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**International cooperation project between the company ALLSCIENCE,
ALGATECH and the Municipal Decentralized Autonomous Government
(GAD) of Santa Isabel, for the production of photosynthetic organisms to
obtain lipids, metabolites and inoculum**

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DEDICATION

I want to dedicate this work to the people that have influenced my life, to reach every one of the goals that I have set for myself, who have taught me take on life with courage and to know how to meet new challenges, to make good decisions and fight hard for all of my ideas and convictions; to those who have imparted me the aura of an impetuous and unbound spirit in the search for better ideals, to empower myself on the path to success with responsibility and the work of being a better person every day, an exemplary world citizen, knowing that new knowledge will be the stronghold to serving all of society; for all of the experiences and the support I have felt along our daily path. I want to tell these important people in my life that they are the cornerstone of my victory. My acknowledgements and dedication are for them: to my mother, Margoth, who has guided me from heaven; my mother-grandmother Luz, who made me who I am, together with my sisters Samantha and Genesis, who have been my strength; and my uncle Flavio and my father Guido, for supporting and protecting me during this process.

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INTRODUCTION

Agreements between countries are a way of improving international relations. Ecuador is no exception, since throughout its history it has carried out international agreements that have collaborated with its economic development, and above all its social wellbeing. As the motor that drives countries' growth, the economy inevitably becomes a subject of study, as well as international relations, since they go hand in hand to achieve optimal progress. For an International Studies student, it is a motivation for research to know the impact of international cooperation between our country and a foreign country on economic and diplomatic relationships.

Therefore, elaborating an international cooperation project between a city in Ecuador and a foreign organization becomes a point of observation, taking into account the impact that investments have had on the social and economic scope of the Azuay province.

Since a long time ago, international agreements and international cooperation between countries has been a basis for progress in less developed towns. In regards to Ecuador, it can be inferred that there are some agreements with different countries of both an economic and diplomatic character which have aided the development process. However, not all provinces have benefitted in the same manner, which is why Santa Isabel County in the Azuay province has taken the initiative to seek cooperation with other countries in order to improve the region, with a special focus on the environment.

It is quite relevant to carry out these projects in order to discover the reach and benefits they offer, to replicate these experiences in other counties of the Azuay province, as well as to stimulate the Ecuadorian economy to benefit the local sector. The current study is a proposal to undertake an international cooperation project in Santa Isabel County, which has demonstrated its interest in carrying out this agreement that would strengthen the economy for its inhabitants.

The present study will be developed in three chapters that are structured in the following manner: The first chapter describes international cooperation between two countries in detail; the benefits obtained from this kind of agreement and all their characteristics; types of international cooperation; their conditions and application

requirements. Some background is given as part of the introduction to the topic of investigation.

The second chapter presents a brief analysis of the environment in which the international cooperation project will be applied, for which the experience of international cooperation agreements in Ecuador is taken into account with the analysis of the reality of Santa Isabel County through its County Development Plan; the alignments that companies have with what will be implemented through the project and the determination of the spaces in which the project will be developed.

The third chapter, which is the basis of this investigative work, will clearly and concisely describe the implementation of the development project between ALLSCIENCE, ALGATECH and the Municipal GAD of Santa Isabel to produce photosynthetic organisms to obtain lipids, metabolites and inoculum which will help with the elaboration of products such as a biofuels, as well as industrial pharmaceutical products and microorganisms for agriculture, among others. The goal of the project is to promote national industry, with what is achieved within the area of Santa Isabel.

ABSTRACT

The present work is framed in the investigation and analysis of a proposal to carry out an international cooperation project. Its title is: “International cooperation project between the companies ALLSCIENCE, ALGATECH and Municipal GAD of Santa Isabel, for the production of photosynthetic organisms for obtaining lipids, metabolites and inoculum” with the aim of contributing to the development of products such as biofuels, as well as industrial pharmaceutical products and microorganisms for agriculture, among others, in order to promote national industry. The objective of the work is to observe the construction work of three plants located in Santa Isabel County in the Azuay province of Ecuador, with a laboratory in the city of Cuenca, Azuay to dedicate space to each of its products. The paper presents the concept of international cooperation and the legal framework in which Ecuador approaches it. An analysis of the location of the project is carried out through a methodology based on bibliographic research and fieldwork, with interviews and direct observation of the project’s development, as well as a brief description of each company involved and the GAD of Santa Isabel. It will then proceed to a description of the agreement, operating spaces, stages of development, and the results expected once implemented.

KEYWORDS: Cooperation, development, international relations, project, collaboration, Santa Isabel, photosynthetic organisms, companies.

CHAPTER 1

1. THEORETICAL ASPECTS

1.1 INTERNATIONAL COOPERATION

Regarding this subject, it is necessary to begin by saying that for a developing country it is indispensable to count on the help of other countries that are in better economic, scientific or technological positions.

According to Lezama Coca (2005), “since the appearance of the United Nations and, primarily after the end of armed conflicts, nations have tried to come closer to each other, either for economic or political interests, intensifying their commerce or lending economic or manufacturing aid. Through partnering agreements, cooperation has been developing throughout the evolution of the world economy and has created its own infrastructure so that cooperation between nations can be overseen, administrated and controlled by supranational organizations. The most notable examples are the creation of the International Monetary Fund (IMF), the International Bank for Reconstruction and Development (IBRD), as well as the Organization for Economic Co-operation and Development (OECD).” (p. 96)

As can be seen from the above description, this is a tool, a resource that bolsters development processes in countries that require aid, which does not circumscribe only to the financial but is also a motor of cooperation for technical assistance, which allows the development of new strategies not only in the field of agriculture and livestock, but opens up many areas of expertise to be implemented in the reality of the country receiving cooperation with processes based on the latest technology.

To specify the meaning of International Cooperation, a brief analysis is carried out on the concept. The criteria of various authors will be considered, first of all that which Ayllon (2007) manifests in his article, pointing out the following:

Of the many existing definitions of International Cooperation, we propose that of Caldach (1991) which considers that it is “any relationship between international actors oriented toward the mutual satisfaction of interests or demands, through the complementary use of their respective powers in the development of coordinated and/or solidary actions.”

The concept is borrowed from that of Sociology and the study of the diversity of relationships that originate in the interaction between individuals and social groups. Applied to the field of International Relations, International Cooperation is defined as the form of cooperation that is carried out between actors in the international system.

If this is the definition, what are the elements that would configure a relationship of international cooperation so it could be identified as such? One International Cooperation theory from Holsti (1967) gives us the answer. These are the elements:

1. The perception that two or more interests coincide and can be achieved simultaneously by both parties.
2. The expectation by one party that the action carried out by the other party, or parties in the case of multilateral cooperation, in order to meet its objectives, assists it in meeting its own interests and values.
3. The existence of an agreement (tacit or implicit) on the essential aspects of the transactions or activities to be carried out.
4. The application of rules and guidelines (action protocols) that determine future transactions.
5. The development of transactions or activities to comply with the agreement. (p. 494)

Cooperate: implies sharing a job or task, to do something in a coordinated manner, according to a plan, with a certain degree of voluntariness which tends to be inspired by some kind of mutual interest or benefit, being able to establish this between countries of equal and unequal levels of development.

There are several definitions of cooperate:

- “Work together with another or others to the same end.” (Diccionario de la Real Academia de la Lengua [Española])
- According to Marx (1965), cooperation is “the manner of working of many laborers, coordinated and united in compliance with a plan, in the same process of production or in different processes of production, but linked.” (p. 181)

International cooperation occurs in which pairs of nations support each other in a determined objective or towards a specific end, including in spaces that exist outside of a territorial context.

Due to this, if this concept adds on an economic dimension, another variable appears that corresponds to the kind of international economic cooperation when it takes place in the latter space. This space involves manufacture, exchange, distribution and consumption of goods and services, as a social tasks that combine people and means.

International Cooperation also has to do with resources that are delivered either by governments or non-governmental organizations.

The Argentine Network for International Cooperation (RACI, 2012) manifests in its introduction a generous description of International Cooperation:

International cooperation is currently a relationship established between partners through different kinds of cooperation and based on its being a fundamental component of modern international relations, is an excellent means for strengthening the solidarity between people and elevating mutual expertise. Likewise, it constitutes an efficient instrument for complementing national efforts, contributing solutions to needs and problems of developing countries.

More specifically, international cooperation can be understood as a combination of actions of international character oriented towards the exchange of experiences and resources between countries worldwide, as well as to reach common goals based on criteria of solidarity, equality, effectiveness, mutual interest, sustainability and co-responsibility. (p. 2)

On the other hand, cooperation for development is based on the combination of actions, which are carried out by public and private actors, between countries of different levels of development, with the objective of promoting economic and social progress of developing countries so they can be more equal in relation to the countries that offer collaboration.

The system of development cooperation is constituted by actors of a diverse nature and function; among them can be found public and private organizations, both general and specialized, with different action strategies. Generally, public and private institutions should be distinguished. Among the former are multilateral institutions, governments of the donating and receiving countries, the regional and local public administrators, universities, among others. Among the private entities are those for-profit, such as businesses, and those non-profits such as non-governmental development organizations (NGDO).

