

## Monitoring & Evaluation (M&E) Plan and Impact Statement Form

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### Objective of the M&E Plan and Impact Statement:

- The M&E Plan and Impact Statement must be designed based on the Technical Assistance Response Plan and must enable the Implementer to complete the Closure Report at the end of the assistance.

### Process for filling in the form:

- The Implementer must identify relevant quantitative and qualitative indicators as specified in the Closure Report. A sub-set of indicators to monitor and assess must be chosen among these.
  - The Implementer may also identify other specific, measurable, achievable, relevant, and time-bound indicators suitable to monitor Activities, Outputs and anticipated Outcomes from the technical assistance and add to the M&E Plan and Impact Statement.
  - During implementation of the TA or FTA, the Implementer must collect all relevant data as described in the Monitoring & Evaluation Plan. Aggregated data on selected indicators as well as an updated version of the Impact Statement will be presented in the Closure Report at the end of the assistance.
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Basic Information	
Title of response plan	Development of Framework for Real-Time Transport Information Systems for Public Transport in Greater Dhaka area.
Technical assistance reference number	CTCN 22-017
Country/ countries	Bangladesh People's Republic (Bangladesh)
NDE focal point and organisation	<p>NDE: Dr Abdul Hamid            Director General            Department of Environment, Ministry of Environment, Forest, and Climate Change            Email: <a href="mailto:dg@doe.gov.bd">dg@doe.gov.bd</a></p> <p>Focal Person: Colonel Zahid Hossain            Director (Technical)            Bangladesh Road Transport Company (BRTC)            Email: <a href="mailto:zahidbrtc@gmail.com">zahidbrtc@gmail.com</a></p> <p>Other Stakeholder: Dhrubo Alam,            Transport Planner</p>

	Bangladesh Road Transport Company (BRTC) Email: <a href="mailto:zahidbrtc@gmail.com">zahidbrtc@gmail.com</a>
Sector(s) addressed	Low-carbon transportation (mitigation)
Technologies supported	Automatic Vehicle Location (AVL), Real-time Passenger Information (RTPI), Bus Management Systems (BMS)
Implementation period and total duration	October 2022 – October 2023
Total budget for implementation	\$270,800 USD
Designer of the response plan	Korea National University of Transportation
Implementer of response plan	Korea National University of Transportation

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments
	<i>Select relevant indicators from the Closure Report (at least one core indicator, section B). You may also define additional relevant indicators to be added.</i>	<i>Add the expected quantitative or qualitative target/value of the indicator (e.g. number of studies, policy recommendations, etc.).</i>	<i>Describe the expected method and frequency for data collection (e.g. survey, head count at a training workshop, application of a standard methodology etc.)</i>	<i>Describe any assumptions made or anticipated challenges for collecting quantitative and qualitative data</i>
<b>1: Development of implementation planning and communication documents</b>	N/A	N/A	N/A	N/A
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Activity 1.1: Detailed work plan of all activities, deliveries, outputs, deadlines	N/A	<i>1 workshop attended by minimum 2 attendees Will result in a net increase in GHGs (1 tonne x 2) = 2 tonnes CO2e</i>	N/A	N/A
Deliverable 1: i) Detailed work plan ii) Monitoring and evaluation plan iii) CTCN Impact Description iv) Closure and Data Collection report	N/A	<i>4 deliverables (see first column)</i>	N/A	N/A
<b>2: Establish a Baseline (Baseline/Existing Conditions)</b>	N/A	N/A	N/A	N/A
Activity 2.1: Summarize existing reports	<i>Transport</i>	<i>Review of 3 related plans</i>	<i>Collected from various online sources by internet key word searches</i>	N/A
Activity 2.2: Undertake data collection	<i>Transport</i>	<i>Collect data from available sources Google Maps API and GTFS</i>	<i>GTFS for all of Dhaka, Google API travel times for all of Dhaka</i>	N/A
Activity 2.3: Data Analysis	<i>Transport</i>	N/A	<i>Various</i>	N/A
Activity 2.4: Write Baseline/Existing Conditions Report	N/A	N/A	N/A	N/A
Deliverable 2: Baseline/Existing Conditions Report	N/A	N/A	N/A	N/A
<b>3: Design of the Bus Management System (BMS)/Bus Information System (BIS) Architecture</b>				
Activity 3.1: Technical Specifications: BIS	<i>Transport</i>	<i>1 transport model, calibrated</i>	<i>Calibrated data collected from Korean government sources</i>	N/A
Activity 3.2: Technical Specifications: BMS	<i>Transport</i>	<i>Specifications for all buses in the Dhaka area</i>	N/A	N/A
Activity 3.3: Technical Specifications: Communications and ICT Architecture	<i>Transport</i>	<i>Specifications for all buses in the Dhaka area</i>	N/A	N/A
Activity 3.4: Data and Information	<i>Transport</i>	N/A	N/A	N/A

