Jilamito Hydropower Project

Complementary Studies

Transmission line Impacts

Final Report

Project # 0363579

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CONTENT

1.0 Transmission Line Impacts

This chapter describes the process of identification and evaluation of the possible environmental and social impacts that can be present as result of the construction and operation activities of the Jilamito transmission line. The project will be constructed and operated in compliance with the Honduran environmental regulations. It will also take into account the IFC environmental and social guidelines.

1.1 Basis of Impact Analysis

The concept of "environmental impact" refers to changes in natural environmental conditions and socio-economic and cultural aspects as a result of Project implementation. The concept includes, therefore, the set of physical, natural, social, economic, cultural and aesthetic factors in relation to the environment, the individuals and the community.

The environmental impact, in its broadest sense, is the change induced by the implementation of a Project, which can lead to both, positive and negative effects. This is achieved by superimposing conceptual structures and processes of the proposed Project on environmental characteristics. The accuracy of the analysis is directly proportional to the level of detail available about the Project and the technical, legal, economic, social and environmental factors that would establish a judgment of its social and environmental feasibility.

The process of impact analysis is based on the joint activity of the multidisciplinary team in charge of preparing the complimentary studies according to the characteristics of the Project and the physical and natural environment and socio-economic surroundings. For the organization and presentation of information, the team has considered the impacts rating matrix. In general terms, this process takes into consideration the following steps:

- Identification of the effects the Project may cause on the environment and the selection of those which, by their relevance (or significance), deserve to be evaluated as impacts;
- Actual assessment of the impacts by analyzing the changes introduced and comparison with the relevant technical standards;
- Ranking of impacts depending on their degree of affectation so as to propose the necessary measures for their proper management;
- Analysis of the Project's impacts begins under the assumption that the following conditions are met:
  - The Project will be constructed as described in the Diagnóstico de Impacto Ambiental (DIA) study;

- The Project will implement environmental protection measures included in the Environmental Management Plan (PGA – in spanish) prepared for Jilamito; and
- The Project will comply with all laws, regulations and norms applicable at national and international levels.

1.2 Methodology for the Analysis of Impacts

The identification and assessment of environmental impacts fundamental objective is to characterize the effects that the Project could cause on the environment. The methodology followed for the assessment of the environmental impacts is known as **"Criteria for Evaluation of Environmental Impacts"**. This methodology complies with the procedures established by the local environmental authority SERNA.

To establish a logical structure for the evaluation, the impacts were organized according to the major components of the environment that may be affected by the specific activities of the Project. Hence, three major categories of impacts have been defined according to the resources that could be impacted:

- Impacts on the Physical Environment (air, soil, water);
- Impacts on the Biological Environment (flora and fauna); and
- Impacts on the Socio-Economic Environment (population, economy, culture, landscape, among others).

As a result of the analysis of information provided by INGELSA and information gathered in the field during the site visit, the following environmental factors and components were evaluated.

Table 1.1: Environmental Factors and Components Evaluated

Resources	Element	Environmental Factors	Components
PHYSICAL-NATURAL	Physical	Soil	Geology Geomorphology Seismicity Edaphology
		Water	Superficial Underground
		Atmospheric	Particulate Noises Gases
	Biotic	Vegetation	Aquatic and terrestrial flora Forest resources

Resources	Element	Environmental Factors	Components
		Fauna	Terrestrial Aquatic
SOCIO-ECONOMIC	Socio-economic	Perceptual	Landscape
		Population	Health Culture Risks
		Economy	Income Employment

Source: ERM 2016.

In the first part of the analysis process the following activities were carried out:

- Identification of all possible effects derived from the development of the Project, without considering the application of management measurements;
- Linking of Project activities and their derived effects, whose occurrence poses a positive or negative impact on the environment;
- Developing a cause – effect matrix, in order to establish the relevance of each impact considered;
- Eliminating the impacts that would not constitute a relevant problem for the medium and its environment, resulting from their environmental consequences being considered very low; and
- Selection of those environmental impacts that, because of their relevance, it was deemed that needed evaluation.

The first list was subjected to a process through discussion and selection, to exclude those not worthy to enter the phase of assessment or detailed evaluation, considering the following assumptions:

- Impacts that have provisions for their elimination or reduction to acceptable levels in the engineering of the Project; and
- Impacts whose probability of occurrence and minimum impact do not warrant the application of special controls.

With the list of identified actions and the possible effects on the environment, a Cause-Effect Matrix or Project-Environment Relationship Matrix was prepared, displaying the effects on physical, biological, and socio-economic resources, grouping the common actions of the different stages of the Project (Matrix 1.1). Afterwards, these effects were analyzed and evaluated in a multidisciplinary fashion with the selected methodology.

1.2.1 Evaluation of the Impacts

Having identified the potential impacts, they are evaluated. This is done for each phase of the Project, according to the environment and its component, applying the quantitative criteria defined for each attribute. This valuation is performed in the following sections.

1.2.2 Description of each Impact

After the identification of each impact, they are described and analyzed and subsequently, characterized and valued. The decision on the degree of significance of the impact is done by expert panel consensus.

Justification is required of the valuation given by the impact to each attribute evaluated in order to determine the reasons for assigning said value to the impact analyzed. This is also explained for each phase of the Project and each component analyzed.

1.2.3 Quantitative Characterization of the Impacts

The numerical assessment of the impacts is calculated in several stages, which are described below.

1.2.4 Assigning values to the Attributes

Each attribute is assigned a value, bounded between a maximum of three (3) for the most unfavorable condition to the environment (the worst case), and a minimum of one (1) for the most favorable condition. The numeric allocation defined in each situation is presented in Table 1.2 below.

Table 1.2: Attributes to be Evaluated in the Valuation Process

MEANING OF CRITERIA		VALUE	CLASSIFICATION	DENOMINATION OF THE CLASSIFICATION
(T)	TYPE			
	It refers to the beneficial (+) or harmful (-) effect	(+)	Positive	When beneficial in relation to the status prior to the action
		(-)	Negative	When the result of the action is harmful
(I)	INTENSITY			

MEANING OF CRITERIA		VALUE	CLASSIFICATION	DENOMINATION OF THE CLASSIFICATION
	Represents the degree of incidence on the factor in the specific environment it has effects (Degree of affectation)	1	Low	The affectation of the impact is low and original conditions are recovered once the action ceases.
		2	Medium	Affects the system environment without causing major changes in its functionality and recovery requires corrective measures.
		3	High	The magnitude of the effect is above acceptable levels and permanent losses occur in the quality of environmental conditions
(E)	EXTENSION			
	Represents the extent of the environmental impact	1	Punctual/Discreet	When the affectation is produced in a focused manner
		2	Partial	If it transcends in a considerably extensive area
		3	Extensive	If the affectation produces damages at regional or national levels
(M)	TIMING			

MEANING OF CRITERIA		VALUE	CLASSIFICATION	DENOMINATION OF THE CLASSIFICATION
	Expresses the time elapsed between the execution of the impacting activity and the manifestation of the alteration of the environmental variable	3	Short term	If it occurs before one (1) year
		2	Medium term	If it originates before five (5) years
		1	Long term	If they occur for a period of time greater than five (5) years.
(P)	PERSISTENCE			
	Discusses the characteristics of the effect in relation to the time elapsed since its appearance	1	Fleeting	When the effect produces a momentary alteration
		2	Temporary	If the alteration occurs in a limited period of time
		3	Permanent	If the effect produces an undefined alteration
(R)	REVERSIBILIBILITY			
	Expresses the probability of returning to initial conditions by natural means	1	Short term	When the conditions reappear naturally after a short period of time
		2	Medium term	If the natural conditions reappear in a natural way after a medium period of time
		3	Irreversible	If the action of the natural process is unable to recover the

MEANING OF CRITERIA		VALUE	CLASSIFICATION	DENOMINATION OF THE CLASSIFICATION
				original conditions
	RECOVERABILITY			
(Rc)	Expresses the possibility of eliminating a disturbance of the environment and its component	1	Recoverable	When the medium can be regenerated to its original state, by itself or with the aid of corrective measures
		2	Mitigable	If it is possible to apply corrective measures to reduce or cancel the effect of the impact
		3	Irrecoverable	It is not possible to apply corrective measures
	SYNERGY			
(S)	Generation of a joint effect of the simultaneous presence of several agents with an environmental impact greater than the effect of the sum of individual incidents taken separately	1	Non synergistic	When the effect considered does not potentiate the action of the other effects
		2	Synergistic	When the effect under consideration potentiates the action of the other effects
		3	Very synergistic	When potentiation is very high
(A)	ACCUMULATION			

MEANING OF CRITERIA		VALUE	CLASSIFICATION	DENOMINATION OF THE CLASSIFICATION
	The effect where prolonged in time, its action increases its severity progressively	1	Simple	When it does not induce secondary cumulative or synergistic effects
		3	Accumulative	Severity increases when the action that generates it persists
(Pr)	PERIODICITY			
	The effect becomes manifest by an intermittent mode of action and continuous in time	3	Periodic	If it manifests itself in a cyclical or recurrent way
		1	Non Periodic	If it manifests itself in an unpredictable manner
(Im)	IMPORTANCE			
	It expresses the degree of attention that the effect should have	1	Low	When the effect on the environment does not require compensatory measures to be taken
		2	Medium	If preventive or compensatory measures must be taken
		3	High	The activity cannot be performed because the effects on the environment could be devastating

Source: ERM 2011

1.2.5 Calculation of the Incidence of each Impact

Incidence is calculated by means of a weighted sum function of the attributes according to their significance. An example of the equation for calculating the incidence of impact is shown below. According to the attributes applied (by type of Project and/or mandate of the ToR), the equation may be adjusted with the multidisciplinary team criteria. The incidence is obtained from the quantitative assessment in the allocation of weight; applying the weighted sum of the attributes according to their application; the incidence thus is obtained by applying the following formula:

$$Ic = I + 2E + 2M + 2P + R + Rc + S + A + Pr + Im$$

The attributes of length, time and persistence of the impact are rated as the most significant, multiplying by two its effect over the others.