According to Gamboa (2014), the term “cooperation” in development is not the same as official development assistance (ODA), although in many cases they are used indiscriminately. According to the Development Assistance Committee (DAC) of the Organization for Economic Co-operation and Development (OECD), ODA constitutes the flows of official agencies, including state and local governments, or their executive agencies, destined to developing countries and multilateral institutions that satisfy the following conditions during each operation:

- a) Their primary objective is the promotion of economic development and the wellbeing of developing countries; and,
- b) They are of concessional character and contain an element of donation of at least 25%.

Therefore, official development aid or assistance (ODA) can be understood as all the net disbursements of credits and donations carried out according to the criteria of the Organization for Economic Co-operation and Development (OECD), which is, in favorable financial conditions and with the primary objective being the economic and social development of the receiving country. (pp. 14-15)

Having specified everything regarding international cooperation and its derived concepts will allow for a step-by-step analysis of the International Cooperation system, to understand the mechanisms of drafting, arrangements and negotiations; tools that are employed to succeed in the field of collaboration between sister countries.

1.1.1 Background of International Cooperation: Origin and Evolution

In order to better understand what international cooperation can generate for developing countries, it is necessary to know about certain antecedents throughout the world. We will refer to different sources for this.

According to Tasara (2013), international Cooperation was born in 1945 with the end of the Second World War, more specifically, from the signing of the San Francisco Charter and the creation of the United Nations (UN). Its main function consisted in watching out to keep peace and international security. One of the strategies to achieve these objectives was

promoting International Cooperation to foster development and diminish inequality between states.

So, by 1947, plans and assistance were being implemented in the countries involved and affected by the consequences of World War II. Since its beginning, the concept, form, channels, focuses and actors initially involved in International Cooperation have been modified according to the events of the world crisis. (p. 32)

According to Tasara (2013), during the 60s, given the advent of political hegemony - product of the Cold War - and in the face of the phenomenon of the processes of de-colonization of the African continent, the first policies of the Official Development Assistance (ODA) were put in place. This led to the most powerful nations financing bilateral relations with their old colonies and to the expansion of multilateral cooperation through regional banks and the signing of agreements of economic integration. In the 70s, successive economic ruptures took place, most of them originating from the oil crisis, which dropped the price of a barrel of oil unusually low. Both the Organization of Petroleum Exporting Countries (OPEC) and political crises, a succession of military coups d'états, and the advent of dictatorships in Latin America had a determining role. In the face of this scenario, the ties of cooperation diversified even more; some were strengthened, others weakened, and new ways were even created. (pp. 43-48)

Tasara (2013) concludes that in the 80s, new theoretical currents appeared within the area of Political Science and International Relations as disciplines that promoted the development and deepening of International Cooperation tendencies. Furthermore, this period was marked by the external debt crises of developing countries, accompanied by successive guidelines and recommendations of developed countries, a situation translated into the Washington Consensus.

Other great landmarks that modified the process of International Cooperation at a global level were the fall of the Berlin Wall in 1989 and the dissolution of the Union of Socialist Soviet Republics (USSR) in 1991. This led to the previously used criteria for defining geographic priorities and topics being strongly affected by a new ruling principle: the poverty level. During the years of the Cold War, the allocation of international assistance was based on the geographical position a country had in relation to the Soviet Block. This meant that the closer a country was, the higher priority for International Cooperation. (pp. 56-65)

Equally, RACI (2012) states that in the year 2000 the Millennium Declaration took place, which established the Millennium Development Goals, goals which were to be met by 2015.

Finally, the location and strategies of International Cooperation were affected by the incidents of 2001 in the United States of America, drove the White House to rethink a new global policy localizing aid in the countries on the way to consolidating or formation, especially in those without consolidated democracies in the Middle East region, redefining the agenda of aid priorities in pursuit of these new objectives.

Currently, not only states participate in the International Cooperation process but multilateral organizations formed of consortiums of states, local and transnational civil society organizations, multinational corporations and diverse kinds of local authorities have been incorporated.

The system of International Cooperation was modified, as well as its forms of acting before those who, while they might have relevance and impact, do not represent countries or nations but rather are bound around the protection of determined problems or that seek to solve conflicts that affect humanity. Non-governmental organizations have also been seen immersed in this, as well; they have written an important chapter within cooperation between the countries of the world, in a dynamic and varying relationship that adapts to the context of each country and each organization according to rules of co-habitation put forth between parties.

1.1.2 Types of Cooperation: Regional and International

Regarding different types of cooperation, for better understanding; several verified and appropriate sources must be referred to in order to clarify the concepts particular to International Cooperation.

According to the publication by the Ministry of Economy of the Dominican Republic (2015), in which the types of assistance or International Cooperation are thoroughly addressed in the following paragraphs:

The modes of international cooperation are conceptual distinctions about different ways of managing Official Development Assistance. Furthermore, international

cooperation instruments grant certain particularities to their management, and the convenience of using them or not depend on:

- The intended goal to be achieved,
- The general context of the setting in which the intervention takes place,
- The existing capacity or the fulfillment of previously determined conditions necessary for an effective and efficient use of each.

The modes are diversified in the following manner:

- Meeting the characteristics of the funds and the type of financing of the assistance received:
 - Non reimbursable cooperation: donations (financial and in-kind) and technical assistance.
 - Reimbursable cooperation: credits or loans, with different degrees of approval, normally under especially favorable financial conditions.
- According to the origin of the funds:
 - Public assistance (official): that which originates from public funds, independent of those managing it, which is dominated Official Development Assistance (ODA)
 - Private assistance: that which originates from private funds, independently of who it is destined to.
- According to the actors channeling the funds:
 - Bilateral assistance: The type of official cooperation that is carried out between two countries based on agreements or written accords between both and that are constituted in the general framework that regulates in detail the conditions, scope, granting and reception of said cooperation, as well as the areas to be attended.
 - Multilateral assistance: The official cooperation provided by international organisms or institutions to governments, such as the United Nations, the IMF, the IDB, the World Bank and the European Union, among others.
 - Decentralized cooperation: Cooperation channeled by regional and local public administrations (local governments, councils, autonomous communities, chapters, municipalities, etc.) through a direct relationship with local public or private actors of the receiving countries. This type of

cooperation is a recent tendency and is consolidated in the context of strengthening cities and regions as executing actors of international cooperation. Some definitions include within this type of cooperation transfers of resources channeled by decentralized institutions, such as state universities or centers of study, among others.

- Non-governmental cooperation: Non-governmental cooperation is considered to be the transfer of resources channeled by private social entities, be they generated through quotas, donations, or sales of services. On the other hand, public subsidies of central and decentralized governments can be accessed by cooperating countries, and due to their origin this is official assistance. The receiving actors of this cooperation are non-governmental organizations.
- Business cooperation: This is primarily a private cooperation between companies of different countries, although it tends to happen that governments have already made bilateral approaches. The agreements that business come to are private and are usually not included in official programs. This type of cooperation tends to take place in the form of technical assistance and transfer of technology.
- According to the geopolitical situation and level of development of the donating and receiving countries:
 - North-South or vertical cooperation: this is the most common and traditional form of international cooperation, which takes place between developed and developing countries, the former providing both financial resources as well as technical assistance to support the development efforts of the latter.
 - Horizontal cooperation: this type of cooperation takes place between countries with similar levels of development.
 - South-South cooperation: this type of cooperation takes place between developing countries, especially between middle-class countries. This kind of cooperation tends to take place in specific sectors where the donor country displays successful experiences, and the collaborating receiving country shows a need.

- Triangular cooperation: This tends to be a combination of the previous two types. In this type of cooperation, generally, a developed country partners with a moderately developed country (which usually provides the technical component) to carry out cooperative actions in benefit to a third country of lesser development.
- Regional cooperation: These are cooperation programs in specific areas: health, environment, trade, etc., which concern a particular region, for example Latin America and the Caribbean, the Ibero-American region, etc. These programs seek to strengthen the ties of integration between member countries, create sectorial networks and elucidate topics of common interest to the Region.
- According to the existence or not of limitations in the application of funds:
 - Tied aid: When funds must be used for the acquisition of goods or services, usually from the donating country.
 - Untied aid: When there are no limitations to the application of funds.

In regards to regional agencies, the investigation refers to a document published by FLACSO, Ecuador (2014) which describes regional and international agencies found in South America:

- ALBA (*Alianza Bolivariana para los Pueblos de Nuestra America* or Bolivarian Alliance for the Peoples of Our America); a meeting space for the peoples and governments that understand that the Caribbean Latin America forms a Great Nation, that our countries should unite to confront the challenges of the present and the future.
- ALADI (*Asociación Lationamericana de Integración* or Latin American Association for Integration); the largest Latin American integration group. Its twelve member countries are comprised of Argentina, Bolivia, Brasil, Chile, Colombia, Cuba, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela, representing a total of 20 million square kilometers and more than 500 million inhabitants.

