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

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.

Basic Information	
Title of response plan	Accelerating the Transition to Sustainable Mobility and Low Carbon Emissions in Panama City
Technical assistance reference number	
Country/ countries	**Panama**
NDE focal point and organisation	Emilio Sempris, Ministro de Ambiente, Panama Ministry of Environment
Sector(s) addressed	**Public transport technology**
Technologies supported	*Public transport, electric vehicles, compressed natural gas as fuel*
Implementation period and total duration	**May 2018 – December 2020**
Total budget for implementation	**USD 84,900**
Designer of the response plan	LOGIOS
Implementer of response plan	**LOGIOS and Panama**

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments
Output 1: Development of implementation planning and communication documents	*Select relevant indicators from the Closure Report (at least one core indicator, section B). You may also define additional relevant indicators to be added.*	*Add the expected quantitative or qualitative target/value of the indicator (e.g. number of studies, policy recommendations , etc.).*	*Describe the expected method and frequency for data collection (e.g. survey, head count at a training workshop, application of a standard methodology etc.)*	*Describe any assumptions made or anticipated challenges for collecting quantitative and qualitative data*
Output 1: Development of implementation planning and communication documents	Technical reports and information material.			
Activity 1.1: Collection of data and information necessary for the analyses in following activities. Formulation of workplan, monitoring and evaluation plan, CTCN impact description, closure and data collection		One response plan. One monitoring and evaluation plan. One CTCN impact description. One draft closure data collection report.	Data collection via direct communication with key stakeholders.	
Output 2: Evaluation of electric bus pilot, emissions analysis, and integrated economic analysis.	Technical reports and information material			
Activity 2.1: Monitor of a pilot electric bus service. Field data collection for a sample of bus routes in Panama City.	Increased capacity to evaluate the electric bus demonstration conducted in the Historical Downtown of Panama City.	One technical report. One presentation at launch of National Strategy of Electric Mobility.	GPS data collection Field visits	No anticipated challenge
Activity 2.2: Comparative	Increased capacity to compare the	One technical report	Technical modelling and simulations.	No anticipated challenge

consumption and emissions analyses of electric, diesel, and CNG buses.	performance and emissions of electric buses vis-à-vis those of alternative technologies.	One presentation to stakeholders	Stakeholder interviews.	
Activity 2.3: Comparative integrated economic analysis of different bus configurations	Increased capacity to evaluate the economics of electric bus assets compared to alternative technologies, for the conditions of Panama City.	One technical report Two presentations to stakeholders	Technical modelling and simulations. Real Options analysis. Literature research. Stakeholder interviews.	Anticipated complexity and time intensity of the data collection process.
Output 3: Innovation analysis and transport plan				
Activity 3.1: Analysis of barriers to adoption and experiences in other countries	Increased capacity to identify and address barriers to technology transfer and enhance the National Strategy of Electric Mobility.	One technical report One presentation to stakeholders	Stakeholder interviews. Technology Innovation Systems methodology Literature research	Anticipated complexity and time intensity of the data collection process.
Activity 3.2: Technical analysis of electric buses in selected routes for deployment and evaluation of charging strategy.	Increased capacity to undertake a successful planning and deployment of adequate electric bus types for routes in Panama City.	One technical report One presentation to stakeholders	Remote collection of GPS data from MiBus buses Technical modelling and simulations Consultation with stakeholders.	Anticipated complexity and time intensity of the data collection process.
Activity 3.3: Sustainable public transport plan	Increased capacity to plan the transition from diesel to electric buses and plan a sustainable public transport system for Panama City.	One technical report One presentation to stakeholders	Consultation with stakeholders Epidemiologic innovation models Literature research	No anticipated challenge
Output 4: Capacity building				
Activity 4.1: Public workshop with regional stakeholders	Dissemination of TA to wide regional audience with diversity in affiliations.	One public webinar to regional audience of 113, with 47 women in attendance. One digital document of the	Webex platform Videos	No anticipated challenge

		material presented at the webinar		
Activity 4.2: Workshop to train stakeholder in the use of transport model	Building of capacity on transport model to the audience selected by the partners, with comparable participation by women and men.	Presentation to MiBus audience about technical assistance, with 50-50 participation by women and men. Training on the use of electric fleet planning model, with 50-50 participation by women and men.	Interactive workshop	No anticipated challenge

<u>Note</u>: 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 and other communication channels. See for example: <u>https://www.ctc-n.org/sites/www.ctc-n.org/files/benin_a_ag_forestry.final_.pdf</u>

Impact Statement	
Challenge	Panama City suffers from poor air quality. Car ownership has grown at an average rate of 9.37% in the period 2010-15, and urban development has been driven by the real estate market more than by urban planning, leading to traffic problems. Public transportation buses meet, at best, Euro III standards, contributing to the degradation of air quality and public health. Transportation is responsible for the majority of the carbon emissions in Panama, and the outdated fleet is estimated to consume 37 million liters of diesel annually.
CTCN assistance	The CTCN assistance comprised the following key blocks: • Comparative analysis of electric buses, natural gas and Euro VI buses for Panama City. • Technical, environmental, and financial evaluation. • Technical analysis of selected routes and corresponding charging strategy. • Assessment of barriers to adoption and sustainable transport plan. • Capacity of local stakeholders
Anticipated impact	Due to Panama's clean electric grid, electric buses could reduce GHG emissions by about 60% or more, depending on operational conditions. Environmental benefits anticipated from this TA are potentially significant. It is estimated that 10,380 tCO_2e could be avoided per year, if 150 Euro III buses are replaced with the right type of electric buses.