1.2.6 Standardization

Using the values obtained in the incidence, standardization between a value of zero (0) and a maximum of one (1) is obtained applying the following formula:

$$Is = \frac{I - I_{min}}{I_{max} - I_{min}}$$

Where:

Is = Value of incidence of the standardized impact between 1 and 0

I = Value of incidence of the non- standardized impact

Imax = Maximum value the incidence of the impact may have

Imin = Minimum value the incidence of the impact may have

The values $\mathbf{I_{max}}$ e $\mathbf{I_{min}}$ are **39** and **13**, respectively, for all the impacts except for the positive ones, taking values of **30** and **10**, respectively. In the positive impacts this is so, since no attributes of recoverability and reversibility are assigned, having no meaning in themselves.

1.2.7 Calculation of the Magnitude

With the value of Incidence of the standardized impact ($\mathbf{I_s}$), the Magnitude of each impact is estimated by classifying it as follows:

Table 1.3: Classification of the Impacts According to their Magnitude

Magnitude			
Based on the fact that Is establishes the importance of the impact.	(CO)	COMPATIBLE	If the value of $\mathbf{I_s}$ is between 0.10 and 0.25
	(B)	LOW	If the value of $\mathbf{I_s}$ is between 0.26 and 0.50
	(M)	MEDIUM	If the value of $\mathbf{I_s}$ is between 0.51 and 0.60
	(A)	HIGH	If the value of $\mathbf{I_s}$ is between 0.61 and 1.00

- **Compatible Importance or Impact (Co)**: if the impact has little entity, with the environment recovering by itself without corrective measures and immediately after the cessation of the action.
- **Low Importance or Impact (B):** if the recovery, without intensive corrective measures, takes a certain period of time.
- **Medium Importance or Impact (M):** if the recovery requires an extended period of time, even with the application of corrective actions.
- **High Importance or Impact (A):** if there is a permanent loss of environmental conditions without possible recovery, including the adoption of corrective practices or measures.

1.3 Identification of the Environmental Impacts of the Project

The identification of effects on the environment that the operation and construction of the Project could cause was carried out using for tools the actions of this Project in its different phases, together with the opinion of the multidisciplinary panel of experts, and the use of the cause and effect matrix. Through the general interaction, it was possible to visualize and predict potential changes, which would manifest themselves in a differentiated manner for each environment under consideration, even though their relationship in many cases is very close.

Thus, the nature of the actions that characterize this Project entails direct or primary affectations, generally on the physical environment. These affectations would manifest themselves as chained effects on other media, which make up the environment. These affectations may be positive or negative.

To strengthen and complement the process of identifying the effects, a workshop was carried out with the participation of specialists from different disciplines who participated in the study, obtaining a list of all possible effects that the development of the Project would generate. Then the list underwent a process of "selection" through discussion and evaluation, excluding those effects that do not merit entering an assessment or evaluation phase.

With the list of Project activities and the possible effects on the environment, a summary table was prepared (**Table 1.4**) which shows the impacts on the physical, biological and socio-economic environment.

Table 1.4: Environmental Impacts Identified for the Project per Phase

Environment	Item	Impact	CO	OP
Geology and Landscape	1	Activation of Erosion and Sedimentation Processes	x	
	2	Increase in solid waste	x	x
	3	Impact on Forestry and Agroforestry Soils	x	
	4	Soil Compaction	x	
	5	Change of Land Use	x	
	6	Deterioration of the Visual Quality of the Landscape	x	x
Water Component	7	Water Use Conflicts	x	
	8	Surface Water Pollution by Accidental Spills	x	x
Flora and Fauna	9	Reduction of Vegetation Cover	x	
	10	Reduction and Fragmentation of Habitat	x	
	11	Reduction in Terrestrial Wildlife Population	x	x
	12	Reduction in Bird Population	x	x
	13	Disturbance of Aquatic Biota	x	
Socio-economic and cultural aspects	14	Disturbances during construction activities	x	
	15	Expectations of the Community	x	
	16	Effects of electromagnetic fields	x	
	17	Impact on the National Economy	x	x
	18	Accidents and Incidents	x	x

Source: ERM, 2016 - CO: Construction; OP: Operation.

1.3.1 Description of Impacts

The presentation of environmental assessment is conducted for each impact with the definition of the details of the evaluation and its results. The minimum content of this description is the following:

- Name of the impact
- Phase of the Project that applies
- Activities that generate the impact

- Derived effects
- Description of the impact
- Location of the development area
- Assessment of the impact
- Conclusions on the valuation obtained

1.4 Impacts to the Physical Environment

1.4.1 Activation of Erossion and Sedimentation Processes

This impact will manifest itself mainly during the construction phase, as described below:

- **Construction Phase –** This phase, will be characterized by the opening and the preparation of the site for implementation of the cableway and later on the transmission line, the preparation of trails and access roads leading to impacts on soil that will generate a large volume of loose particulates, which will be easily mobilized by the construction equipment and machinery, causing an impact on the environment locally.
- **Operation Phase –** At this stage the transmission line is in the process of operation, therefore, there will be no impacts of erosion and sedimentation.

1.4.1.1 Activities that generate impact

The erosion and sedimentation process during the phases of the Project may be generated by the following activities:

Construction Phase:

- Construction of new access roads;
- Deforestation (punting and clearing of vegetation);
- Removal soil;
- Repair/maintenance of existing access roads;
- Construction of buildings for the operation and maintenance of the Project;
- Construction of the cableway;
- Transit of vehicles and heavy machinery to transport personnel, machinery, equipment, supplies and materials and/or waste;
- Transport of machinery and equipment for the preparation of access roads; and

  Excavations, foundations and materials handling.

Operation Phase:

- Natural processes of erosion due to heavy rains in the area;
- Activities related to maintenance of the TL.

1.4.1.2 Location of Impact

The areas where it is expected that the effects of erosion and transport of materials will manifest themselves, include:

- In the areas where clearing works are carried out to remove vegetation for construction of the cableway and towers;
- In the areas of transit of equipment and machinery;
- Opening tracks for foundations of towers;
- In areas where the substation and foundations for the cableway and towers will be built; and
- Management of construction materials.

1.4.1.3 Derived effects

Failure to take appropriate measures to prevent and control erosion processes and sediment transport, some of the following effects may be generated:

- Generation of loose material on the surface;
- Increase of sediment and transport into the beds of the adjacent waterways;
- Affectation of surface waters due to increased sediment loads;
- Impact of the aquatic ecosystems in surface waters bodies;
- Loss of soils and nutrients; and
- Landslides.

1.4.1.4 Descripcition of the Impact

Soils have the characteristic that, when exposed by the removal of vegetative cover, their profile or structure will start to alter as they suffer the actions of climatic factors. Rain and wind particularly can develop a process of erosion and transport of large amounts of soil particles to the lower areas of the terrain.

The movements of soil by equipment and machinery, plus the continued circulation of vehicles, machinery and transport of equipment and personnel throughout the area of influence of the Project, will contribute to sediment transport.

The implementation of these activities enhances the erosion process generating various forms of lamellar accumulation, in furrows and gullies. Loose sediment particles are distributed throughout the area and give way to the formation of a layer of loose material. This layer under the action of wind and water will be exposed to the effects of drag, accumulating in an irregular manner throughout the area, depositing from the low-lying grounds to the beds of water bodies, completing the process of sedimentation.

1.4.1.5 Impact Assessment

The Quantitative Assessments of the impact on soil properties have been included in the Impact Assessment Matrix. A qualitative description of the impacts in phases is provided below:

Activation of Erosive and Sedimentation Processes		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	High	Low
Extension	Punctual	Punctual
Timing	Short Term	Short term
Persistence	Temporary	Frugal
Reversibility	Medium Term	Short term
Recoverability	Mitigable	Recoverable
Synergy	Synergistic	Non SSynergistic
Accumulation	Acumulative	Simple
Periodicity	Periodic	Periodic
Importance	Medium	Low
Magnitude	**0.6 - Medium**	**0.2 – Compatible**

1.4.2 Increase in Solid Waste

The increase in solid waste could be an impact mainly during the construction phase of the Project.

- **Construction Phase** – This phase is characterized by the preparation of access routes to the Project area, soil movement and the continuous circulation of vehicles, machinery and transport equipment and

personnel through the area of influence of the project. It is possible that solid waste would increase due to the increase in staff in the area.

- **Operation Phase** - During the operation phase, there is a small possibility that due to the presence of maintenance personnel performing tasks at substations or on the transmission line.

1.4.2.1 Activities that Generate the Impact

Increase of solid waste could be generated by the followin activities:

Construction and Operations Phases:

- Increase of personnel in the Project area.