- ACS-AEC (*Asociación de Estados del Caribe* or Association of Caribbean States); an international organism dedicated regionally to consulting, agreements and cooperation, whose primary purpose is to promote sustained development in culture, economy, social, science and technology in Caribbean States.
- ALCA (*Área de Libre Comercio de las Américas* or Area of Free Trade of the Americas); a large free-trade agreement originating at the Summit of the Americas celebrated in 1994. The constituting agreement includes the promise to liberalize trade, as well as the development of policies for jurisdiction, anti-dumping and countervailing measures.
- IDB (*Banco Interamericano de Desarrollo* or Inter-American Development Bank); today, the IDB is the main source of multilateral financing for sustainable economic, social and institutional development in Latin America and the Caribbean, as well as for the integration of the region. It grants loans, non-refundable resources, guarantees, assessment in matters of policy and technical assistance to the public and private sectors of its receiving countries.
- CEPAL (*Comisión Económica para América Latina* or Economic Commission for Latin America); it is one of five regional commissions of the United Nations and its headquarters is in Santiago de Chile. It was founded to contribute to the economic development of Latin America, coordinate actions aimed at its promotion and strengthening the economic relations between countries and with other nations of the world.
- CAN (*Comunidad Andina de Naciones* or Andean Community of Nations); community of four countries that decided to unite voluntarily with the objective of achieving a development faster, more balanced and autonomous, through Andean, South American and Latin American integration.
- ICHR (*Comisión Interamericana de Derechos Humanos* or Inter-American Commission for Human Rights); autonomous organ of the Organization of

American States (OAS), which constitutes one of the two entities in the inter-American system for the protection and promotion of human rights in the Americas.

- MERCOSUR (*Mercado Común del Sur* or Southern Common Market); lays down the fundamental base on which the relationships between State Parties are framed and represents, above all, a Political Accord. MERCOSUR is an element of stability in the region, since the interweaving of interests and relations generated deepen both economic and political ties and neutralizes the tendencies towards fragmentation.
- OLADE (*Organización Latinoamericana de Energía* or Latin American Energy Organization) is an intergovernmental organization of public nature that works for the development of energy in Latin America and the Caribbean, contributing to the economic and social development of its 27 Member Countries and its Participating Country, Algeria.
- OPS (*Organización Panamericana de la Salud* or Panamerican Health Organization) is an international public health organization with 100 years of experience dedicated to improving the health and living conditions of the peoples of the Americas. It acts as a Regional Office in the Americas for the World Health Organization. Within the Inter-American System it is the organization specialized in health.
- *Parlamento Andino* or Andean Parliament; fulfilling its objectives, it should promote the participation of peoples as direct actors in the Latin American Integration Process, without neglecting the strengthening of the democratic system, of peace and international justice, and the right to self-determination of peoples.
- PARLACEN (*Parlamento Centroamericano* or Central American Parliament), regional organism, permanent and unicameral, integrated by the national Parliaments of Latin America, democratically elected by popular vote, charged with promoting, harmonizing and channeling movement towards integration.

- SELA (*Sistema Económico Latinoamericano y del Caribe* or Economic System of Latin America and the Caribbean); an intergovernmental, regional organism, with headquarters in Caracas, Venezuela, integrated by 26 countries in Latin America and the Caribbean. It seeks to promote a system of consultation and coordination to enter into positions and common strategies in Latin America and the Caribbean, on the subject of economy, before countries, groups of nations, forums and international organisms.
- UNASUR (*Unión Suramericana de Naciones* or South American Union of Nations), is the new name given to the South American Community of Nations. This community was proposed by governments after a convergence process between the two large commercial blocks, Mercosur and the Andean Community, towards a duty-free zone, which includes Chile, Surinam and Guayana.

According to FLACSO (2014), there are many more international organizations. For this investigation those considered the most important will be indicated:

- General Assembly of the United Nations; established in 1945 in virtue of the United Nations Charter, the General Assembly occupies a central place as the primary deliberative body, which formulates policies and represents the United Nations. The Assembly is integrated by the 192 Member States of the United Nations and provides a forum for the multilateral debate from all ranges of international issues that the Charter encompasses.
- IDB, International Development Bank; today it is the primary source of multilateral financing for sustainable economic, social and institutional development in Latin America and the Caribbean, as well as for the integration of the region. It grants loans, non-refundable resources, guarantees, assessment in matters of policy and technical assistance to the public and private sectors of its receiving countries.
- World Bank, vital source of financial and technical assistance for developing countries around the world. This international organization is the property of 185 member countries and is formed by two singular development institutions: the

International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA).

- FAO, Food and Agriculture Association of the United Nations, conducts international activities focused on eradicating hunger. By providing its services to both developed and developing countries, the FAO acts as a neutral forum where all countries can meet on equal footing to negotiate agreements and debate policies.
- United Nations; international organization founded in 1945 after the Second World War by 51 countries that committed themselves to keeping peace and international security, to develop friendly relations between countries and promote social progress, improve quality of life and human rights.
- NAFTA, North American Free Trade Agreement; through this agreement, Mexico, Canada and the United States create a North American free trade area, which took effect in 1994, to eliminate commercial barriers and ease transborder circulation of goods and services between the Parties territories.
- UNICEF, United Nations Children's Fund; the main tasks of UNICEF are directed towards guaranteeing the validity of the rights intrinsic to childhood at a basic level of quality of life; rights that the world's delegates defined more specifically in the Convention on the Rights of the Child.

Among existing cooperation agencies, according to FLACSO (2014), the following stand out:

- ACF International, Action Against Hunger; international humanitarian organization, neutral and independent, that fights malnutrition while guaranteeing access to water and safe livelihoods to vulnerable populations.
- AECID, Spanish Agency for International Development Cooperation; the management body of the Spanish policy on international development cooperation. It is an autonomous agency attached to the Ministry of Foreign

Affairs and Cooperation through the Secretary of State for International Cooperation.

- CAF, Andean Development Corporation; a development bank founded in 1970 and currently formed by 18 countries from Latin America, the Caribbean and Europe, as well as 14 private banks in the Andean region. The institution promotes sustainable development and regional integration.
- USAID, United States Agency for International Development; the independent federal agency responsible for planning and administering economic and humanitarian assistance outside of the United States. It has always had the dual purpose of supporting political interests in the exterior, expanding democracy and the free market and, at the same time, improving the lives of peoples in developing countries.

To better understand the following image, the different organizations the work in the Americas is detailed, describing the six most influential organizations on the American continents.

FIGURE 1: GOVERNMENTAL ORGANIZATIONS



Source: www.la-razon.com

1.2 INTERNATIONAL COOPERATION PROJECT

International Cooperation Projects, according to Gamboa (2014), are cooperation agreements that are well defined, of a determined duration and endowed with a budget; they require an organizational framework, specific treaties and a system of execution. The contracts prioritize goals, personal needs, equipment, administrative management and a system of accountability for the project within the parameters of the objectives to be met. (p. 34)

Likewise, Regional Projects are so defined when two or more countries from South America, Andean and Ibero-American countries, jointly develop a cooperation project of any kind. (ibid, 2014, p. 25)

However, to carry out an International Cooperation project, certain considerations must be taken into account which the Argentinean Network for International Cooperation (2012) cites in its Manual to Structure an International Cooperation Project:

- a) Identification and definition of the problem – All projects stem from an analysis of the identified reality of the problems that affect a group of people or a community. The analysis should be carried out in the field, given that the problem is produced in a determined time and place, and should never be expressed as “the lack of something”, since that is a way of limiting possible solutions, restricting the possibility of finding alternative answers. It is important to keep in mind that the more one considers, examines and analyzes the conflict, the greater the knowledge achieved and, therefore, the particularities that define the best alternative solutions.
- b) The importance of participation - To achieve adequate identification of the problem to address, it is indispensable to include the participation of those who will be the beneficiaries of the project, given that they are those who know their needs and their order of priorities when searching for solutions.
- c) Objectives - Objectives are divided into general and specific.
 - General objectives: The general objective alludes to the end goal the project pursues. They tend to be broad and descriptive. For this reason it is necessary to translate them into more operative and concrete objectives: divide the general objective into specific objectives.
 - Specific objectives: The specific objectives clearly express that which should be achieved. They stem from the general and for that reason cannot include information not sourced from the general objective. Due to addressing a solution or response to a problem, all of the objectives are expressed in positive terms and in the infinitive form. There can be one or many.

- d) Goals - In the same manner that specific objectives stem from the general, goals stem from the specific objectives. It is a methodological action which changes qualitative elements into quantitative. Generally, goals are expressed in percentages.
- e) Activities – Activities surge and stem from the specific objectives. Here should appear each of the activities necessary to achieve each specific objective; therefore they are correlated. The activities are not defined in verbal terms but in the substantive.
- f) Outputs or Outcomes – The definition of outputs allows for the estimation of the fulfillment of the activities exactly as they have been set forth. They should be expressed in quantitative terms and with as much precision possible.
- g) Budget – The budget is the means of giving monetary value to the resources necessary to carry out planned activities. The resources can be of diverse kinds and come from different sources. Therefore, it is also convenient to establish a value to all resources that support the administration of the project, even if they are already existing resources.

