

Technical Assistance Closure Report Template

Objective of the technical assistance (TA) Closure Report:

- To communicate publicly in one document a summary of progress made and lessons learned during the TA towards the anticipated impact (sections 1-4).
- To document qualitative and quantitative data collected during TA, for use in donor and UN reporting (Annex 1).

Steps for completing the TA closure report:

1. The lead TA implementer submits the closure report at the end of the technical assistance as a final deliverable. The TA closure report will capture outputs, outcomes and impacts of all activities conducted under the TA. Please copy and summarise relevant material from previous TA outputs/deliverables and the Response Plan, as relevant.
2. A CTCN Manager will review and revise the closure report before final approval by the CTCN Deputy Director.

Important note on public and internal use of the closure report:

Once approved by the CTCN Deputy Director, the TA closure report will be a public document available on the CTCN website www.ctc-n.org. Selected content will be used for targeted communication activities. Annex 2 is for internal use only and will not be publicly available.

Closure Report for CTCN Technical Assistance

1. Basic information

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| Title of response plan | Accelerating the Transition to Sustainable Mobility and Low Carbon Emissions in Panama City |
| Technical assistance reference number | 7000002657 |
| Country / countries | Panama |
| NDE organisation | Panama Ministry of Environment |
| NDE focal point | Emilio Sempris, Ministro de Ambiente |
| NDE contact information | esempris@miambiente.gob.pa |
| Proponent focal point and organisation | Gustavo Collantes, LOGIOS, gustavo.collantes@logios.global |
| Designer of the response plan | Gustavo Collantes, LOGIOS, gustavo.collantes@logios.global |
| Implementer(s) of technical assistance | LOGIOS |
| Beneficiaries | MiBus, Secretaría de Energía, MiAmbiente, Alcaldía de Panamá, electricity companies of Panama, residents of Panama City. |
| Sector(s) addressed | The focus of the TA was on the transport sector. |
| Technologies supported | The central impetus of the TA was on electric vehicles and compressed natural gas as fuel. Since the models and simulations accounted for it, another technology that was supported is regenerative braking. |

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| | Certain technologies listed in the CTCN taxonomy also received secondary support. These include more efficient heavy-duty vehicles, promotion of non-motorized transport, and road pricing. |
| Implementation start date | 05/2018 |
| Implementation end date | 12/2020 |
| Total budget for implementation | Net cost to CTCN: \$84,900 Discount by implementer: \$15,000 |
| Description of delivered outputs and products as well as the activities undertaken to achieve them. In doing so, review the log frame of the original response plan and refer to it as appropriate | <p>D1- Development of implementation planning and communication documents</p> <p>D2.1- Evaluation of ongoing pilot of electric bus in Panama City's Historic Downtown: Technical report</p> <p>D2.2- Identification of most suitable low-emission public transport for Panama City: Technical report + presentation to stakeholders</p> <p>D2.3- Economic assessment of the bus configurations: Technical report + presentation to stakeholders</p> <p>D3.1: Assessment of barriers and drivers of electric mobility in Panama: Technical report + presentation to stakeholders</p> <p>D3.2: Technical evaluation of public bus routes for electrification and charging strategy: Technical report + presentation to stakeholders</p> <p>D3.3: Sustainable public transportation plan for Panama City: Technical report + presentation to stakeholders</p> <p>D4.1: Workshop with regional stakeholders about the technical assistance: Online webinar</p> <p>D4.2: Capacity building workshop for stakeholders to learn to use LOGIOS's advanced tool for electric bus planning</p> <p>D5.1: Description of intended outcomes</p> <p>D5.2: Closure and Internal Information report</p> <p>D5.3: Monitoring & evaluation report and impact statement</p> <p>D5.4: Gender analysis (integrated into D3.3)</p> <p>While not included in the Response Plan, and in a response to a request by UN Environment, LOGIOS contributed to the two-day event to launch the National Strategy of Electric Mobility, hosted in Panama on August 2018. LOGIOS gave a presentation and actively participated in the panels.</p> |
| Methodologies applied to produce outputs and products | <ul style="list-style-type: none"> • Field work to collect GPS data • Computational modelling of technical systems • Computer simulations • Computational modelling of asset valuation • Stakeholder interviews • Technology Innovation Systems methodological framework • Lifecycle analysis |
| Reference to knowledge resources | No UNFCCC Technology Executive Committee knowledge products were used in the implementation of the TA. |
| Deviations | Activity 3 was restructured and upgraded. In particular, Activity 3.2 was modified to replace the original task |