1.4.2.2 Location of the Impact

The increase of solid waste could happen mainly in the construction areas near access roads, substations, and towers.

1.4.2.3 Derived Effects

If appropriate measures to prevent the increase of solid waste are not taken, it is possible that these effects could occur:

- Solid waste accumulation in the Project areas;
- Water contamination; and
- Sicknesses related to water contamination.

1.4.2.4 Impact Assessment

The Quantitative Assessments of the impact have been included in the Impact Assessment Matrix. A qualitative description of the impacts in phases is provided below:

Increase in Solid Waste		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	Low	Low
Extension	Punctual	Punctual
Timing	Short Term	Short Term
Persistence	Temporary	Sporadic

Increase in Solid Waste		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Reversibility	Short Term	Short Term
Recoverability	Mitigable	Mitigable
Synergy	Non Synergistic	Non Synergistic
Accumulation	Cumulative	Cumulative
Periodicity	Periodic	Periodic
Importance	Low	Low
Magnitude	0.4 – Low	0.3 – Low

1.4.3 Impact on Forest Soils and Agroforestry

This impact is reflected in the construction phase of the Project, as described below.

- **Construction Phase –** This phase is characterized by the preparation of access roads to the Project area, soil movement and the continuous circulation of vehicles, machinery and transport equipment and personnel through the area of influence of the Project. The removal of soils as part of the construction operations involves disabling forest soils.

1.4.3.1 Activities that Generate Impacts

The activities that may generate impacts on forestry and agroforestry soils of the site and in each of the phases of the Project are:

Construction Phase:

- Construction of new access roads;
- Drilling;
- Deforestation (clearing of vegetation);
- Repair/maintenance of existing access roads;
- Construction of the cableway for the transportation of materials up the mountain, as part of the construction of the Project;
- Transport of machinery and equipment;
- Transit of mules that will carry personnel and construction material up the mountain until the cableway is built;

- Transit of vehicles and heavy machinery to transport personnel, machinery, equipment, supplies and materials and/or waste; and
- Excavations, foundations and materials handling.

1.4.3.2 Location of Impact

The effect of this impact will be evident from the following components of the environment influenced by the Project in:

- In the areas where clearing works are carried out to remove vegetation for construction of the cableway and towers;
- In the areas of transit of equipment and machinery;
- Opening tracks for foundations of towers;
- In areas where the foundations will be built; and
- Management of construction materials.

1.4.3.3 Derived Effects

Among the derived effects resulting from this impact the following may be mentioned:

- The first and most important effect lies in the loss of the soil profile with the corresponding subsequent loss of soil fertility;
- The resistance of the soil to the penetration of plant roots;
- There reduction of natural soil percolation;
- Aeration problems will generated and ponding in the soils; and
- Potential induction of lamellar accumulation and concentrated erosion will take place.

1.4.3.4 Description of Impact

The barring of soils with forest and/or agroforestry capital is basically produced as a result of various processes:

- Deforestation, which is one of the initial activities, consists of removing the layer of soil. This has an impact by limiting or fragmenting the land where areas cannot continue with the agroforestry activity;
- The preparatory works for the pathways and access roads have a direct influence as their positioning and use of agricultural soil;

- The temporary installations built during the construction phase use part of these soils, occupying their space and limiting the use of agroforestry;
- The movement of sediment characterized by the excavation completely degrades the soil profile in the areas selected for the foundations disabling the capacity for forestry use;
- The compaction that soils will suffer as a result of the compression of solid particles on the soil, increase resistance to water penetration and roots of plants;
- The transit of machinery, vehicles and equipment used to transport supplies and personnel over topsoil increases compaction. This process causes the soil to become less saturated during rainy periods, substantially decreasing the water retention necessary for vegetation; and
- The siting of the foundations for the construction of the camp and offices in the Project area.

1.4.3.5 Impact Assessment

The Quantitative Assessment of the impact is included in the Impact Assessment Matrix. A qualitative description of the impact in phases is included below:

Soil Impacts on Forestry and Agro forestry		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	High	Low
Extension	Partial	Punctual
Timing	Short Term	Short Term
Persistence	Temporary	Temporary
Reversibility	Medium Term	Medium Term
Recoverability	Mitigable	Mitigable
Synergy	Synergistic	Synergistic
Accumulation	Cumulative	Simple
Periodicity	Periodic	Periodic
Importance	Medium	Low
Magnitude	**0.7 - High**	**0.4 - Low**

1.4.4 Soil Compaction

The effect of soil compaction occurs during the phases of construction and operation; although in the latter phase compaction will be minimal.

- **Construction Phase –** During this phase, due to the opening and preparation works of the site for the operation and construction of trails and access roads, etc. compaction works will be performed to facilitate equipment and machinery to operate under a safety factor on the terrain. In consequence, this impact significantly affects the environment within the Project site.
- **Operation Phase –** During this phase, compaction might be caused by the service vehicles that will perform the maintenance activities for the transmission line.

1.4.4.1 Activities that Generate the Impact

Construction Phase

- Construction of new access roads;
- Construction of buildings for the operation and maintenance of the Project;
- Repair/maintenance of existing access roads;
- Transport of machinery and equipment for environmental research and for the design of the Project (Geological and Geotechnical, Hydrological, etc.);
- Transit of vehicles and heavy machinery to transport personnel, machinery, equipment, supplies and materials and/or waste;
- Transport of machinery and equipment for the installation of camps, preparation of access roads; and
- Excavations, foundations and handling of materials.

Operation Phase

- Vehicles driving during maintenance activities;
- Maintenance operations of the transmission line.

1.4.4.2 Location of the Impact

The effect of soil compaction would be evident in:

- Areas where clearing works are carried out to remove vegetation and topsoil;
- Pathways and access roads to be built in the different faces of the Project;
- Roads with traffic of equipment and machinery; and
- Areas designated for the construction of foundations and substations.

1.4.4.3 Derived Effects

The consequences of soil compaction include the following:

- Resistance to root penetration into the soil;
- Reduced water percolation and recharge of the aquifers;
- Generation of aeration problems and ponding of soils, and
- Local changes in topography.

1.4.4.4 Description of impact

Compaction is one of the phases, within soil management, that has great importance because through this activity there is the attempt to create the conditions of soil stability. Furthermore, compaction helps preserve the soil from the action of climate that may trigger a process of erosion and transport of large amount of soil particles to lower elevations and/or distant areas.

The great number of structures to be built and the ongoing maintenance, could generate severe effects due to compaction on the soils located in pathways and access roads to be built and the areas where buildings will be constructed.

The use of these spaces at the will potentiate the compaction process. The main consequence is the modification of soil porosity. As compaction increases, the pore space decreases, especially the porosity of larger diameter, which is occupied by air and useful water. Infiltration is also affected since it reduces the permeability of the compacted layer. If this compaction is produced in the surface layer, an increase of runoff and erosion will be produced, and if the compacted layer is at a certain depth then ponding problems will arise as the infiltration rate decreases.

1.4.4.5 Impact Assessment

The Quantitative Assessments of the impact on soil properties have been included in the Impact Assessment Matrix. A qualitative description of the impacts in phases is provided below:

Soil Compaction		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	NA
Intensity	Medium	NA

Soil Compaction		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Extension	Punctual	NA
Timing	Medium Term	NA
Persistence	Temporary	NA
Reversibility	Medium Term	NA
Recoverability	Mitigating	NA
Synergy	Synergistic	NA
Accumulation	Simple	NA
Periodicity	Non Periodic	NA
Importance	Medium	NA
Type	0.3 – Low	NA

1.4.5 Change of Land Use

The change of land use occurs mainly during the Construction phase.

1.4.5.1 Activities that Generate the Impact

The activities that potentially generate such impacts are those that modify the soil cover, whether it is for the construction of infrastructure to support the installation of the TL towers and handling of the construction material. Such activities are listed below.

- Preparation of trails and access roads;
- Transport of machinery and equipment;
- Deforestation as part of construction activities;
- Earthwork (cutting and filling);
- Excavations;
- Construction of civil works;
- Assembly and connection of equipment;
- Operation of machinery and equipment;
- Handling of residues;
- Maintenance of transmission line and right of way;
- Cleaning of drains; and

- Handling of waste.

1.4.5.2 Location of Impacts

This covers the whole area of direct influence of the Project, as it is necessary to remove the vegetation in order to build tower bases and substations as well as access roads.

1.4.5.3 Derived Effects

From the standpoint of soil, important changes occur because the region's soils are suitable for forestry and/or agroforestry. Logically, this change also assumes changes in the dynamics of life styles of the inhabitants of the region, readapting their socio-economic activities to the new conditions of the Project. Although it is anticipated that people who have cattle and work agriculture will continue to do so, there could be some changes in the activities related to incoming work force.

1.4.5.4 Description of the Impact

This impact is primarily related to the introduction of the Project in the area, which causes the change of land use in question.

- The arrival of the Project brings to the region modifications of the forest with the beginning of the clearing of vegetation and soil in the area, together with groundbreaking. Moreover, it brings an increase in traffic through the movement of machinery, vehicles, equipment and the arrival of personnel.

