CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Bonyic hydroelectric project.

Version 05,
12/12/2012

A.2. Description of the project activity:

The proposed project activity consists in the installation of a new hydroelectric power plant with a capacity of 32.64 MW, located on the Bonyic River, in the Northwest corner of Panama. The objective of the Bonyic hydroelectric project is to provide renewable energy to the Panamanian Interconnected Electricity System.

The project is being implemented by Hidroecológica del Teribe, S.A. (HET), a special purpose company owned by Empresas Públicas de Medellin of Colombia, Administradora Serviagro and Consultores Asociados de Ingenieria, S.A. of Panama and MacEnergy (Cayman) Limited. HET was formed to build, own and operate the hydroelectric power plant. The proposed project activity involves the construction of a run of river hydroelectric power plant, the access roads, bridges, a transmission line of 115kV between Bonyic and Changuinola, and a substation plant for interconnection of the project with a step-up transformer to step up the voltage from 13.8 kV to 115 kV.

The project activity reduces greenhouse gas emissions that would have occurred in the absence of the project by avoiding electricity generation by fossil fuel sources. The primary objective of the project is to help meet Panama's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to social and economic sustainability by creating new jobs, enhancing the infrastructure and increasing the share of renewable energy in the total electricity supply in Panama.

The participants of the project recognize that this project activity is helping Panama to fulfill its goals of promoting sustainable development. Specifically, the project is in line with host-country specific CDM requirements due to the following reasons:

- It contributes to local environmental sustainability, since it decreases the dependence on fossil fuels, thus improving air quality.
- It contributes towards better working conditions and increases employment opportunities in the area where the project is located.

- It contributes towards better revenue distribution since it contributes to regional/local economic development.
- It contributes to regional integration and connection with other sectors. The project facilitates the increase of small hydroelectricity as a generating source in the region and therefore may encourage other similar companies that want to replicate this experience.

The Bonyic hydroelectric project improves the supply of electricity with clean, renewable hydroelectric power while contributing to regional/local economic development.

Considering all the inherent benefits that the implementation of the project brings, it can be concluded that the proposed activity contributes to the sustainable development of the country.

A.3. Project participants:

Table 1: Party(ies) and private/public entities involved in the project activity

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Panama (host)	Hidroecológica del Teribe, S.A.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Panama

A.4.1.2. Region/State/Province etc.:

Bocas del Toro.

A.4.1.3. City/Town/Community etc.:

Changuinola.

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

Bocas del Toro is a province in the northwest of Panama. The province has an estimated population of 89,300 inhabitants and a surface of 8,745 square kilometers.

The Bonyic hydroelectric project will be located in the Quebrada de Bonyic, 16 km from Changuinola, the largest city in the province of Bocas del Toro.

The project coordinates are 9°21' N and 82°36' W, that is to say, in decimal coordinates the project location are 9.35 N and 82.6 W. The equivalent project UTM coordinates are UTM Zone= 17N x =333140.3 and y = 1012555.87

Figure 1: Map of Panama showing project location

A.4.2. Category(ies) of project activity:

Sectoral Scope: 1 – Energy industries (renewable/non-renewable sources).

Category: Renewable electricity generation for a grid.

A.4.3. Technology to be employed by the project activity:

The project consists of a run of river hydroelectric plant with an installed capacity of 32.64 MW which uses the water from the Quebrada de Bonyic (Bonyic ravine), Teribe river sub-basin, which discharges in the Changuinola River that flows to the Atlantic Ocean.

The power plant has a diversion dam which directs the water into the feeder canal using the existing flow without water regulation reservoir.

The main Project works include:

- A compacted concrete roller (CCR) dam
- A pressure channel localized on the left bank of the Bonyic ravine, formed by a tunnel and a steel pipeline.
- A power station and a transmission line of 115 kV.

The characteristics of the main components of the hydroelectric power plant are the following:

Dam

The dam will be located about 8 km from where the Bonyic ravine joins the Teribe River and will be built according to the following specifications:

Table 2: Dam characteristics

Type	FSHD (Faced Symmetrical Hardfill Dam)
Height	37 m
Length	165 m
Elevation of the dam top	244.00 m.a.s.l.
Superior elevation of the parapet wall	245.50 m.a.s.l.
Design flow	1,300 m^3/s
Material of construction	Concrete
Total volume of concrete	60,000 m^3

Adduction system

The Bonyic hydroelectric project consists of several structures and adduction works, specified as follows:

- ***Water intake***

The reservoir water is captured by means of a frontal adduction structure constructed on the slope of the left bank of the Bonyic ravine.

Table 3: Water intake characteristics

Type	Frontal adduction
Control element	Flat lockgate with wheels of 3.30 m x 3.70 m
Adduction flow Speed	0.80 m/s on the grilles and 2.25 m/s in the lockgate
Design flow	27.5 m^3/s

- ***Feeder canal***

Table 4: Feeder canal characteristics

Length		3,800 m
Covering		Shotcrete, poured concrete, metallic reinforcement
Section: Trunk	***radius***	1.85 m
	height of walls	1.85 m
	base	3.70 m
Slope		- 0.5 % y – 1.80%
Speed of the flow		2.25 m/s

Power station

The power station will be located near the junction of the Rancho Quemado ravine with a branch of the Bonyic ravine. The power station contains three Francis turbines and their corresponding synchronous generators.

- ***Turbines***

The chosen turbines are Francis type of 10MW power capacity and the following characteristics.

Table 5: Turbine characteristics

Type	Francis
Number Units	3
Nominal capacity	10.88 MW
Design flow	9.17 m^3/s
Rotation speed	600 rpm
Axle position	Horizontal
Specific speed	151.3 m-kW
Power	11.1 MVA

- ***Transformer***

Table 6: Transformer characteristics

Type	Three-phase oil transformer
Capacity	30/36 MVA
Voltages	13.8/115 kV
Cooling	ONAN/ONAF
Number of transformers	1

(a) ONAN (Oil Natural Air Natural) and ONAF (Oil Natural Air Forced)

- ***Generators***

Table 7: Generator characteristics

Number of generators	3
Generator type	Synchronous
Capacity	12 MVA
Power factor	0.9
Nominal tension	13.8 kV
Frequency	60 Hz
Power factor	0.90
Number of poles	12
Axle position	Horizontal

Tail race

The used water is released through the *tail race*, a channel which leads the water from the turbine back into the river. The tail race dimensions are 5 m width and 512 m length.

Table 8: Tail race characteristics

Type	Conduct in reinforced concrete
Length	512 m
Delivery elevation	88 m.a.s.l.
Closure elements	Flat lockgate of 4.30 m x 1.85 m

In conclusion, the technology described above provides the means to generate the power that will lead to the accomplishment of the project's objective, that is to say, to reduce GHG emissions through the displacement of energy from the grid generated with fossil fuels

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

The *ex-ante* emission reductions are estimated to be **619,710** tCO_2e for the chosen first crediting period of 7 years. Note that actual emission reductions will be based on monitored data and may differ from the estimate shown below.

Table 9: Total emission reductions during the first 7-year crediting period

Years	Annual estimation of emission reductions (tonnes of CO_2e)
2013	88.530
2014	88.530
2015	88.530
2016	88.530
2017	88.530
2018	88.530
2019	88.530
Total estimated reductions (tonnes of CO_2e)	**619.710**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reduction (tonnes of CO_2e)	**88.530**

A.4.5. Public funding of the project activity:

No funds from public national or international sources are involved in any aspect of the proposed CDM project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

The project activity uses an already existing consolidated baseline and monitoring methodology (ACM0002 – Version 12.3.0), which has been approved and made publicly available by the CDM Executive Board.

The methodology is designated ***"Consolidated baseline methodology for grid-connected electricity generation from renewable sources – Version 12.3.0".***

This methodology also refers to the latest approved versions of the following tools:

- Tool to calculate emission factor for an electricity system
- Tool for the demonstration and assessment of additionality
- Combined tool to identify the baseline scenario and demonstrate additionality
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The approved methodology ACM0002 – Version 12.3.0 is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The methodology is applicable under the following conditions:

- The project activity is the installation, or modification/retrofit of a, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;
- In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity

expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;

- In case of hydro power plants, one of the following conditions must apply:
  - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir.
  - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emission section, is greater than 4 W/m^2.
  - The project activity results in new reservoirs and the power density of the power plant, as per definition given in the project emission section, is greater than 4 W/m^2.

The project activity is not applicable to the following:

- Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site.
- Biomass-fired power plants.
- Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.

In addition, the applicability conditions included in the tools referred to above apply.

The project consists in grid-connected renewable power generation activity and meets the applicability criteria of the methodology ACM0002 version 12.3.0.

The proposed project activity is the installation of a hydroelectric power plant with a new reservoir having power density (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m^2. The power density of the Bonyic hydroelectric plant reservoir is equivalent to 173.88 W/m^2. The installed power generation capacity is equivalent to 32.64 MW and the surface area at the full reservoir level is equivalent to 180,000 m^2.

This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity: the project consists of the construction of new hydroelectric plants; therefore no fuel switch is applicable.

As stated above, the project activity under consideration meets all applicability conditions of the methodology. This justifies the appropriateness of the choice of the methodology for the project activity.

B.3. Description of the sources and gases included in the project boundary:

As per ACM0002 version 12.3.0, the spatial extent of the project boundary includes the project power plant, the transmission line, the project substation and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the following table:

Table 10: Emission sources included in or excluded from the project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel-fired power plants that are displaced due to the project activity	CO_2	Yes	According to ACM0002 version 12.3.0, project participants shall only account CO_2 emissions from electricity generation in fossil fuel-fired power plant that is displaced due the project activity.
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	As the project is a hydro power station with power density greater than 10 W/m^2 no project emissions have to be considered according to ACM0002 version 12.3.0.
		CH_4	No	
		N_2O	No	

For the baseline determination, project participants shall only account for CO_2 emissions from electricity generation in fossil fuel-fired power plants that is displaced due the project activity. The following figure shows a flow diagram of the project boundary.

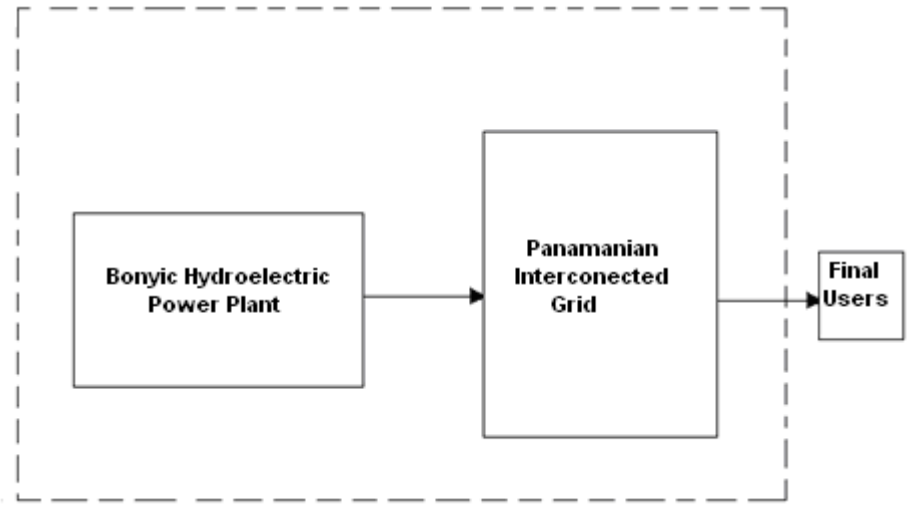

Figure 3: Flow diagram of the project boundary

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

According to the approved consolidated baseline methodology ACM0002 version 12.3.0, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the electricity delivery to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" version 02.2.0

Therefore, the baseline scenario is described as the electricity supply to the Panamanian interconnected grid.

