

ENVIRONMENTAL ASSESSMENT OF SIEPAC PROJECT

TERMS OF REFERENCE

A. Antecedents

The governments of the Central American countries subscribed in 1987 to the Framework of the Electric Market in Central America Treaty with the purpose of developing a regional and competitive market for electricity. This initiative will be carried out through a transmission line connecting the national networks. This project has been named SIEPAC (for of its Spanish acronym)- Electric Interconnection Systems of the Central American Countries-.

A product of the framework Treaty, the partnership named Corporation Owner of the Network S.A. (EPR, for of its Spanish acronym) was constituted with the main objective of designing, constructing, operating and maintaining the SIEPAC network.

The EPR shareholders are these electric companies:

- Guatemala: National Institute of Electricity (INDE, for of its Spanish acronym).
- El Salvador: Executive Commission of Lempa River Hydroelectric (CEL, for of its Spanish acronym).
- Honduras: National Company of Electric Energy (ENEE, for of its Spanish acronym).
- Nicaragua: Nicaraguan Company of Electricity (ENEL, for of its Spanish acronym).
- Costa Rica: Costa Rican Institute of Electricity (ICE, for of its Spanish acronym).
- Panama: Electric Transmission Company, S.A. (ETESA, for of its Spanish acronym).
- Spain: ENDESA, incorporated November 2001.

The physical infrastructure of the SIEPAC Project includes approximately 1830 kilometers of 230 kV lines, spanning from Guatemala to Panama and connecting to power substations of each one of the six Central American countries.

In 1997 an Environmental Impact Assessment (EIA) on regional scale was presented based on the valid trajectory at that date. This study served as base so that a mission of analysis of the I.A.D.B. accepted the advances obtained in environmental issue until this date like acceptable for the infrastructure credit transactions of the Project.

At this moment it is had to accomplish the national EIA and to make the proceeding of the obtention of corresponding environmental licenses, according to the legislation of each country.

B. Objective

The object of the present terms of reference is to give environmental and social viability to SIEPAC Project on the basis of the main pillars established within the framework of the Puebla-Panama Plan. Additionally the Project will look for the administrative transaction of the environmental licenses with the Responsible Organizations in the different countries according to the effective legislation in each one of them.

C. Reach of the tasks

The tasks will be the following ones:

i Coordination of the tasks (throughout the administrative proceeding)

- Accomplishment of the administrative proceeding of Environmental Assessments.
- To maintain the necessary contacts with the interested administrative agencies.

ii The study of the environment and the natural risks (2,5 Months)

- Compilation and analysis of the legislation and the existing information.
- Analysis of the validity of the contents of the 1997EIA.
- Complementary field works and laboratory.
- Description of the environment and the natural risks, and plan edition.
- Support to the proceeding of public information and accomplishment of complementary studies (outside the 2,5 months)

iii Project Impact Assessment (1,5 months)

- Identification of impacts
- Characterization and valuation of such
- Identification and description of the preventive and mitigation measures
- Elaboration of the of Environmental Management Plan for the project, identifying associate costs
- Support the proceedings of public information and accomplishment of necessary complementary studies (outside the 1,5 months)

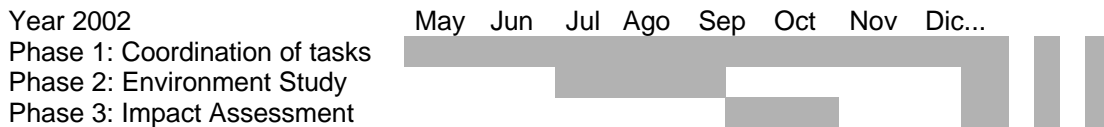
Complementary Works.

Once subject under the EIA to public information and received the pertinent comments from the environmental administrative agency, the company responsible of EIA will have to come:

- To extend the studies with the intention of including the different considerations that the respective competent administrative agencies consider opportune.
- To order by thematic the diverse allegations received in the public information phases, making specific to what chapters or sections the EIA will specifically refer to the specific raised subjects.
- To analyze the comments contributed by the EPR adduced and proponents, within the framework of the knowledge of the zone, the answer to give to each one of them. All the allegations and the answers will be proposed by the proponents and written up definitively by EPR. These allegations and answers will form an Annex to the EIA.
- To complete the study in those aspects that have not been considered during the writing of the Study and whose inclusion EPR considers opportune, based on the allegations received in the public information phases.