1.4.5.5 Impact Assessment

The Quantitative Assessment of the impact over the change in land use of the soils, are included in the Impact Assessment Matrix. A qualitative description of the impact in phases is presented below:

Change of Land Use		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	NA
Intensity	Medium	NA
Extension	Punctual	NA
Timing	Short term	NA
Persistence	Permanent	NA
Reversibility	Irreversible	NA

Change of Land Use		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Recoverability	Irrecoverable	NA
Synergy	Non Synergistic	NA
Accumulation	Simple	NA
Periodicity	Periodic	NA
Importance	Medium	NA
Type	0.6 – Medium	NA

1.4.6 Deterioration of the Visual Quality of the Landscape

It is expected that the negative changes will take place during the construction phase and the operation phase of the Project.

- **Construction Phase –** This impact has its greatest expression in the construction phase where deterioration involves many natural landscape features such as the contour, and the vegetation, among others.
- **Operation Phase –** In the operation phase of the Project, the impact produced by the visual effect of the transmission line in the landscape is expected to be minimum.

1.4.6.1 Activities that Generate the Impact

The activities that may generate impacts on the quality of the landscape are listed below, for each of the phases:

Construction Phase:

- Preparation of trails and access roads;
- Drilling and excavations;
- Deforestation (clearing of vegetation);
- Repair/maintenance of existing access roads;
- Construction of operation and maintenance buildings of the Project;
- Construction of the cableway;
- Transport of machinery and equipment for environmental research and for the design of the Project (Geological and Geotechnical, Hydrological, etc.);
- Location of the excavations and foundations; and
- Construction of platforms for the cableway towers and transmission line towers.

Operation Phase:

- Presence of the transmission line.

1.4.6.2 Location of the Impact

The changes in the quality of the landscape will be more noticeable in:

- Areas where clearing works are carried out to remove the vegetation and excavate soils;
- In the roadways and access roads to be built;
- Transportation of the equipment, materials, etc;
- Areas of mobilization of equipment and machinery;
- Areas opened for foundations;
- Implementation of substations;
- Areas where the foundations will be built;
- Locations of borrow material; and
- Areas selected for dumping of excess material.

1.4.6.3 Derived Effects

The most important effect is the loss of visual quality, both in the actual site of the Project as well as its indirect area. The space intervened by elements foreign to the nature of the landscape damages its scenic view. Other derived effects are:

- Sudden changes in color and hues that occur as a result of the removal of vegetation and earthwork; and
- The modification of the natural spatial forms by the presence of the structures associated with the Project.

1.4.6.4 Description of the Impact

The environmental unit most affected during a process of construction of any type is usually the landscape, because during this phase the intervention of unfavorable elements in the scenic surroundings takes place. The deterioration of the visual quality of the landscape is produced fundamentally by several processes:

- The deforestation is one of the initial activities consisting of the cutting of vegetation and removal of the soil layer, resulting in impacts that limit or fragment the land;

- The preparatory works for roadways and access roads are a direct influence because from the beginning, positioning and spatial distribution and access to it is verified in the field;
- The temporary installations that are generated during the construction phase use part of these terrains, occupying their space and adding foreign objects to the landscape;
- The passage of machinery, vehicles and equipment used in hauling construction material and the transfer of workers that transit along these roadways should also be considered.

1.4.6.5 Impact Assessment

The Quantitative Assessment of the impact on visual quality has been included in the Impact Assessment Matrix. A qualitative description of the impact in phases is presented below:

Deterioration of the Visual Quality of the Landscape		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	Medium	Medium
Extension	Punctual	Punctual
Timing	Short Term	Short Term
Persistence	Temporary	Temporary
Reversibility	Short term	Short term
Recoverability	Recoverable	Recoverable
Synergy	Non Synergistic	Non Synergistic
Accumulation	Simple	Simple
Periodicity	Periodic	Periodic
Importance	Low	Low
Magnitude	0.4 - Low	0.4 - Low

1.4.7 Water Use Conflicts

Based on information collected during the field visit interviews in the communities along the project area, this impact is not anticipated. Water use conflicts are not anticipated because the communities of the area use different water streams, that are not part of the Jilamito River or it's tributaries. Details about the water sources are included in the Social Consultations chapter.

1.4.7.1 Activities that Generate the Impact

The activities that coul generate the impact of water use conflicts are listed below:

Construction Phase:

- Preparation of Access roads;
- Construction of bases for the substations, cableway and towers;
- Deforestation prior to construction

Operations Phase:

- Maintenance activities.

1.4.7.2 Location of the Impact

The water use conflict impacts could be seen in any of the communities located near the Project's area of influence. If at some point communities used the Jilamito river as a source of drinking water.

1.4.7.3 Derived Effects

The most important effect could be the loss or potential loss of drinking water in communities.

1.4.7.4 Description of the Impact

Based on observations made in the Project area, the rivers, streams and wells in the project area are suitable for human supply. Most water for consumption comes from streams that are not part of the Jilamito. However, if there were spills or accidents during construction, these streams could be impacted and impaired for human consumption.

1.4.7.5 Impact Assessment

The Quantitative Assessment of the impact has been included in the Impact Assessment Matrix. A qualitative description of the impact in phases is presented below:

Water Use Conflicts		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative

Water Use Conflicts		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Intensity	Medium	Medium
Extension	Punctual	Punctual
Timing	Short Term	Short Term
Persistence	Temporary	Temporary
Reversibility	Short Term	Short Term
Recoverability	Recoverable	Recoverable
Synergy	Non Synergistic	Non Synergistic
Accumulation	Simple	Simple
Periodicity	Periodic	Periodic
Importance	Medium	Medium
Magnitude	0.4 – Low	0.4 – Low

1.4.8 Risks of Water and Soil Pollution by Accidental Spills

The risk of contamination of surface water streams as a result of accidental releases of toxic and/or hazardous substances is present in the phases of construction and operation.

- **Construction Phase –** In the construction of the Project, as well as all other activities involving the use of equipment to open access roads and infrastructure works necessary for the Project, accidental spills of fuels, lubricants and residual oils can occur causing contaminants to reach streams and contaminate the water bodies.
- **Operation Phase –** The potential of spills to occur during maintenance activities in minimum compared to the construction phase, but there could be accidental spills, as well as discharges from the process of maintenance and repair of the transmission line.

1.4.8.1 Activities that Generate the Impact

In the construction phase, the activities involving the use of equipment, vehicles and workshops that can generate contamination of surface water are:

- The preparation of trails;

- Deforestation (clearing of vegetation);
- The construction and repair of access roads;
- The construction of the system of drainage ditches and culverts to dispose of stormwater and permanent surface water;
- The construction of buildings for the operation and maintenance of the Project;
- The transport of personnel, machinery, equipment, supplies and materials and waste.

Activities in the Phase of operation that require the use of machinery, equipment and vehicles, in addition to maintenance workshops that could generate accidental spills include:

- The clearing and deforestation;
- Machinery and transport equipment for the personnel, supplies, materials and waste; and

During the closure phase, the activities under this category include:

- Transport of employees; and
- Maintenance of equipment, access roads and right of way for the TL.

1.4.8.2 Derived Effects

The main effect of this impact is the deterioration of the water quality and the effects on the ecology of the aquatic ecosystems.

1.4.8.3 Description of Impact

The construction and maintenance of works, auxiliary structures, the electrical system, the fuel station, the workshops, tank trucks, water trucks, in addition to the equipment for each activity mentioned above all altogether add up to a large pool of vehicles in the construction phase, which have the potential to accidentally discharge fuels, oils and lubricants on the soil. During the operation phase there will only be two vehicles.

As a result of the action of climate (very frequent rainfall) these contaminants can be washed into waterways and contaminate the waters of the project area.

1.4.8.4 Location of the Impact

The greatest risk of occurrence of contamination by accidental spills of hazardous substances into surface water bodies would manifest itself:

- In areas where each of the abovementioned impact-generating activities will take place; and
- In the area where the equipment and machinery will be kept and in the area of the repair workshops.

1.4.8.5 Impact Assessment

The Quantitative Assessment of the impact on the waters and soils have been included in the Impact Assessment Matrix. A qualitative description of the impact in phases is indicated below:

Risk of Water and Soil Contamination from Accidental Spills		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	High	Low
Extension	Partial	Punctual
Timing	Short Term	Short Term
Persistence	Temporary	Temporary
Reversibility	Medium Term	Short Term
Recoverability	Mitigable	Recoverable
Synergy	Non Synergistic	Synergistic
Accumulation	Cumulative	Acumulative
Periodicity	Non Periodic	Non Periodic
Importance	Medium	Medium
Magnitude	**0.6 – Medium**	**0.4 – Low**

1.5 Impacts to the Biological Aspects

The Biological Environment has been analyzed under three separate components:

- Flora and vegetation;
- Terrestrial fauna; and
- Aquatic ecosystems.

1.5.1 Reduction of Vegetation Cover

The reduction of vegetation cover will occur during the construction phase of the Project, mainly during the construction of access roads, the cableway that will take the materials up the mountain for the installation of the first towers and then during the clearing of areas for the installation of the transmission line towers.

1.5.1.1 Activities that Generate the Impact

The main activities that generate the impact in each of the phases include the following:

- Preparation of the ground for construction of bases for towers (cableway and transmission line); and
- Construction and repair of trails and access roads.

1.5.1.2 Derived Effects

The removal of vegetation cover has a direct relationship with several anticipated changes in the environment due to the loss of the buffering effect of vegetation. Among these, the following can be mentioned as possible derived effects:

- Increased soil temperature;
- Changes to natural drainage;
- Alteration of the landscape;
- Loss of soil; and
- Impact on wildlife and habitats.

