Document of the Inter-American Development Bank

**Colombia**

**CTF Renewal Energy Financing Program for the Non-Interconnected Zones**

**(CO-L1161)**

**Monitoring and Evaluation Arrangements**

# Introduction

1. **General Framework**
   1. The main purpose of this document is to present the monitoring and evaluation plan of the CTF Renewal Energy Financing Program for the Non-Interconnected Zones.
   2. The proposed program will provide Bancóldex, Colombia’s second tier public bank in charge of supporting entrepreneurial development, with additional long term finance to enhance access to long term finance by private sector investors on terms and conditions needed to cover CAPEX and payback requirements of renewable energy projects in the ZNIs through on-lending to IFIs that should in turn provide sub-loans in adequate terms to these investors.
   3. In order to ensure higher environmental impacts and promote its replication, the program will focus on providing access to long term finance to energy generation operators and technology providers that already have a credit history and experience with mini-grids and investments in areas not interconnected to the grid. Furthermore, it is expected that the eligible projects would mainly replace both installed and planned increases in diesel capacity in areas with the highest concentration of users; and that the financing of RE mini-grids would focus on technologies with highest potential for replication, i.e. hybrid solar-diesel , solar, SHP and biomass.
2. **Scheme for Implementation and Monitoring**
   1. The executing agency for the program will be Banco de Comercio Exterior de Colombia S.A. (Bancóldex). Bancóldex is a well reputed national credit institution with ample experience in finance structuring and fiduciary management
   2. Bancóldex will execute the program under its current organizational structure. The provisions governing program execution, financial intermediaries' participation, and eligibility of each project to be granted access to the use of funds from the program, will be established in the OR agreed by the IDB and Bancóldex, in accordance with Bancóldex and IDB standards and policies, local laws, and Colombia's financial industry practice. Bancóldex will be responsible of supervising the adequate use of program financial resources and of the timely provision of human and technical resources necessary to implement the program. The program will apply the standard procedures established by the IDB for monitoring and evaluation of investment operations, but will also be consistent with reporting obligations to the CTF.
   3. During the disbursement period, Bancóldex is required to submit audited financial statements of the program within 120 days after the closing of each fiscal year, duly audited by an independent firm acceptable to the IDB and contracted by the executing agency

**Table 1.1 Costs of the Program by Expected Output (USD million)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cost component** | **Y1** | **Y2** | **Y3** | **Y4** | **Total** |
| **Output** |  |  |  |  |  |
| Program funds allocated to eligible projects. | 2.4 | 2.4 | 2.4 | 2.4 | **9.7** |

# Monitoring

1. **Indicators**
   1. The monitoring intends to follow up the execution of the program in order to identify the intermediate milestones achieved in each phase, identify corrective actions if necessary and evaluate its outcomes and fulfillment of proposed targets. The indicators to be monitored will be those included in the Results Matrix and in the Progress Monitoring Report (PMR). Table 2.1 summarizes them and includes information on the source and frequency of collection and reporting process.

**Table 2.1 Indicators**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Indicators** | **Unit** | | **Frequency of measurement** | **Description / Source of verification** | |
| **Output** | | | | | |
| Program funds allocated to eligible projects | USD Million | | Annual | This indicator follows the allocation of CTF funds to eligible projects. Although not in the results matrix, the number of projects (and size and technology used) financed by the program will be monitored by the Program Report from Bancóldex[[1]](#footnote-1).  Source: Program report from Bancóldex. | |
| **Results** | | | | | |
| Additional investment leveraged by the program beneficiaries | | USD Million | Annual | | Volume of additional investment leveraged by the program beneficiaries. Includes all financing from sources other than the CTF (private equity, government, Bancóldex and other financial institutions).  Source: Program report from Bancóldex. |
| Greenhouse Gas emissions reduced by projects financed by the program. | | tCO2e | Annual | | Tons of GHG emissions that will be reduced by renewable energy financed by the program.  Source: IDB estimations made using information of renewable energy generated by financed projects coming from Program Report from Bancoldex and the emissions factor of Diesel. This indicator will be computed using actual, ex-post information of generation by RE projects financed by the program during its lifespan.  tCO2e = Tons of CO2 equivalent |
| Average hours of electricity provided to localities served by RE plants. | | Number of hours | Annual | | This indicator measures the number of hours of electricity generated by RE financed by the program. The baseline consists of the RE hours generated in the target group before the program.  Source: Program report from Bancóldex. |
| RE generation by project beneficiary firms compared to non-beneficiaries. | | kWh | Annual | | This indicator measures the difference between the RE generated by projects financed by the program and the RE generated by non-beneficiaries.  A comparison group will be identified from the target group defined in the Economic Analysis (See Annex). The energy and financial authorities (IPSE and SSPD[[2]](#footnote-2)) generate periodic data on generation by operators in the ZNIs. The information from the counterfactual will primarily come from this source. However, in case the information is not released for some years, the members of this group will be surveyed to gather information about RE generation and investments.  Source: Program report from Bancóldex and surveys to selected non-beneficiaries. |