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	<i>Select relevant indicators from the Closure Report (at least one core indicator, section B). You may also define additional relevant indicators to be added.</i>	<i>Add the expected quantitative or qualitative target/value of the indicator (e.g. number of studies, policy recommendations, etc.).</i>	<i>Describe the expected method and frequency for data collection (e.g. survey, head count at a training workshop, application of a standard methodology etc.)</i>	<i>Describe any assumptions made or anticipated challenges for collecting quantitative and qualitative data</i>
Review (BIS)				
Activity 3.5: UX Design, Look and Feel Concept (Human Factors)	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Activity 3.6: Software and GTFS-Realtime Review	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Activity 3.7: Geographic Review	<i>Transport</i>	<i>Number of recommended stops (bi-directional), and their geographic locations</i>		
Activity 3.8: Administrative and Governance Review	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Deliverable 3: Draft and Final System Architecture Report	<i>Transport</i>	<i>1 report</i>	<i>N/A</i>	<i>N/A</i>
<b>4: Costing (Estimation)</b>	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Activity 4.1: Costing of the BIS and BMS equipment	<i>Transport</i>	<i>Costs for all components</i>	<i>N/A</i>	<i>N/A</i>
Activity 4.2: Costing installation/construction	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Activity 4.3: Costing of the software development & database maintenance	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Activity 4.4: Costing of the operation, data management, and software	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Deliverables 4: Costing Report	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
<b>5: Bus Reform</b>	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Activity 5.1: Preparation for Webinar on Bus Reform	<i>Transport</i>	<i>1 2-hour webinar</i>		
Activity 5.2: Webinar on Bus Reform: April 13 (TCB)	<i>Transport</i>	<i>1 2-hour webinar</i>		
<b>6: Concept Note for the next steps of this Project</b>	<i>Transport</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Activity 6.1: Prepare Concept Note, based on Green Climate Fund (GCF) target	<i>Transport</i>	<i>1 concept note (1-2 page)</i>		

*Note: The Response Plan may contain information useful for the section below. The information in the table below will be used by the CTCN for public communication of the achieved and expected results of the Technical Assistance through the CTCN website [www.ctc-n.org](http://www.ctc-n.org) and other communication channels. See for example: [https://www.ctc-n.org/sites/www.ctc-n.org/files/benin\\_a\\_ag\\_forestry.final\\_.pdf](https://www.ctc-n.org/sites/www.ctc-n.org/files/benin_a_ag_forestry.final_.pdf)*

<b>Impact Statement</b>	
Challenge	<p><i>Dhaka is a megacity in Bangladesh home to over 21 million people in a relatively small area making it one of the most densely populated places on earth. With rising population and economic growth, the GHG emissions in Bangladesh from the transport sector have been increasing since at least 2013 and is responsible for at least 15% of CO2 emissions from energy-related sectors. Bangladesh is committed to reducing its GHG emissions in the power, industry, and transport sectors by 5% by 2030, or by 15% if sufficient and appropriate support is received from developed countries. The transport sector would contribute a 9% reduction in GHG emissions by 2030 or 24% if support is received from developed countries (Ministry of Environment, 2018). Further, the city suffers from incredible traffic congestion and the privately-operated bus-based public transport system is inefficient and insufficient for the city's population.</i></p> <p><i>The government of Bangladesh realizes the increasingly important need to incentivize the use of public transport system and control the permitted user of automobiles to materialize its mitigation goals and cater to the mobility needs of citizens. In particular, the service quality for public buses should be significantly improved by adopting information and digital technology in its operation and management. Encouraging use of the public transport system, over the use of a private transport, will require making the system more accessible, easier to use, and more convenient for users.</i></p>
CTCN assistance	<p><i>The objective of this technical assistance is, in consultation with the Dhaka and Bangladeshi colleagues, develop all the necessary technical and functional system details and other design considerations including potential locations to implement a real-time monitoring system for the Dhaka public transport buses (Bus Management System, BMS) including potentially digital signs at stops displaying arriving times and other information (Bus Information System, BIS).</i></p> <p><i>As such Bangladesh is requesting the following TA:</i></p> <ol style="list-style-type: none"> <li><i>1. Establishing a baseline by collecting the information and data required</i></li> <li><i>2. Design of the overall system architecture</i> <ul style="list-style-type: none"> <li><i>• Defining the technical and functional specifications of an integrated information system</i></li> <li><i>• Deciding on the information offered and format</i></li> <li><i>• Selecting locations and media where information should be offered</i></li> </ul> </li> <li><i>3. Development of the information services architecture in detail</i> <ul style="list-style-type: none"> <li><i>• Definition of the data to be acquired, managed, communicated, and displayed</i></li> <li><i>• Creating an operational scheme</i></li> </ul> </li> </ol>