Activity Chronogram

The tasks will adjust to the following programming:



D. Organization of study

EPR will have a regional environmental Coordinator who will settle down the criteria and main lines of performance and will review the quality of the EIA during this elaboration. In each country, the company that makes the EIA will designate a Project Director, which will coordinate with EPR and the rest of the national Project Directors and will be directly responsible for the evaluation, analysis, designs, projects, calculations and measurements of its work team.

The tasks will have to be made by a multidisciplinary team, with experts in the diverse implied areas. Among others, the following capacities will be present:

- Project Director, with direct responsibility on the tasks and specialized technical criterion in environment.
- Documentarist expert of the environmental and social sources of information in the country.
- Specialists in geology and related sciences.
- Specialists in the biotic environment.
- Specialists in sociology.
- Specialists in archaeology.
- Specialists in digital treatment of maps and planes.
- Specialists in analysis and assessments of impacts.
- Specialists in electrical and civil engineering

All of them will have the required qualification, experience demonstrated in EIA and, if this requirement exists, to be credited by the competent national Authorities.

E. Minimum content of the Environmental Impact Assessment

0. Executive Summary

A synthesis document will be drafted with all the information in which the environmental viability of the project is demonstrated, in a language that allows an easy spreading to the public in general. It will contain a summary of the main characteristics of the project, the introduced description of the main impacts and co governing measures. It will be accompanied by photographic and graphical material.

This chapter will be written up when the rest of the EIA is finished.

1. Introduction

The introduction will include the index of the EIA, a presentation of the proponent of the project (EPR), the objective of the EIA, the methodology of impact assessments that has been used, the content of the study and the consultations that have been made during their elaboration. Likewise all the used terms and technical abbreviations in the document will be defined.

Also it will be included in this chapter the name and the professional qualification of each one of the components of the work team, specifying his qualification and experience in each environmental field as well as the participation that they have had in the different sections of the EIA.

2. General description of the project

In this chapter the antecedents of project SIEPAC, the advantages of the international interconnection, the necessity and the objectives of the installation, the justification of the proposed technical solution and the layout of SIEPAC project will be described, justifying in this last case the proposed alternative in comparison to the other options.

3. Technical description of the project

In this chapter, the general characteristics of the line and of the connections will be described to the different substations, a detailed description of the project will be made, the technical conditioners, the auxiliary description of works and facilities, the machinery and materials used in the construction, the labor costs, the crossovers and rights of passage generated, the control during works and the operation and maintenance.

4. Political, legal and administrative framework

In this chapter it will be described the environmental political framework and the institutions and organizations who develop their performance in the country and its role according to the carry out of the project. The requirements will be summarized to fulfill the applicable environmental legislation and documents of reference, including the ones referring to the operation of the environmental authorizations.

The regional and national policies will be defined in which the project is framed.

It will be consulted to the interested institutions (environmental, power, regional, municipal, etc.) in order to get to know plans, programs and projects of development in the zone of the project.

5. Definition of homogenous sections

In this chapter the criteria for the division of the layout in homogenous sections will be established and also they will be defined.

6. Description of the environment

This description will be made in the zone of influence of the project (refer to the section of geographic situation) by means of explanatory texts and with the corresponding maps and plans.

In the case of the maps, the degree of detail will be according to the amount of information represented in them, considering itself as general rule the scales defined in the different sections or similar considering the use of cartographic bases of each country.

6.1 Geographic situation

A brief description of the Central American area and the country will be included. The areas affected by the project will be defined and described:

For the assessment of direct impacts, the area directly affected will be the portion of land affected by the construction and the operation; and the influence area will be the portion that can receive the direct impacts of the project, defined in the 2 km on each side of the line.

For the assessment of indirect impacts, the influence area will be demonstrated an existing relation, without distance limit.

A topographic map will be enclosed that'll cover the project submitted to EIA and the maps, also topographic, that'll be necessary, on 1:100.000 or 1:200.000 scale.

6.2 Physical location

6.2.1. Geology and geomorphology

It will include data of basic regional and local geology in the area of influence of the project, a description of geologic units of rocky as well as superficial formation, an analysis of the geologic structure of the units and a basic evaluation at level of contacts, faults, folds and other structures.

Also the geomorphologic formation and its dynamics will be analyzed.

The geologic-geomorphologic study of the area will include individual maps based on the geologic cartography available of the area of influence of the projected line on a 1:50.000 scale and of the respective memories. In areas where singular geologic and geomorphologic formation exist, it will have to be collected more detailed information.

