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Geothermal Training Programme



ENVIRONMENTAL MANAGEMENT AND MONITORING IN NICARAGUA

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ABSTRACT

By means of activities, policies and strategies that environmental procedures entail, damages to the environment, because of geothermal project related activities, can be mitigated. Environmental monitoring is a paramount component to evaluate the efficacy of environmental management. The following document presents the tools and instruments that Nicaragua has developed for such environmental management, particularly, for geothermal projects. The applicable legal structure and responsibilities for environmental monitoring of the distinct institutions are summarized.

1. INTRODUCTION

Nicaragua has developed great interest in support of electricity generation projects based on alternate sources, with the goal of diminishing dependence in fossil fuels. In recent years, the inception of environmental projects of such nature, especially geothermal projects, has been strengthened with a wide legal scaffolding that allows for the establishment of duties, on the part of the proponent, to care for the environment, thus, reducing and mitigating whatever impact that could be produced during the project. It also states the role of each institution for monitoring and follow-through of the projects.

In the last five years, interest in developing geothermal projects has soared, because it is considered one of the most stable sources of alternate energy. Nicaragua possesses a huge potential for such projects, and thanks to the “Geothermal Master Plan” devised in 2010, ten areas with geothermal potential were identified. Of which, two are already functional, and other three are in exploratory phase (Table 1).

2. INSTRUMENTS FOR ENVIRONMENTAL PROPOSAL

The group of policies, guidelines, legal and technical norms, activities, programs and institutions are the instruments that allow the application of general environmental principles for environmental proposal.

2.1 Legal frame

Nicaragua has a wide legal frame regarding legislation and environmental policies, specifically for conceptualization and monitoring of geothermal projects, legal tools are as follow:

TABLE 1: Current status of geothermal projects in Nicaragua

Project	Location	Phase	Description
Momotombo Geothermal Field	León	Operation and management	First geothermal field in Nicaragua, currently in operation and management.
San Jacinto Tizate Geothermal Field	León	Operation and management	Second geothermal field in Nicaragua, currently in operation and management.
Mombacho Volcano	Granada	Feasibility	Recognisance phase finished, exploratory phase initiated.
Casitas Volcano	Chinandega	Feasibility	Recognisance phase finished, exploratory phase initiated.
Cosigüina Volcano	Chinandega	Feasibility	Recognisance phase finished, exploratory phase initiated.

- Ley 217, “Ley General del Medio Ambiente y los Recursos Naturales” y su reforma Ley 647. (Law 217, “General law for the environment and natural resources” and its Law 647 reform.)
- Ley 532, “Ley para la Promoción de Generación Eléctrica con Fuentes Renovables” (Law 532, “Law for the promotion of electricity generation with renewable sources”.)
- Ley 620, “Ley General de Aguas Nacionales” (Law 620, “General law of national waters”.)
- Ley 443, “Ley de Exploración y Explotación de Recursos Geotérmicos” y su reforma Ley 882. (Law 443, “Law of Exploration and use of geothermal resources” and its Law 882 reform.)
- Decreto 76-2006 “Sistema de Evaluación Ambiental” (Decree 76-2006, “Environmental assessment system”.)
- Decreto 01-2007 “Reglamento de Áreas Protegidas de Nicaragua” (Decree 01-2007, “Guidelines for protected areas of Nicaragua”.)

Noteworthy among the changes Nicaragua has made to its environmental legislation, is the addition of geothermal exploration and handling activities in its protected areas, in account of them being projects of national interest for the enhancement of the environment.

2.2 Environmental evaluation system

Nicaragua has implemented a robust system of environmental evaluation. According to Decree 76-2006, in which projects are characterized per their nature and magnitude, classification branches into three categories (Republic of Nicaragua, 2006):

- Category I:* Especial projects due to their national transcendence, bi-national, or regional of high environmental impact.
- Category II:* Projects, industries and activities that produce a high environmental impact.
- Category III:* Projects, industries and activities that produce a moderate environmental impact.

In the case of geothermal projects, be it exploratory or handling, they fall within Category II, and the process they must follow to obtain the permits from the Ministry of Environment and Natural Resources, is described in Figure 1.