It is also important to establish how the project document is created:

TABLE 1: COMPONENTS OF AN INTERNATIONAL COOPERATION PROJECT

COMPONENTS OF THE PRESENTATION OF THE PROJECT	DESCRIPUION OF THE COMPONENTS	OBSERVATIONS
a) Cover Page	Should include: 1. Name of the Institution presenting the proposal, 2. Name of the financing Institution, and 3. Name of the Project.	It is important that the information be clear and specific.
b) Specification Sheet	The specification sheet should contain data, which clearly and	It is known as the Executive Summary. It should contain all

	specifically provides the general idea of the initiative.	of the information possible in regards to the project.
c) Project Document	It is the justification of the Project, seeking a solution to a problematic situation.	Should be argued sufficiently to support the solution.
d) Objectives	Both the general and the specific objectives of the Project should be listed.	They should be clear and specific to be more effective when proposing the problem and its solution.
e) Goals	Here is the explanation of what is hoped to be achieved.	They should be measurable.
f) Timeline of Activities	The different activities to be carried out during the Project are listed in a calendar.	This timeline should respond to the project's needs and must be respected to the utmost.
g) Outputs and Outcomes.	Refer to the outcomes of the project in solving the problema.	Should be measurable and quantifiable.
h) Sustainability	Every presentation of a project with the end of obtaining funding should demonstrate the capacity to be self-sustaining and to administrate.	It is good to demonstrate that the project is self-sustaining in the future.
i) Local strategy	Allows the visualization of resources that have been used both for the desing as well as the implementation and evaluation of the project.	Makes known the degree of involvement of the community in the proposal and the value given to their knowledge, be it formal or informal.

Created by the author of this study
Source: RACI

1.2.1 Examples of International Cooperation in Ecuador

In a report by the Ecuadorian Institute for International Cooperation (2015), information about international cooperation in Ecuador was published: The publication includes information about the different forms of cooperation practiced in Ecuador. Mentioned is the assistance offered by traditional donors and the sectors that includes, as well as how it is granted or channeled by non-governmental organizations – NGOs – whose participation is acquiring ever more importance.

The majority of donors are NGOs. South-South cooperation is also mentioned, a subject being specifically examined for the first time, as well as the triangular type of cooperation applied in Ecuador, also emerging, by facilitating the orchestration of South-

South cooperation thanks to the financial or technical backing of a traditional source of ODA. With the assistance of international cooperation, especially in Europe, the Ecuadorian Institute for International Cooperation has sponsored a process of institutional enhancement, with the aim of wholly fulfilling its mandate. It is not only about detecting deficiencies but also identifying the means to overcome them, as well as establish the mechanisms to train and professionalize the instrumentation of triangular type international cooperation.

In the report “Evolution of Development Cooperation in Ecuador” from the Technical Secretary of International Cooperation (2015), it states that International Cooperation in Ecuador has behaved rather cyclically. In other words, since the 80s, positive fluctuations can be seen in times of crisis. However, since the international financial crisis in 2009, the general tendency worldwide has decreased and Ecuador is no exception, also because of its ranking as a middle-income country.

The following figure clearly shows the evolution in the historical behavior of International Cooperation in our country, from the year 1962 till 2014.

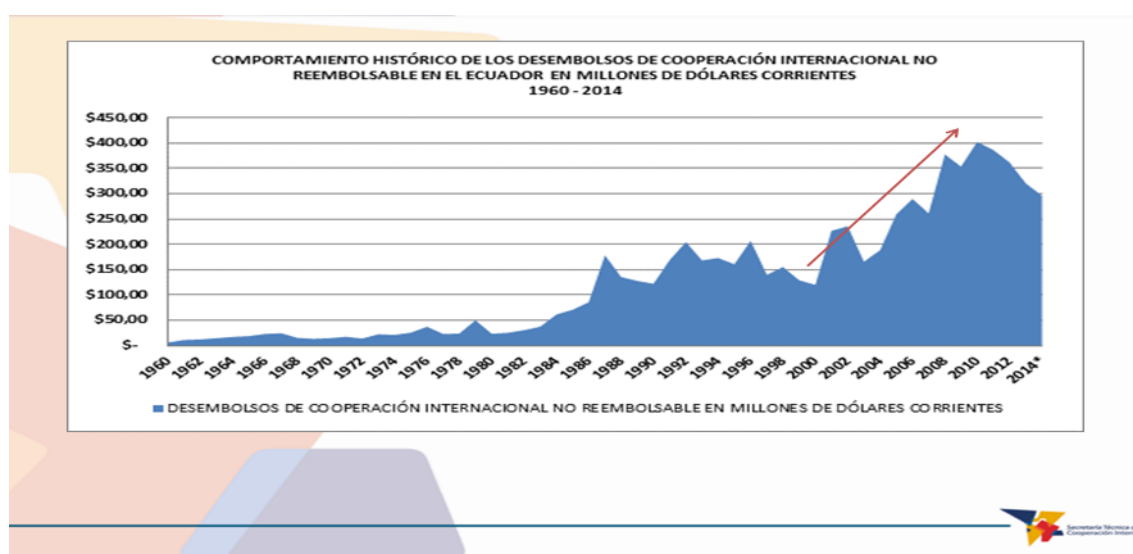


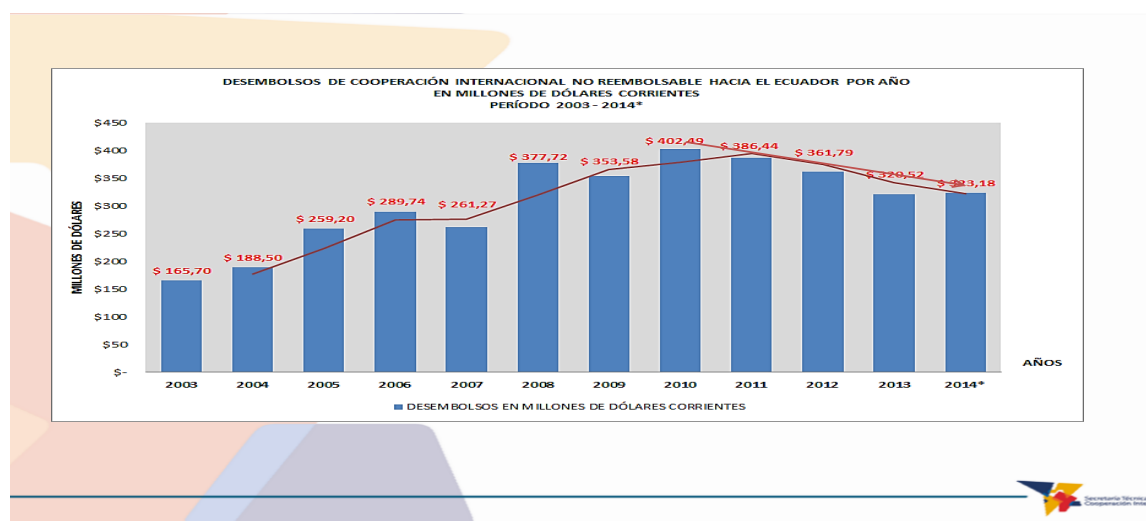
FIGURE 2: HISTORICAL BEHAVIOR OF INTERNATIONAL COOPERATION IN ECUADOR

Source: Technical Secretary of International Cooperation

According to the Technical Secretary of International Cooperation (2015): in the last decade, the global tendency towards cooperation has grown. However, it is important to mention that there will be lags in the levels of information. Before the year 2007, databases and reports were done by the same cooperation, incompletely since they did not have the data for all the

actors. Through the administration of international cooperation it has been possible to rescue a planning tool and make decisions and therefore have updated information on all the actors. In the period 2007-2014, disbursements have been registered totaling 2,684.57 millions of dollars, for a total of 4,243 programs and projects. This is detailed in the following figure.

FIGURE 3: DISBURSEMENTS IN MILLIONS OF DOLLARS



International Cooperation represents a mere 0.48% of the country's GDP and 1.7% of the GSB. It is also important to point out the tendency of disbursement of the 10 principal cooperating partners.

In the document by the Technical Secretary of International Cooperation (2015), it is noted that the ten principal cooperating partners in Ecuador have historically concentrated more than 80% of the total international cooperation that occurs in the country. It can be noted that the tendency decreases in the years 2013 and 2014, with the expectation of increasing further in 2015. That is why Ecuador has found it important to seek new cooperation partners, to diversify the mechanisms and sources of financing, prioritizing topics more complementary and of higher impact, such as South-South collaboration. The figure below details the previous description.