6.2.2 Edaphology

A characterization of the types of land present in the area of influence will be made as well as its agronomic capacity. The U.S.D.A Soil Taxonomy or the countries official will define the methodology for the classification of such. The work scale could be between 1:50.000 and 1:200.000.

6.2.3. Water

A description will be made according to the hydrology of the zone affected by the project, including the network of superficial drainage, its type and distribution, the regime of the water courses, maximum levels in avenues and patterns of flood, the quality of superficial waters, lakes and lagoons. Also it will be made a basic description of the hydrology of the zone, ground-water aquifers, their vulnerability and the variation in the water infiltration in those cases were the vegetal cover is affected.

A superficial hydrological map will be enclosed with the main lotic (rivers) and lenitic (lakes and lagoons) systems of the area of influence in a 1:50,000 scale. And hydrogeology map in a scale between 1:50,000 and 1:200,000.

6.2.4. Climate

The following climatic parameters will be described at a local level: rainfall, temperature, winds, humidity and isolation.

Also the key climatologic events in the regional characterization (incidence of cyclones, hurricanes, episodes of high intensity rainfall, tropical storms, etc.) will de studied.

Maps of these climatic parameters will be included.

6.2.5. Vegetation

The biogeography and bioclimatic frame, and the series of potential vegetation will be described, the actual vegetal formations will be cartographed, based on the existing bibliographical sources, a general catalogue of present species in different vegetal formation will be made, emphasizing singular species, protected, rare and/or species on the way to extinction, catalogued by the national and international Legislation.

The fragility of the vegetal systems according to the structure of the vegetation, functions of connectivity, degree of intervention and number of singular species will be defined.

For the description of the bioclimatic frame it will be necessary to have documentation and updated cartography of the series of vegetation of the influence area. The present vegetal formation cartography in the influence area will be made by satellite images (to be georeferenced) or a similar method, these images will be interpreted and the results will be verified on the land.

The catalogue of species will have a bibliographical base and it will be verified in the field by means of itineraries in the influence area. The units of present vegetation and, generalizing, the uses defined in the referenced territory, will determine homogenous units, biotopes or ecosystems. The cartography will be on a 1:400,000 scale for the potential vegetation, 1:200,000 for anthropized vegetation and 1:50,000 for the interest vegetation.

6.2.6. Fauna

The biogeography framework, defining the existing habitats, will be described. Being based on the existing bibliographical sources, a general catalogue will be made of present species in each defined habitat, describing the diversity, stability and complexity of the fauna community, the protected species according to the national legislation and international treaties, threatened, rare, endemic and on the way to extinction and defining the ecological corridors.

Special attention to the birds will be placed, identifying the existing populations, refuges, habitats, migratory routes, areas of nest building and raising. This study will be included in an independent section.

The definition of the fauna communities and the catalogue of species will have support in the bibliographical base and cartography available, as well as in the specific legislation.

The definition of ecological or fauna corridors will be made on the same base that the one used for the definition of vegetation units. This information will be mapped on a 1:50,000 scale.

6.2.7 Protection of the biological environment

There will be a catalogue of the Protected Natural Spaces and ecological interest that are within the zone of influence of the line. It will be studied how it affects the applicable legislation in the phases of construction and operation. This information will be complemented with a map on scale between 1:100,000 and 1:200,000.

6.3 Socioeconomic Environment

The information gathered in the following sections will be mapped on a suitable scale to visualize the information correctly.

6.3.1. Situation

The present political-administrative structure of the municipalities included in the area of direct affection of the project, the structure of the population centers, the present land use planning and infrastructures as well as communitarian services will be described.

6.3.2. Population

The density of present and foreseen population, its urban-rural distribution, the composition by age and sex, the rate of growth and migration, the degree of schooling, the economically active population, the level of income and any other pertinent demographic information for the purpose of the study.

6.3.3. Economy

The economic situation of the zone, the economic activities established in the area of influence of the project and the use and advantage of the resources will be described.

6.3.4. Uses of the land

The present uses of the land and the modifications that will be suffered by the project, the urbanized areas and the main infrastructure works that are in the area of influence of the line, indicating the applicable norms that they affect the project, will be described.

6.3.5. Indigenous communities

In the case where there are indigenous communities in the influence area, an investigation and description of their cultural characteristics, their history, traditions, monuments, holy areas, root to the zone and other aspects of interest will have to be made.

6.3.6. Historical and cultural heritage

A characterization of the historical and cultural heritage of the area of influence of the project, identifying its important elements will be made.