1.5.1.3 Description of the Impact

The reduction of plant cover is an important impact of the Project, because it is necessary to clear all vegetation from the area to be intervened for the transmission line as well as the construction of acess roads and civil works associated with the Project.

1.5.1.4 Location of the Impact

The impact will occur in the areas of intervention for the construction of civil works, access roads, and bases for the towers – for the cableway as well as the transmission line towers.

1.5.1.5 Impact Assessment

The quantitative assessment of the impact on the vegetation cover has been included in the Impact Assessment Matrix. A qualitative description of the impact in phases is presented below:

Reduction of Vegetation Cover		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	NA
Intensity	Medium	NA
Extension	Punctual	NA
Timing	Short Term	NA
Persistence	Permanent	NA
Reversibility	Medium Term	NA
Recoverability	Mitigable	NA
Synergy	Synergistic	NA
Accumulation	Cumulative	NA
Periodicity	Non Periodic	NA
Importance	Medium	NA
Magnitude	0.6 – Medium	NA

1.5.2 Habitat Reduction and Fragmentation

The habitat reduction and fragmentation will be minor and would likely occur during the construction of the Project.

1.5.2.1 Activities that Generate the Impact

The activities that typically have an effect on the continuity of natural habitats are those that eliminate or remove in a total or partial way the vegetal cover. Among these are:

- Preparation of the terrain;
- Repair of trails and access roads;
- Deforestation; and
- Earthwork (cutting, filling, grazing and compaction).

1.5.2.2 Derived Effects

Habitat fragmentation has a direct impact on populations of species that are rare, which fail to maintain a sufficient number of individuals to ensure genetic exchange of the population.

1.5.2.3 Descripción del impacto

Habitat fragmentation is an affectation that, among other things, prevents the exchange of genetic material from the sub-populations of species that become isolated. Similarly, this can affect reproduction of dioecious species, if the specimens with flowers of different sexes are separated.

With the clearing of vegetation, in addition to related transmission line works, there is a fragmentation in the connection of habitats in the area. This would not only affect the plant resources in their dispersion, but also the wildlife. Fragmentation can prevent the exchange of genetic material

1.5.2.4 Location of the Impact

The effect of habitat fragmentation is expected to occur directly in the areas of construction, substations, cableway and transmission line towers, and accsess roads.

1.5.2.5 Impact Assessment

The Quantitative Assessment of the impact on the habitat has been included in the Impact Assessment Matrix. A qualitative description of the impact in phases is presented below:

Habitat Reduction and Fragmentation		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	NA
Intensity	Medium	NA
Extension	Punctual	NA
Timing	Short Term	NA
Persistence	Permanent	NA
Reversibility	Short Term	NA
Recoverability	Mitigable	NA
Synergy	Synergistic	NA
Accumulation	Acumulative	NA
Periodicity	Non Periodic	NA
Importance	Medium	NA

Habitat Reduction and Fragmentation		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Magnitude	0.6 - Medium	NA

1.5.3 Reduction in Terrestrial Wildlife Population

This impact will likely occur during the construction activities.

1.5.3.1 Activities that Generate the Impact

Construction Phase:

- Preparation of trails and access roads;
- Construction works (substations, staging areas, tower bases); and
- Management of hazardous substances.

Operation Phase

- Maintenance activities; and
- Management of hazardous substances.

1.5.3.2 Derived Effects

The direct effect of reducing populations of terrestrial wildlife in the area of the Project is the possible decline of biodiversity in the area during construction activities.

1.5.3.3 Description of the Impact

In the construction phase, the impacts can be caused by the movement and traffic of machinery and vehicles when opening access roads. During the operation phase of the Project, this impact will be minimal because operation activities will be reduced to the maintenance of the transmission line right of way.

Construction activities could result in damage to terrestrial wildlife, either by running over, colliding against vehicles and machinery, by damaging nesting sites (as in the case of reptiles) and causing deaths during reforestation as result of cutting of vegetation, loss of nests and young species of wildlife.

1.5.3.4 Location of the Impact

The effects of this impact manifest themselves mainly in the areas of construction, roads, tower bases, substations, etc. However, the effects on sensitive species may also extend to adjacent areas.

1.5.3.5 Impact Assessment

The Quantitative Assessment of the impact has been included in the Impact Assessment Matrix. A qualitative description of the impact in phases is presented below:

Reduction of Terrestrial Wildlife Populations		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	Medium	Low
Extension	Partial	Punctual
Timing	Medium Term	Short Term
Persistence	Temporary	Temporary
Reversibility	Medium Term	Medium Term
Recoverability	Mitigable	Mitigable
Synergy	Synergistic	Synergistic
Accumulation	Cumulative	Cumulative
Periodicity	Periodic	Non Periodic
Importance	Medium	Low
Magnitude	0.6 – Medium	0.4 – Low

1.5.4 Reduction in Bird Population

Activities that could impact bird populations will occur during the construction and operation phases of the Project.

1.5.4.1 Activities that Generate the Impact

The main activities that can generate this type of impacts are those that have the potential to modify the routes of flight of these species, such as:

- The presence of equipment and machinery; and

- The installation and presence of the towers and cables from the line of transmission.

1.5.4.2 Derived Effects

The derived effect associated with this impact in the area of the Project are the decrease of biodiversity in the area, due to loss of habitat. In addition, the collisions of birds with electrical lines could cause power failures and fires.

1.5.4.3 Description of the Impact

The activities included in the construction phase such as the improvement of access roads, construction of substations, construction of internal roads and construction of foundations for the cableway and transmission line towers could alter the habitat and will generate loss of individuals.

The impact could be more significant in the operation phase of the project in relation to bird populations and because of the high mobility presented, especially if the transmission line crosses migratory flyways.

1.5.4.4 Location of the Impact

Locations where this impact can occur are determined by the location of the towers and high-voltage transmission line lines.

1.5.4.5 Impact Assessment

The Quantitative Assessment of the impact has been included in the Impact Assessment Matrix. A qualitative description of the impact in phases is presented below:

Reduction in Bird Population		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	Low	Medium
Extension	Punctual	Partial
Timing	Short Term	Medium Term
Persistence	Temporary	Temporary
Reversibility	Medium Term	Medium Term
Recoverability	Mitigable	Mitigable

Reduction in Bird Population		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Synergy	Synergistic	Synergistic
Accumulation	Cumulative	Cumulative
Periodicity	Non Periodic	Periodic
Importance	Low	Medium
Magnitude	0.4 – Low	0.6 – Medium

1.5.5 Disturbance of Aquatic Biota

The occurrence of actions that may affect the quality of aquatic habitat may manifest itself during the construction phase.

1.5.5.1 Activities that Generate the Impact

The main activities that could generate this type of impacts are those that have the potential to modify the surface water quality and the hydroperiod of discharge, such as:

- Construction and repairs on access roads; and
- Cutting and clearing of vegetation.

1.5.5.2 Derived Effects

The main effects derived from the disturbance of the aquatic environment could include the reduction of freshwater biodiversity and abundance of species for food.

1.5.5.3 Description of the Impact

Excavation and construction of access roads, the substation and all other associated structures will produce sediment and stormwater runoff flowing towards the nearby streams. Although the works will be specific to certain areas (Tower bases for example) sediments could enter the streams and contribute to the impairment of the waters of the Jilamito River and near by creeks, causing negative effects on the aquatic biota. Furthermore, an accident in handling hazardous substances (fuel, grease or oil) during the construction or maintenance activities could affect runoff sources, and these in turn affect aquatic biota.

1.5.5.4 Location of the Impact

The sites where this impact can manifest itself are determined by locating the structures associated with the transmission line that are near the surface water

bodies particularly the Jilamito River, its tributaries and associated creeks and streams.

1.5.5.5 Impact Assessment

The Quantitative Assessment of the impact on the aquatic biota has been included in the Impact Assessment Matrix. A qualitative description in phases of this impact is presented below:

Disruption of Aquatic Biota		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	Low	Low
Extension	Punctual/Discreet	Punctual/Discreet
Timing	Medium Term	Medium Term
Persistence	Temporary	Temporary
Reversibility	Medium Term	Medium Term
Recoverability	Mitigable	Mitigable
Synergy	Synergistic	Synergistic
Accumulation	Simple	Simple
Periodicity	Non Periodic	Non Periodic
Importance	Medium	Medium
Magnitude	**0.3 – Low**	**0.3 – Low**

1.6 Socio-Economic and Cultural Impacts

The relevant impacts on socio-economic and cultural aspects during the construction and operation phases have been summarized in this section.

1.6.1 Disturbances during construction activities

1.6.1.1 Activities that generate the impact

Transportation of machinery and excavations are the main activities that could generate disturbances during construction activities.

1.6.1.2 Location of the impact

Given that construction activities are temporary in duration, the activities of transport of tower pieces and large machinery will run on a scheduled basis and will be mostly transported by the mules while the cableway is in construction and

transported by the cableway from then on, it is not expected that the disturbances during construction will be extended in time.

1.6.1.3 Derived effects

During the phases of construction the transit of trucks with building materials and the movement of heavy machinery will disrupt traffic and in some cases can even impact the access to the communities.

1.6.1.4 Description of the impact

It is anticipated that the generation of these disturbances will be perceived at a local level, for example on the air quality due to the presence of dust in the vicinity of the construction areas; their roads of access and the areas of material management. The work fronts and roads will be kept damp to minimize the dust emission.