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| | <p>(updating databases) with a more complex and time/resource-intensive task (analysis of bus performance of a new set of routes in Panama City and analysis of charging strategy). This task, which was adopted to better support the electric bus adoption goals of Panama City, was requested by Panama stakeholders and approved by CTCN.</p> <p>The transport model, as a deliverable, was upgraded and replaced with the granting to Panama City of access to a web application developed by the implementer, which will enable Panama City to do extensive analyses of performance of electric buses in their service routes.</p> |
| <p>Anticipated follow-up activities and next steps</p> | <p>The following activities and next steps are anticipated:</p> <ul style="list-style-type: none"> • Dissemination to stakeholders of the reports prepared and its conclusions. Ejemplo: http://www.energia.gob.pa/2020/11/presentacion-analisis-para-incorporar-buses-electricos-en-transporte-publico-panameno/ • MiBus will utilize the LOGIOS advanced tool to plan future bus fleet electrification • Panama is starting funding applications for the electrification of part of the fleet of MiBus • Panama will be informed by analysis of barriers and opportunities to electric bus adoption, to plan next steps. |

2. Lessons learned

| | Lessons learned | Recommendations |
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| <p>Lessons learned from the CTCN TA process</p> | <p>Challenges and essential factors contributing to successful implementation:</p> <ul style="list-style-type: none"> • Electric buses require methods of planning different than those of conventional combustion buses. • The technical planning of electric buses is critical to mitigate investment risks and secure environmental positive impacts. • Technical planning needs to account for local operating conditions. • Technical planning using computational methods is far more efficient than direct bus testing. Bus pilots must <i>follow</i> the technical analysis. | |

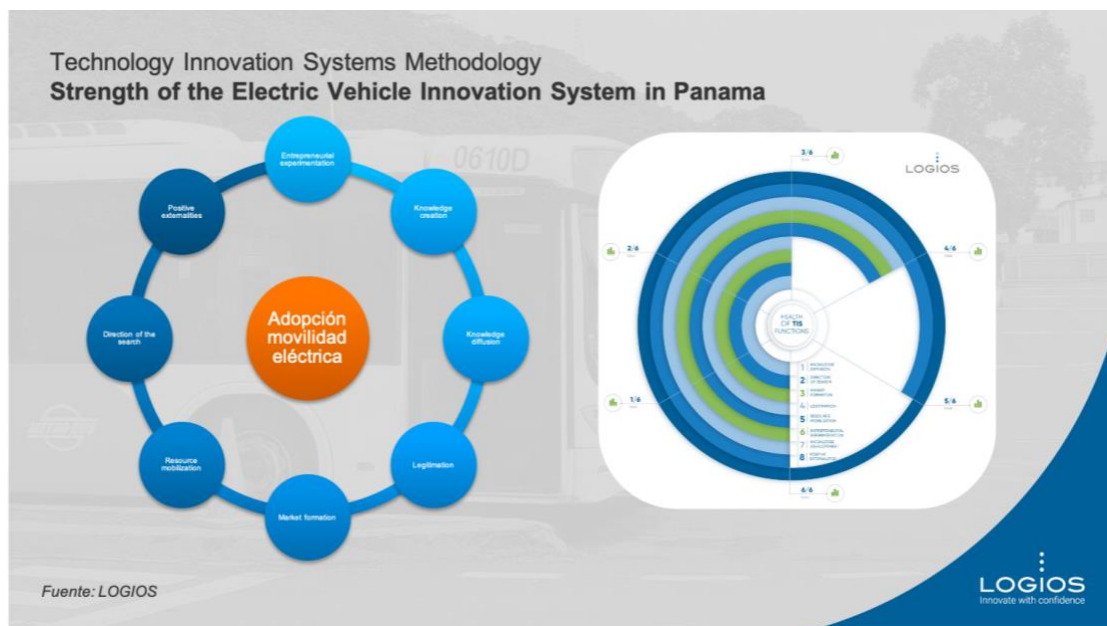
| | | |
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| | <ul style="list-style-type: none"> • Economic and financial analyses of electric buses need to build upon a technical analysis, to understand the system of assets that are needed for the local conditions and the operating costs. • Opportunity charge electric buses should be included, in addition to overnight charge buses, in any evaluation of an electric bus procurement. | |
| <p>Lessons learned related to climate technology transfer</p> | <p>The following factors were identified as challenges for technology transfer:</p> <ul style="list-style-type: none"> • The TA demonstrated that the successful planning the electrification of a bus fleet is complex. With the right methods of analysis and planning, electric bus systems can be found that fit the local operating conditions, and competitive on an economic basis with conventional technologies. • The very limited knowledge about and understanding of these required planning practices, greatly increase the short- and medium-term risks for successful and/or efficient deployments of electric buses. • The market of electric buses in Latin America is dominated by a few providers, offering a limited range of technologies. This limits choice and opportunities to procure the technologies that may be most adequate for the local conditions. • Bus providers are typically reluctant to share relatively basic, non-confidential, technical information about their products, which would be very valuable to | <p>The following few key recommendations are offered:</p> <ul style="list-style-type: none"> • Investors considering financing the procurement of electric buses should require a strong technical analysis and integrate the results from this into the economic and financial analysis. • General guidelines for the performance of technical analyses should be adopted, to create a benchmark for quality. • National and local governments should be educated about recommended practices for the planning of electric bus adoption. |