	<ul style="list-style-type: none"> <li>• <i>Designing the software required</i></li> <li>• <i>Defining the design and characteristics of how the data will be provided - interface for administrators and end-users</i></li> </ul> <p>4. <i>Costing but not limited to</i></p> <ul style="list-style-type: none"> <li>• <b>Equipment</b> (hard- and software) and design of websites, internet- and mobile-phone trip planning tools</li> <li>• Equipment for installation at stops, in stations and vehicles, which inform the users (e.g. signs, touch-screens)</li> <li>• <b>On-board equipment for buses and trams</b> (e.g. GPS) and a central real-time prognosis server to manage and provide real-time information (hard- and software)</li> <li>• <b>Installation costs</b> (e.g. installing real time signs, touch-screens, electrical supply to bus stops)</li> <li>• <b>Operation and management costs</b> (hardware maintenance, software license and operation, marketing and communication, costs for operations staff)</li> </ul> <p>5. <i>Webinar on Bus Reform (lessons from Korea)</i></p> <p>6. <i>Concept Note for the next steps of this Project.</i> <i>To be based on Green Climate Fund (GCF) Concept Note template.</i></p>
<p>Anticipated impact</p>	<p><i>By taking the first steps to establishing a framework, this TA will develop an architecture and implementation plan to introduce real-time bus information systems (BIMS) to the public transport network in Dhaka. As such, the plan will allow the entire public transport network to be greatly improved in terms of its accessibility and convenience, and therefore make it more competitive against other competing, generally fossil-fuel-based private or pseudo-private, modes such as CNGs, private cars, and motorcycles. Over time, this could reduce the amount of GHG emissions from transport within the Dhaka area, and importantly, hopefully encourage people to not buy new cars and motorcycles.</i></p>
<p>Anticipated co-benefits from the TA</p>	<p><i>With investment in public transport, and transport more generally, there will be significant co-benefits in terms of increased economic opportunity which will lead to economic growth. This is especially true in places with underdeveloped public transport networks, like Dhaka.</i></p> <p><i>Investing in transport infrastructure has long been shown to increase and enable economic activity. Mainly, this is caused by the “agglomeration effect”, meaning that as more people, jobs, materials, and places become better connected (due to enhanced transport activity) economic activity becomes easier and more efficient and more of it occurs.</i></p> <p><i>Further, the environment will benefit from implementation of our recommendations since they will encourage a switch (or remaining) in highly efficient public transport versus private transport options, which are still very often using fossil fuels.</i></p>
<p>Gender aspects of the TA</p>	<p><i>In many countries, women are highly under-represented in decision-making with majority of the transport sector being managed and operated, and designed for, men. Data shows that this is especially true in Bangladesh where men make significantly more trips per day than women, and are much higher represented on public transport systems.</i></p> <p><i>A disruptive market change through technology enhancements, could to an increasing women’s participation in the transport sector and provide more socio-economic opportunities for women. For example, our recommendation in this TA is to provide real-time information to passengers through</i></p>