Given this baseline scenario, project sponsors would have not invested in the proposed project activity.

As stated in the approved consolidated baseline methodology ACM0002 version 12.3.0, the baseline emissions are the product of the grid emission factor with the electricity supplied by the project activity to the grid. The grid emission factor ($EF_{grid, CM\ y}$) is calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" as a combined margin (*CM*), consisting of the combination of operating margin (*OM*) and build margin (*BM*) factors.

For emission reduction calculation, the baseline emission factor ($EF_{grid, CM\ y}$) is 0.568 tonnes of CO_2 equivalent per MWh of energy displaced, which was calculated for the electricity grid of Panama. This value is considered fixed during the first crediting period.

The following table summarizes the key data necessary for the *ex-post* determination of baseline emissions:

Table 11: Key data

Data	Source
Bonyic Hydroelectric Project Generation	Hidroecológica del Teribe, S.A.
Combined margin emission factor for the Panamanian Interconnected Electricity System.	Data provided by Panamanian Energy Secretary. It was calculated according to the "*Tool to calculate the emission factor for an electricity system"* Version 2.2.0

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

Prior consideration of the CDM

According to the guideline for completing the PDD, if the starting date of the project activity is before the date of publication of the PDD for global stakeholder consultation, it is necessary to provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity. In such cases, project proponents shall provide an implementation timeline of the proposed CDM project activity.

Since the starting date of Bonyic hydroelectric project, was before project validation, the following paragraph describes the implementation timeline and the evidence that the incentive for the CDM was seriously considered in the decision to proceed with the project activity.

As per CDM rules, the starting date of the proposed project activity is 28th August 2007, corresponding to the date on which an agreement was signed with Jera for the construction of the access road to the power station.

Notwithstanding the aforementioned, a number of problems arose subsequent to the signing of this agreement with Jera, leading to its termination a year later. Following a series of attempts to obtain financing, Empresas Públicas de Medellin (EPM) decided to finance the project themselves, taking into consideration primarily CDM benefits. It is reflected in the Executive Board minute 1408 (dated 14th August 2008) where it was explained this situation, the time-consuming process expended and the

importance of the CDM in the decision to finance the project. This decision, together with the removal of several other barriers below explained, allowed project development to continue.

CDM was seriously considered prior to the project activity start date. Evidence to support this awareness of the CDM is based mainly on the following events:

- The Letter of Endorsement, where the Republic of Panama endorses the further development of the Bonyic hydroelectric project and commits to render and facilitate assistance in the future, for the purposes of the Kyoto Protocol of greenhouse gases emissions reduction generated by the project (2002).
- The compensation and benefit agreement signed with the local indigenous Naso Teribe tribe for the construction of the Bonyic hydroelectric project, whereby it was agreed that the CDM benefits would be shared with this community (December 2004).
- The Letter of Consent issued by the Panamanian DNA regarding the participation of the Bonyic project in the carbon market through the Clean Development Mechanism (March 2007).

These actions confirm that CDM was seriously considered for this project activity in accordance with the criteria expressed in Annex 46 of the EB meeting 41[1].

The timeline for the DOE to assess the awareness and the serious consideration of the CDM in the project's decision making process and project implementation is stated in Annex 5.

Demonstration and assessment of additionality

According to the consolidated baseline methodology ACM0002 version 12.3.0, the additionality of the project activity shall be demonstrated and assessed using the latest version of the "*Tool for the demonstration and assessment of additionality*" agreed by the CDM Executive Board, which is available on the UNFCCC CDM website.

This tool considers some important steps necessary to determine whether the project activity is additional and it is also important to demonstrate how the emission reductions would not occur in the absence of the Bonyic Hydroelectric Project activity.

The following are the steps necessary for the demonstration and assessment of additionality of the proposed project activity.

[1] *http://cdm.unfccc.int/EB/041/eb41_repan46.pdf*

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

The realistic and credible alternatives identified, available to the project participants that provide outputs comparable with the proposed CDM project activity, are the following:

Alternative 1: The proposed project activity not undertaken as a CDM project activity.

Alternative 2: Continuation of the current trends of the Panamanian interconnected grid.

Alternative 1: involves a 32.64 MW hydro power plant not undertaken as a CDM project. As explained below, this alternative faces a prohibitive barrier that prevents its implementation.

Alternative 2: The Panamanian interconnected electricity system needs to increase its power generation capacity to respond to increasing demand. Given current market conditions and regulations governing the electricity system, it is both easier and faster to install a thermal power plant than a hydro power plant in Panama. Therefore, Alternative 2 would primarily contemplate the installation of new thermal power plants in the Panamanian electricity system in order to supply the country's ever-increasing electricity demand (this fact is already contemplated in the approximate estimation given by the build margin calculation of baseline emissions). The alternative for the project participant would be to look for more attractive investment opportunities elsewhere and not invest in the proposed project.

Sub-step 1b. Consistency with mandatory laws and regulations:

The alternatives named above are in compliance with all applicable legal and regulatory requirements in Panama. This is reflected in the Panamanian Expansion Plan which considers both alternatives[2].

Step 2. Investment analysis

This step is not selected.

Step 3. Barrier analysis

This step aims at demonstrating that the project activity faces barriers that:

(b) Prevent the implementation of the proposed project activity; and

[2] http://www.etesa.com.pa/plan_expansion.php

(c) Do not prevent the implementation of at least one of the alternatives.

Sub-step 3a. Identify barriers that would prevent the implementation of the proposed project activity:

The main barriers identified for the implementation of the "Bonyic Hydroelectric Project" are:

Barrier due to project location

A significant barrier for project implementation has been the project location in a sensitive social and biophysical environment, which has led to major obstacles in obtaining project financing and, consequently, serious delays in project construction and implementation.

The project had duly obtained the water concession and the Panamanian Environmental Authority's construction and operation permit. The specific location of the project does not include areas apt for human settlement, and therefore does not negatively affect existing activities within its direct area of influence nor cause any population displacements.

An environmental assessment based on best practices was carried out, as was a stakeholder information/consultation/consensus process with the indigenous community, in compliance with the Panamanian legislation. Maximum attention was paid throughout to ensure respect for the indigenous community and the ecosystem, to which effect support was sought and received from the Environmental National Authority (ANAM) as well as from Fundación Dobbo Yala, a prestigious ONG working in favour of the rights of indigenous populations.

However, at the time of the consultation process, the indigenous people living in the surrounding areas, belonging to the Naso Teribe community, were in the midst of a prolonged leadership crisis, caused by historical and political factors, as well as by family feuds and personal interests. This resulted in problems and delays in carrying out the stakeholder process, and in reaching an agreement between the project participant and the Naso Teribe people with respect to the project-derived benefits that would be acceptable to the community. This became a major obstacle in project development, since it inevitably affected the process of obtaining financing for the project and proceeding with its implementation.

Towards the end of August 2004 a Mandate Letter was signed with the Inter-American Development Bank for the purpose of structuring Project financing. Following the signature of this Mandate Letter, the Bank began to gather information on the Project and was informed of the concerns surrounding the legitimacy of King Tito Santana (the "King"), leader of the Naso people, which were also expressed by local and international non-governmental organizations (NGOs).

In view of the above, the Bank, together with HET, started drafting a strategy to carry out a social analysis of the situation with the Nasos and the development of the project. In early 2005, the Bank and HET contracted a social welfare consultant with extensive experience in matters related to indigenous populations to carry out an independent assessment of the implications that the Project would have on the Naso community, taking into account especially the internal problems within the Naso community with regards to the legitimacy of their king. In early February 2005, the Bank, HET and the social welfare consultant visited the project area and held a number of meetings with the various parties. It should be kept in mind that the Bank could not initiate its formal environmental due diligence activities until HET completed the revision of the Environmental Impact Assessment (EIA); this document was handed in towards the end of March 2005.

In mid-March the bank received the social welfare consultant's report, in which he informed of an internal crisis within the Naso community. This crisis had been caused by a number of factors, including historical and political issues, family feuds, personal interests, etc. However, it was evident that the crisis jeopardized to some extent the processes of information, consultation and building of consensuses. The consultant pointed out the risk that the minimum socio-political climate required to proceed with the Project would not be reached unless a consensus were achieved between the feuding parties. Similar arguments were presented to the Bank by NGOs during the IDB's Regional Meeting with civilian organizations held in Panama City on 20-21 February 2005.

The Bank, expressed its reluctance to proceed with the environmental due diligence until the conflict between the feuding parties were resolved and a socio-political climate that would enable the fieldwork related to the Project to proceed appropriately were achieved. This decision was based on the recommendations of the social welfare consultant and the Bank's Indigenous Populations Unit (that was providing institutional support to the Project), as well as other communications received by the Bank.

The Bank's stand on this issue should not be interpreted as being opposed to the Project; its aim, rather, was to avoid jeopardizing the Project by intervening at an inappropriate moment, a move that could end up by contaminating it with a problem that surpassed the limits of the Project. They therefore did not consider that they were sending a negative message to potential developers of hydroelectric projects in the area[3].

After extensive negotiations, an agreement was reached with the Naso people, a key clause of which was that 25% of CDM-derived income would be transferred to the indigenous community. In addition,

[3] Inter-American Development Bank letter to HET, 28th June 2005

HET would provide funds for local community training and employment opportunities, as well as academic scholarships.

In addition, the special requirements of the Bosque Protector Palo Seco (BPPS) Protected Area (where the project is located), constituted a further barrier to project implantation. Thus, as per DINEORA's resolution IA-100-2005 (November 2005), before project construction could start Hidroecológica del Teribe had to sign a land management concession agreement with ANAM, which included the obligation to pay ANAM a yearly canon throughout the duration of the concession.

Thus, implementation of the proposed CDM project activity best provides for the needs of local development and, at the same time, generates the appropriate resources for the management of the protected area. At the same time, CDM revenues will contribute to overcome the barriers raised by the project's sensitive location.

Investment barrier

A further significant barrier that the project developer had to overcome was access to long-term debt. This process was strongly affected by the aforementioned difficulties.

In 2004 the Inter-American Development Bank (IDB) signed a mandate letter, with a view to initiating actions leading to project finance structuring. Prior to proceeding with the environmental impact due diligence, the IDB required further information on the Naso community leadership crisis. To this effect, an independent consultant was hired by IDB and HET to investigate and analyze this issue. In his report, the consultant described the historical and political factors, as well as family feuds and personal interests that had given rise to the crisis. In addition, he pointed out that until and unless the underlying leadership conflict were solved, social and political conditions might not be conducive to the normal development of the project. On the basis of this report, and taking into account the potential complications these types of social issues might have on a multilateral financing institution such as the IDB, the IDB decided that it would have to withdraw its offer to provide financing for the project, and proceeded to cancel its mandate letter.