	Panama will be able to make more efficient investments when they renew their fleet. The TA provides Panama with tools to better plan the type of electric buses needed to meet their operational requirements and minimize the risk of underperformance or overspending.
Anticipated co-benefits from the TA	This TA is the first rigorous technical analysis of electric buses that integrates real operational data with computational models to produce credible projections of bus performance in a metropolitan area in Latin America. As such, it is expected that it will draw attention to the importance of these methodologies to mitigate the risk and maximize the impact of investments in bus electrification. To the extent that the results provided to Panama are integrated into procurement decisions, the TA will result in more efficient, more successful deployments of electric buses. This will contribute to mitigate the perceived risk of the technology and support further analyses and investments in the region. The extent to which this co-benefit materializes will depend on the dissemination of the TA and the ensuing investments. As discussed in Deliverable 2.3, the deployment of electric vehicles creates opportunities for develop strategies for the efficient integration of these assets with the electrical grid. This is particularly true for large rolling assets such as electric buses, which constitute larger electrical loads. The integration with the grid, taking advantage of the flexible and highly responsive nature of these loads, creates opportunities to support the deployment of renewable sources of power.
Gender aspects of the TA	While a gender component was not included in the Terms of Reference or in the budget for the TA, such component was integrated as section 5.6 of Deliverable 3.3. The sustainable transport plan adopted an encompassing definition of sustainability consistent with the UN's 2030 Agenda for Sustainable Development. It was enunciated that such plan is necessarily concerned with providing services that are physically accessible to the elderly and persons with disabilities, preserving the personal safety of women. The central point in the component related to gender and in the sustainable transport plan in general, is that sustainability is not achieved only with the deployment of zero-emission vehicles; it needs a wide perspective. Besides this point, because women tend to be more dependent on public transportation for their personal mobility, clean technologies reduce their exposure to toxic emissions and thus may help with creating a more gender-equitable transportation system.
Anticipated contribution to NDC	• As indicated in section 3.4 of Deliverable 3.1, while Panama's NDC recognize transportation as the main source of greenhouse gases, the contributions center on energy, efficiency in transportation, and land-use change and forestry. • As contributions in the energy sector focus on increasing the penetration of non-hydro renewable sources, transportation electrification could make a contribution supporting the integration of power from these sources.

The narrative story	Panama is a signatory of the Paris Agreement and, as such, is committed to implementing carbon mitigation and climate adaptation measures. Transportation is responsible for nearly 60% of the national carbon emissions, and thus is key to Panama's climate strategic options. Panama has seen a steep growth in car ownership and in the rate of motorized trips. Given the local urban infrastructure, increased road congestion and air quality deterioration have resulted. Areas of the city, such as Historic Downtown, are exposed to concentrations of particulate matter that exceed World Health Organization standards. The modernization of the public transport system, particularly via electrification, is a key pathway to mitigate emissions from this sector and improve air quality. Panama had deployed a battery electric bus for testing, and this technical assistance demonstrated the risks of deploying this complex technology without adequate planning. This technical assistance helps Panama further understand the potential of this technology in local conditions and lay the ground for a long-range strategy and investments to dramatically reduce emissions from public transportation.
Contribution to SDGs	*To the extent possible, please describe contribution to approximately 3 SDGs, including SDG13, with a few sentences for each SDGs concerned.* The Response Plan identified contributions to the following SDGs: • SDG7.b - *By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.* This technical assistance was essential to position Panama to undertake a process of technology transformation of its public bus fleet. The particular case of electric buses was rigorously analyzed and provided clear directions on technology and economic questions. This work included analysis relative to the charging infrastructure for the different types of electric buses. The planning support tool to which Panama was given access, provides the local operator with a much-enhanced capacity to evaluate routes for electrification. • SDG11 - *Make cities and human settlements inclusive, safe, resilient and sustainable* Fundamentally, this technical assistance is concerned with creating foundations for the technological transformation of Panama's public transportation system, to make it, and by extension the metropolitan area, safer, more resilient, and more sustainable. The technical assistance took an encompassing perspective to sustainability, and thus the transition to cleaner technologies is only a part of it. However, transportation is central to every society and its influence reaches in multiple dimensions. • SDG13.2 - *Integrate climate change measures into national policies, strategies and planning* A central tenet and conclusion of this technical assistance is that adequate planning is critical to the success of electric bus deployment. Because bus electrification is at its core related to climate change, this technical assistance indeed contributes to rethink the fleet procurement, deployment, and operation planning process, to maximize climate related benefits.

Reference to knowledge products	*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.* *Link to TEC knowledge database:* *https://unfccc.int/ttclear/tec/documents.html* *Which knowledge products do you envisage to use? Please list*