6.3.7. Affliction to the population

The levels of continuous and occasional noise during the phase of construction will be identified. Also the electric and magnetic fields awaited in the phase of operation of the normal line and fully charged will be described, the affliction that can have on the population and the distances allowed for the location of the houses.

6.4 Landscape

The local landscaping area, units of landscape and the predominant forms and volumes will be described. The visual river basins will be defined and maps of homogenous landscaping

units will be elaborated. An initial evaluation of the units defined, as the capacity of visual absorption, the fragility, the intrinsic visual quality and the intervisibility will be made.

6.5 Picture report

Demonstrative pictures of the most relevant characteristics will be included in this section, or in each one of chapter 6.

6.6 Consulted bibliography and sources of data and information

A list of the bibliographical references and the consulted sources of information will be made in this section, or each one of the ones of chapter 6.

7. Natural risks

In the following sections the natural risks will be evaluated, as well as their effects on the facilities and the probabilities of happening. As a conclusion of each one of them, the places and aspects of the most vulnerable facilities are identified. All the elements contemplated in this chapter will be represented on the geologic map (that includes the representation of the contours) in a scale between 1:50,000 and 1:200,000.

7.1 Seismic risk

To make a general description of the seismicity and tectonics of the surroundings, the sources near the area of the project and the historical seismicity, including the awaited magnitudes and maximum intensities, the period of seismic recurrence and local accelerations peak.

7.2 Volcanic risk

In all the sections of the line located to a distance less than 30 km of an active emission volcanic center, a study shall be made of the volcanic susceptibility of the land and the facilities of the project to the piroclastic flows, avalanches, mud flows, lava outflow, opening of new volcanic cones, ash falls, volcanic gas dispersion and acid rain.

7.3 Risk of erosion

A characterization of the land within the area of influence according to their susceptibility to the erosive processes will be made, contributing the historical data available.

7.4 Risk of substrate stability

For all the sections of the line that go through lands with slopes superior to 15 % and for those located in karstic zones, a study of the susceptibility of the land to mass gravitational movements (sliding, loosening, landslides, collapses, etc.) will be made.

7.5 Risks derived from the hydrological processes

The vulnerability of the low zones to the floods, and in the case of coastal areas to Tsunamis will be studied through an historical evaluation.

7.6 Fire risk

The possibility of a fire incident and how they would affect the line will be evaluated technically and historically.

7.7 Risks resultant from the human activities

The human activities that can have any impact in the line, such as air spraying or gas sources that cause acid rain.

8. Environmental Impacts of the Project

8.1 Description of the potentially impacting activities of the project.

In this section the cause-effect relations must be identified and the magnitude and importance of the environmental impacts caused by the actions to be developed in all the phases of the project must be evaluated.

8.1.1 Potential impacts during the construction

An analysis will be made of the direct and indirect impacts (understanding by direct impact the one that has an immediate incidence in some environmental aspect, and by indirect impact the interdependences or caused by the existing interrelation between different environmental factors), for each element of the environment, geomorphology, land, water, vegetation, fauna, uses of the land, landscape and socioeconomic, that can produce the construction activities of the project:

- Opening of roads and temporary trails of access.
- Creation of auxiliary facilities (warehouses, factories, etc.) .
- Tree felling.
- Foundations lying.
- Supports assembled
- Cable lying.

8.1.2 Potential impacts during the operation and the maintenance of the line.

The direct and indirect impacts will be analyzed, for each element of the environment (geomorphologic, land, water, vegetation, fauna, socioeconomic and landscape), that can produce the activities of operation and maintenance of the line:

- Presence of Supports.
- Presence of conductive cable and ground lines
- Presence and Maintenance of Corridor or Road.
- Current Passing
- Presence of roads and accesses with permanent character.

8.2 Characterization and evaluation of impacts

In this section the criteria that will be used to characterize the impacts of the project on the environment will be defined. These criteria will include the magnitude of the impact, its character, the incidence on the element considered, the possibility of accumulation on the considered element, the continuity, the permanence, the moment of their appearance, the reversibility and the capacity of the element for their recovery.

Also the criteria will be defined to evaluate the impacts from this characterization, within the categories of: positive, void, no significant, compatible, moderate, severe and critical impact.

In both cases the direct and indirect impacts will be considered separately.

8.3 Impact Assessment by sections

For each one of the defined sections the environmental impacts of the project will be identified and they will be characterized and evaluated according to the criteria defined in point 8.2.

After the description of the impacts, the information for each section will be summarized in the corresponding template of activities of the project versus will be transformed elements of the environment.