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| | inform the models used for the technical evaluation. | |
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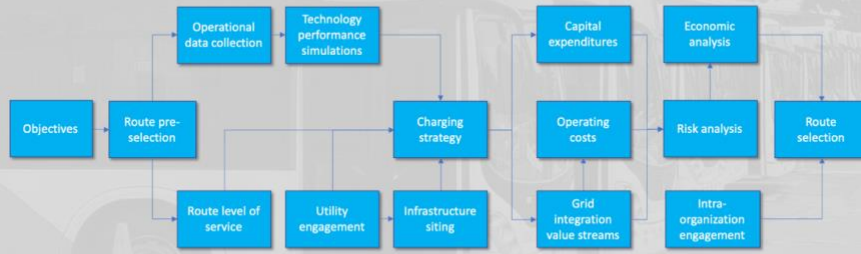
3. Illustration of the TA and photos

This section includes PowerPoint slides that illustrate key methods, outputs, and achieved results. The PowerPoint file is delivered separately. Also provided are five photos that illustrate several aspects of the work in Panama toward the technical assistance.

3.1. Power Point slides

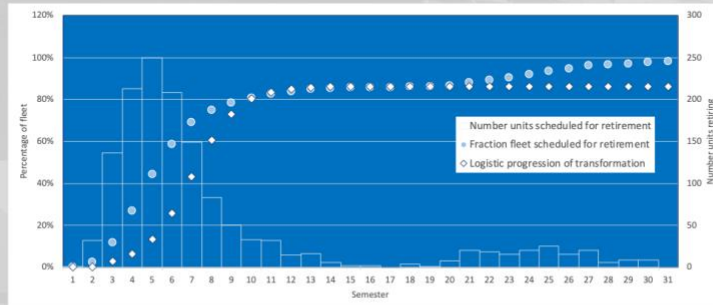


Electrification of a Bus Fleet Decision Flowchart



Fuente: LOGIOS

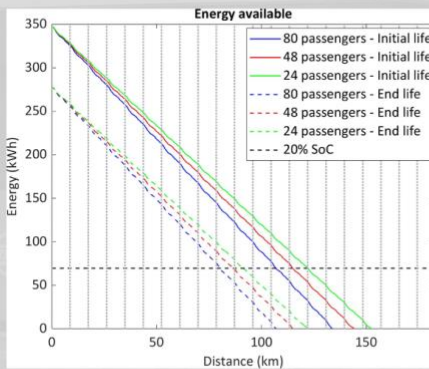
Technology Transformation Scenarios Phasing off of diesel buses and phasing in of electric buses