In 2006 Santander Bank won the public tender to provide support in the analysis of the different financing sources available in the market and in subsequently contacting these sources. Following extensive research, it was decided that the best offer was that presented by Banco Centroamericano de Integración Economica (CABEI –Central American Bank of Economic Integration) as a lender of record, together with Corporación Interamericana para el Financiamiento de Infraestructura (CIFI –Inter American Corporation for Infrastructure Financing), with Santander Bank as lead arranger. In

December 2007 CIFI approved the financing, which was followed by CABEI's approval in March 2008.

In November 2008 CIFI-CABEI Banks asked EPM (Empresas Públicas de Medellín), as principal shareholder of the HET society, to provide a real guaranty for the total amount of the loan. EPM was unable to provide this guaranty, since as a public sector entity, it has strict statutory limitations regarding the guaranties it can furnish. These limitations constituted a significant obstacle in negotiations with potential lenders.

In view of the major difficulties confronted in trying to secure external financing for the project, and taking into account that the delay this search was entailing was severely handicapping project development, EPM decided to provide the initial funding themselves.

EPM is known for its strong commitment to Corporate Social and Environmental Responsibility, and has played a pioneering role in promoting climate change awareness and CDM projects in Latin America. In this regard, it has a long history in CDM project activities, including its active role in the Jepirachi Wind Power Project (registered in April 2006), and the La Vuelta and La Herradura Project (registered in January 2007). In addition, EPM has established a Climate Change work group whose specific tasks include the identification of potential CDM projects, CDM project development and implementation and CDM project portfolio management, as well as supporting entities related with the National Strategy on Climate Change, and carrying out research in regards to climate change mitigation, adaptation, technology and financing.

CDM considerations played an important part in EPM's decision to finance the Bonyic project. Foremost among these considerations were those: (1) the project was participating in the Panamanian CDM portfolio and (2) the sharing of the proceeds of the sale of the CERs with the indigenous community potentiated the benefits the indigenous population would derive from the CDM project, in line with the company's stated corporate mission.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The continuation of the current practices, i.e., keeping the actual grid as it is, (baseline = *alternative 2*: the electricity supply by the Panamanian Interconnected Electricity System) is not affected by any of the barriers; the continuation of the current situation does not imply any change in the usual operation of the company, thus, it is not affected by the barriers mentioned above.

Step 4. Common practice analysis

Sub-step 4a. Analyse other activities similar to the proposed project activity and

Sub-step 4b. Discuss any similar options that are occurring:

As mentioned above, the Panamanian power system is composed mainly of thermal power plants and large hydroelectric projects. According to the CND[4], 63% of the total installed capacity corresponds to thermal power plants, demonstrating that hydroelectric power generation is not the common practice in the country. Currently there are only 7 hydropower plants operating in Panama; all 7 differ from the proposed project activity. Taking into account that Bonyic hydroelectric plant has an installed capacity of 32.64 MW, and will be developed and implemented after the privatization of the electricity sector in Panama (that took place in 1997-1998) there is no plant with similar characteristics in Panama. The only plant that could be considered to some extent similar is the Mendre hydroelectric project; however, Mendre is a CDM project, as shown in the following table:

Table 12: Hydroelectric Power Plants currently in operation in Panama

Plant Name	Installed Capacity (MW)	Operation Start	Comments
Fortuna	300	1984	Hydroelectric dam with installed capacity higher than the proposed project
Bayano	260	1976	Hydroelectric dam with installed capacity higher than the project, upgraded in 2002 and 2004 (CDM Project)
La Estrella	47.2	1979	Hydroelectric upgraded in 2007
Los Valles	54.8	1979	Hydroelectric upgraded in 2007
Esti	120	2003	CDM hydroelectric project with installed capacity higher than the proposed project
Concepción	10	2008	CDM hydroelectric project with installed capacity smaller than the proposed project
Mendre	18.94	2009	CDM hydroelectric project

[4] Source: http://www.cnd.com.pa/informes.php?cat=5

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The designed output of the proposed project activity is 32.64 MW.

The applicable output range as +/- 50% of the design output is 46.96 MW and 15.65 MW.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step;

In the applicable geographical area, there is no plant that delivers the same output of capacity between the range 15.65 MW and 46.96 MW, and has started commercial operations before the start date of the project activity. Only project between this range is Mendre project (18.94), but considering that is a project undergoing validation shall not be included in this step. Therefore, N_{all} is 0

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}..

No plants were identified in step 2, therefore, N_{diff} is 0.

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

For this particulate case F is considered as 0, since $N_{all} - N_{dif\,f} = 0$ and taking into account that this factor represents the share of plants using technology similar to the technology (used in the proposed project activity) in all plants that deliver the same output or capacity as the proposed project, and the fact that there is no plants using similar technology delivering the same output or capacity as Bonyic Hydroelectric project.

The proposed project activity is a common practice within a sector in the applicable geographical area if both the following conditions are fulfilled:

(a) the factor F is greater than 0.2, and

(b) $N_{all} - N_{diff}$ is greater than 3.

In conclusion, the Bonyic power plant cannot be considered common practice since there is no hydroelectric power plant with similar conditions in Panama and, according to the tool F is not greater than 0.2 and $N_{all} - N_{diff}$ is not greater than 3. . The common practice is the installation and the operation of large power plants, such as thermal power plants and large hydroelectric plants, and refurbishment or upgrading of existing power plants; and therefore Bonyic does not fit in the business-as-usual scenario. It should be noted that since the 1980s the only three new hydropower plants installed in Panama pursued the CDM, highlighting the importance of CDM in determining their viability.

Considering all the statements made above, it can be concluded that the project activity is not common practice.

Conclusions

Summarizing, Bonyic Hydroelectric Project cannot be considered as common practice, is not a business-as-usual type scenario and faces several barriers that prevent its implementation. Therefore, it is clear that, in the absence of the incentive created by the CDM, this project would not be the most attractive scenario.

The registration of the proposed project activity will prove beneficial to the indigenous community, and may have a strong impact in paving the way for similar projects to be implemented in Panama.

Considering all the above assessments, it is clear that the proposed project activity satisfies all the additionality requirements and therefore, the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission reduction

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel-fired power plants by renewable electricity. The emission reduction ER_y, by the project

activity during a given year y is the difference between baseline emission reductions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Baseline emissions

The baseline emissions (BE_y, in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y, in MWh) as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM\,y}$$

Where

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM\,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "*Tool to calculate the emission factor for an electricity system*" (tCO_2/MWh)

Emission factor

The baseline emission factor ($EF_{grid,\,CM\,y}$) is calculated (by Panamanian Energy Secretary) using the latest version of the "*Tool to calculate the emission factor for an electricity system*" according to the following steps.

Step 1. Identify the relevant electricity system.

For the purpose of determining the electricity emission factors, a project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

The delineation of the electricity system is publicly available through the national dispatch centre (CND[5]) and was used to clearly define the grid boundary. The Panamanian electricity distribution network is operated by three main distributors, namely, Edechi, Edemet and Elektra. The grid networks of these three distributors are interconnected and together with the national transmission system owned and maintained by ETESA, they form the national grid system (SIN). The national dispatch centre

[5] http://www.cnd.com.pa

(CND) of Panama is part of the ETESA and is responsible for issuing plans and assuring a reliable performance of the national grid.

Step 2. Choose whether to include off-grid power plant in the project electricity system (optional).

Project participant may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation

Option II: Both grid power plant and off-grid power plants are included in the calculation.

Option I was selected to calculate the operating margin and build margin emission factor.

Step 3. Select a method to determine the operating margin (OM).

The tool to calculate the emission factor for an electricity system gives 4 different options to calculate the operating margin emission factor ($EF_{grid,OM,y}$). These options are:

(a) Simple OM

(b) Simple adjusted OM

(c) Dispatch data analysis OM

(d) Average OM

The selection of the appropriate calculation method depends on, among other factors, the characteristics of the national electrical grid and the available information about it.

The simple OM method (a) can only be used where low-cost/must-run resources constitute less than 50% of total grid generation either 1) based on the average of the five most recent years, or 2) based on long-term normal for hydroelectricity production.

The average OM method (d) can only be used where low-cost/must-run resources constitute more than 50% of total grid generation.

For this project activity, the simple adjusted operating margin method has been selected from the four options proposed in the tool, since the low-cost/must-run resources constitute more than 50% of total grid generation, as it is shown in the following table:

Table 13: Percentage of low-cost/must run in total generation in Panama[6]

Year	Low-Cost/Must-run Percentage (%)
2004	61%
2005	61%
2006	55%
2007	54%
2008	59%
2009	54%
2010	55%
Average	**57%**

According to the tool, the simple adjusted operating margin emission factor can be calculated using one of the following data vintages:

- *Ex-ante* option: A 3-year generation-weighted average based on the most recent data available at the time of PDD submission to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period, or
- *Ex-post* option: The emission factor is determined for the year in which project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring.

In this particular case, the *ex-ante* option is selected among the two options proposed by the tool. As a consequence, the operating margin emission factor is calculated *ex-ante* and it is considered fixed during the first crediting period.

Step 4. Calculate the operating margin emission factor (EF_{OM}) according to the selected method.

In order to calculate the operating margin emission factor ($EF_{grid,OM,y}$) the simple adjusted method is used, as stated above. In this method, the $EF_{grid,OM,y}$ is calculated as the generation-weighted average CO_2 emission per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, where the power plants/units (including imports) are separated into low-cost/must-run power sources (*k*) and other power sources (*m*):

[6] http://www.cnd.com.pa

$$EF_{grid,OM-adj,y} = (1-\lambda_y).\frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y.\frac{\sum_k EG_{k,y} \times EF_{ELk,y}}{\sum_k EG_{k,y}}$$

where

$EF_{grid,OM-adj,y}$	=	Simple adjusted operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
λ_y	=	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year *y*
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by all power unit *m* in year *y* (MWh)
$EG_{k,y}$	=	Net quantity of electricity generated and delivered to the grid by all power unit *k* in year *y* (MWh)
$EF_{EL,m\,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2 /MWh)
$EF_{EL,k\,y}$	=	CO_2 emission factor of power unit *k* in year *y* (tCO_2 /MWh)
m	=	All grid power units serving the grid in year *y* except low-cost/must-run power units
k	=	All low-cost/must-run grid power units serving the grid in year *y*
y	=	The relevant year as per date vintage chosen in Step 3

$EF_{EL,m,y}$, $EF_{EL,k,y}$, $EG_{m,y}$ and $E_{Gk,y}$ should be determined using the same procedures as those for the parameters $EF_{EL,m,y}$ and $EG_{m,y}$ in Option A of the simple OM method as follows.

Determination of $EF_{EL,m,y}$

The emission factor of each power unit *m* should be determined as follows:

- **Option A1.** If for a power unit *m* data on fuel consumption and electricity generation is available, or
- **Option A2.** If for a power unit *m* only data on electricity generation and the fuel types used is available or,
- **Option A3.** If for a power unit *m* only data on electricity generation is available, an emission factor of 0 tCO_2/MWh can be assumed as a simple and conservative approach.

In this particular case, *Option A1*is selected among the other options proposed by the tool. As a consequence, the emission factor ($EF_{EL,m,y}$) is determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

where

$EF_{EL,m\,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2 /MWh)
$FC_{i,m,y}$	=	Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by all power unit *m* in year *y* (MWh)
m	=	All grid power units serving the grid in year *y* except low-cost/must-run power units
i	=	All fossil fuel types combusted in power unit *m* in year *y*
y	=	The relevant year as per date vintage chosen in Step 3

The parameter λ_y is defined as follows:

$$\lambda_y(\%) = \frac{\text{Number of hours low - cost / must - run sources are on margin in year y}}{\text{8,760 hours per year}}$$

where lambda (λ_y) should be calculated as follows:

Step i) Plot a load duration curve. Collect chronological load data (typically in MW) for each hour of the year *y*, and sort load data from highest to lowest MW level. Plot MW against 8,760 hours in the year, in descending order.