* 1. It should be noted that projects funded by the program may have environmental and social impacts that require an effective evaluation system for proper mitigation and management. To mitigate these risks, the IDB will support Bancóldex to adapt its Environmental and Social Management System (ESMS) for renewable energy project lending, which will enable the identification of potential impacts and risks and ensure that the beneficiaries of the financing will implement environmental and social assessment, prevention, mitigation and management measures consistent with IDB safeguard policies. Bancóldex shows a strong institutional capacity in the management of environmental and social risks, with a full-fledged Environmental and Social Management System designed and implemented with the technical assistance of the IDB. Bancóldex is among the most advanced financial institutions in the Region in the management of Environmental and Social risks for Tier 2 banking activities.

1. **Data Collection and Instruments**
   1. Bancóldex will collect the necessary data for monitoring and present annual reports to the IDB. In some cases, the IDB will make calculations required for some indicators, based on the information provided by Bancóldex in the annual reports. The IDB must report annually to the Clean Technology Fund Trust Fund Committee (CTF TFC) on results. Table 2.1 presents the main indicators to be monitored during the execution period of the operation, the methodology to be used, source of information, and responsible of data gathering.
   2. From the Bank’s side, the project team composed by specialists from IFD/CMF, INE/CCS and INE/ENE, with support from the country office in Colombia, will be in charge of following up the execution, monitoring and evaluation of the program. The executing agency and the Bank have committed to carry out monitoring meetings according to a regular schedule to be agreed upon between the two parts (see Table 2.2 Monitoring Work Plan for an indicative schedule).
2. **Reporting Monitoring Results**
   1. Bancóldex will report to IDB through annual reports including the defined indicators and any other relevant information on the performance of the program. Based on the information provided by these reports, the executing agency and the IDB could introduce adjustments to the program. Bancóldex will deliver the reports within 60 calendar days after the end of each year of the program’s implementation. The reports will include information regarding the evolution of the indicators, as well as financial information regarding the use of the resources and the state of the program’s account. The Bank will be entitled to request additional information, if necessary.
3. **Monitoring Coordination, Work Plan and Budget**
   1. Bancóldex will be responsible for the supervision, technical and administrative coordination of the program. Bancóldex will be responsible for the execution of the activities envisioned under the program, and performing the necessary reporting duties to the Bank.
   2. CTF resources are to be fully committed and disbursed within four years from the effective date of the loan agreement.
   3. The cost and planned schedules for the activities are shown in Table 2.2. Resources to cover these costs will come from the supervision budget included in the CTF funding plus any standard administrative costs associated to IDB and Bancóldex staff involved in the project. The TC that forms part of the program will finance the monitoring system and monitoring activities of Bancóldex.

**Table 2.2 Monitoring Working Plan**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Activities** | **Year 1** | | **Year 2** | | **Year 3** | | **Year 4** | | **Responsible** | | **Budget**  **(USD)** |
| **I** | **II** | **I** | **II** | **I** | **II** | **I** | **II** |
| **Coordination meetings and supervision visits** |  | X |  | X |  | X |  | X | Bancóldex /IDB | | **5,000** |
| **Collection of data for output indicators** |  |  |  |  |  |  |  |  |  | |  |
| * **Component I** |  | X |  | X |  | X |  | X | Bancóldex /IDB | | **5,000** |
| **Collection of data for outcome indicators[[3]](#footnote-3)** |  |  |  |  |  |  |  |  |  | | **10,000** |
| * **Additional investment leveraged by the program beneficiaries.** |  | X |  | X |  | X |  | X | Bancóldex | | 2,500 |
| * **Greenhouse Gas emissions reduced by projects financed by the program.** |  | X |  | X |  | X |  | X | IDB/ Bancóldex | | 2,500 |
| * **Average hours of electricity provided to localities served by beneficiaries.** |  | X |  | X |  | X |  | X | Bancóldex | | 2,500 |
| * **RE generation by project beneficiary firms compared to non-beneficiaries. (Includes annual surveys to non-beneficiaries when government data is not available).** |  | X |  | X |  | X |  | X | Bancóldex | | 2,500 |
| **Final report (input for PCR)** |  |  |  |  |  |  |  | X | Bancóldex /IDB | | **10,000** |
| **Data Projections and Analysis** |  |  |  |  |  |  |  | X | Consultant | | **5,000** |
| **Final Evaluation: Cost-Benefit Analysis** |  |  |  |  |  |  |  | X | Consultant | | **20,000** |
| **Distribution and discussion of the report** |  |  |  |  |  |  |  | X | Bancóldex/IDB | | **5,000** |
|  |  |  |  |  |  |  |  |  | **Total** | | **60,000** |
|  |  | |  | |  | |  | |  |