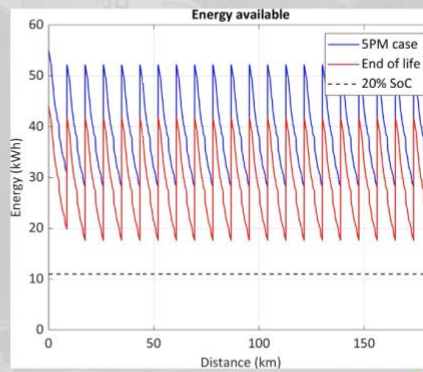
Fuente: LOGIOS

Bus Energy Consumption Modeling and Projections (Sample Route)

Overnight charge bus



Opportunity charge bus



Fuente: LOGIOS models and simulations

3.2. Pictures



Figure 1. Member of the implementer's team riding the test electric bus in Panama, during field data collection.



Figure 2. Media and outreach activities during the launch of the National Strategy of Electric Mobility



Figure 3. Member of the implementer's team, giving a presentation at the launch of the National Strategy of Electric Mobility, stressing that a key goal of CTCN's technical assistance is to inform the process.



Figure 4. Operator at MiBus's depot, charging an electric bus



Figure 5. Passengers climbing on an electric bus in Panama City's Historic Downtown.

4. Impact Statement

The information in the table below will be used to communicate results and anticipated impacts of this technical assistance publicly. Please copy information from impact statement developed in the M&E Plan and update as relevant.

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| <p>Challenge</p> | <p>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.</p> |
| <p>CTCN Assistance</p> | |

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| | <ul style="list-style-type: none"> • Comparative analysis of electric buses, natural gas and Euro VI buses for Panama City. • Technical, environmental, and financial evaluation. • Analysis of charging strategy. • Assessment of barriers to adoption and sustainable transport plan. • Capacity of local stakeholders |
| Anticipated impact | <p>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.</p> <p>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.</p> <p>The key stakeholders who were directly involved in the communications during the TA included the Secretaría Nacional de Energía (National Secretariat of Energy), the Ministerio de Ambiente (Environment Ministry), and MiBus (Panama City's public transportation fleet operator). Communications with electricity companies, such as ENSA, were also frequent.</p> <p>The deliverables of this TA included: D1- Development of implementation planning and communication documents D2.1- Evaluation of ongoing pilot of electric bus in Panama City's Historic Downtown: Technical report D2.2- Identification of most suitable low-emission public transport for Panama City: Technical report + presentation to stakeholders</p> |

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| | <p>D2.3- Economic assessment of the bus configurations: Technical report + presentation to stakeholders</p> <p>D3.1: Assessment of barriers and drivers of electric mobility in Panama: Technical report + presentation to stakeholders</p> <p>D3.2: Technical evaluation of public bus routes for electrification and charging strategy: Technical report + presentation to stakeholders</p> <p>D3.3: Sustainable public transportation plan for Panama City: Technical report + presentation to stakeholders</p> <p>D4.1: Workshop with regional stakeholders about the technical assistance: Online webinar</p> <p>D4.2: Capacity building workshop for stakeholders to learn to use LOGIOS's advanced tool for electric bus planning</p> <p>D5.1: Description of intended outcomes</p> <p>D5.2: Closure and Internal Information report</p> <p>D5.4: Gender analysis (integrated into D3.3)</p> <p>Due to Panama's clean electric grid, electric buses could reduce GHG emissions by about 60% or more, depending on operational conditions.</p> <p>Environmental benefits anticipated from this TA are potentially significant. It is estimated that 10,380 tCO₂e could be avoided per year, if 150 Euro III buses are replaced with the right type of electric buses.</p> |
| <p>Co-benefits: Achieved or anticipated co-benefits from the TA</p> | <p>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.</p> <p>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</p> |

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| | <p>and investments in the region. The extent to which this co-benefit materializes <u>will depend on the dissemination of the TA and the ensuing investments.</u></p> <p>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.</p> |
| <p>Gender aspects of the TA</p> | <p>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.</p> <p>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.</p> <p>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.</p> |
| <p>Anticipated contribution to NDC</p> | <ul style="list-style-type: none"> 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. |

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| | <ul style="list-style-type: none"> 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. |
| <p>The narrative story</p> | <p>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.</p> <p>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.</p> <p>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.</p> |
| <p>Contribution to SDGs</p> <p>A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/</p> | <p>The Response Plan identified contributions to the following SDGs:</p> <ul style="list-style-type: none"> SDG7.b - <i>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.</i> 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.