Step ii) Collect power generation data for each power plant/unit, and calculate total annual generation (in MWh) from low-cost/must-run power plants/units (i.e., $\Sigma_k EG_{k,y}$).

Step iii) Fill load duration curve. Plot a horizontal line across the load duration curve such that the area under the curve (MW times hours) equals the total generation (in MWh) from low-cost/must-run power plants/units (i.e., $\Sigma_k EG_{k,y}$).

Step iv) Determine the "Number of hours for which low-cost/must-run sources are on the margin in year *y*". First, locate the intersection of the horizontal line plotted in Step (iii) and the load duration curve plotted in Step (i). The number of hours (out of the total of 8,760 hours) to the right of the intersection is the number of hours for which low-cost/must-run sources are on the margin. If the lines do not intersect, then one may conclude that low-cost/must-run sources do not appear on the margin and λ_y is equal to zero.

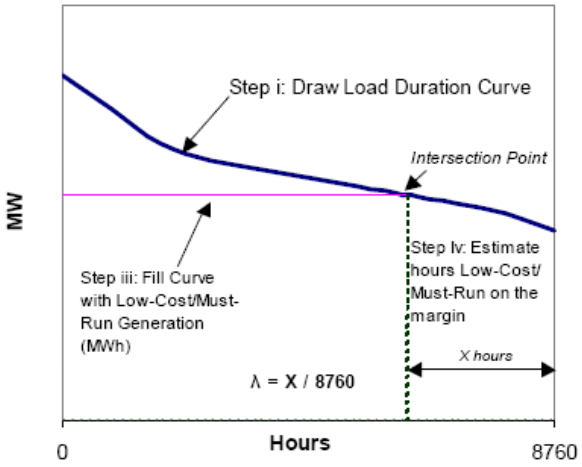

Figure 2: **Illustration of Lambda Calculation for Simple Adjusted OM Method**

Step 5. Calculate the build margin (BM) emission factor.

In terms of vintage of data, one of the following options could be chosen:

- Option 1: for the first crediting period, calculate the build margin emission factor *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated on the basis of the most recent information available on units already build at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

- Option 2: for the first crediting period, the build margin emission factor shall be updated annually, *ex-post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emission factor shall be calculated *ex-ante* as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

In this particular case, Option 1 is selected among the two options proposed by the tool. As a consequence, the build margin emission factor is calculated *ex-ante* and it is considered fixed during the first crediting period.

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with data vintage selected above:

(a) Identify the set of power unit, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5units}$, in MWh)

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activivities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently an that comprise 20% of AEG_{total} (if 20%falls on part of the generation of a unit, the generation of that units is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine fo the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SER\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM>10\ years}$)

For this project activity, the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently has been selected, since it comprised the larger annual generation, as it is shown in the following tables:

Table 14: Last plant built that represent 20% of total system generation

Plant	Operation Start date	Generation (MWh)
CICLO	2000	293,473.80
ESTI	2003	668,260.50
PEDREGAL	2003	397,203.70
HCANDELA	2006	2,657.20
HIDROPMA	2006	13,644.50
EGESA	2007	15,954.80
ISTMUS	2008	45,026.70
CANOPO	2008	490.40
IDB	2008	69,825.00
TCARIBE	2008	51.50
TOTAL		**1,506,588.10**

Table 15: Generation of the last five plants built

Plant	Operation Start date	Generation (MWh)
EGESA	2007	15,954.80
ISTMUS	2008	45,026.70
CANOPO	2008	490.4
IDB	2008	69,825.00
TCARIBE	2008	51.5
Total		**131,348.40**

The build margin emission factor ($EF_{BM,y}$) is calculated as the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y}.EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

where

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power units *m* in year *y* (MWh)
$EF_{EL\ m,\ y}$	=	CO_2 emission factor of power units *m* in year *y* (tCO_2 /MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which power generation data is available

Step 6. Calculate the combined margin emission factor (EF_{grid}).

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$)is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as preferred option.

The simplified CM method (option b) can only be used if:

- The proposed project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered project at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

For this project activity the option (a), weighted average CM has been selected and calculated as follows.

(a) <u>Weighted average CM</u>

The combine margin emission factor is calculated as the weighted average of the operating margin emission factor and the build margin emission factor and is expressed in tCO_2/MWh.

$$EF_{grid,CM,y} = w_{OM}.EF_{grid,OM-adj,y} + w_{BM}.EF_{grid,BM,y}$$

Where

$EF_{grid,OM-adj,y}$ = Simple adjusted operating margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} = weighting for operating margin emission factor (%)

w_{BM} = weighting for build margin emission factor (%)

In this case, for weighting these two factors, the default value of 50% will be considered for both the operating margin and the build margin emission factors (i.e., $w_{OM} = w_{BM} = 0.5$).

Project emissions

According to the methodology, for new hydroelectric power project with reservoirs no project emissions have to be considered if power density is greater than 10 W/m^2. The project power density is 181.33 W/m^2 (installed power generation capacity is 32.64 MW and surface area at full reservoir level of 180,000 m^2). Therefore, no project emissions are considered in the proposed project activity.

Leakage

As per the methodology, the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, upstream emission from fossil fuel use (e.g. extraction, processing, transport). These emission sources are neglected. Therefore, project participants do not need to consider these emission sources as leakages in applying this methodology.

B.6.2. Data and parameters that are available at validation:

Data/Parameter:	$EF_{grid, CM, y}$
Data unit:	tCO_2/MWh
Description:	Emission factor for the Panamanian interconnected grid
Source of data used:	Data provided by Panamanian Energy Secretary
Value applied:	0.568
Justification of the choice of data or description of measurement methods and procedures actually applied:	The baseline emission factor calculation consists of the combination of operating margin (OM) and build margin (BM) and the calculation was made from CND (Centro Nacional de Despacho de Panamá -Dispatch National Center-) official data according to the procedures prescribed in the approved tool to calculate the emission factor for an electricity system.
Any comment:	These data will remain fixed to estimate baseline emissions and emission reductions during the crediting period.

B.6.3. Ex-ante calculation of emission reductions:

As stated before, emission reductions are equal to baseline emissions because neither project emissions nor leakage effects are expected.

Baseline emissions

The baseline emissions (BE_y, in tCO_2) are the product of the baseline emissions factor ($EF_{grid,CMy}$ in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y, in MWh) as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM\,y}$$

Emission factor

Following the tool to calculate the emission factor for an electricity system, the combined margin emission factor ($EF_{grid,CM,y}$) consisting of the combination of operating margin emission factor ($EF_{grid,OM,y}$) and build margin emission factor ($EF_{grid,BM,y}$).

Calculate the operating margin emission factor ($EF_{grid,OM,y}$)

In order to calculate the operating margin, generation data from the Dispatch National Center (*Centro Nacional de Despacho*, CDN) needed to be gathered. The provided information comprised years 2006, 2007 and 2008; and is the most recent information available at this stage.

$$EF_{grid,OM-adj,y} = (1-\lambda_y).\frac{\sum_m EG_{m,y}..EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y.\frac{\sum_k EG_{k,y}.EF_{EL,k,y}}{\sum_k EG_{k,y}}$$

Following the tool to calculate the emission factor for an electricity system, the factor lambda (λ) was calculated on the basis of the number of hours that "low-cost/must-run" resources are on the margin in Panama. The hourly dispatch data permits the drawing of the curve (MW against hours) for the calculation of lambda (λ).

The emission factor of the operating margin (EF_{OM}) is:

$$EF_{grid,OM-adj,y} = (1-\lambda_y).\frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y.\frac{\sum_k EG_{k,y} \times EF_{ELk,y}}{\sum_k EG_{k,y}} = 0.778\ tCO_2/MWh$$

Build margin emission factor ($EF_{grid,BM,y}$)

Build margin emission factor $EF_{grid,BM,y}$ is based on the most recent information available on plants already built for sample group *m* at the time of PDD submission The sample group *m* consists of the

power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The emission factor of the build margin (EF_{BM}) is:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y}.EF_{EL,m,y}}{\sum_{m} EG_{m,y}} = 0.357 \text{ tCO}_2/\text{MWh}$$

Baseline emission factor ($EF_{grid, CM,y}$)

This is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{gridBM,y}$). The weights w_{OM} and w_{BM}, have been chosen as 50% (i.e., w_{OM} = w_{BM} = 0.5), following the default values given in the methodology.

$$EF_{grid,CM,y} = w_{OM}.EF_{grid,OM-adj,y} + w_{BM}.EF_{grid,BM,y}$$

$$EF_{grid,CM} = 0.5 \times 0.778 + 0.5 \times 0.357 = 0.567 \text{ tCO}_2\text{e/MWh}$$

Electricity generation

The proposed project activity involves the installation of a hydroelectric plant with a capacity of 32.64 MW. The Bonyic hydroelectric plant is already under construction and it is expected that its operation will start by September 2012. The electricity expected to be supplied by the project activity to the grid (EG_y in MWh/ year) is calculated as follows:

$$EG_y = Power\ Capacity \times hours\ per\ year \times Load\ Factor$$

The following table summarises the values used to calculate the above result.

Table 16: Input values for calculating electricity generation

Parameter	Value	Unit
Power capacity	32.64	MW
Hours per year	8,760	hs/year
Load factor	55	%

Therefore, electricity supplied by the project activity to the grid for the chosen crediting period can be estimated and is shown in the following table.

Table 17: *Ex-ante* electricity generation during the first 7-year crediting period

Year	Generation (hours per year)	EG_y (MWh/year)
2013	8760	156.000
2014	8760	156.000
2015	8760	156.000
2016	8760	156.000
2017	8760	156.000
2018	8760	156.000
2018	8760	156.000
Total	**61,320**	**1.092.000**

Electricity generation has been estimated in the spreadsheet *Emission Reductions Bonyic.xls*.

Baseline emissions

As mentioned above, baseline emissions include CO_2 emissions from fuels that would have been used by the operation of grid-connected power plants and by the addition of new generation sources, in order to generate the quantity of electricity generated through the proposed project activity.

$$BE_y = EG_{PJ,y} \times EF_{grid,CM\,y}$$

where

EG_y	Electricity supplied by the project activity to the grid (MWh/year)
$EF_{gridCM,y}$	Combined margin CO_2 emission factor for grid-connected power generation in year y calculated using the latest version of the "tool to calculate the emission factor for an electricity system" (tCO_2/MWh)
$BE_{,y}$	Baseline emissions in tonnes of CO_2 equivalent per year

The combined margin CO_2 emission factor for grid-connected power generation displaced due to the project activity is equivalent to 0.568 tonnes CO_2e/MWh.

Therefore, GHG baseline emissions for the chosen crediting period can be estimated and are shown in the following table.

Table 18: *Ex-ante* baseline emissions during the 7-year crediting period

Year	EGy (MWh/year)	Baseline emissions (tCO_2/year)
2013	156.000	88.530
2014	156.000	88.530
2015	156.000	88.530
2016	156.000	88.530
2017	156.000	88.530
2018	156.000	88.530
2018	156.000	88.530
Total	**1.092.000**	**619.710**

Baseline emissions have been estimated in the spreadsheet *Emission Reductions Bonyic.xls*.