1.6.1.5 Impact assessment

The quantitative assessment of the inpact to the population is included in the impact assessment matrix. A qualitative description of the impact phase is included below:

Disturbances during construction activities		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	NA
Intensity	Medium	NA
Extension	Partial	NA
Timing	Short Term	NA
Persistence	Temporary	NA
Reversibility	Medium Term	NA
Recoverability	Mitigable	NA
Synergy	Synergistic	NA
Accumulation	Simple	NA
Periodicity	Periodic	NA
Importance	Medium	NA
Magnitude	0.6 – Medium	NA

1.6.2 Expectations of the Community

The expectations of the communities in the vicinity of the Project has already begun and it is expected to continue during the phases of construction of the Project.

1.6.2.1 *Activities that Generate the Impact*

The communities are aware of the feasibility studies and environmental impacts conducted for Jilamito and many have been involved in one way or another during the construction activities of the other hydroelectric plant built in the area, Mezapa. ERM conducted several interviews in the various communities near the project during the site visit of August 2016.

1.6.2.2 *Location of the Impact*

At the provincial level there are expectations of employment, and of the benefits of the development. The most important thing is that Jilamito River are of great economic and recreational importance in the communities of Jilamito Nuevo, Jilamito Viejo and Jilamo.

1.6.2.3 *Derived Effects*

The main effect is the possibility of non-compliance with the communities' expectations in relation to two principal matters: 1) employment, 2) support of their basic needs. This would result in an adverse attitude of the communities towards the execution of the Project, which would bring negative consequences.

1.6.2.4 *Description of the Impact*

The existing operations of the Mezapa hidroplant in the area of Jilamito have introduced these communities to the bennefits a project like one of these could bring, many community members have already worked in Mezapa project and have the expectation that Jilamito would bring same or more bennefits. The local communities have high expectations in relation to the benefits that Jilamito could provide them, specifically in relation to the creation of employment and benefits of direct development (roads, schools, and similar benefits).

The communities have expressed great concern over the possibility that the Project will not execute its commitments in relation with social benefits and employment, and because of that, they are requesting that INGELSA define a long term agreement in order to secure investment in the area, in relation to the number of jobs that will be gathered from the area of influence and characteristics of the employment program.

1.6.2.5 *Impact Assessment*

A qualitative description of this impact in phases is presented below:

Expectations of the Community		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	NA
Intensity	Medium	NA
Extension	Partial	NA
Timing	Medium Term	NA
Persistence	Temporary	NA
Reversibility	Medium Term	NA
Recoverability	Mitigable	NA
Synergy	Synergistic	NA
Accumulation	Simple	NA
Periodicity	Periodic	NA
Importance	Medium	NA
Magnitude	0.5 – Media	NA

1.6.3 Effects of Electromagnetic Fields

1.6.3.1 Activities that Generate the Impact

The consumption of electricity has become an integral part of everyday life. Whenever there is flow of electricity, electromagnetic fields are generated along the transmission lines that transport it, as well as in the proximity of electric equipment. Since the end of the 1970s, questions have been raised over whether exposure to these electric and magnetic fields (EMF) of extremely low-frequency (FEB) has adverse consequences for health. Since then, there have been numerous studies conducted, which have contributed to resolve important issues to better focus future research.

1.6.3.2 Location of the impact

The impact could occur in the proximities of the transmission line towers as well as in its the right of way and the viscinity of the substations.

1.6.3.3 Derived Effects

The health effects of exposure to short-term high-frequency fields have been demonstrated and are the basis of two sets of international guidelines on exposure limits (ICNIRP, 1998;) (IEEE, 2002). Currently, both agencies considered that them possible health effects caused by the exposure to long term electro magnetic fields (EMF) of low frequency are insufficient to justify a reduction of these limits of quantitative exposure.

1.6.3.4 Description of the Impact

EMFs are present wherever there is a flow of electric current, i.e. in power transmission cables, lines and electrical equipment, domestic installations. Electric fields are generated by electric charges and are measured in volts per meter (v/m). some common materials, such as wood or metal, minimize and protect against its effects. Those fields magnetic is originate by the movement of loads electric (i.e., a current) and is expressed in Tesla (T) or, more commonly, in millitesla (mT) or microtesla (µT). It is important to note that both types of fields intensify at the source and decreases rapidly with increasing distance with respect to the same.

In essence, the frequency of the electrical current is usually 50 Hz in Europe and 60 Hz in America. Near certain devices, the values of the magnetic fields can get to several hundreds of microtesla. Below a power transmission line, the magnetic field can be 20 µT (200 mG) and the electric field can reach several thousands of volts per meter. However, those magnetic fields of network frequency in homes have a much lower intensity: around 0.07 µT (0.7 mG) in Europe and 0.11 µT (1.1 mG) in North America. Those mean values corresponding to the homes' electric fields can reach several tens of Volt by meter.

1.6.3.5 Impact Assessment

It is known that EMF decrease rapidly with the increase of distance from the source (in this case the transmission cables). Also, the height of the cables varies slightly by the effect of several factors, such as the temperature of the environment, the temperature of the cable (that also varies with the load), the speed of the wind, between others. Therefore, the analysis of potential impacts is carried out from a qualitative perspective.

The quantitative evaluation of the electromagnetic fields is includes in the matrix of evaluation of impacts. A qualitative description of the impact phase is included below:

Effects of Electromagnetic Fields		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	NA	Negative
Intensity	NA	Medium
Extension	NA	Punctual
Timing	NA	Long Term
Persistence	NA	Temporary
Reversibility	NA	Irreversible
Recoverability	NA	Recoverable
Synergy	NA	Non Synergistic
Accumulation	NA	Simple
Periodicity	NA	Periodic
Importance	NA	Medium
Magnitude	NA	0.3- Low

1.6.4 Stimulus to the National Economy

The Jilamito Project will provide a stimulus to the national economy during its construction and operation phases.

1.6.4.1 Activities that Generate the Impact

This is a positive, indirect impact that involves all the activities carried out in each of the construction and operations phases of the Project including employment of non qualified personnel for construction activities, local homes operating as hotels for workers coming from out of town, etc.

1.6.4.2 Location of the Impact

The impact of investment during the construction phase and the income from the connection to the grid, will be the final product that will manifest itself throughout the southern region of Honduras.

1.6.4.3 *Derived Effects*

The main effect of the approval of the Project is stimulating new investments in the complementary sectors by companies that provide goods and services to Jilamito. This effect has already begun in the region with the construction of the Mezapa hydroelectric plant and it is expected to continue during the construction and operation phases of the Project.

1.6.4.4 *Description of the Impact*

The investment for the construction will have a major effect on domestic demand and gross domestic product (GDP). This effect will be reflected primarily in a considerable increase in demand for assets from the suppliers of materials for construction, as well as, and indirectly, in the spending multiplier in salary (increase in liquidity or greater current cash), on the demand of consumables and services for homes; the activation of commercial sectors in the hospitality sales (food and hotels), rendering of services to the personnel of the various construction firms, such as services of telecommunications, private transportation, private security, clothing and industrial equipment, among others.

1.6.4.5 *Assessment of Impact*

The quantitative assessment of the stimulus to National Economy is included in the Impact Evaluation Matrix. A qualitative description of the impact per phases is included here:

Stimulus to National Economy		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Positive	Positive
Intensity	High	Medium
Extension	Partial	Partial
Timing	Medium Term	Medium Term
Persistence	Permanent	Permanent
Reversibility	Irreversible	NA
Recoverability	NA	NA
Synergy	Very Synergistic	Very Synergistic
Accumulation	Cumulative	Cumulativo
Periodicity	Periodic	NA

Stimulus to National Economy		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Importance	High	NA
Magnitude	1.0-High	0.5- Medium

1.6.5 Accidents and Incidents

1.6.5.1 Activities that Generate the Impact

Accidents can occur during the construction phase. Activities such as carrying the materials to build the cableway in mules up the mountain, construction of roads, construction of bases to mount the towers, installation of them towers, could eventually cause accidents to the workers.

1.6.5.2 Location of the Impact

The impact will be located in areas were activities are carried out, whether access to the cableway locations, transmission line or substation. Once towers have been installed, the impact could be generated during maintenance activities.

1.6.5.3 Derived Effects

Issues relating to access to the project sites, including possible tensions resulting from the restriction of access to the area with the nearby populations.

1.6.5.4 Description of the Impact

The security of communities is also an aspect to be considered. Access to the construction area or the towers of high voltage can result in accidents. Therefore all points of access to the project sites need to be clearly marked and in have security personnel if necessary.

1.6.5.5 Impact Assessment

The quantitative assessment of the impact is included in the Impact Evaluation Matrix. A qualitative description of the impact per phases is included here:

Accidents and Incidents		
PHASE : ATTRIBUTE	**CONSTRUCTION**	**OPERATION**
Type	Negative	Negative
Intensity	High	Low
Extension	Partial	Partial
Timing	Short Term	Short Term
Persistence	Permanent	Frugal
Reversibility	Irreversible	Short Term
Recoverability	Mitigable	Mitigable
Synergy	Synergistic	Non Synergistic
Accumulation	Simple	Simple
Periodicity	Non Periodic	Non Periodic
Importance	High	Low
Magnitude	0.7-High	0.3-Low

1.7 Summary of Impacts

The Impact Assessment Matrix shows all impacts considered and the evaluation in the different phases of the Project. The impacts of high and medium magnitude require specific measures of prevention, minimization, mitigation and/or compensation to ensure the social and environmental viability of the Project. These measures should be addressed and implemented by the promoter of the Project.