# Evaluation

1. **Main Evaluation Questions**
   1. This section aims at proposing a plan to carry out an evaluation of the program. Given the small number of beneficiaries that are expected from the program, it will not be possible to carry out an impact evaluation using a sample size that would provide enough power for statistical inference. However, given the expected availability of data that will come from the monitoring process, an ex-post cost-benefit analysis will be undertaken. Hence, the main evaluation questions that will be answered using this method are:

#### What is the economic value of the savings achieved by the projects financed by the program compared to a counterfactual scenario?

#### What is the economic value of the greenhouse gas emissions reduced by the projects that were financed by the program compared to a counterfactual scenario?

#### What is the net present value of the project overall?

1. **Existing Knowledge** 
   1. Important studies have been undertaken in recent years focused on the development of non-conventional renewable energy in Colombia. Among these, *“Integración de las Energías Renovables no Convencionales en Colombia”* (UPME 2015) makes an exhaustive analysis of the benefits, costs, a regulation aspects of integrating non-conventional renewable energy in Colombia. Also, *“Analisis Costo-Beneficio de Energías Renovables no Convencionales en Colombia”* (Fedesarrollo 2013) performs a prospective evaluation of renewable energy compared to fuel-based ones. Furthermore, UPME reference plan of generation expansion for 2028[[4]](#footnote-4) analyses the impact of introducing renewable energy on emissions reductions, price of electricity and system stability for Colombia. However, there are no studies that quantify the economic benefits of renewable energy specifically for the ZNIs, considering the investment and operations costs particular to these regions. *.*
   2. The ex-ante cost-benefit analysis[[5]](#footnote-5) found that the net cash flows discounted at a rate of 12% produce a net present value (NPV) for the program of US$33.27 million. Besides, the cost-efficiency analysis gave a very positive output of the program in terms of mitigation costs of renewable energy technologies. Based on estimated reductions of CO2 emissions over the course of a 25 year lifetime of projects financed, and using indicative total resources of US$28 million from the CTF, Bancoldex and private sector, the cost of abatement is estimated at some: (i) US$9.08 per tCO2e considering CTF financing and (ii) US$26.2 when considering total program financing.
2. **Key Outcome Indicators**
   1. The proposed outcome indicators and their corresponding description, frequency of measurement and means of verification are listed in Table 2.1. All of their registered values during the execution of the program will be used as an input for the evaluation.
3. **Evaluation Methodology**
   1. Given the scale and nature of the program, it is expected that only a small number of operators and technology providers will be among the beneficiaries. For this reason, the number of observations collected will not provide a sample size with enough power to make reliable statistical inferences of the program’s attribution. However, given the availability of information of costs, generation and emissions factors, it is feasible to implement a cost-benefit analysis that will account for economic and environmental benefits of the program.
   2. Hence, the evaluation will follow an ex-post cost-benefit analysis based on the ex-ante model, but replacing estimates and projections with measured data and measured structural parameters when information availability allows it. It will also rely on additional data gathering activities that will help construct a counterfactual that reflects to the best possible extent the scenario had the project was not implemented.
   3. For the analysis, the Net Present Value (NPV) and the Internal Rate of Return (IRR) will be calculated for the lifespan of the plants financed by the program at a rate of 12%. This requires establishing the costs savings and environmental benefits flows for the project measured against a counterfactual scenario. For cost calculations, the representative plant of the program will be defined as in the ex-ante analysis: a representative plant consisting of weighted average costs. The weights will be equal to the share of participation of each renewable technology that was actually financed by the program (solar, hybrid, biomass, small hydroelectric, etc.). The weights, as well as costs and power generation data used for the analysis should be updated yearly in order to account for the evolution of the representative plant during the four years of execution. From year fourth onwards, projected values for the main variables will be used until the model reaches the expected end of the lifespan of the financed technologies, which is about 25 years.
   4. **Counterfactual scenario.** The counterfactual scenario that will be used for the analysis will consist of information from selected non-beneficiaries of the program. The selection will be made among the 37 operators that constituted the pool of potential beneficiaries used in the Economic Analysis and Analysis of Demand. Once the beneficiaries are known, a group of non-beneficiaries will be selected based on similar characteristics to the beneficiaries[[6]](#footnote-6). If possible, and conditional to similar characteristics, the selection will prioritize operators whose credit applications were rejected[[7]](#footnote-7). The information about power generation and costs from the non-beneficiaries will come from the information they regularly report to the energy and financial authorities. In case there is not enough data, interviews will be conducted with these operators[[8]](#footnote-8). Since the number of expected beneficiaries is small, this will not require significant budget and time allocation. It is important to notice, that special attention will allocated to account for investments in RE that were made by operators/investors that were not program beneficiaries in order to account for a more accurate counterfactual scenario.
   5. Hence, the analysis will be based on the following calculations:
4. **Electricity Generation**
   1. Recorded Generation