B.6.4 Summary of the ex-ante estimation of emission reductions:

The project activity has the capacity to reduce **619.710** tonnes of CO_2 equivalent emissions during the first 7-year crediting period.

The emission reduction ER_y achieved by the project activity is given by:

$$ER_y = BE_y - PE_y - LE_y$$

The following table summarises the values obtained above.

Table 19: *Ex-ante* emission reductions during the 7-year crediting period (tCO_2)

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2013	0	88.530	0	88.530
2014	0	88.530	0	88.530
2015	0	88.530	0	88.530
2016	0	88.530	0	88.530
2017	0	88.530	0	88.530
2018	0	88.530	0	88.530
2018	0	88.530	0	88.530
Total	**0**	**619.710**	**0**	**619.710**

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data/Parameter:	EG_y
Data unit:	MWh/year
Description:	Electricity supplied by the project activity to the grid
Source of data to be used:	Hidroecológica del Teribe, S.A.
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	156,000 MWh/year
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording of the electricity delivered to the grid will be monitored through electricity meter installed in the generation unit and in the energy generation reception unit. To measure the energy that is provided to the interconnected grid, two redundantly set-up energy meters, reading, as established in the commercial measuring system regulations, have been installed in the ETESA Changuinola substation, defined as the project commercial boundary substation
QA/QC procedures to be applied:	Equipment will be regularly calibrated. Cross check measurement results with records for sold electricity
Any comment:	These data will be used to calculate the emission reductions obtained through the project activity. Data will be archived electronically until two years after finishing the crediting period.

Data/Parameter:	Cap_{PJ}
Data unit:	MW
Description:	Installed capacity of the hydropower plant after the implementation of the project activity
Source of data to be used:	Hidroecológica del Teribe, S.A.
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	32.64
Description of measurement methods and procedures to be applied:	The installed capacity will be determined on the basis of recognized standards.
QA/QC procedures to be applied:	The uncertainty level of the data is low, and the installed capacity of the hydropower plant after implementation of the project activity will be cross checked trough the equipment

	nameplate.
Any comment:	These data will be monitored yearly.

Data / Parameter:	A_{PJ}
Data unit:	km^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be used:	Hidroecológica del Teribe, S.A.
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	0.18
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc.
QA/QC procedures to be applied:	The uncertainty level of the data is low and the equipment used will be calibrated
Any comment:	These data will be monitored yearly.

B.7.2. Description of the monitoring plan:

According to the approved methodology ACM0002 version 12.3.0, the monitoring plan shall consist of the monitoring of the electricity generation from the proposed project activity, the surface area of reservoir at the full reservoir level and the installed capacity of the plant after project implementation.

The project participant will assign a qualified person to compile the necessary data according to the approved methodology to accurately calculate emission reductions. The data will be compiled in a manner amenable to third party audit and deliverable to the DOE for certification purposes.
The monitoring of the electricity generation will be carried out by Hidroecológica del Teribe, S.A. through its maintenance and operation team.

Project connection to the national grid, commercial frontier and measurement systems of the electricity delivered to the grid are regulated by Operation and Transmission Regulations.

Bonyic hydroelectric power plant will be connected to the national interconnected grid by means of a 12 km long, 115 kV transmission line that connects the power plant substation with the ETESA Changuinola substation.

To connect it with the Changuinola substation, a 115 kV field has been installed. It is composed of, among others:

- Three power transformers on the transmission line
- One three-phase switch on the transmission line
- Three power transformers on the barrage
- One control, measurement and protection panel.
- Auxiliary alternating current and direct current panels.

The power plant is connected to the terminals of the current 220/115 kV autotransformer of the ETESA substation.

In order to project the transmission line there are two line protections redundantly set up with the following features:

- Distance protection (21/21N)
- Directional phase and earth overcurrent protection (67/67N)
- Surge protection (59)
- Synchronization verifier (25 F)
- Triggering circuit monitoring (74-1,74-2)

For teleprotection between both substations, the equipment installed in both extremes is communicated by means of standard monomode optical fiber, installed in the OPGW type return cable of the transmission line.

To control the substation field, there is a programmable controller, which shall be integrated to the existing grid in the ETESA substation by means of a communication network. The ETESA substation shall also serve the purposes of enabling the National Dispatch Center (CND in Spanish) to monitor the equipment, pursuant to current regulations.

To measure the energy that is provided to the interconnected grid, two redundantly set-up energy meters, with 0.2 S accuracy class and prepared for remote reading, as established in the commercial

measuring system regulations, have been installed in the ETESA Changuinola substation, defined as the project commercial boundary substation.

Additionally, in the Bonyic power plant, there is measurement and protection equipment with similar characteristics to the equipment installed in the Changuinola commercial Boundary substation, both for internal control and for monitoring by the National Dispatch Center (CND in Spanish) of the equipment that connects the 115 kV substation to the grid and of the generation equipment.

Currently, there is no contractual relationship with ETESA. The relationship, electricity monitoring and equipment calibration are regulated by Operation and Transmission Regulations and Law 6.

In this context, measurement equipment calibration, which must be performed by the responsible entity in Panama (ETESA) by means of the corresponding laboratories, and must be certified by placing the corresponding stamps on the equipment.

On the other hand, during project implementation stage different procedures will be prepared (for example for training, emergencies, records, uncertainties, corrective actions and calibration of the equipments).

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

The application of the baseline study and monitoring methodology was completed on 12/08/2010 by Rocio Rodriguez, MGM Worldwide LLC, as subcontractor of MGM Innova Consulting LLC.

Contact information:

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Rocio Rodriguez, MGM Worldwide LLC, is not a project participant.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

The starting date of the proposed project activity is 28th August 2007, which corresponds to the agreement with Jera, company in charge of the power station access road construction.

C.1.2. Expected operational lifetime of the project activity:

50 years.

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

01/01/2013 or project registration date, whichever is later.

C.2.1.2. Length of the first crediting period:

7 years.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The following is a summary of the Environmental Impact Assessment (EIA)

Positive Impacts

Controls on hydro resources: In this regard, a change in the shallow regime in the dried up segment of the natural drain is generally assumed as a negative effect, but since there is a management of water resulting from the hydraulic engineering, this change is positive. For example, there will be a better control of flooding and exhaustion of the resources due to droughts.

Management of the sub-basin territory: Since the Project has a hydraulic nature and requires a good management of existing natural resources in the area, it requires a planned management of the territory. A social factor important for this Project will be the trend towards a population concentration in the area, the use of the forest for new activities (for example eco-tourism), the control of tree felling and other uses such as managed water, etc., which entails a reorganization of the land, which will improve the quality of life of the communities, guaranteeing the sustainability of water resources.

Diversification and intensification of economic activities: The new requirements created by the construction and operation of the Project demand new economic activities. Most significantly, it requires the change from current state to a local subsistence fragmented economy, including indigenous communities and an extended mercantile economy, linked not only to national major cities but also to international major cities.

Development of the local infrastructure: The construction of access ways is a positive effect, especially for the local community and economy in the area. Nevertheless, it is necessary to consider that this development factor may also have undesirable effects due to the new distribution of population, the promotion of migration ravines, etc.

Access to new services: The Project shall require the need of services such as telephone, permanent potable water, appropriate disposal of solid waste, shopping centers, etc., all of which would consititute new services for the area.

Development of social consciousness with regards to the indigenous community: The above-mentioned economic and social results involve a liberalization of the work force, which in the short term will become an industrial labour force from agricultural production force, which implies a new enhancement of social consciousness with regards to indigenous communities. This is positive, in terms of socioeconomic advance, but also the negative aspect must be analyzed, which involves the change of some cultural patterns, costumes and traditions that may be important for the sustainability of the system.

Savings in the national accounting of atmospheric contaminants: The hydroelectric project, as an energy project, belongs to the "non-contaminant generation" group. In particular, the derivation dam, with water in small pools, with fast circulation and renewal of the water, does not lead to methanization processes (and their concurrent harmful greenhouse gas effects). Thus, it is assumed that such hydroelectric projects will reduce the national energy generation based on the combustion of fossil fuels and avoid the corresponding emissions of gases, resulting in a saving in the national account of atmospheric contaminants.

National saving of fossil fuels: This is an effective, measurable positive effect and corresponds to the consumption of fossil fuel to be supplied in order to generate the same amount of energy produced by the hydroelectric project. The biggest savings come from hydrological resources, which are abundant in Panama and renewable on its energy use.

Physical Impacts

Alteration of landforms: The Project shall involve some alteration of the local geography, and the formation of new products modeled by the land movements (cutting of terraces, excavation for channels, etc.) and the compacting during civil and hydraulic works. This includes the flooding of a segment of the river valley, turning it into a lake environment as a consequence of the operation of the Project.

Increase in land erosion rate: Due to the characteristics of the soil, geomorphology and rainfalls, described in the Environmental Baseline, movement of soil and removal of vegetation create conditions favorable for increased hydric erosion of soils. Regressive erosion may occur at the edges of the Bonyic ravine in the reduced flow segment.

Alteration of the sediment and nutrients pattern of the Bonyic ravine: The barrier created on the ravine by the dam and the deviation of water to the turbine change the sediment and nutrient dynamics in the Bonyic ravine. In addition, the eventual opening of the lock gates at the bottom of the dam would entail a distribution of the sediments throughout the ravine, downstream of the dam site, very different to the usual situation.

Change of the hydrological regime: This change is caused mainly in the flow reduction segment of the Bonyic ravine, due to the deviation of water for electricity generation. As described before, an ecological flow will be located there due to the construction of the Project. The natural flow is reconstructed in the area of discharge of turbine water. Downstream from this point there shall be no major variations, since the dam that shall be constructed shall not regulate the water.

Change of the bottom dragging pattern at Bonyic Ravine: The bottom dragging of the river bed is very important for the life of a watercourse. The Bonyic ravine will change its dragging pattern, mainly due to the change of flow regimes in the area with a decrease of flow, or due to the eventual opening of the lockgate in the bottom of the dam. In addition, there will be a change of the dragging in the discharge of water after it passes through the turbine, due to the kinetic energy transferred by the fluid on the natural flow of the ravine and the area for the extraction of material.

Damage to the quality of shallow waters: This problem is mainly linked to the construction stage of the Project and is caused by the contribution of sediments (especially colloidal), oil, grease and additives used in the construction, as well as waste and wastewaters generated by the workers. During the operation, an opening of the lockgate at the bottom may also produce changes in the quality of water at Bonyic.

Contamination due to noise and vibration: The environmental contamination due to noise and vibration occurs during the construction stage, due to the movement of machinery and equipment operation, and during the operation of the project due to the movement of turbines.

Air affected by particles and gases: This effect is associated with the construction stage, due to the movement of machinery and equipment using fossil fuel. The equipments use fossil fuel, especially while transporting materials by land. Due to the volume and topography of the work area, this produces significant emissions. In addition, gases and particulate matter will be produced due to explosions.

Change of the landscape: This aspect is mainly related to the modification of the land due to land movements, creation of dikes, etc., and also due to the creation of a lake in a place where it did not exist before, creating a new artificial landscape.