8.4 Significant impacts

Of the impacts identified in point 8,3, those that have been evaluated as moderate, severe or critical will be selected.

9. Preventive and mitigation measures

In this chapter the preventive and mitigation measures for the defined significant impacts in the point 8,4 will be described, defining in what place and in what stage of the project they will have to be applied.

All these measures will have to be gathered in the plans of chapter 10 and economically evaluated in chapter 11.

9.1 Preventive measures in the design phase

The preventive measures during the design phase will consider, among others, the redefinition of the layout, the location of the supports, the increase of supports, the use of unequal legs and the time of accomplishment of the activities.

9.2 Preventive measures in the construction phase

During the phase of construction it will be considered, among others, the following preventive measures: the control of the building through the contractors, the design of the accesses, a characterized study of the bases of the supports, the preservation of the herbaceous and bushel layer, the cares in the assembly and hoisting of supports, the control of the tree fell, the elimination of the leftover materials of works, the rehabilitation of damages caused and other complementary measures.

9.3 Preventive measures in the operation and maintenance phase

During the phase of operation and maintenance it will be considered, among others, the following preventive measures: periodic visits of inspection, painting of the towers, maintenance of the streets, time of fulfillment of activities, treatment of nests, pursuit of predicted measures and relation with affected proprietors.

9.4 Mitigation measures

Additionally to the preventive measures, the mitigation measures will be studied to use in slopes and bare zones, on the fauna and according to landscape.

10. Environmental Management Plan

The Environmental Management Plan will be designed to execute throughout the stages of the project. This general Plan will consist of the following specific plans:

10.1 Plan of implantation of the environmental measures.

In this section it will be described how to carry out the preventive and defined mitigation measures, specifying the environmental terms of reference to include in the conditions of the project, the concrete procedures to use in the activities and zones where the significant impacts have been identified.

Different plans for the phases from design, construction and operation-maintenance will be considered.

10.2 Plan of technical-environmental training

All the participants must have the environmental knowledge identified. The formation resources will be developed as well.

10.3 Security plan

The measures of protection for the personnel will be identified and are to be considered in all the phases of the project.

10.4 Contingency Plan

It will be made written taking into consideration the identified natural risks in the corresponding chapter. It will have to contain the following basic elements at least:

- Objectives and reach of the plan.
- Operative organization.
- Procedures of performance, including the training of the personnel.

- Programs of evaluation and follow up.
- Necessary logistic inventories.

10.5 Environmental follow up plan

It will be specified the form and the responsibilities to make the follow up of the environmental variables during the different phases of the project and the adopted measures in the different previous plans to verify that they have been made and which has been the effectiveness of the same ones. A chronogram of supervisions shall be enclosed.

11. Costs of the Plans

In this chapter, the costs of the carrying out of the plans in chapter 10 will be economically evaluated as a whole as well as individually, separated for the phases of design, construction and operation-maintenance.

The valuation will be made in United States dollars (USD), considering the chronogram of the project and updating the numbers according to the foreseen evolution in the years of extent of the project.

12. Residual impacts

In this chapter a comparative analysis of the existing environmental quality is due to make in the area of influence of the project, considering the option without the project, with the project but without environmental measures and the project with environmental measuring.

Sections will identify the environmental impacts after the adoption of Management Plans, and they will be characterized and valued with the criteria defined in section 8.2 of the EIA. The corresponding drafts will be elaborated and they will be compared with the obtained ones before the application of the preventive measures and mitigation.

13. Public information

In this chapter a Public Information Plan will be defined. It will take into account all the institutions, organizations and population interested in the project. In it, the informative actions to be carried out will be described, the objective population, the means of communication, the relevant aspects of who informs, the chronogram and the cost of them.

As a part of the information that will given to the public, it will be requested that all the information, including the annexes, has to be published in the Web page of the Plan Puebla Panama of the Inter-American Development Bank and subject to comments to improve the EIA by means of an interactive process.

14. Conclusions and recommendations

The conclusions resulted after the elaboration of the EIA will be exposed taking into evaluation the environmental viability of the project. The high-level environmental recommendations considered during the design, the construction and the operation and maintenance of the line will be described.

15. Annexes

It will be enclosed as annex, the results of the public information activities and an evaluation of the opinion that the interested institutions, organizations and population have on the project, including a detailed list of the people who participated in these activities.

Also it will be included as an annex, all the complementary studies made as a result of the allegations of the competent administrative agencies and the obtained ones in the proceedings of public information.