Annex 1 Technical assistance data collection

Please add quantitative and qualitative values for the indicators selected in the M&E plan and monitored throughout the technical assistance in the tables below. Indicators which have been monitored in addition to the proposed indicators below may be added at the end of table A. Non-relevant indicators should be left blank.

A. Output and outcome indicators

| Indicator | Quantitative value | Qualitative description |
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| Please note indicators below highlighted as anticipated | <i>Numerals only; disaggregates must sum to the total</i> | <i>List the various elements corresponding to the quantitative value as well as timelines and responsible institutions</i> |
| Total number of events organized by proponents and implementing partners | 10 | <ol style="list-style-type: none"> 1. LOGIOS conducted six presentations to local stakeholders about the various technical reports. 2. LOGIOS conducted a capacity building workshop for local stakeholders. 3. LOGIOS conducted a public workshop for a regional audience about the TA. 4. LOGIOS convened a meeting with key stakeholders in Panama on March 2019. 5. LOGIOS participated in the launch of Panama's National Strategy of Electromobility on August 2018. |
| Number of participants in events organized by proponents and implementing partners | | |
| a) Number of men | Counting events 1-4 above, the total attendance was 90, including 67 for event 3. | Events in the groups 1, 2, and 4 above were directed primarily to stakeholders in Panama. Event 5 was opened to guests from other regions, but it was predominantly for local stakeholders too. Event 3 was public, and attendance was from Latin American countries, but the registration did not collect information on location. |
| b) Number of women | Counting events 1-4 above, the total attendance was 78, including 47 for event 3. | Same above. |
| Number of climate technology RD&D related events | 0 | |

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| Number of participants in climate technology RD&D events | 0 | |
| a) Number of men | | |
| b) Number of women | | |
| Number of training organized by proponents and implementing partners | 1 | Capacity building workshop to train personnel in the use of an advanced tool for electric bus planning. |
| Number of participants in trainings organized by proponents and implementing partners | 8 | |
| a) Number of men | 4 | Personnel of MiBus |
| b) Number of women | 4 | Personnel of MiBus |
| Total number of institutions trained | 1 | |
| a) Governmental (national or subnational) | 1 | MiBus, Transporte Masivo de Panamá |
| b) Private sector (bank, corporation, etc.) | | |
| c) Nongovernmental (NGO, University, etc.) | | |
| Percentage of participants reporting satisfaction with CTCN training (from CTCN training feedback form) | 100% | Feedback was provided by leadership of MiBus. |
| Percentage of participants reporting increased knowledge, capacity and/or understanding as a result of CTCN training (from CTCN training feedback form) | | |
| a) Percentage of men | 100% | Attendees were consulted about any questions and areas that needed further elaboration. Extensive time was allocated to clear all questions. |
| b) Percentage of women | 100% | Same above. |
| Total number of deliverables produced during the assistance (excluding mission, progress and internal reports) | 8 | Excluding documents required by CTCN (Response plan, etc.) |
| a) Number of communication materials, including news releases, newsletters, articles, presentations, social media postings, etc. | | <p>Accelerating the Transition to a Sustainable Mobility with Low Carbon Emissions in Panama. Presentation to regional audience.</p> <p>Panama's First Biennial Report to the UNFCCC, 2018. (Report, MiAmbiente)</p> <p>Why are technical analyses key to finance electric buses? (Blog Portal Movilidad)</p> <p>Presentan Análisis para Incorporar Buses Eléctricos en Transporte Público Panameño. (Newsletter, Secretaría de Energía)</p> <p>Accelerating the Transition to a Sustainable Mobility with Low Carbon Emissions in Panama. (Social media posting, LinkedIn)</p> |