Biotic Impact

Loss of biomass: This effect is produced by the loss of vegetation cover due to the construction of access ways, camps, service areas, dam, engine room, etc.; and it is also the result of a pool of water replacing the gallery forest in the dam area. The vegetation in the area of the artificial lake will be removed before the flood affects the biomass.

Alteration of terrestrial fauna population: The noise, vibration and human presence during the construction of the project will definitely produce at least a temporary displacement of local fauna to safer habitats. Although some will remain or return to the affected area, overall population is likely to decrease.

Loss of natural habitats: Due to the flooding of the dam, some natural habitats of the gallery forests and lower terraces in the river valley will be reduced. In addition, some habitats shall be lost due to the construction of access ways, engine rooms and the protection dike, since they are located over an ecotone and these sites are in general rich in species that help in the reconstruction of the riverside ecosystems after extreme situations ("Life insurance species" according to Barbier, 1994).

Increase in habitats for pathogenic agents: The disposal of solid waste, especially organic solid waste, attracts disease vectors. Likewise, the creation of bodies of slow-moving water attracts diseases as well, which may create a new habitat for species such as Aedes Aegypti.

Alteration of the migration pattern of species: The barrier effects of roads and of the dam will modify the migration pattern of the terrestrial and aquatic fauna, respectively. It also will have effects in this field, due to the massive human presence during the construction of the project.

Socioeconomic Impacts

Unemployment on completion of works: The negative effect is the drastic unemployment. The most serious problems are likely to arise for local non-qualified manpower, which is very common in the Naso indigenous sector.

Changes in the migration pattern in the area: Due to the effects of the project, the indigenous manpower that migrated will return to their land, and those about to migrate will remain in their area waiting for new opportunities, and finally, some external manpower will arrive and settle with their families in the areas surrounding their work place. Although this new pattern is well anticipated, together with the conditions existing at the project siteas per the Environmental Baseline, it is understood that this change will complicate the situation of the system, especially when the construction is over.

Increase of morbidity: The social migratory flow, the concentration of population, the formation of habitat favoring pathogen vectors, etc. are conditions that may increase the morbidity of the area, if appropriate sanitary and health conditions are not followed.

Increase of social pathologies: Due to the increase of the local gross incomes and the new migratory pattern, with the presence of personnel foreign to the indigenous environment, in general some social pathologies may arise including prostitution, alcoholism, delinquency, etc., especially in the absence of education and organization policies aimed to increase social and cultural awareness of the population in the area.

Lack of balance in the offer/demand of services: In an area with very basic service offers, any sudden increase of the demand will generate some conflicts. The conflict will be focused mainly on food and transportation services, since the local population expects to obtain benefits from this project, and sometimes, in order to guarantee the quality/cost relationship, these services are provided by groups from other areas, and in this case this conflict may be mixed with the ethnic factors.

Abrupt increase of the productive force in the area: This is related mainly to the Naso indigenous region, which has a very basic level of productive force. The region will be in contact with the highest technologies, involving management of these technologies, liberalization of work force –which enters into the labor free market-, organization and labor discipline, hierarchy of the time over the space according to the indigenous view of the world, etc. The negative effect is not the change itself, but how it is brought about, the "abrupt increase" or sudden growth for which the social environment is not prepared, may cause negative effects (for example, critical gaps between the material sufficiency and the spiritual sufficiency of the social entity).

Alteration of traditional production relationships: The Baseline describes the current relationships of indigenous production, which certainly will suffer modifications with the project. This may be considered as positive or negative, depending on the approach to the development of the project within

the environmental system. In other words, this alteration may involve a huge step towards the progress or towards a crisis, with unpredictable consequences due to the particular ethnic and social conflict.

Changes of land use: The flood of the dam produces a new land use, nevertheless, the environmental organization required by the Project is more important because it involves an objective organization of the land uses to sustain the water.

Increase of the value of the land: This is the immediate consequence of the multiplicative economic effects of the Project. In general this is a positive effect for agricultural producers with credit capacity that are aware of the value of changing agricultural products and the mercantile culture of the land. Nevertheless, this is not the situation of the indigenous communities, which are engaged in a subsistence agricultural environment without property deeds of the lands, credits, etc. The agricultural history of our countries has proved that these increases of values are a prelude to the relinquishing of properties and, thus, the people are reluctant to provide details of the property deeds for the lands.

Effects in the tenancy of lands: This aspect is aimed at the people directly affected by the project. Some indigenous families will be affected by the project, whether due to the access roads or due to the facilities of the engine room and diverting works of the dam. These are very few families and the lands are used in accordance with the national agricultural concept of "Possession Right". In any case, this conflict may be solved by means of a transaction by consensus between the parties, which must consider the historic and commercial value of the lands.

Increase of the cost of living: This effect is related to the increase of the gross salary per capita in the area, and market dynamics, etc., that is to say, this is the logical result of the economic growth generated by the Project. The negative aspect is defined by the uneven distribution of growth, which may involve the emergence of a sector that is able to take care of this higher cost of life and another sector that is not able to do so, generating a process of even more poverty and exclusion.

Population concentration: This effect is likely to arise as some areas are clearly favored by the development of the Project (for example crossroads or social centers of exchange and decision making) over which the population will converge. For example Solón, which already is a village with some basic services and is the community that is closest to the project, will have an access road and a bridge that will connect it with Changuinola, thus it will be a point of convergence and population growth; the same will happen with Sieyic, as center of power of Naso government. The problem is to achieve the urbanization of a population of such nature, respecting the indigenous cultural aspects and fulfillment of

the sustainability principles. Some conflicts may arise if this process is not developed in accordance with planned criteria.

Cultural and Human Impact

Disintegration of families: The disintegration of families is a result of the conflicts between families due to the new attitudes and habits due to the project, which clash with the family unity. The current execution of tasks and distribution of work within the family will change, especially in those families where the head of the family is participating in the industrial labor market of the project. Some of these new habits are opposite to the tradition and will lead to the disintegration of the group.

Increase of conflicts inter/intra ethnic groups: The Naso ethnic group has a clear identity expressed in their customs and traditions. In addition, it has a power structure that has allowed their own management of their political, social, economic, cultural and environmental life up to date. The arrival of new ethnic groups to the area, as direct or indirect workers of the project, especially from other ethnic groups such as gnöbés, will create inter-ethnic frictions that may lead to conflicts. Likewise, the economic and political factors that are a consequence of the project, will involve intra-ethnic conflicts within the Naso group, due to the new interests that arise from the new opportunities, with limited access because of the existing inequalities.

Imbalance of the traditional indigenous institution: This effect is already observed, even without the construction of the project, and refers to what K. Wittfogel clearly points out in his work "The Hydraulic Civilizations" about the relations between the political institutions and hydraulic work, which is an issue widely proved throughout history. The social, economic and political problems to be faced by the Naso ethnic group due to this project are not the same as what they faced under a subsistence society, which requires their institutions to be at the same level as the democratic management of the kind of decisions to be made.

Effect of traditions and customs: The permanent contact with other cultures, the inclusion of the new work order because of the project, as well as the opportunities and risks that may arise will condition the daily life and customs of the Naso people. This may have some positive effects in some cases, as well as negative effects even for the sustainability of the system. For example, an alteration of the perception of some ichthyofauna, by giving them a commercial value instead of the use value they currently have, would affect the current tradition of fishing, with negative effects for the sustainability of the specie.

Effect on archeological and historic resources: During the archeological explorations some archeological ceramic pieces were found in the area. Although, these do not indicate the existence of important settlements, they do prove the presence of people such as harvesters, hunters, fishermen)that have left a historic footprint of the population

Components of the environmental management plan

The following constitute the various components of the environmental management plan:

Physical management plans

- MM1. Work for the control of runoff
- MM2. Control of sediments
- MM3. Control of the erosion in the exposed soil
- MM4. Management of the exploitation of material sources
- MM5. Recovery of areas by landscape alteration
- MM6. Management and control of vibrations due to explosions
- MM7. Control of noise
- MM8. Disposal of excavation remains
- MM9. Recovery and restoration of areas for temporary use
- MM10. Planning and organization of areas for direct and indirect activities of the construction
- MM11. Collection, management and disposal of waste
- MM12. Collection, management and appropriate disposal of liquid waste

Biotic Management Plans

- MM13. Management of the deforestation in the dam and work area
- MM14. Management of the ecological volume of flow
- MM15. Management of the biota in the area of reduction of the flow volume
- MM16. Re-vegetation
- MM17. Maintaining of the vegetation cover
- MM18. Formulation of a plan for the organization of the land for environmental sustainability
- MM19. Management of fauna

Social Management Plans

- MM20. Training on appropriate and sustainable technologies

- MM21. Information, communication and environmental education
- MM22. Negotiation of lands, compensation for improvements and payment for damages and way rights
- MM23. Generation of jobs
- MM24. Support for the strengthening of the institution of ethnic groups
- MM25. Implementation of compensations

Biophysical Monitoring Plan

- M1. Monitoring of sediments
- M2. Monitoring of flow volume
- M3. Monitoring of the amount of shallow water
- M4. Monitoring of noise and vibrations
- M5. Monitoring of particulate matter
- M6. Monitoring of the morphological conditions of Bonyic ravine
- M7. Monitoring of the erosive processes and sedimentation in the dam
- M8. Monitoring of the land fauna
- M9. Monitoring of land vegetation
- M10. Monitoring of water fauna
- M11. Monitoring of species with biomedical importance in the project area
- M12. Monitoring of the physical conditions of vehicles
- M13. Monitoring of the stability of slopes

Social Monitoring Plan

- M14B. Monitoring of the economic multiplicative effect
- M15. Monitoring of the follow up of jobs
- M16. Monitoring of the follow up of the conflicts generated by the project
- M17. Monitoring of the follow up of compensation measures
- M18. Monitoring of the follow up of the information, communication and environmental education
- M19. Archeological monitoring

Risk Plan

- MR1. Prevention and attention of emergencies due to labor accidents

- MR2. Prevention of accidents caused by explosions
- MR3. Prevention and control of effects on biomedical species
- MR4. Prevention and control of contamination caused by spillage of fuel and oils
- MR5. Control of air contaminants and accumulation of toxic gases
- MR6. Prevention and control of movements of mass
- MR7. Prevention of effects on archaeological resources
- MR8. Manual for inter-ethnic coexistence
- MR9. Emergency plan in case of rupture of dam and flood.
- MR10. Prevention and emergency plan in case of terrorism, disorders and violence

Public Forum

In line with Article 27, Clause 2 of Executive Decree N° 59 (March 16th, 2000), on June 28th 2005 a Public Forum was held in the District of Changuinola, with the aim of presenting the proposed activities and Environmental Impact Study to all interested parties (i.e., community, NGOs, State entities) and finding out the concerns these parties might have with regards to the Project.

In order to reach the largest possible audience, a widespread publicity campaign was mounted, including announcements in public areas, in the press and over radio, personal invitations, etc.

Close to 250 people from the indigenous and non-indigenous population of the areas influenced directly and indirectly by the Project attended the Forum.

The questions raised by the participants focused primarily on aspects such as employment, wages and contracting conditions, compensations and indemnifications, effects on cultural heritage and handling thereof, information/consultation process, energy distribution to community, benefits to the community and municipality, timeline and financing of project, water quality, loss of biodiversity, institutional issues related to the indigenous population, validity of agreements and project-community relations.