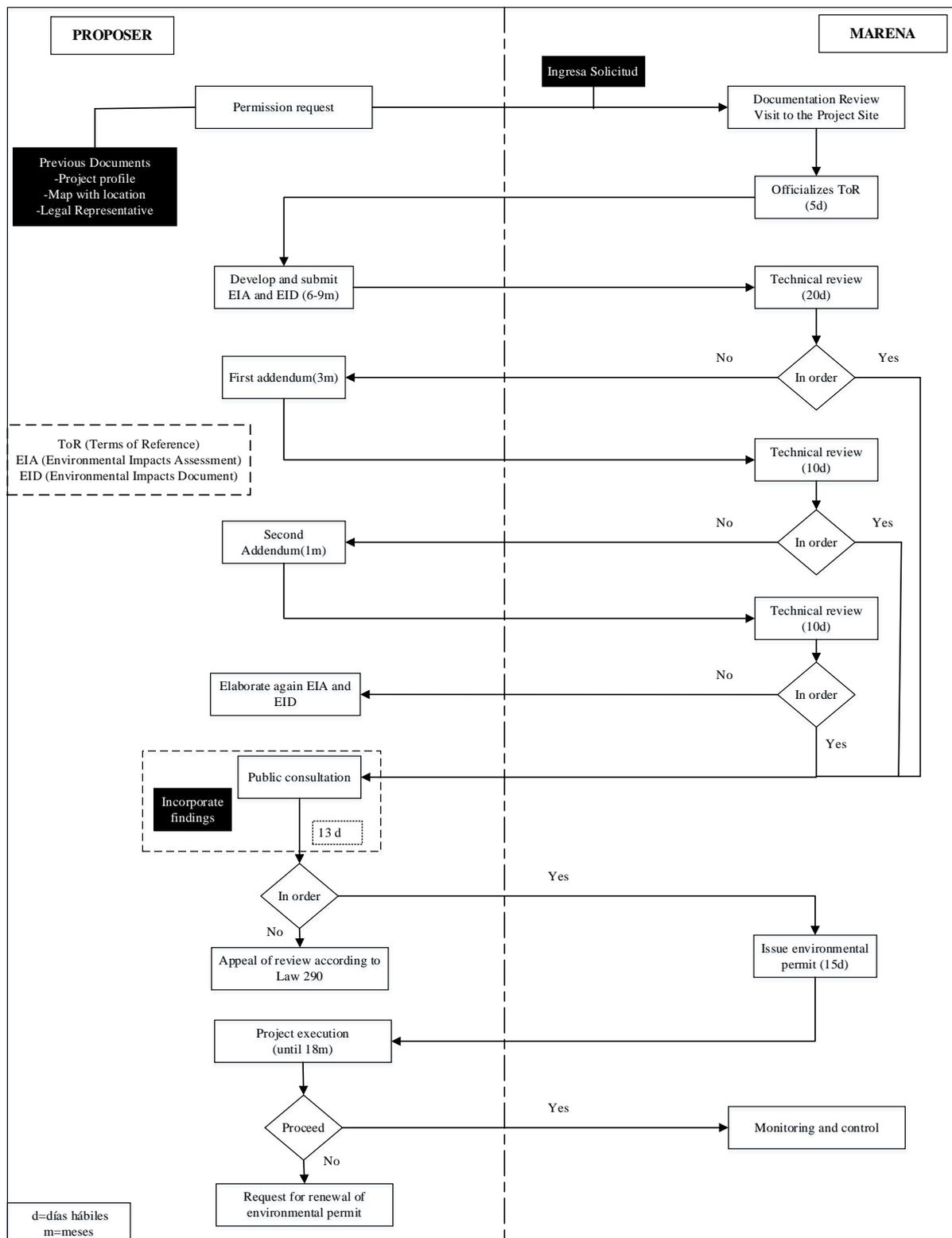


FIGURE 1: Environmental evaluation process

2.3 Environmental measures

Environmental measures have the objective of prevent, reduce, correct or compensate adverse effects of the project in its surroundings, whichever the phase in execution. In the following diagram, we present the sequence followed by environmental measures, where we can observe as a first instance, it seeks to

impede adverse effects, and as a last resort it utilizes mitigation techniques (Republic of Nicaragua, 1996; Figure 2).