It is important to point out that the determination of the value of magnitude of each impact was performed according to the methodology described previously in this chapter. This methodology is based on the impact assessment, by assigning numerical values to a series of attributes, which, analyzed together using a mathematical formula, determine the specific magnitude of the impact assessed.

IMPACTS ASSESSMENT MATRIX ***Prepared by: ERM***		Positive Negative	Low (1) Medium (2) High (3)	Punctual/ Discreet (1) Partial (2) Extents (3)	Short Term (3) Medium Term (2) Long Term (1)	Frugal (1) Temporary (2) Permanent (3)	Short Term (1) Medium Term (2) Irreversible (3)	Recoverable (1) Mitigable (2) Irrecoverable (3)	Non Synergistic (1) Synergistic (2) Very Synergistic (3)	Simple (1) Accumulative (3)	Periodic (3) Non Periodic (1)	Low (1) Medium (2) High (3)	I max: Imin:	(-) 39 13	(+) 33 11
														0.1 - 0.25	COMPATIBLE
														0.25 - 0.4	LOW
														0.5 - 0.6	MEDIUM
														0.7 - 0.8	HIGH
INDICATOR OF IMPACT ▼	*MEDIUM*	**TYPE**	INTENSITY (I)	EXTENSION (E)	TIMING (M)	PERSISTENCE (P)	REVERSIBILITY (R)	RECOVERABILITY (Rc)	SYNERGY (S)	ACCUMULATION (A)	PERIODICITY (Pr)	IMPORTANCE (Im)	VALUATION	ASSESSMENT Standardized	**MAGNITUDE**
CONSTRUCTION PHASE															
Activation of Erosive Processes and Sedimentation	*Soil*	Negative	Medium	Partial	Short Term	Temporary	Medium Term	Mitigable	Synergistic	Cumulative	Periodic	Medium			
Valuation		**(-)**	3	1	3	2	2	2	2	3	2	2	28	0.6	**MEDIUM**
Increase in Solid Waste	*Environmet*	Negative	Low	Punctual	Short Term	Temporary	Short Term	Mitigable	Non Synergistic	Cumulative	Non Periodic	Low			
Valuation		**(-)**	1	1	3	2	1	2	1	3	3	1	24	0.4	**LOW**
Impact on Forestry and Agroforestry Soils	*Soil*	Negativo	Alta	Parcial	Short term	Temporary	Mediano Plazo	Mitigable	Synergistic	Cumulative	Periodic	Media			
Valuation		**(-)**	3	2	3	2	2	2	2	3	3	2	31	0.7	**HIGH**
Soil Compaction	*Soil*	Negative	Medium	Punctual	Medium Term	Temporary	Medium Term	Mitigable	Synergistic	Simple	Non Periodic	Medium			
Valuation		**(-)**	2	1	2	2	2	2	2	1	1	2	22	0.3	**LOW**
Change of Land Use	*Soil*	Negativo	Medium	Punctual	Short term	Permanent	Irreversible	Irrecoverable	Non Synergistic	Simple	Priodic	Medium			
Valuation		**(-)**	2	1	3	3	3	3	1	1	3	2	29	0.6	**MEDIUM**
Deterioration of Visual Quality of Landscape	*Landscape*	Negativo	Medium	Punctual	Short term	Temporary	Short Term	Recoverable	Non Synergistic	Simple	Periodic	Medium			

IMPACTS ASSESSMENT MATRIX ***Prepared by: ERM***		Positive Negative	Low (1) Medium (2) High (3)	Punctual/ Discreet (1) Partial (2) Extents (3)	Short Term (3) Medium Term (2) Long Term (1)	Frugal (1) Temporary (2) Permanent (3)	Short Term (1) Medium Term (2) Irreversible (3)	Recoverable (1) Mitigable (2) Irrecoverable (3)	Non Synergistic (1) Synergistic (2) Very Synergistic (3)	Simple (1) Accumulative (3)	Periodic (3) Non Periodic (1)	Low (1) Medium (2) High (3)	I max: Imin:	(-) 39 13 0.1 - 0.25 0.25 - 0.4 0.5 - 0.6 0.7 - 1.0	(+) 33 11 COMPATIBLE LOW MEDIUM HIGH
INDICATOR OF IMPACT ▼	*MEDIUM*	**TYPE**	INTENSITY (I)	EXTENSION (E)	TIMING (M)	PERSISTENCE (P)	REVERSIBILITY (R)	RECOVERABILITY (Rc)	SYNERGY (S)	ACCUMULATION (A)	PERIODICITY (Pr)	IMPORTANCE (Im)	VALUATION	ASSESSMENT Standardized	**MAGNITUDE**
Valuation		**(-)**	2	1	3	2	1	2	1	1	3	2	24	0.4	**LOW**
Risk of Water and Soil Contamination due to Accidental Spills	*Water/Soil*	Negative	High	Partial	Short term	Temporary	Medium Term	Mitigable	Non Synergistic	Cumulative	Non Periodic	Media			
Valuation		**(-)**	3	2	3	2	2	2	1	3	1	2	28	0.6	**MEDIUM**
Water Use Conflicts	*Water*	Negativo	Medium	Punctual	Short term	Temporary	Short Term	Recoverable	Non Synergistic	Simple	Periodic	Medium			
		(-)	2	1	3	2	1	2	1	1	3	2	24	0.4	**LOW**
Reduction of Vegetation	*Flora*	Negative	Medium	Punctual	Short term	Permanent	Medium Term	Mitigable	Synergistic	Cumulative	Non Periodic	Medium			
Valuation		**(-)**	2	1	3	3	2	2	2	3	1	2	28	0.6	**MEDIA**
Reduction and Fragmentation of Habitat	*Flora*	Negative	Medium	Punctual	Short term	Permanente	Short Term	Mitigable	Synergistic	Cumulative	Non Periodic	Medium			
Valuation		**(-)**	2	1	3	3	1	2	2	3	3	2	29	0.6	**MEDIUM**
Reduction of terrestrial Wildlife Populations	*Terrestrial Fauna*	Negative	Medium	Partial	Medium Term	Temporary	Mediano Plazo	Mitigable	Synergistic	Cumulative	Priodic	Media			
Valuation		**(-)**	2	2	2	2	2	2	2	3	3	2	28	0.6	**MEDIUM**

IMPACTS ASSESSMENT MATRIX ***Prepared by: ERM***		Positive Negative	Low (1) Medium (2) High (3)	Punctual/ Discreet (1) Partial (2) Extents (3)	Short Term (3) Medium Term (2) Long Term (1)	Frugal (1) Temporary (2) Permanent (3)	Short Term (1) Medium Term (2) Irreversible (3)	Recoverable (1) Mitigable (2) Irrecoverable (3)	Non Synergistic (1) Synergistic (2) Very Synergistic (3)	Simple (1) Accumulative (3)	Periodic (3) Non Periodic (1)	Low (1) Medium (2) High (3)	I max: Imin:	(-) 39 13 0.1 - 0.25 0.25 - 0.4 0.5 - 0.6 0.7 - 1.0	(+) 33 11 COMPATIBLE LOW MEDIUM HIGH
INDICATOR OF IMPACT ▼	*MEDIUM*	**TYPE**	INTENSITY (I)	EXTENSION (E)	TIMING (M)	PERSISTENCE (P)	REVERSIBILITY (R)	RECOVERABILITY (Rc)	SYNERGY (S)	ACCUMULATION (A)	PERIODICITY (Pr)	IMPORTANCE (Im)	VALUATION	ASSESSMENT Standardized	**MAGNITUDE**
Reduction in Bird Populations	*Wildlife*	Negative	Low	Punctual	Short Term	Temporary	Medium Term	Mitigable	Synergistic	Cumulative	Non Periodic	Low			
Valuation		**(-)**	1	1	3	2	2	2	2	3	1	1	24	0.4	**LOW**
Impairment of Aquatic Biota	*Aquatic Biota*	Negative	Low	Punctual	Medium Term	Temporary	Medium Term	Mitigable	Synergistic	Simple	No Periodic	Medium			
Valuation		**(-)**	1	1	2	2	2	2	2	1	1	2	21	0.3	**LOW**
Disturbances During Construction	*Social*	Negativo	Medium	Partial	Short term	Temporary	Medium Term	Mitigable	Synergistic	Simple	Periodic	Medium			
Valuation		**(-)**	2	2	3	2	2	2	2	1	3	2	28	0.6	**MEDIUM**
Expectations of the Community	*Social*	Negative	Medium	Partial	Medium Term	Temporary	Medium Term	Mitigable	Synergistic	Simple	Periodic	Media			
Valuation		**(-)**	2	2	2	2	2	2	2	1	3	2	26	0.5	**MEDIUM**
Effects of Electromagnetic Fields	*Social*	**NA**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Stimulus to National Economy	*Social*	Positivo	High	Partial	Medium Term	Permanent	Irreversible	NA	Very Synergistic	Cumulative	Periodic	High			
Valuation		**(+)**	3	2	2	3	3		3	3	3	3	32	1.0	**HIGH**