The Forum was duly documented in conformity with ANAM (Autoridad Nacional del Ambiente, the Panamanian environmental authority in charge of environmental issues**)** requirements, and the corresponding document was handed to the environmental authority as part of the requirements to validate the environmental impact studies of the Project.

No significant concerns that might potentially affect the viability of the project were submitted either during the Forum itself or within the legally-established subsequent time period. In view of this, ANAM issued Resolution IA-100-2005 approving the EIA of the project and the management measures contemplated therein.

Conclusions and final remarks

The Bonyic Hydroelectric Project presents an excellent opportunity to apply measures guaranteeing environmental sustainability.

The cost-benefit analysis shows positive results, both from the point of view of the company and the environmental regulation perspective. The net social benefits are clear and ensure that if the Bonyic Hydroelectric Project is well managed, it will result in future benefits for all parties involved as well as for the environment.

The risk justification analysis shows values greater than 10, indicating that the investments proposed in order to avoid risks are fully justified.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The project participant submitted the Environmental Impact Assessment (EIA), carried out under the terms established by the InterAmerican Development Bank and the Instituto de Recursos Hidráulicos y Electrificación (IRHE – Institute of Hydraulic Resources and Electrification) and approved by ANAM–, in their Resolution Nº IA-150-98. The project participant agreed to follow the guidelines set forth in the submitted EIA and in the aforementioned Resolution for the prevention, mitigation and compensation of project environmental impacts.

The project includes an environmental management program and a series of plans that not only mitigate and neutralize the environmental impacts caused by the project, but also provide local infrastructure and resources to improve community life and development.

The environmental and social management program set forth by Bonyic allows for a good coexistence between conservation of biodiversity and resources of the indigenous community, and energy generation activities (in all cases respecting community dynamics and land use under any form of land ownership).

In line with its corporate environmental and social responsibility policies, as a standard measure, EPM (Empresas Públicas de Medellín, principal shareholder of the HET society) ensures community participation and implements preventive measures already at the early stages of development of all its projects, with the aim of minimizing impacts, complying with all legal requirements, improving the quality of life of the surrounding communities and promoting local, regional and national development.

All EPM projects are carried out following strict environmental and social management standards. Thus, for example, the social plan developed by EPM for the Wayuu native community living in the area of influence of the Jepírachi wind project in Colombia, was recognized by the World Bank as a model for the management of projects located in native communities, and served as reference for the creation of the World Bank's Community Carbon Fund (CCF), the aim of which is to support less-favored communities in the areas of influence of CDM projects.

In line with its social and environmental responsibility policies, on June 14th, 2006, EPM officially endorsed the Global Compact, a United Nations initiative that is both a policy platform and a practical framework for companies that are committed to sustainability and responsible business practices, and brings together thousands of companies worldwide that voluntarily commit to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption.

HET is currently implementing, and will continue to implement during the whole process of project construction and operation, measures aimed to foster the recovery of the vegetation that existed prior to the impact on the area, trying to preserve or emulate the initial ecosystem structure. Environmental management entails the identification of the initial vegetation and the characterization of its flora and structure, followed by the design of a reforestation and compensation plan. During the preliminary construction works, seeds and other vegetative parts that can serve as reproductive material shall be collected and tested to determine their germination viability.

According to the environmental management plan of the project, HET will carry out programs aimed at environmental recovery and at the compensation of areas such as the access road to the area (an unavoidable impact). In order to execute the project environmental management plan, HET has a special department in charge of environmental and social management as follows:

Figure 3: Environmental and Social Management structure

The management plan presents clear measures to avoid the deterioration of the water quality by removal of vegetation cover, to foster stabilization of a new aquatic habitat, to ensure that the impacted areas be the minimum required for the site construction, and to rationally manage vegetation cover by utilization of the wood and capture of those seeds and plants of species of particular interest for the region.

The Company declares that certain preferences and compensatory and environmental measures shall be awarded or carried out in benefit of the Naso people, as stated in its environmental management plan.

Said preferences and measures include the following:

- Preference in the contracting of Naso qualified and non-qualified manpower, when available
- Indemnification for damages and easement related to the Bonyic hydroelectric project; in these cases, the Nasos shall receive a single, one-off payment
- Contracting of Rangers from the Naso people when these are required by the Project
- Both parties shall define together with ANAM the location of a guard post to control entry into the area
- Reforestation and recovery of degraded areas in the areas occupied by the Nasos.

Additionally to the mitigation measures contemplated in the EIA, Resolution DINEORAIA- IA-100-2005, where the updated EIA is approved, stated that HET must take several measures, including:

a) Prior to tree felling, process the corresponding permits, in coordination with the Bocas del Toro Regional Administration of the Environmental National Authority. The project developer must present an inventory of the flora with a sampling intensity of 20% in the reservoir area, power house, dam site and complementary project infrastructures.

b) For each felled tree, reforest, with ten trees of a local native species and provide the necessary maintenance for five consecutive years in a place approved by the Bocas del Toro Environmental Regional Administration.

c) Comply with Resolution AG-0235-2003, under which a tariff is established (as a form of indemnification for environmental impact) both for tree felling and the issuance of the permits required for works, infrastructure and construction implementation.

d) Prior to felling trees, recover and relocate flora and any other endemic species of the area, including nests, eggs, young both birds, reptiles and mammals. Such actions shall be coordinated and supervised by Bocas del Toro Regional Administration of ANAM.

e) Report any findings of historical value that may appear during project construction to the competent authority and suspend activities until the corresponding rescue has been carried out.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The stakeholders' consultation process was conducted in two stages. In the first stage, in order to obtain the environmental licence, a Public Forum with local stakeholders was carried out. The second took place in March 2010 during the International Exhibition and Symposium of Cleaner Production in Panama.

The initial social actions taken consisted of an information/consultation process directed at the communities, municipal and environmental authorities and other social, political and institutional players, and referred to the project and its characteristics, required studies, activities, environmental impacts and management plan, among other aspects.

The consultation process, carried out with the Naso Teribe people, fully complied with all Panamanian legal requirements for public consultations and was based on national and international regulations on ethnic minorities and environmental and social policies as well as EPM Group's corporate policies, which establish the need to encourage early and effective participation of the local and regional communities throughout the different stages of the project, by means of information, consultation and concertation mechanisms.

The formal informative process was carried out in the direct and indirect area of influence of the project (which included the 11 communities and the banana plantation area), with the aim of informing the Naso Teribe people about the current status of the project and requesting their authorization to continue with the on-site work to update the Environmental Impact Assessment. The process was carried out jointly with the traditional Naso authorities, pursuant to Decree 59 as of March 16 2000 regulating the procedure for approval of Category III environmental impact assessments.

The scope of the process was:

- Information: Project sponsor, stages, activities inherent to the studies, possible impacts and management measures, company environmental policy.
- Consultation: impacts and management measures, and interests and expectations of the communities and institutions, so as to enable the communities to evaluate the impact that the Project would have on the environment and the management measures to be taken to counteract them.
- Concertation: management and compensatory measures.

Information and consultation was carried out by means of interactive workshops in the 11 communities and in the banana plantation area. The aim was not only to inform about the Project and its impacts but also to identify the expectations of the communities in relation with the Project and its impacts, to identify, give priority and classify the most important impacts for the Naso Teribe community in relation to the environment and its physical, biotic and social aspects; to revise, discuss and analyze the mitigation measures and the management and compensation plan for the Naso people; to unify criteria regarding the more significant socio-environmental impacts and mitigation measures and compensation plan to be negotiated with HET. All the activities were conducted jointly with the Naso Coordination Committee, whose members were actively involved in each of the workshops carried out.

The information, consultation and concertation process extended without interruptions until September 2004, when the Naso People General Assembly took place and granted definitive approval to the Bonyic project, ratifying the agreements related to the compensations discussed previously during the consultation process. Dobbo Yala Foundation, a native non-governmental organization with extensive experience in the area and the Naso people, by recommendation of the traditional authorities and their Council and the support of the entire region given its extensive background working with said communities, participated in the process.

During the information/ consultation process, HET reached 100% of the Naso people, from Bonyic, Sorí, Santa Rosa and Solón (area of direct influence) to San-San, Druy, La Tigra and Loma Bandera (very distant communities, located outside the area of direct influence). The process was specifically planned taking into consideration the traditional consultation and decision-making mechanism, based on the Leaders Council and the Naso People General Assembly.

Since it was the first time that the communities took part in this kind of process, internal organization was needed. The King, top authority and legal representative of the Naso people, was the main spokesman for the 11 communities. In addition, the Leaders Council decided to establish the Naso Coordination Committee to facilitate the information and consultation process, supported by the Dobbo Yala consultants. It was with this group that induction and capacity building in issues such as company policies, characteristics of a hydroelectric project, environmental impacts and management measures was carried out.

Marking a precedent in the community, over 1,000 natives took part in the assembly, which gave the green light to the Project and to the compensation and benefits agreement with the Naso Teribe people. The agreement was signed by the King in front of the community and the traditional authorities

acknowledged by the Panamanian government. ANAM subsequently approved –via Resolution DINEORA IA-100-2005, the Project EIA.

Starting in 2004 onwards, a regular information process has taken place through meetings with the King and with the representatives of the 11 communities, who have undertaken to channel the information to the entire community - a task they have been carrying out since 2004, when Dobbo Yala joined them. HET has used the following tools to maintain the information flow regarding the Project:

- Radio advertising slots, informative bulletins, environmental magazines.
- Group activities in which HET takes part.
- Semi -monthly meetings with the traditional authorities represented by a committee formed by the representatives of each community.
- Monthly informative tours through the communities.
- Website basically oriented to stakeholders with access to the media.

These tools have been used throughout the entire development of the project, although their use has been intensified since late 2007.

The second Stakeholder Consultation Process was carried out in March 2010 in order to present the CDM project activity. On this occasion a presentation on the project was made and comments received from the following invitees through a survey questionnaire:

1. Directors, Deputy Directors and employees of:
    a. Government entities (Municipalities, Ministries, etc.).
    b. Research Institutes.
    c. Industries
2. Environmental consultants
3. Independent professionals involved in environmental issues
4. University students
5. University Professors

The following questionnaire was circulated to the group of 53 stakeholders in order to obtain different opinions on the project activity:

- According to the information available and your knowledge about issues related to Environment, Climate Change, Kyoto Protocol, Clean Development Mechanism and Carbon Market; briefly express your opinion on *Bonyic Hydroelectric Project*.

- Would you recommend to private parties, governmental authorities or other organisations to develop such projects (the use of renewable energy to generate power projects as a CDM)?
- Do you consider that *Bonyic Hydroelectric Project* will contribute to social, economic and environmental development (Sustainable Development) of both, the region and Panama itself?
- Any additional comments you would like to express

E.2. Summary of the comments received:

The survey consisted of interviewing different people. Most of them had positive opinions related to project activity implementation.

Table 20: Summary of comments received from stakeholders about project construction.