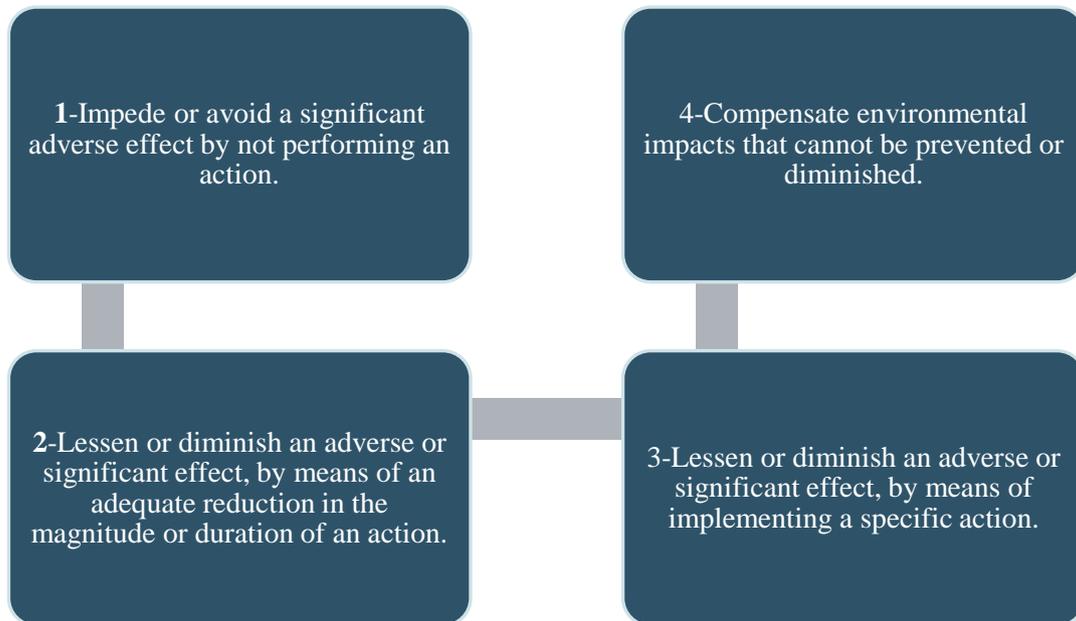


FIGURE 2: Environmental measures objectives

2.4 Environmental planning program

The environmental planning program (PGA by its Spanish acronym) is oriented to present mitigation and rehabilitation techniques, with which the developer takes ownership and responsibility of the negative impacts that could be produced during the execution of the project (Ministry of Transport and Infrastructure, 2008).

It comprises environmental action plans that will be executed throughout the project, and that have as ultimate goal, to be an instrument to enhance environmental performance across all the project's phases. Next, we point out the action plan to be implemented within a project's PGA:

- Environmental contingency plan;
- Solid residue management plan;
- Liquid residue management plan;
- Equipment management plan;
- Hydrocarbon management plan;
- Atmospheric emissions management plan;
- Pluvial water management plan;
- Reforesting plan;
- Toxic, hazardous and/or similar substance management plan;
- Prevention, promotion of workspace hygiene and safety plan;
- Environmental monitoring plan; and
- Environmental education and training plan.

Each plan present in the PGA must be developed by the environmental department of the executing industry, and contractors that belong to the project. A detailed log of activities is to be kept.

3. INSTITUTIONAL ROLE REGARDING MONITORING AND ENVIRONMENTAL FOLLOW THROUGH

Nicaragua possesses numerous institutions that are linked to environmental monitoring of geothermal projects. Next, we describe each of them and their role:

TABLE 2: Institutional roles

Institution	Role
Ministry of environment and natural resources (MARENA)	Grant environmental permit for project development. Monitor fulfilment of the PGA described in the environmental impact study presented in the proposal, and of every environmental condition exposed in the permit.
Ministry of energy and mines (MEM)	Plan, coordinate and monitor the formulation and implementing of policies, guidelines and strategies of enhancement, promotion and development for geothermal projects. Produce concession for geothermal exploration and usage.
Environmental planning unit for local governments. (Municipalities)	Verify and monitor fulfilment of environmental measures proposed in the environmental impact study.
National forestry institute (INAFOR)	Convey forestry inventory and oversee lumbering activities when/if necessary; monitor reforestation plan.
National water authority (ANA)	Grant concession for water usage in project activities. Verify and monitor fulfilment of environmental measures for the protection of hydric resources.
Nicaraguan electricity enterprise (ENEL)	Act on behalf of the State in each geothermal project developed in the country. Monitor fulfilment of the PGA described in the environmental impact study presented in the proposal.

Every aforementioned institution have the following tools at their disposal to achieve successful inception and monitoring, thus, protecting the country’s natural resources.

Environmental permits:

Monitoring and follow through is responsibility of each territorial delegation of MARENA. Municipalities and sectorial environmental units also have an important role in monitoring.

Monitoring reports:

A monitoring plan is included within the PGA (environmental planning program), is prepared by the developer and turned into: the municipality, MARENA, and the environmental development units from MEM and ENEL.

Field visits / Inspections:

Technical personnel from regulatory institutions can perform field visits with or without previous notice to the developer, in order to verify monitoring reports and mitigation conditions in the field.

Administrative sanctions:

If a developer incurs in infractions regarding regulations or conditions pre-established in the environmental permits, MARENA can apply sanctions such as: retention, intervention, temporary or definite suspension of activities, and/or economic fines.

4. CONCLUSIONS

Through the Environmental Evaluation System, all guidelines are established to guarantee that the development of a project in Nicaragua, fulfils environmental requirements; and is a joint responsibility among all the state institutions, to upkeep environmental monitoring throughout all phases of the projects, in order to minimize environmental impact according their nature. One of the key tools for an appropriate environmental proposal is the environmental permit, because it dictates the conditions to be fulfilled by the developer during the span of the project.

In Nicaragua, there is a high potential for the development of geothermal projects, and a number of legal tools that facilitate adequate planning and management of geothermal resources, such as the fiscal incentives described in Law 532, “Law for the promotion of electricity generation with renewable sources”. There are still some aspects of current legislation that must be subject to reform, and be updated to clarify the context in which environmental authorities work in protected areas.

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