, development, and pollution control, in alignment with the responsibilities outlined in the Allocation of Business for the Ministry.

Whether private sector/local government or NGO's participation is considered? : The output of the project the Local Government (City Corporation) all stations will be established in Dhaka and Chattogram City Corporations Area. The Cities people/Private sector/NGOs are directly have excess on the monitoring stations data.

Major Terms and Conditions of Foreign Financing: : The terms and conditions of the grant aid will be in accordance with the financing agreement signed between the Economic Relations Division (ERD) and JICA.

Involvement of Compensation, Rehabilitation/Resettlement issues (Indicate the magnitude and cost, if applicable:) :

N/A

Risk Analysis and Mitigation Measures: : 1) Risk of climate

The meteorological conditions for Dhaka City and Chattogram City, the target sites for this project, are shown in Table 1-6. All figures below are calculated based on meteorological data from 2012 to 2021.

Table 1-6 Meteorological Condition of Dhaka and Chattogram

City	Temperature (°C)			Humidity (%)			Rainfall (mm)			Wind Speed (km/h)	
	Max of Month Ave	Min of Month Ave	Ave of Year	Ave of Year	Max of Month Ave	Min of Month Ave	Ave of Year	Max Monthly Accumulation	Min Monthly Accumulation	Max of Ave	Min of Ave
Dhaka	34	15	27	71	80	57	1,930	427	10	11	3

					(Jul, Aug)	(Feb, Mar)		(Jul)	(Jan, Feb)	(Apr)	(Nov)
Chattogram	33	15	27	74	85 (Jul)	61 (Feb)	3,000	854 (Jul)	5 (Jan, Feb, Dec)	23 (Jul)	10 (Nov)

Regarding temperature and humidity, most of the air pollutant measurement equipment to be procured under the project will have temperature conditions set between 0°C and 40°C, and humidity conditions set at 85% relative humidity (RH) or lower. Therefore, the air conditioners in the Roadside CAMS building, where the equipment to be procured for the project will be installed and should be planned so that the indoor temperature and humidity are within the ambient conditions of the equipment.

Since the annual precipitation is about 2,000 to 3,000 mm, the Roadside CAMS building must be adequately flooded and waterproofed.

The Roadside CAMS consists of air quality measurement equipment and a building for storing them. There are two types of buildings, i.e.: one is constructed of reinforced concrete or blocks, and the other is a container-type building.

The construction cost of a reinforced concrete building is expected to be lower than that of container-type, but the concern for the concrete building is about water leakage due to rain. On the other hand, the cost of the container-type building is expected to be higher, but its watertightness and airtightness against rainwater can be ensured, providing a safer and more secure building. In addition, in the case of the container-type, the measurement location can easily be changed because it is easier to move it than a reinforced concrete building. Based on the above comparison, the container-type building will be adopted for more stable and continuous measurement.

The container-type building shall be insulated and waterproofed to ensure stable operation of the measurement equipment and to maintain measurement accuracy. It shall be durable enough to be used for at least 20 years through appropriate maintenance and management. Two air conditioners shall be installed,

one of which shall be treated as a spare. However, the spare should be operated moderately to extend its expected service life, and it should be planned to be operated alternately with a cycle of about one month span.

The container-type building should be constructed on a foundation built on the ground. The foundation should be 0.5 m deep below ground level and 1.0 m above ground level, and the container station building should be raised 1.0 m above the ground surface. Security facilities (e.g., fences, block walls, etc.) should be installed around the container station building.

2) Management of Supplies

There appears to be no problem with the consumables being procured once a year without shortage. For the storage of the consumables, it is necessary to confirm that the storage conditions (temperature and humidity) are met when they are stored at the outsourcing companies.

Since the parts necessary for the measurement equipment and the time they need to be replaced vary from one to another, it is recommended to proceed with securing a budget by creating a plan for parts replacement and determining the expenses that will be required. It is also necessary to have a system that enables prompt replacement of parts in the event of a malfunction.

Among the equipment required for the operation of measurement equipment, the high-pressure gases used for calibration require safety control. Accidents that involve high-pressure gases can result in gas spurts and leaks due to high-pressure gas cylinders overturning or being destroyed, which can lead to fires, explosions, and poisoning.

Table 1-7 Considerations for Installing and Storing High-pressure Gas Containers

Items	Matters Requiring Attention
Installation and Storage	1. Keep high-pressure gas containers away from direct sunlight in a well-ventilated location. 2. Ensure that the storage temperature is below 40°C and differentiate between oxygen and flammable gas containers. 3. Keep filled containers (containers filled with gas) and empty

	containers (empty after use) separately. 4. Keep high-pressure gas containers upright. Secure them with a wedge or other means to prevent them from tipping over or falling. Ensure that the container valve is tightened and store the container with a protector or protective cap properly attached. 5. Do not start a fire within a two-meter radius of the storage area. Post a sign prohibiting fire and prepare a fire extinguisher. 6. When returning high-pressure gas containers, make sure that the container valves are completely tightened and return the containers to the distributor, leaving any remaining gases. 7. Even if containers have residual gases, do not leave them unattended for more than six months.

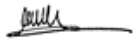
3) Construction management

In this project, the installation process begins with placing containers on the constructed foundations, followed by the installation of the necessary equipment and subsequent adjustments. This sequence of tasks is crucial to ensure that the infrastructure is correctly set up and the operational systems function as planned. To carry out the container installation, heavy construction vehicles, including cranes, will be used to lift and position the containers with precision. The use of such equipment is necessary for the smooth execution of the installation phase, as the containers are often large and heavy, requiring careful handling.

Given the scale and complexity of the operation, a comprehensive plan will be developed to secure the delivery routes and ensure the safety of the construction site. The delivery routes will be carefully planned to accommodate the large construction vehicles, taking into account factors such as road width, traffic flow, and any potential obstacles that may hinder the movement of the cranes and other construction vehicles. These routes will be assessed to ensure that they are suitable for heavy machinery and can support the weight and size of the containers during transportation.

Safety measures at the construction site will be a priority throughout the project. To protect workers, visitors, and the general public, a variety of safety equipment will be placed around the construction zone. This includes barricades to physically separate the

construction area from pedestrian pathways and vehicle traffic, ensuring that no unauthorized persons enter the hazardous areas. Color-coded cones will be used to mark specific zones within the construction site, directing the flow of traffic and providing visual cues to

keep vehicles and personnel away from high-risk areas. 

Revolving lights and other visual safety indicators will be utilized,

Strict adherence to established safety protocols will be maintained throughout the construction process, supported by continuous monitoring and prompt resolution of safety concerns. This approach prioritizes the well-being of all individuals involved while reinforcing the project's commitment to upholding high safety standards. By integrating these precautions, the project not only safeguards workers and the community but also promotes confidence in the construction process, contributing to a positive and responsible execution of project activities.

Other Important Issues (Technical or others):	:	N/A
Sustainability of the Project Benefits with Exit Plan	:	Appendix-T
Others, If any	:	N/A

Signature of the Head of the Executing Agency with Seal and Date

Signature of the Sr. Secretary/Secretary of the Sponsoring Ministry/Division with Seal and Date