Target Group	Quantity	Positive Comments	Negative Comments	Without Comments
Civil Society (Private company, independent, University professors and students, journalist, labor union, associations, NGOs)	26	25	0	1
National and regional authorities	10	9	0	1
Naso teribe Community (leaders)	16	16	0	0
Not apply	2	0	0	0
Total	**54**	**50**	**0**	**2**

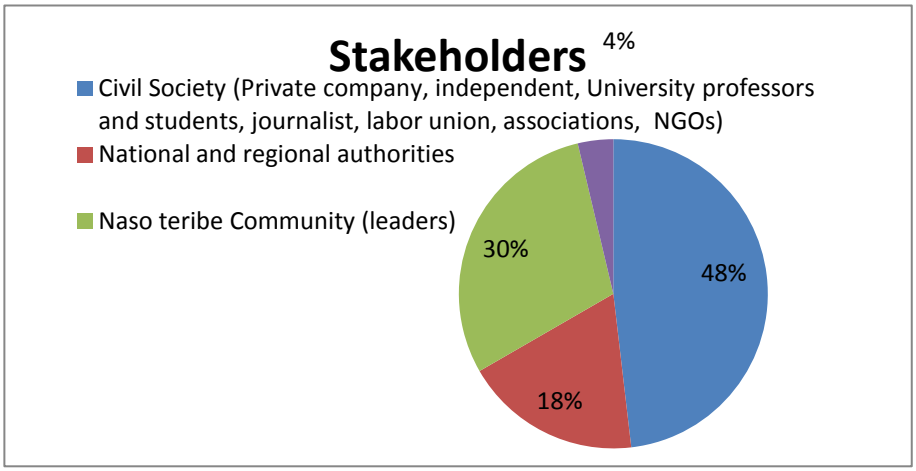

Figure 4: **Stakeholder participation**

E.3.	Report on how due account was taken of any comments received:

During the first stakeholders' consultation process, information/consultation was implemented by means of interactive workshops in the 11 communities and in the banana plantation area. The aim was not only to inform about the Project and its impacts but also to identify the expectations of the communities in relation with the Project and its impacts, to identify, give priority and classify the most important impacts for the Naso Teribe community in relation to the environment and its physical, biotic and social aspects; to revise, discuss and analyze the mitigation measures and the management and compensation plan for the Naso people; to unify criteria regarding the more significant socio-environmental impacts and mitigation measures and compensation plan to be negotiated with HET. All the activities were conducted jointly with the Naso Coordination Committee, whose members were actively involved in each of the workshops carried out. Each community identified the impacts that the project might generate, as well as the possible management and compensatory measures. These suggestions were analyzed and given priority based on criteria such as needs expressed, community and collective benefits, whether proposed actions represented the interests of the entire community, whether they were supported by authorities or community leaders, whether they were given priority by the communities, and whether they addressed critical areas or needs. The management and compensation measures were defined based on the aforementioned, and were supported and approved by the Naso People General Assembly on 19 September 2004 in the Bonyic community.

HET submitted to ANAM a program containing the general guidelines for the implementation of the compensatory measures to be agreed with the communities as a result of a continuous information, consultation and concertation process. The proposed measures were:

- **Education:** college, technical and high school scholarships.
- **Health**: support to existing health care centers.
- **Community infrastructure**: e.g., a supply center and access roads.
- **Self-management projects**: funds for forest rangers, reforestation, ecotourism.
- **Institutional and communal strengthening:** projects for community life quality improvement, sustainable throughout time.

The agreements reached throughout the process balance the initial requests of the Leaders' Council, the most pressing needs of the communities (as evidenced and expressed throughout the information and

consultation process) and the measures set forth in the Resolution by which ANAM approved the Project's EIA.

The final measures are summarized below:

- Reconstruction of community schools
- Construction of a commercial center in El Silencio
- Support for construction of a seat of government
- Construction of a pedestrian bridge in Bonyic
- Improvement of the road to the Druy or opening of the Corral Negro-Rio Teribe road
- Purchase of a parcel of land in El Silencio (or equivalent)
- Support for installation of a plant for bottling water in plastic bags for the community.
- Provision of furniture for seven health stations
- Three-year scholarships for college, high school and elementary school students.
- Transfer of 25% of the CERs to the communities, subject to negotiations with interested parties, under the framework of clean development mechanisms established by the Kyoto Protocol.

In addition, the following compensation measures were agreed to:

- Indemnification for damages and road rights during the construction of the Project
- Preferential hiring of Naso workers
- Management of archaeological patrimony according to regulations
- Hiring of forest rangers from the community
- Jointly with ANAM, selection of a site for an access control station
- Reforestation or recovery of degraded areas

The Compensation and Benefits Agreement was ratified in a public act and was signed by the President of Hidroecológica and by King Tito Santana on behalf of the Naso People.

All the aforementioned was coordinated with the traditional authorities of the Naso people.

As of September 2010, a total of 265 professional, qualified and non-qualified workers have been contracted. The Naso people represent 65% of the total workforce, i.e., a majority of the Project's

workers. Thus, HET is complying with the obligations it assumed under the Compensation and Benefits Agreement in terms of favoring the Naso people when contracting staff.

The comments received from local stakeholders during the second stakeholder's consultation process were highly positive.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Parties included in Annex I is available for this project activity.

Annex 3

BASELINE INFORMATION

The key data used to determine the *ex-ante* baseline scenario are given in the following table.

Table 21: Key data

Parameter	Data sources
Combined margin emission factor for the electricity system	Calculated according to the "Tool to calculate the emission factor for an electricity system" by the Panamanian Energy Secretary
Variable	**Data sources**
Electricity generation of the industrial facility per year	Hidroecológica del Teribe, S.A.

Annex 4

MONITORING INFORMATION

The Monitoring and Verification Plan (MVP) will describe the procedures for data collection and auditing required for the project, in order to determine and verify emission reductions achieved by the project. This project will require only very straightforward collection of data, described below, most of which is already collected routinely by the staff of Hidroecológica del Teribe, S.A., where the proposed CDM project is to be implemented.

The MVP document fulfills the CDM Executive Board requirement that CDM projects have a clear, credible, and accurate set of monitoring and verification procedures. The purpose of these procedures is to direct and support continuous monitoring of project performance and periodic auditing, verification and certification activities to determine project outcomes, in particular in terms of greenhouse gas (GHG) emission reductions. The MVP is a vital component of project design, and as such is subject to a formal third party validation process – along with the project baseline and other project design features.

Managers of the project must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to successfully develop and maintain the proper set of information to undergo an audit for a greenhouse gas (GHG) emission reduction investment. These records and monitoring systems are needed to subsequently allow an Operational Entity to verify project performance as part of the verification and certification process. In particular, this process reinforces the fact that GHG reductions are real and credible to the buyers of the Certified Emission Reductions (CERs). This set of information will be needed to meet the evolving international reporting standards developed by the UNFCCC.

The document must be used by the project implementers and operators of the Technical Departments of Hidroecológica del Teribe, S.A. Strict adherence to the guidelines set out in this monitoring plan is necessary for the project managers and operators to successfully measure and track project impacts for audit purposes.

The methodologies describe the procedure and equations for calculating emission reductions from monitored data. For the specific project, the methodologies are applied through a spreadsheet model. The staff responsible for project monitoring must complete the electronic worksheets on a shift basis. The spreadsheets automatically provide annual totals in terms of GHG reductions achieved through the project.

The models contain a series of worksheets with different functions:

- Data entry sheets: electricity generation
- Result sheet: emission reductions

There are worksheets where the user is allowed to enter data. All other cells contain model fixed parameters or computed values that cannot be modified by the staff.

A color-coded key is used to facilitate data input. The key for the code is as follows*:*

- ***Input fields:*** Pale yellow fields indicate cells where project operators are required to supply data input, as is needed to run the model.
- ***Result fields:*** Green fields display result lines as calculated by the model.

Other sheets include fixed values, or values that are computed from data in the data entry sheets, and the last sheet shows the resulting annual emission reductions.

Annex 5

PROJECT TIMELINE

Document	Date	Event	Comment
Reference: 01	23 January 2002	Letter of endorsement for the Bonyic hydroelectric project.	The Republic of Panama endorses the further development of the Bonyic hydroelectric project and commits to render and facilitate assistance in the future registration, verification, certification and issuance for the purposes of the Kyoto Protocol of greenhouse gas emissions reduction generated by the project
Reference: 02	06th November 2003	Shareholder agreement where EPM bought a participation in the company	Agreement where EPM bought a participation of the HET company.
Reference: 03	27th August 2004	BID Mandate Letter.	Letter of mandate issued by the BID to lead a financing arrangement for the project.
Reference: 04	18th December 2004	Compensation and benefit agreement between Hidroecologica del Teribe company and Naso people for the construction of hydroelectric Bonyic.	Agreement signed between Hidroecologica del Teribe company and Naso people to share the CDM benefits. Part of the revenues coming from the sale of CERs will be transferred to the Naso people.
Reference: 05	27th August 2005	Suspension of the Letter of mandate with the IDB	As it was not considered appropriate to start with the due diligence process for the financing, BID decided to suspend the mandate letter and the financing process.
Reference: 06	22nd September 2005	Letter sent to the Panamanian DNA	Letter sent by the Hidrologica del Teribe President to the Panamanian DNA in order to express the conformity to include Bonyic hidrolectric Projec in emission reduction negotiation program.
Reference: 07	11th November 2005	Bonyic hydroelectric project Environmental Impact Assessment.	Resolución DINEORA IA-100-2005
Reference: 08	27th December 2006	Financing request process	After a public bid, the Santander Bank was chosen to help with the feasibility studies of the different financing options. On 13 February 2007 the work order was signed to contract Santander as integral assessor in investment banking for the project financing.

Document	Date	Event	Comment
Reference: 09	20th March 2007	Letter of consent	Letter of consent issued by the Panamanian DNA regarding the participation of the Bonyic project in the carbon market through the clean development mechanism
Reference: 10	28th August 2007	Agreement with Jera	
Reference: 11	14th September 2007	Environmental impacts analysis approval	Environmental impacts analysis for the road access.
Reference: 12	October 2007	MGM Commercial Proposal	Power point where the commercialization advisor option was analyzed for commercialization of certified emission reductions.
Reference: 13	6th November 2007	Term sheet signature with CIFI-CABEI	On 26th December 2007 CIFI approved the financing loan operation; on 14th March 2008 CABEI also approved By the time, a due diligence was performed for the project financing
Reference: 14	10th March 2008	Contract signature with MGM	Part of the consulting agreement between HET and MGM signed
Reference: 15	26th June2008	Contract termination with JERA	
Reference: 16	17th September 2008	Electro mechanical and Hydro mechanical equipments contract signature	The electro mechanical equipment manufacture started on August 2009, after completion of detailed engineering studies
Reference: 17	November 2008	Real guaranty request to HET	The CIFI-CABEI banks ask for real guaranteey from Empresas Públicas de Medellin (EPM) as a main shareholder in HET. As EPM has a policy that does not allow signing a guarantee, the financing could not be obtained.
Reference:18	03 October 2008	Financing closure	After several attempts to obtain financing, the important barriers presented and the time-consuming process expended for the financial process, EPM decided to finance the project themselves considering the CDM revenues and the importance of having a CDM project activity.
Reference: 19	05 March 2009	Contract signature with ConConcreto Internacional, S.A	Contract signature for the civil work management. The order to start with the work was for May 2009. The work consists of the construction of the bridge over Teribe river, access roads and the hydroelectric civil work.
Reference: 20	15 June 2009	The Autoridad Nacional del	With this awarding the order to sign the contract was also given. In

Document	Date	Event	Comment
		Ambiente (National Environmental Authority) awarded Hidroecológica the concession of the administration of an area within the Bosque Protector de Palo Seco.	October Hidroecológica was waiting for this signature in order to start with the main project works.
Reference: 21	11 March 2010	Stakeholder process	

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