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| | | Methods for eBus Planning. (Blog in LOGIOS's website and posted in LinkedIn) |
| b) Number of tools and technical documents strengthened, revised or developed | 6 | D2.1- Evaluation of ongoing pilot of electric bus in Panama City's Historic Downtown: Technical report D2.2- Identification of most suitable low-emission public transport for Panama City: Technical report D2.3- Economic assessment of the bus configurations: Technical report D3.1: Assessment of barriers and drivers of electric mobility in Panama: Technical report D3.2: Technical evaluation of public bus routes for electrification and charging strategy: Technical report D3.3: Sustainable public transportation plan for Panama City |
| c) Number of other information materials strengthened, revised or created (For example training and workshop reports, Power Points, exercise docs etc.) | 8 | <i>Power Point presentations for:</i> <ul style="list-style-type: none"> • <i>Each of the technical reports</i> • <i>Capacity building workshop</i> • <i>Regional workshop</i> |
| Total number of policies, strategies, plans, laws, agreements or regulations supported by the assistance | 1 | |
| a) Adaptation related | | |
| b) Mitigation related | 1 | National Strategy of Electric Mobility |
| c) Both adaptation- and mitigation related | | |
| Anticipated number of policies, strategies, plans, laws, agreements or regulations proposed, adopted or implemented as a result of the TA | 1 | |
| a) Adaptation related | | |
| b) Mitigation related | 1 | National Strategy of Electric Mobility |
| c) Both adaptation- and mitigation related | | |
| Anticipated number of technologies transferred or deployed as a result of CTCN support | 6 | The central impetus of the TA was on electric vehicles and compressed natural gas as fuel. Since the models and simulations accounted for it, another technology that was supported is regenerative braking. Certain technologies listed in the CTCN taxonomy also received secondary support. These include more efficient heavy-duty vehicles, |

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| | | promotion of non-motorized transport, and road pricing. |
| Anticipated number of collaborations facilitated or enabled as a result of technical assistance | 0 | |
| a) Number of South-South collaborations | | |
| b) Number of RD&D collaborations | | |
| c) Number of private sector collaborations | | |
| Number of countries with strengthened National System of Innovation as a result of CTCN support | 1 | Panama |
| Insert any additional indicators here | | |

B. Core impact indicators

Please fill in the tables for anticipated impacts of the CTCN assistance. Every technical assistance should contribute to at least one of the indicators below. For guidance on how to report on core indicators see the [‘M&E Guidance Document for TA Implementers’](#).

| Core indicator 1 | Anticipated metric tons of CO₂ equivalent (CO₂e) emissions reduced or avoided as a result of CTCN TA | |
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| | <i>Please add your calculations in word or excel format as an Annex to this Closure Report, where applicable.</i> | |
| | Anticipated metric tons of CO ₂ e reduced or avoided as a result of the TA on annual basis | Anticipated metric tons of CO ₂ e reduced or avoided as a result of the TA in total |
| Quantitative value (emissions reductions) | 10,380 | 124,560 |
| Unit | tCO ₂ e | tCO ₂ e |
| GHG assessment boundary (project emissions) Identify expected post-TA activities, associated effects and assess boundary for quantification of GHG emission reductions | Panama is projecting the procurement of between 35 and 160 buses in the short term, to be deployed in a handful of routes. The expectation is that Panama will continue the process of fleet electrification beyond these numbers, although this process is to be determined. | |
| Baseline emissions Describe baseline scenario, baseline candidates, emission factors and emissions calculated | Carbon emission factor for buses operating in average conditions in Panama City were estimated at about 328 gCO ₂ /kWh for diesel Euro III buses and at about 349 gCO ₂ /kWh for electric buses. Energy consumption for these buses was estimated at about 0.6 litre/km. From this, the emission factor can be expressed as 1.97 kgCO ₂ /km. | |
| | Assuming that diesel buses have a minimum service life of 12 years, the total baseline emissions may be estimated at 1,225 tonCO ₂ /bus for buses meeting Euro III standards. For the same time span, emissions for an opportunity charge electric bus may be estimated at 393.8 tonCO ₂ /bus. | |