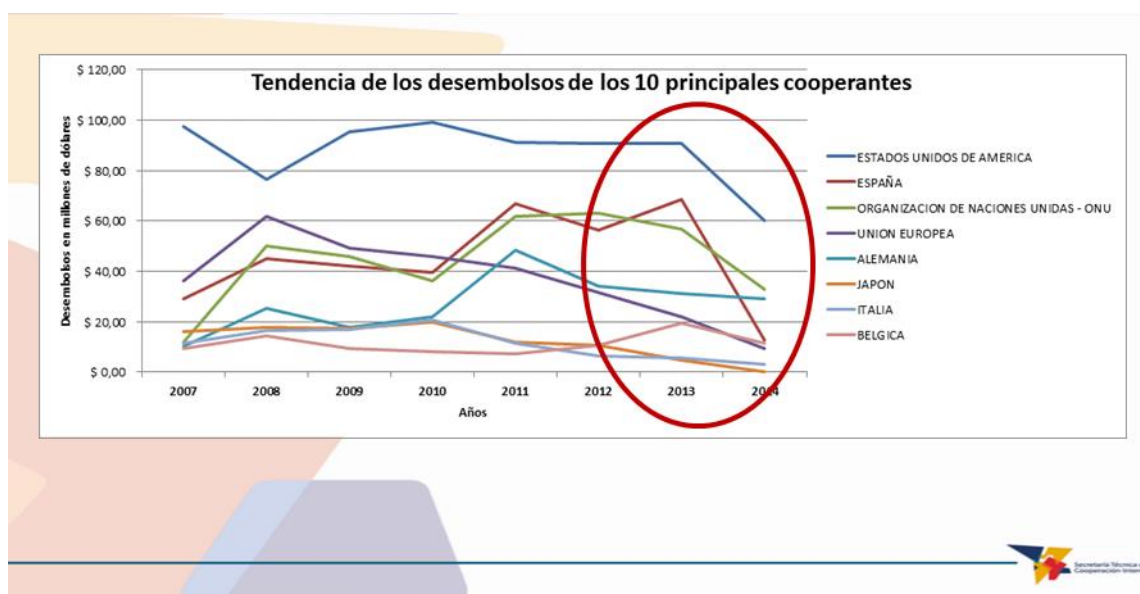


FIGURE 4: TENDENCY OF PRIMARY COUNTRIES TO COOPERATE WITH ECUADOR

Source: Technical Secretary of International Cooperation

According to the Technical Secretary of International Cooperation, we can see that 35% of international cooperation resources have come from bilateral sources, although NGOs increased from 28% to 32% during those years, surpassing the disbursements of bilateral agencies in the years 2009, 2010 and 2014. Four of ten cooperating partners channeled their resources through NGOs, and in the case of the United States it was 100%, upon the exit of USAID.

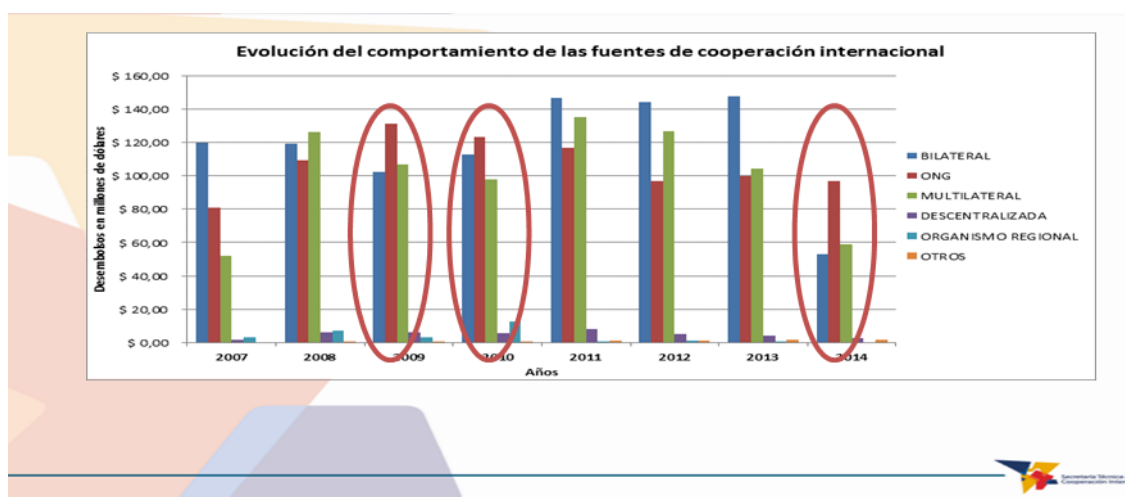


FIGURE 5: BEHAVIOR OF INTERNATIONAL COOPERATION

Source: Technical Secretary of International Cooperation

Likewise, international cooperation has shown different behavior according to the executors, which is shown in the following figures. In regards to the Autonomous, Decentralized Governments (GADs) and the central government, the execution carried out by NGOs with local actors.

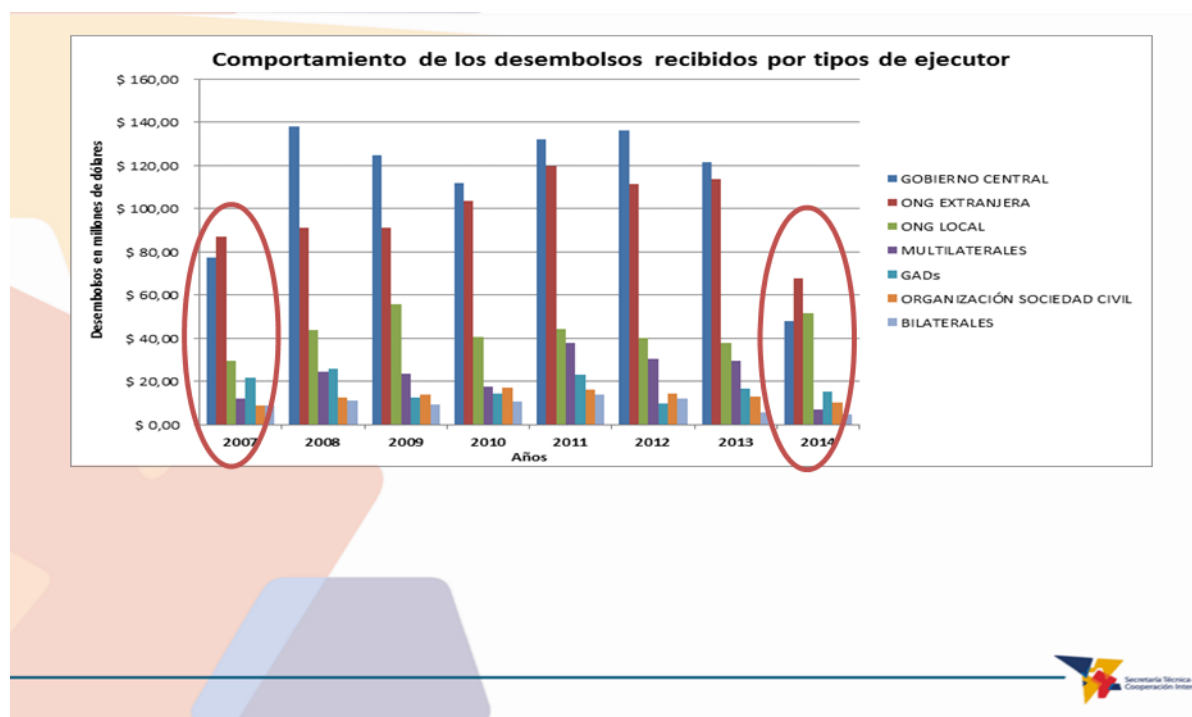


FIGURE 6: DISBURSEMENTS BY TYPE OF EXECUTOR

Source: Technical Secretary of International Cooperation

TABLE 2: BILATERAL COOPERATION BETWEEN ECUADOR AND OTHER COUNTRIES

TYPE OF EXECUTING BODY	SOURCE OF FINANCING			
	BILATERAL AGENCY	MULTILATERAL AGENCY	FOREIGN NGO	DECENTRALIZED AGENCY
CENTRAL GOVERNMENT	56.40%	40.40%	3.00%	0.20%
FOREIGN NGOs	25.70%	11.90%	60.50%	1.90%
INT'L ORG.	44.30%	53.70%	1.00%	1.00%
LOCAL NGO	20.70%	22.90%	43.40%	13.00%
GAD.	63.14%	33.76%	2.40%	0.70%
CIVIL SOCIETY ORGANIZACIÓN	9.80%	5.10%	82.20%	2.90%
PRIVATE COMPANY	66.90%	12.60%	18.30%	2.20%
NETWORKS	23.80%	16.40%	48.00%	11.80%

UNIVERSITIES	68.60%	22.84%	8.50%	0.06%
PUBLIC PRIVATE ALLIANCE	70.00%	0.00%	30.00%	0.00%
OTHER STATE BODIES	0.00%	100.00%	0.00%	0.00%

Source: Technical Secretary of International Cooperation

This table establishes that even if the largest contributors to the GADs occur bilaterally, not less important are the agreements with NGOs that seek to contribute scientific technology and resources to carry out projects in benefit of the country's most vulnerable social collectives.

CHAPTER II

2. ANALYSIS OF THE ENVIRONMENT IN WHICH THE PROJECT WILL BE CARRIED OUT

2.1 Brief PEST analysis of Ecuador

The PEST analysis refers to an examination of the Political, Economic, Social and Technological aspects of the country and in order to do this some publication and documents are referenced which have been consulted to outline a coherent analysis that can aid the understanding of the country's reality.

2.1.1 Political

The Ecuadorian State is divided into five branches, which are the Executive Branch, Legislative Branch, Judicial Branch, Electoral Branch and the Transparency and Social Control Branch. The principal socio-political movement that has dominated in Ecuador during the last few years has been that of Alianza PAIS, which was created by former president Rafael Correa.