The information of power generation from plants financed by the program will be used for the first four years of the analysis. This information will come from the program’s monitoring. For the counterfactual plants, the information of generation will come from their reported data to energy and financial authorities or, in case there is not enough information, from surveys conducted in the fourth year for the analysis.

* 1. Projected Generation

Since the analysis will consider the average life span of the financed technology (which is about 25 years), it will be necessary to use projections from year fifth onwards. The projections will be made using the same methodology developed in the Economic Evaluation (See Annex) but replacing the baseline data with the information that was gathered during the execution of the program.

1. **Technology Parameters**
2. Installed capacity

The actual installed capacity of the plants financed by the program shall be used for the analysis. Similarly, the installed capacity of the counterfactual plants reported during the first four year will be used.

1. Load capacity

The actual load capacity of the financed and counterfactual plants shall be used for the entire life span of the analysis.

1. Distribution of financed renewable technologies.

The participation of each type of renewable energy among the programs beneficiaries will be calculated and used as the weights for estimating the average costs of the representative plant financed by the program.

1. **Cost Savings**
2. Investment Costs.

The actual capital costs of the projects financed by the program will be used. This information will come from program’s monitoring. For the counterfactual scenario the recorded capital costs during the execution period will be used.

1. O&M Costs

Information of operation and maintenance costs of project beneficiaries shall be collected on an annual basis by Bancoldex. After the execution period finishes, the O&M costs will be projected based on CPI inflation projected for Colombia. Costs information for counterfactual plants will be collected on a survey conducted by the end of the program, and will be projected for the remaining years using the same method as for the beneficiaries.

1. **CO2 emissions**

The basis for emissions reductions calculation is the electricity generated by the plants and the emissions factor of diesel. Hence, the basis for the estimation will be the reported renewable energy generated by projects financed by the program. Once the generation is known, it shall be multiplied by the emissions factor in order to account for the emissions that are being reduced by avoiding diesel based generation. For the portion of the analysis that goes beyond the execution period, the emissions reductions will be calculated based on projected generation of the beneficiaries and non-beneficiaries, following the same method developed in the Economic Analysis, but based on measured data of the first four years.

1. **Net present value and economic return**

The Net Present Value (NPV) of the overall program will be calculated as follows[[9]](#footnote-9): First, the NPV of the cost savings will be calculating by discounting the difference between the flow of non-beneficiaries average costs and beneficiaries weighted average costs.

Second, the NPV of the CO2 emissions will be calculated by discounting the flow of the monetary value of the emissions reduced by the financed plants. These are calculated by multiplying the amount of emissions by the carbon market price.

Finally, the programs NPV will be the sum of the NPV of costs savings and the NPV of the emissions reduced. The internal rate of return (IRR) will be calculated based on the programs NPV.

* 1. This method is appropriate because: (i) there is a small population of expected beneficiaries in the ZNIs, and (ii) the availability of outcome indicators is very high.
  2. It will be the responsibility of the Bank, through its Division of Capital Markets and Financial Institutions (IFD/CMF), Energy Division INE/ENE and Climate Change and Sustainability (INE/CCS), and to supervise the execution of the ex post cost-benefit analysis from the data collected in accordance with the plan proposed. It is expected that the information needed to make such an evaluation will be available from national sources as indicated in Table 2.1 and from the final report produced by Bancóldex and included in the monitoring activities.
  3. **Data collection.** Bancóldex will collect the necessary data from the information sources as indicated in Table 2.1, and by submitting annual reports to the IDB. Information systems and planned support for monitoring in Bancóldex are considered sufficient to follow the proposed indicators.
  4. Bancóldex makes systematic field visits to monitor the risk and monitor their financing programs. Supervision visits are also carried out by Bank’s staff members, an activity that is included in this monitoring and evaluation plan.