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| | <p>The selection of routes provided by Panama as candidates for immediate electrification has a daily distance per bus ranging from 74 to 311 km, and an average of 166 km. This yields an approximate 102 tonCO₂/year/bus for buses diesel Euro III.</p> <p>Opportunity charge electric buses for the routes selected by Panama have an estimated average consumption per service of 19 kWh. Services for these routes have an average distance of 10.5 km, giving an average consumption of 1.8 kWh/km accounting for air conditioning. This yields an estimate for the carbon emissions of 32.8 tonCO₂/year/bus.</p> | |
| <p>Methodology</p> <p>Explain the method or process of verifying the indicator and how data was gathered</p> | <p>Emissions were estimated on a lifecycle basis, using the GREET model. Parameters were adjusted to Panama's conditions to reflect the carbon intensity of the electricity produced locally. The overall methodology is described in better detail in Deliverable 2.2. Computational modelling was used to estimate energy consumption for the operating conditions of a range of routes in Panama. The operating conditions were measured via field work. It is estimated that electric buses could reduce GHG emissions by 48 – 57%, relative to the baseline.</p> | |
| <p>Assumptions</p> <p>Describe assumptions made during calculation and quantification of GHG reductions</p> | <p>It is assumed that 150 buses are switched from diesel Euro III to opportunity charge electric in the short term. Other assumptions are included in the calculations.</p> | |

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| <p>Core indicator 2</p> | <p>Anticipated increased economic, health, well-being, infrastructure and built environment, and ecosystems resilience to climate change impacts as a result of technical assistance</p> <p><i>Please provide a qualitative description of the anticipated impacts on the categories below</i></p> |
| <p>Infrastructure and built environment</p> <p>Anticipated increased infrastructure resilience (avoided/mitigated climate induced damages and strengthened physical assets)</p> | |
| <p>Ecosystems and biodiversity</p> <p>Anticipated increased ecosystem resilience (areas with increased resistance to climate-induced</p> | |

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| disturbances and with improved recovery rates) | |
| Economic Anticipated increased economic resilience (e.g. less reliance on vulnerable economic sectors or diversification of livelihood) | |
| Health and wellbeing Anticipated increased health and wellbeing of target group (e.g. improved basic health, water and food security) | |

| Core indicator 3 | Anticipated number of direct and indirect beneficiaries as a result of the TA | |
|---|--|--|
| | Quantitative value | Means of verification |
| Total beneficiaries | <i>Total number</i> | |
| Number of adaptation beneficiaries | | <i>Describe calculation methods and assumptions made</i> |
| Number of mitigation beneficiaries | | <i>Describe calculation methods and assumptions made</i> |
| Number of adaptation-and mitigation beneficiaries | | <i>Describe calculation methods and assumptions made</i> |

| Core indicator 4 | Anticipated amount of funding/investment leveraged (USD) as a result of TA (disaggregated by public, private, national, and international sources, as well as between anticipated/confirmed funding) | | | |
|---|---|--|---|--|
| | Quantitative value confirmed in USD | Quantitative value anticipated in USD | Qualitative description <i>List the institutions, timelines, and description or title of the investment</i> | Methods <i>Describe methods used for quantification of funds leveraged</i> |
| Total funding | <i>Total number in USD (numerals only, no rounding or abbreviations)</i> | <i>Total number in USD (numerals only, no rounding or abbreviations)</i> | | |
| Anticipated amount of public funding mobilised from national/domestic sources | | | | |

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| Anticipated amount of public funding mobilised from international/ regional sources | | | | |
| Anticipated amount of private funding mobilised from national/domestic sources | | | | |
| Anticipated amount of private funds mobilised from international/regional sources | | | | |

Annex 2 (for internal use – to be filled in by the CTCN)

CTCN evaluation

This section will be completed by the relevant CTCN Technology Manager.

- Evaluation of the timeliness of the TA implementation as measured against the timeline included in the response plan;
- Evaluation of TA quality as defined in the response plan;
- Overall performance of the Implementers;
- Overall engagement of the NDE and Proponent;
- Lessons learned on the CTCN process and steps taken by the CTCN to improve.