Muñoz (2016) states the following opinions: The accumulation of measures adopted by the government has filled the democratic spirit of the Ecuadorian people, whose protests have strengthened in the last few days. Measures against workers, the mining policy is contrary to the spirit of the Constitution of 2008, the persecution of popular leaders against this policy and the provision of subsoil to Chinese and Canadian transnationals; the signing of the FTA with the EU, which damages the popular economy because there is no techno-scientific preparation in our country compared to Europe; the illegal intervention in the pension funds of professors and others in 2015; the suppression of state contributions to social security for retirement that same year; the enactment of the COIP (Organic Code of Criminal Procedure), penal code destined for the criminalization of social protests; the divestment of the country, through the anticipated sale of oil to China, since the beginning of this government's administration, because of the loans received and the aggressive debt to the Asian state; the uncontrolled corruption, covered up and not investigated; all of that, plus other situations, have led to the government's decline.

A World Bank report (2017) shows that between 2006 and 2014, Ecuador experienced an average GDP growth of 4.3%, generated by high oil prices and important flows of external financing to the public sector. This allowed for increased public expenses, including the expansion of social spending and emblematic investments in the energy and transportation sectors. During this period, poverty decreased from 37.6% to 22.5% and the Gini coefficient for inequality was reduced from 0.54 to 0.47 due to the income of the poorest sectors of the population increasing faster than the average income. However, these achievements are at risk due to low oil prices and inflation of the dollar. This context was aggravated by an earthquake that affected the northeast costal region of the country on 16 April 2016. Between 2014 and 2016, urban unemployment increased from 4.5% to 6.5 % and urban underemployment increased from 11.7% to 18.8%. During this same period, poverty and the Gini coefficient for inequality remained the same.

Insofar as International Cooperation is concerned, it has depended on clear rules, better objectives have been outlined, and a much more satisfactory legal context has been created to apply agreements or treaties in a participative way; diversifying them and not being limited only to organizations from countries like the United States, has opened up to new international communities.

However, it is worth analyzing legislation in regard to this type of international cooperation agreement, that even if they could be carried out with decentralized governments like municipalities and provincial councils, when it comes time to draw up the legal documents to put them into effect there must be permits and approvals from governmental organizations that centralize the process, be that at regional or national offices. In other words, there is not the liberty to carry out cooperation agreements between similar bodies or those of international character; there will always be regulations at a central level that impede the rapid execution of processes.

2.1.2 Economic

Within the Ecuadorian economy, the primary source of income is oil, followed by shrimp, banana and, recently, tourism. According to the Center for Latin American Studies – CESLA (2017), in recent years there has been a continuous growth with an average GDP growth rate

of 4.3% in the period 2000-2013, and public external debt as of September 2013 was 13.9% of GDP.

According to the Center for Latin American Studies – CESLA (2017), this result is primarily due to a weak internal demand and the fall of investment and consumption. Likewise, both the non-oil commercial balance and oil production have worsened. The reduced price of oil and the cost of recovering from the earthquake have contributed to this situation. However, there is a deterioration in the quality and quantity of employment, which is generating higher unemployment, affecting levels of consumption.

The fiscal deficit has grown past predictions, due to insufficient tax revenues as a consequence of the economic situation. Likewise, the low price of oil impedes obtaining the petroleum income necessary to cover said deficit. Therefore, the reduction in the price of oil has forced the government to reduce public expenditures, primarily owing to the cost of importation of derivatives.

The low price of oil forces the implementation of cuts to public expenditures, which involves reductions in investments and consumption. In this context, it can be seen how aid favors GADs and social organizations, as well as international cooperation agreements aid the population in general, be they non-governmental organizations or private companies that participate, as long as the purpose of these agreements is to benefit the parties involved - especially those who live in the sector where the project is located – be it economically, environmentally or in the development of this social collectives.

Moreover, a slight recovery of the checking account balance is expected, thanks to weak internal demand, the hoped for recover of oil prices and the increase in remittances. In consequence, a reduction in inflation is expected. It will be necessary to adopt a fiscal consolidation policy, given that petroleum incomes and revenues are at low levels and the fiscal deficit is unsustainable.

This situation includes a greater public debt, dependent on external financing, primarily from China and other international organizations. The following figure shows some data analysis of the economic situation in the country in 2016 and its projections for 2018.



FIGURE 7: ECONOMIC INDICATORS FOR ECUADOR 2016

Source: CESLA (Center for Latin American Studies, 20 January 2017)

According to the report included in the table by the Center for Latin American Studies (2017), an analysis can be made to define the following points:

- Judging by the rates of inflation and lack of investment in the country, by the accelerated growth of external debt, the country's economic risk is medium to high. In other words, economic recovery depends on decisions made by the government.
- Instability is medium. Presidential candidates assure they plan to strengthen the dollarization system. To do that they must encourage investment and reduce uncertainty caused by the current economic situation.
- Sovereign risk is medium. The level of risk in Ecuador is heightened and only inferior to countries in Latin America such as Cuba, Nicaragua and Venezuela.
- Public Sector Financial Risk is medium-high. The Administration should adopt fiscal measures due to a high fiscal deficit, due to a reduction in petroleum income together with elevated costs of loans.
- Socio-political risk is high. Although the party currently in power (Alianza País) has changed candidates for the upcoming presidential elections in February 2017, the results are still uncertain.

2.1.3 Social

When dealing with a social situation in the country, a thesis accessed in the records of the Universidad de San Francisco de Quito, whose author Sandoval (2012) states that it has improved greatly in certain aspects, especially for the marginalized sectors, due to a large investment by the current government in the social quarter. The GDP per capita has gradually increased from 2,913.81USD at the beginning of 2014 to 3,653USD at the end of 2014, with a GDP per capita to PPP of 8,382.57 in 2013. In health indicators, we can see that the death rate has lowered drastically in the last two decades, from a high of 25.9% in 1999 to 14% in 2013; the infant death rate in 2012 was 2%; average life expectancy in 2012 was 76.2 years; access to public services has improved, especially education for which the government has dedicated itself to improving its quality through new reforms, and reducing illiteracy, which has been reduced from 9.3% in 2004 to 6.7% in 2013.

Sandoval (2012) also states that Ecuador is a country recognized for its extensive biodiversity. There are thirteen indigenous nations and fourteen indigenous communities. Each one of the nationalities possesses its own language and culture. Thanks to this diversity, Ecuador has been classified as a mega-diverse country, but despite this some communities face dangers, such as the Kichwas who do not have a defined territory and so are expelled from their lands little by little, losing their culture and their communities. The Waorani, like many other communities in the Amazonia, are highly threatened by the presence of transnational petroleum companies that destroy the environment, causing irreparable damage.

Ecuador is also mega-diverse in flora and fauna. The fauna of Ecuador is extensive, with a large variety of species: approximately 3800 species of vertebrates, 1550 species of birds, 320 species of mammals, 350 species of reptiles, 375 species of amphibians, 800 species of freshwater fish, and 450 species of saltwater fish and more than a million species of insects. Ecuador has more species of birds than any other country in Latin America, and contains 18% of all the world's species. The Ecuadorian territory contains around 25,000 species of vascular plants. Within the family of orchids, 2725 species have been identified and 66 of them exist only in Ecuador, which includes 11% of all the world's species and 30% of those in Latin America.

2.1.4 Technological

In a thesis from the Universidad Internacional del Ecuador, author Medina (2015) states that according to a technological analysis on the Internet and social networks, Ecuador has opened up to technology, which has permitted both public and private companies to gamble on change. This is the case of the government's project to make sure that the Internet reaches most people.

This provides a great opportunity for people to communicate and learn about their surroundings. According to a survey on socio-economic stratification in 2011 (NSE), more than 98% of Ecuadorians use Internet tools to communicate, be it email or social networks (INEC).

For the agreement carried out in Santa Isabel, it was a great advantage to know that more people communicate via the Internet because it can be a means of communication about products that are easy to use as well as cheap. The Internet also brings a world of information to the hands of its users because people can research our products and read forums that talk about people's experience with them. This is of great assistance to the implementation of new international cooperation agreements because people who are not located in our country, such as non-governmental organizations and private companies, can get in contact, achieving relationships that were not available before, due to the lack of access to social networks in Ecuador.

However, a notice published in El Universo (2012) states that the digital gap between developed countries and developing countries persists, and in Latin America the lag is "evident", according to the latest report on information and communication technology (ICT) presented at the New York World Economic Forum (WEF).

Of a total of 142 countries, in 2012 Ecuador was located in 96th place, advancing twelve places from the previous year, when it was in 108th place, according to the 2011 WEF report. This is due to the fact that conditions have improved and currently better Internet service is available, with the implementation of free WiFi by GADs in all the cities and counties in Ecuador, which facilitates access to social networks.