1. **Technical Aspects of Selected Methodology**
   1. The execution of an ex-post cost benefit analysis is highly dependent to the data collection of indicators set out in the monitoring work plan. For the methodology to be effective it is very important to have the information gathered for the monitoring indicators concerning the results matrix (see Table 2.1).
2. **Reporting Evaluation Results**
   1. Bancóldex will report to IDB through annual reports on the defined indicators and in the detailed performance of the program. Based on the conclusions of these reports, Bancóldex and IDB could introduce adjustments to the program. The executing agency will deliver the reports within 60 calendar days after the end of each year of the program’s implementation. The reports will include information regarding the evolution of the evaluation indicators as well as any other information considered relevant to the performance of the program. The Bank will be entitled to request additional information, if necessary.
3. **Complementary Evaluation (Optional)**
   1. Besides the annual reports and the scheduled contacts for monitoring of the operations carried out under the program, Bancóldex and the Bank will conduct a midterm evaluation within 36 months from the date of the first disbursement of financing. The evaluation will assess progress in accomplishing program objectives and outcomes based on the Results Matrix, in order to identify any corrective action required.
   2. An extended project monitoring report (XPMR) and a Project Completion Report (PCR) have been planned, to be carried out six months after the disbursement conditions for the last operation under the program have been met. The PCR will evaluate the fulfillment of targets and review the results of the operation. The assumptions in the Results Matrix will be taken into consideration as well as the methodology explained in this document.
4. **Evaluation Coordination, Work Plan and Budget**
   1. Bancóldex will be responsible for the supervision, technical and administrative coordination of the program and perform the necessary reporting duties to the Bank.
   2. For the implementation of this assessment, it is expected that Bancóldex will use its own staff, with the supervision of the IDB, which are considered adequate and sufficient to ensure the quality and success of the evaluation work. For activities that require additional expertise, consultancy services may be hired by Bancóldex or the IDB (see Table 2.1).
   3. Bancóldex and the IDB will conduct a midterm evaluation once 50% of the program funds allocated to eligible beneficiaries is committed. The evaluation will assess progress in accomplishing program objectives and outcomes based on the Results Matrix in order to identify any corrective action required. Periodical monitoring meetings are also scheduled. The executing agency will provide the information necessary for the Bank to conduct a Project Completion Report (PCR), to be carried out six months after the last disbursement date.
   4. The Bank, through its Division of IFD/CMF, INE/ENE and INE/CCS, with support from the Office of Strategic Planning and Development Effectiveness (SPD), will collaborate with Bancóldex in any aspects required and requested. The Bank may provide technical and financial support to carry out the activities of specialized analysis on the economic assessment.
   5. The costs of the activities listed in this plan will be financed by the supervision budget included in the CTF funding and/or with transactional budget of the CMF division. Its completion is expected by the end of the execution period of the program (see details in Table 2.2). Bancóldex and the IDB have the structure and resources to ensure compliance with the tasks and commitments in this assessment plan. Any further evaluation with more specific purposes or seeking to determine externalities resulting from the execution of the program may be carried out if considered relevant, but will not be incorporated as part of this Monitoring and Evaluation Plan.

1. See additional indicators described in the Result Matrix Annex. [↑](#footnote-ref-1)
2. Instituto de Planificación y Promoción de Soluciones Energéticas para las Zonas no Interconectadas, and Superintendencia de Servicios Publicos Domiciliarios, respectively. [↑](#footnote-ref-2)
3. The monitoring activities for each outcome indicator include annual surveys to non-beneficiaries to gather information for the ex-post evaluation. Thesesurveys will be conducted for every year for which IPSE and SSPD will not provide the required data. [↑](#footnote-ref-3)
4. UPME (2015). *Plan de Expansión de Referencia Generación – Transmisión 2014-2028* [↑](#footnote-ref-4)
5. See the Economic Analysis Annex [↑](#footnote-ref-5)
6. These characteristics are: technologies used, installed capacity, annual generation, average hours of electricity generated, number of users in localities served. [↑](#footnote-ref-6)
7. As the Analysis of Demand for Credit for Investments in Renewable Energy in ZNI (see POD Annex) estimates, there is a demand for investments in RE in ZNIs that is much larger that the funds to be provided by the program. Hence, it is expected that there will be a significant number of operators/investors that will not be able to be financed and that share similar characteristics to the final beneficiaries. However, the identification of these control group members will depend of the availability of information provided by financial intermediaries. [↑](#footnote-ref-7)
8. See table 2.1 for further details. [↑](#footnote-ref-8)
9. For an illustration of this procedure, see the Economic Analysis Annex. [↑](#footnote-ref-9)