IMPACTS ASSESSMENT MATRIX ***Prepared by: ERM***		Positive Negative	Low (1) Medium (2) High (3)	Punctual/ Discreet (1) Partial (2) Extents (3)	Short Term (3) Medium Term (2) Long Term (1)	Frugal (1) Temporary (2) Permanent (3)	Short Term (1) Medium Term (2) Irreversible (3)	Recoverable (1) Mitigable (2) Irrecoverable (3)	Non Synergistic (1) Synergistic (2) Very Synergistic (3)	Simple (1) Accumulative (3)	Periodic (3) Non Periodic (1)	Low (1) Medium (2) High (3)	I max: Imin:	(-) 39 13 0.1 - 0.25 0.25 - 0.4 0.5 - 0.6 0.7 - 1.0	(+) 33 11 COMPATIBLE LOW MEDIUM HIGH
INDICATOR OF IMPACT ▼	*MEDIUM*	**TYPE**	INTENSITY (I)	EXTENSION (E)	TIMING (M)	PERSISTENCE (P)	REVERSIBILITY (R)	RECOVERABILITY (Rc)	SYNERGY (S)	ACCUMULATION (A)	PERIODICITY (Pr)	IMPORTANCE (Im)	VALUATION	ASSESSMENT Standardized	**MAGNITUDE**
Accidents and Incidents	*Social*	Negative	High	Partial	Short Term	Permanent	Irreversible	Mitigable	Synergistic	Simple	Non Periodic	High			
Valuation		**(-)**	3	2	3	3	3	2	2	1	1	3	31	0.7	**HIGH**
OPERATION PHASE															
Activation of Erosive Processes and Sedimentation	*Soil*	Negati ve	Medium	Punctual	Short Term	Temporary	Medium Term	Recoverable	Synergistic	Accumulative	Periodic	Medium			
Valuation		**(-)**	1	1	3	1	1	1	1	1	3	1	19	0.2	**Compatible**
Increase in Solid Waste	*Environmen tal*	Negati ve	Low	Punctual	Short term	Sporadic	Short Term	Mitigable	Non Synergistic	Cumulative	Periodic	Low			
Valuation		**(-)**	1	1	3	1	1	2	1	3	3	1	22	0.3	**LOW**
Impact on Forest and Agroforestry soils	*Soil*	Negati ve	High	Punctual	Short Term	Temporary	Medium Term	Mitigable	Synergistic	Simple	Periódico	Low			
Valuation		**(-)**	1	1	3	2	2	2	2	1	3	1	24	0.4	**LOW**
Soil Compaction	*Soil*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Valuation															
Change of Land Use	*Soil*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Valuation															
Deterioration of Visual Quality of Landscape	*Landscape*	Negati	Medium	Punctual	Short	Temporary	Short Term	Recoverable	Non Synergistic	Simple	Periodic	Medium			

IMPACTS ASSESSMENT MATRIX ***Prepared by: ERM***		Positive Negative	Low (1) Medium (2) High (3)	Punctual/ Discreet (1) Partial (2) Extents (3)	Short Term (3) Medium Term (2) Long Term (1)	Frugal (1) Temporary (2) Permanent (3)	Short Term (1) Medium Term (2) Irreversible (3)	Recoverable (1) Mitigable (2) Irrecoverable (3)	Non Synergistic (1) Synergistic (2) Very Synergistic (3)	Simple (1) Accumulative (3)	Periodic (3) Non Periodic (1)	Low (1) Medium (2) High (3)	I max: Imin:	(-) 39 13 0.1 - 0.25 0.25 - 0.4 0.5 - 0.6 0.7 - 0.1.0	(+) 33 11 COMPATIBLE LOW MEDIUM HIGH
INDICATOR OF IMPACT ▼	*MEDIUM*	**TYPE**	INTENSITY (I)	EXTENSION (E)	TIMING (M)	PERSISTENCE (P)	REVERSIBILITY (R)	RECOVERABILITY (Rc)	SYNERGY (S)	ACCUMULATION (A)	PERIODICITY (Pr)	IMPORTANCE (Im)	VALUATION	ASSESSMENT Standardized	**MAGNITUDE**
		vo			term										
Valuation		**(-)**	2	1	3	2	1	2	1	1	3	2	24	0.4	**LOW**
Risk of Water and Soil Contamination due to Accidental Spills	*Water/Soil*	Negati vo	Low	Punctual	Short Term	Temporary	Short Term	Recoverable	Synergistic	Cumulative	Non Periodic	Media			
Valuation		**(-)**	1	1	3	2	1	1	2	3	1	2	23	0.4	**LOW**
Water Use Conflicts	*Water*	Negati vo	Medium	Punctual	Short term	Temporary	Short Term	Recoverable	Non Synergistic	Simple	Periodic	Medium			
Valuation		**(-)**	2	1	3	2	1	2	1	1	3	2	24	0.4	**LOW**
Reduction of Vegetation	*Flora*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Valuation															
Reduction and Fragmentation of Habitat	*Flora*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Valuation															
Reduction of Terrestrial Fauna Populations	*Terrestrial Fauna*	Negati ve	Low	Punctual	Short Term	Temporary	Medium Term	Mitigable	Synergistic	Cumulative	Non Periodic	Low			
Valuation		**(-)**	1	1	3	2	2	2	2	3	1	1	24	0.4	**LOW**
Reduction in Bird Populations	*Wildlife*	Negati ve	Medium	Partial	Medium Term	Temporary	Mediano Plazo	Mitigable	Synergistic	Cumulative	Priodic	Media			

IMPACTS ASSESSMENT MATRIX ***Prepared by: ERM***		Positive Negative	Low (1) Medium (2) High (3)	Punctual/ Discreet (1) Partial (2) Extents (3)	Short Term (3) Medium Term (2) Long Term (1)	Frugal (1) Temporary (2) Permanent (3)	Short Term (1) Medium Term (2) Irreversible (3)	Recoverable (1) Mitigable (2) Irrecoverable (3)	Non Synergistic (1) Synergistic (2) Very Synergistic (3)	Simple (1) Accumulative (3)	Periodic (3) Non Periodic (1)	Low (1) Medium (2) High (3)	I max: Imin:	(-) 39 13 0.1 - 0.25 0.25 - 0.4 0.5 - 0.6 0.7 - 1.0	(+) 33 11 COMPATIBLE LOW MEDIUM HIGH
INDICATOR OF IMPACT ▼	*MEDIUM*	**TYPE**	INTENSITY (I)	EXTENSION (E)	TIMING (M)	PERSISTENCE (P)	REVERSIBILITY (R)	RECOVERABILITY (Rc)	SYNERGY (S)	ACCUMULATION (A)	PERIODICITY (Pr)	IMPORTANCE (Im)	VALUATION	ASSESSMENT Standardized	**MAGNITUDE**
Valuation		**(-)**	2	2	2	2	2	2	2	3	3	2	28	0.6	**MEDIUM**
Impairment of Aquatic Biota	*Aquatic Biota*	Negative	Low	Punctual	Medium Term	Temporary	Medium Term	Mitigable	Synergistic	Simple	No Periodic	Medium			
Valuation		**(-)**	1	1	2	2	2	2	2	1	1	2	21	0.3	**LOW**
Disturbances During Construction	*Social*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Valuation															
Expectations of the Community	*Social*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Valuation															
Effects of Electromagnetic Fields	*Social*	Negative	Medium	Punctual	Long Term	Temporary	Irreversible	Recoverable	Non Synergistic	Simple	Periódico	Media			
Valuation		**(-)**	2	1	1	2	3	1	1	1	3	2	21	0.3	**LOW**
Stimulus to National Economy	*Social*	Positive	Medium	Partial	Medium Term	Permanent	NA	NA	Very Synergistic	Cumulative	NA	NA			
Valuation		**(+)**	2	2	2	3			3	3			22	0.5	**MEDIUM**
Accidents and Incidents	*Social*	Negative	Low	Partial	Short Term	Frugal	Short Term	Mitigable	Non Synergistic	Simple	Non Periodic	Low			

IMPACTS ASSESSMENT MATRIX ***Prepared by: ERM***		Positive Negative	Low (1) Medium (2) High (3)	Punctual/ Discreet (1) Partial (2) Extents (3)	Short Term (3) Medium Term (2) Long Term (1)	Frugal (1) Temporary (2) Permanent (3)	Short Term (1) Medium Term (2) Irreversible (3)	Recoverable (1) Mitigable (2) Irrecoverable (3)	Non Synergistic (1) Synergistic (2) Very Synergistic (3)	Simple (1) Accumulative (3)	Periodic (3) Non Periodic (1)	Low (1) Medium (2) High (3)	I max: Imin:	(-) 39 13 0.1 - 0.25 0.25 - 0.4 0.5 - 0.6 0.7 - 1.0	(+) 33 11 COMPATIBLE LOW MEDIUM HIGH
INDICATOR OF IMPACT ▼	*MEDIUM*	**TYPE**	INTENSITY (I)	EXTENSION (E)	TIMING (M)	PERSISTENCE (P)	REVERSIBILITY (R)	RECOVERABILITY (Rc)	SYNERGY (S)	ACCUMULATION (A)	PERIODICITY (Pr)	IMPORTANCE (Im)	VALUATION	ASSESSMENT Standardized	**MAGNITUDE**
Valuation		**(-)**	1	2	3	1	1	2	1	1	1	1	20	0.3	**LOW**