On the other hand, the techno-scientific part to be implemented is extracted from studies done by companies that are part of the agreement, being state-of-the-art technology for

processing microalgae - provided for this project - the main economic beneficiary of which is the GAD of Santa Isabel, in the Hatos Pilchez sector where the project will be located, and the residents of the entire county, since the environment will be improved and the possibility to boost the region in this type of project benefits all of Santa Isabel. In this sense, ALGATECH, a biotech company, headed by Israeli Ezequiel Gonzales, is the company that supplies these new technologies for the project.

2.2 Assessment of the reality Santa Isabel County

To outline a baseline of the sector where the project took place, we should first refer to general information about Santa Isabel County.

Regarding the socio-economic atmosphere in which the residents of Santa Isabel County live: this can be found described in the County Development Plan (2014), done by the county's GAD. The following aspects can be assessed:

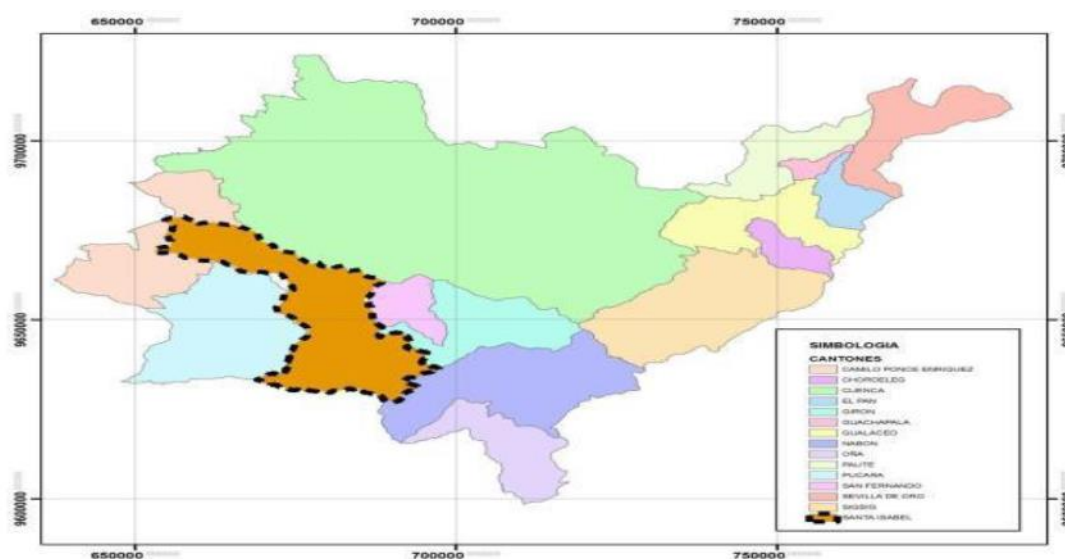
Santa Isabel County was established on January 20, 1945. Its population is at 21,450 inhabitants (2010 Census) and covers 77,552.19km², its borders are: to the NORTH: Cuenca County (Azuay), to the SOUTH: Nabón County (Azuay), and Saraguro (Loja); to the EAST: San Fernando and Girón Counties (Azuay) and to the WEST: Ponce Enríquez and Pucará Counties (Azuay).

The altitude of Santa Isabel County is between 200 and 4000 meters above sea level, which is why it has different climate zones which range from cold to tropical, with different crops on its lands that represent a large amount of forestry and environmental services, existing both agricultural and cattle breeding zones. However, a large part of the surface of the county is covered with native forest.

Its political division is structured in the following way: it is divided into the Parishes Santa Isabel, Abdón Calderón, Pijili and Shaglli, which make up Santa Isabel County. In each of them, except for Santa Isabel, there are Decentralized, Autonomous Governments or Parish GADs. Both the Municipal or County GAD are located in the county seat, which is Santa Isabel Parish, which functions as a municipality, an organization that is comprised of the County Council by a Mayor and five council persons or councilors.

In the following figure, the location of Santa Isabel in Azuay Province can be seen.

FIGURE 8: POLITICAL MAP OF THE AZUAY PROVINCE



Source: Development and Territorial Organization Plan of Santa Isabel GAD

Regarding the socio-economic situation, according to the Development and Territorial Organization Plan of Santa Isabel GAD, it can be noted that at a parish level, Santa Isabel is in better shape than the other parishes (Shaglli, Abdón Calderón and Carmen de Pijili) where problems can clearly be distinguished in regard to illiteracy, poverty and extreme poverty, inadequate housing and inadequate services. Among the three previously mentioned parishes, Shaglli is the most effected. The illiteracy rate is strongest in the female population and principally in Shaglli parish. Education is not well attended and in terms of population density it is lowest among the counties of Azuay, a percentage of almost 45%.

Forty-one percent of the inhabitants that comprise the economically active population (EAP), are farmers and qualified workers, followed by a 14% of service workers and 14% in elementary occupations. According to branches of principal activity and the 2010 Census, agriculture, livestock, forestry and fishery rank with the highest percentage of 46%, followed by wholesale and retail commerce at 11%, construction with 10%, and the other 33% of the economically active population work in other branches of activity. (Development and Territorial Organization Plan of Santa Isabel GAD, Ch. 3, pp. 31-35)

In this county, and with the initiative of the Municipal GAD headed by its mayor, an International Cooperation agreement will take place between Santa Isabel GAD/ALLSCIENCE and ALGATECH, with the purpose of completing the project named MICROALGAE PRODUCTION PLANT, which will be explained more in detail later, during the development of the study.

In order to have a better vision of what this agreement represents, it is important to know the opinion of the highest-ranking official in the Municipal GAD of Santa Isabel, Mr. Rodrigo Quezada R. In order to do this, an interview was held with the city official on April 15, 2017, of which is transcribed the most fundamental and important aspects:

1. Briefly describe Santa Isabel's potential for development.

Respecting Santa Isabel's potential it can be said that it is related to its geographical location in Yunguilla Valley, with an exceptional climate that allows for the development of agriculture and livestock, aside from having rich mining resources. It is important to recover the industriousness of the people who work the land. All of these elements combined, today we have the privilege of offering to locals and foreigners all that is within our borders.

2. What are the geographical strengths of Santa Isabel in the area of the environment?

Well, as was mentioned in the previous question, Santa Isabel enjoys a very important geographical location with a very healthy habitat that we can say that if Vilcabamba is known for its longevity, Santa Isabel has people who are equally long lived from the quality of the climate and geography and can easily compare with the aforementioned town. So, it can be said that Santa Isabel has an enviable environment, with subtropical temperatures between 17-28°C, very good precipitation and enough water for the crops grown in the county.

3. What kind of interaction has the Municipal GAD of Santa Isabel had with NGOs or international organizations?

Santa Isabel has always had international support, be it through friendly governments, like Spain, France, or an NGO that has offered its volunteers to the city, so we already know the work method these organizations use. They are very organized and respect the country's norms for executing these kinds of agreements. Furthermore, they always try to socialize the project with the beneficiaries that make up the national counterpart.

4. How would the community of Santa Isabel respond to the possibility of a project that benefits the County through an agreement with international organizations?

I am very proud to answer this question saying that the people of Santa Isabel are distinguished for their hospitality, their openness to profound change and development. They are always willing to collaborate and seek the progress of the homeland. With the effort and perseverance of the members of the county, we have achieved that it grown and strengthen daily. Besides, we have already had success with other similar agreements.

5. What are Santa Isabel's development priorities?

In Santa Isabel there are still some issues that need to be addressed in order to develop effectively, satisfying the needs of the county residents and their communities, regarding to water for both domestic consumption and irrigation, as well as roadways in the county seat and between parishes and communities that belong to Santa Isabel. Another important issue is creating jobs for the inhabitants of this beautiful territory.

6. Does Santa Isabel fight for its development and does it have strategic objectives to achieve it?

Effectively, the County Development and Territorial Organization Plan (PDOT) has specified the route it wants to follow to achieve development. Among its strategic goals are strengthening ties with other organizations, either governmental or international with volunteers, in pursuit of the county's progress. Santa Isabel is a county in growth, which it extends to its communities.

2.3 The companies AllSCIENCE and ALGATECH: Generalities

To understand the purpose and objectives of the different companies that are expected to form this strategic alliance, it is necessary to get to know each one in a general manner. Therefore, each company with whom an agreement is sought will be briefly described.

The company ALGATECH (2000), states the following on its blog:

Algatechnologies is a premier biotechnology company specializing in commercially cultivating microalgae. Established in 1998, Algatechnologies is a global leader in premium natural astaxanthin, producing and supplying AstaPure® – one of the world's most powerful antioxidants, sourced from the microalgae *Haematococcus pluvialis*. AstaPure® is a core ingredient in dietary supplements, cosmeceuticals, and functional foods/beverages.

Located in Israel's Arava Desert – with its stable climate and high light intensity – Algatechnologies is ideally positioned to cultivate microalgae. The company has earned a reputation for innovation, state-of-art technologies and highest quality standards. Algatechnologies markets its products globally, through a professional network of distributors and direct sales, providing just-in-time supply and quality customer service.” (Algatech, “About Us – Company Profile”)

Algatechnologies has implemented patented technologies developed together with Professor Sammy Boussiba, Director of the Microalgal Biotechnology Laboratory at Ben Gurion University (BGU) in Israel, to create the largest microalgae photobioreactor facility worldwide. Together with BGU, Algatech participated in the EU's Genetic Improvement of Algae for Value Added Product (GIAVAP) VII Framework Program for Research & Development.