	<p><i>technological means, being the priority. By installing (physical) digital signage at numerous locations, women will directly benefit from increased access to information. Current bus tracking systems in Dhaka (for BRTC) require the use of a mobile phone only. Data also shows that women are less likely to have access to the internet/mobile phones in Bangladesh. Therefore, it is critical that an equitable distribution of information, in the format of physical signage, being undertaken (one of the critical components of this TA).</i></p> <p><i>Eventually, these signs could also be used to provide information about, for example, women-only buses to increase safety and well-being. The signs are customizable so that information can be provided to people waiting at the bus stops.</i></p>
<p>Anticipated contribution to NDC</p>	<p><i>Bangladesh has updated its Nationally Intended Contributions (NDCs) as of August 2021. These include plans to improve fuel efficiency of transport by 5% and address road congestion issues. In addition, Bangladesh' NDC document projects its total GHG emissions to increase from 169.05 MT CO<sub>2</sub>e in 2012 to 409.4 MT CO<sub>2</sub>e in 2030, of which transport would account for around 9%, under the Business as Usual (BAU) scenario. With mitigation policies and projects in place, Bangladesh assumes projects a total reduction of up to 21.85 MT CO<sub>2</sub>e by 2030 compared to the BAU scenario.</i></p> <p><i>This TA will contribute to the GHG reduction targets set by Bangladesh by targeting an increase in usage of the public transport network, which should lead to a "mode shift" from primarily fossil-fuel-based private or pseudo-private transportation to more efficient buses, as the public transport becomes more convenient and usable for potential users. At the same time, this TA will, because of the same reasons, help to tackle the extreme traffic conditions that consistently plague Dhaka.</i></p>
<p>The narrative story</p>	<p><i>This TA is a planning study, to develop an architecture plan including software, and placement plans for a bus management systems/bus information system in Dhaka. As such, this study allows for follow-on work to be undertaken using the architecture plan developed. Since this TA will develop costing estimates, and potentially funding arrangements, Bangladesh departments will be well-prepared to develop budgets, estimates, and tender documents to get potential private sector bidders to undertake the actual installation and development of the BIS/BMS.</i></p> <p><i>First, we will (1) understand the base conditions, including traffic congestion, travel times, understanding the bus networks, operating companies, and future plans for Dhaka. With this understanding, we can begin to develop and architecture and plan for the implementation of the real-time tracking systems. For example, if any such systems exist, what are their specifications and where are they being use? (2) We will then develop architecture plans and technical specifications for the equipment and software, which will be based on compatible Korean systems that have seen wide success here in Korea (3) We will develop reasonable capital and annual maintenance cost estimates for the equipment and software which will also be based on Korean experience. (4) We will host a webinar to discuss how the bus system can be reformed more generally, which may be required before a tracking system can be effectively used.</i></p> <p><i>Finally, we will report our results to the main client, the BRTC. However, it should be noted that the framework will consider that the system will be applied to all buses in the Greater Dhaka area, not just BRTC ones. Korean companies may be well-poised to provide and install the equipment necessary</i></p>

	<p>for a modern and effective BIS/BMS system in Dhaka. Follow-on work involving our network of Korean companies could be undertaken.</p>
<p>Contribution to SDGs</p>	<p><b>SDG #9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation:</b> This TA will identify infrastructure needs in Dhaka, and provide opportunity for the private sector to implement the solutions, and innovate while doing so.</p> <p><b>SDG # 11: Make cities and human settlements inclusive, safe, resilient, and sustainable:</b> The long-term impacts of this TA will bring the population in Dhaka both economic and health benefits. The planning works in the TA will cover the public transport system, both formal and informal, and if implemented would contribute to establishing (and maintaining the exiting) the Dhaka public transportation system, sustainably (including sustainable revenue and environmental sustainability).</p> <p><b>SDG # 13: Take urgent action to combat climate change and its impacts:</b> This TA will assist Bangladesh in reducing its increasing dependence of fossil-fuel-based private transportation while promoting more efficient usage of their roadways. Given that the current public transport system in Dhaka is highly unsatisfactory, there is a substantial risk that the system will continue to be widely disused and inconvenient for locals. Improving the public transport system will improve the city’s ability to prevent locals from switching to private transport in great numbers.</p> <p><b>SDG 13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities:</b> This TA will assist Bangladesh in reducing its dependence of fossil-fuel-based transportation while promoting more efficient usage of their roadways.</p> <p><b>SDG #17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development:</b> The TA has strengthened and will continue to strengthen the relationship between Korea and Bangladesh. Many of the recommendations in the TA will require substantial support from developed countries for technology transfer and equipment supplies. Korea is well prepared and eager to provide this support to the Bangladesh for a mutually beneficial economic relationship.</p>
<p>Reference to knowledge products</p>	<p>Please indicate if any UNFCCC Technology Executive Committee (TEC) knowledge products (publications, briefs, tools etc.) were used in the development of the TA request and/or are envisaged to be used during implementation of the technical assistance.</p> <p>Link to TEC knowledge database:  <a href="https://unfccc.int/ttclear/tec/documents.html">https://unfccc.int/ttclear/tec/documents.html</a></p> <p>Which knowledge products do you envisage to use? Please list</p>