Algatechnologies is committed to developing new efficiencies for growing the highest quality microalgae in environmentally friendly conditions.” (Algatech, “Technology”)

In the case of ALLSCIENCE (2002), it is established that the company was founded in July 2002 as a company that represents the analytical technology sector in the central-western region of Brazil and that it expanded to other countries, in this case Ecuador, appearing as ALLSCIENCE ECUADOR.

As of October 2014, the company extends its participation in the region and positioned itself in other Latin American countries, in this case, in Ecuador specifically.

Currently ALLSCIENCE is a provider exclusively of BWTEK products in Latin America. Additionally, it has great experience in the area of analytical instruments, with a team able to understand the needs of clients, developing the capacity of the entire product catalogue.

The mission is to satisfy the expectations of our clients, participating as the primary support system to maximize operational initiatives, marketing innovative equipment for their laboratories with excellent customer service and a friendly spirit.” (AllScience, “About Us”)

In its submission document, ALLSCIENCE (2002) states that its project is based on the following values and principles:

- We act proactively and we anticipate the needs and total expectations of our clients, marketing high-quality products and services, guaranteeing the sustainable growth of our company.
- We build long lasting, mutually beneficial ties with our clients, representatives and commercial partners.
- We value transparency, integrity, honesty and teamwork in all our commercial relations, rigorously complying with the laws and regulations applicable to our line of business.

2.4 Project operating spaces

The project is carried out as an agreement between the Illustrious Municipality of Santa Isabel (Municipal GAD) and the company ALLSCIENCE G.U&V LLC., strengthening international cooperation in this county of the Azuay province. It is worth noting that one of the commitments of the Santa Isabel GAD is to provide the physical space in which this venture will take place.

This section carefully details the location of the Microalgas project, as well as a profile with the characteristics of the area and the facilities available for its viability.

In the following table can be observed the structure of the project, with its respective dimensions and technical aspects.

TABLE 3: DESCRIPTION OF THE LOCATION AND ITS CHARACTERISTICS

<u>PROJECT:</u> SANTA ISABEL GAD / ALLSCIENCE & ALGATECH: MICROALGAES PRODUCTION PLANT	
Structures Total:	16 greenhouses and 1 laboratory
Esplanade Total:	6 platforms
Esplanade Dimensions:	<ul style="list-style-type: none"> ○ 40m.x 40m. ○ 34m. x 85m. ○ 34m. x 85m. ○ 65m. x 44m. ○ Esplanade in L-shape; with greater sides: 126m. x 96m. ○ 65m. x 44m

Earth work:	Dig - 150,000 m3 (TENTATIVE) Fill – 10,000 m3 (TENTATIVE)
Roadway:	4m wide 800 m. long (TENTATIVE)

Created by the author of the study. Source: Santa Isabel GAD

It is also pertinent to break down each one of the offices from which the Cooperation Project is based, so for better understanding on this topic some details are given in regard to important data that this study has attempted to determine about this important international cooperation agreement. The technical characteristics of construction, the finished product and location of each element of the project are shown in the Project Specification Sheet.

As can be seen in the sheet, relevant data on the organizations participating in the agreement are considered, as well as the specifications of the necessary personnel and machinery for the construction of the spaces required for the project, its accessibility and other construction details.

With the aim of providing a general overview of the project summarized in the international cooperation agreement, the construction processes and characteristics of the project are displayed in the following table:

TABLE 4: DESCRIPTION OF THE PROJECT LOCATION

PROJECT SPECIFICATION SHEET				
PROJECT, WORK OR ACTIVITY.			ECONOMIC ACTIVITY.	
Microalgae Production Plant			Construction and Operation of Food Manufacture	
GENERAL INFORMATION.				
Coordinate System UTM WGS84, Zone (corresponding to Time Zone) Centroid of project, work or activity:				
X: 684318	Y: 9631088		Altitude: 1051 masl	
State of project, work or activity:	Construc tion: X	Opera tion:	Closure:	Abandoned:
Address of project, work or activity:				
County: Santa Isabel	City: Santa Isabel		Province: Azuay	
Parish: Santa Isabel Urban: Rural: X	Un-zoned area:		Periphery: The project is located in the periphery of Santa Isabel parish, Sector lower Hato Pilchez	
Developer's Information: Company ALLSCIENCE G.U.&V LLC Legal Representative : Patricio Wellington Viteri Cabezas				

Developer's address: Unidad Nacional y Esmeralda		
Developer's email: patricioviteri@hotmail.com		Telephone: 4126172
CHARACTERISTICS OF THE ZONE.		
Area del project (ha o m2): 15 ha	Infrastructure (residential, industrial, or other): Industrial	
Map of location: Topographical Image (IGM), SIG (Arcgis), Google Earth.		
PRIMARY EQUIPMENT AND ACCESSORIES.		
1.-Dump trucks	3.- Crawler	5.- Compactor
2.- Backhoes	4.- Roller	6.- Concrete trucks
Observaciones:		
PERSONNEL REQUIREMENTS: Civil Engineers: 2; Biologist 1; Topographer 1; Assistants 5; Heavy Machine Operators; Personnel 10		
PHYSICAL SPACE OF PROJECT.		
Total Area (m2, ha): 15 ha	Implementation Area (m2, ha): 6 ha	
Potable Water: YES () NO(X)	Water consumption (m3): 15000 m ³	
Electricity: YES () NO(X)	Energy consumption (Kv):	
Vehicle Access: YES (X) NO ()	Ease of transportation access: The sector does not have public transportation services.	
Terrain Topography: Irregular	Type of Roadway: As required	
Sewage: YES () NO (X)	Telephone: Celular(X) Landline () Other()	
PLOT SITUATION		
Rent:	Purchase: X	
Communitary:	Restricted zones:	
Other (Specify):		
Observations:		
LOCATION COORDINATES OF PROJECT ZONE.		
Coordinate System UTM WGS84 Zone (corresponding to Time Zone) to create an implantation polygon. (minimum four points)		
East (X): 684318	North (Y): 9631088	Altitude (masl): 1051
East (X): 684634	North (Y): 9631323	Altitude (masl): 1094
East (X): 684892	North (Y): 9631129	Altitude (masl): 1037
East (X): 684639	North (Y): 9630954	Altitude (masl): 1053

Created by the author of the study. Source: Santa Isabel GAD.

Also described within the Construction Process is an example of the different activities to be carried out to implement all of the civil works to be located in the site named

“LOT 3-GREENHOUSES”. The respective technical visit was made, in which certain issues were considered:

- Earth work
- Topographic conditions of the terrain
- Stratigraphy and visual characterization of existing soil
- Access roads
- Existing basic services and those lacking in the area

According to this, a plan or construction process to follow was defined:

- Conduct a detailed topographical survey of the complete terrain.
- Based on the model generated from the topography, proceed to distribute or place the greenhouses and an office; this involves esplanades existing in the areas of construction.
- Reconsider the placements, indicating the depth of the dig and proceeding to move the earth. The excavated material will serve as fill in required areas of the project.
- Determine the mechanical characteristics of the soil, make soil pits technically distributed on the esplanades and take samples at varying depths to later perform lab tests.
- Design the greenhouses and offices, through the databases obtained in the previous items. Proceed to design the works from the architectural, civil, electrical and environmental aspects.
- Place safety signage before beginning construction.
- Construction will begin with pads, girders; to later mount the steel frames (beams and columns) that make up the structure of the greenhouses and offices, respectively.
- The placement, design, construction and evaluation of a treatment plant will be carried out, with the aim of recirculating water for the basic services required by the project.

With that, the design and feasibility of the agreement between the Illustrious City of Santa Isabel (Municipal GAD) and the companies ALLSCIENCE and ALGATECH for the project: Microalgae Production Plant for the manufacture of food products has been briefly and coherently explained.

CHAPTER III

3. DEVELOPMENT OF THE INTERNATIONAL COOPERATION PROJECT

3.1 Project

3.1.1 Introduction

According to the project's technical report, ALLSCIENCE and ALGATECH, companies that are dedicated to the production and cultivation of microalgae, to capture carbon dioxide and the production of biofuels, some characteristics of the project are detailed for better understanding.

Marine algae have various applications in products that have enhanced their development. This makes possible the research and technical development of the sector in an association between companies and research centers. Some of their uses are in agriculture, fertilizer, cosmetics, anti-ageing treatments, moisturizing creams, sunscreen, hair treatments, make-up, production and harvesting, pharmaceutical products, cancer research, nutrition, natural therapies, biodegradable materials (plastic bags), organic fuel, carbon dioxide capture, radioactivity elimination, and water treatment.

3.1.1.1 World Market in marine algae

In the same technical report on the project, it is mentioned that the marine algae industry offers an ample variety of products, the total annual production value is estimated to be between US\$5,500 and US\$6,000 million, with a volume of 11.3 million tons. Of that total, the food products for human consumption correspond to US\$4,000 million.

The substances extracted from the algae, hydrocolloids (a natural solution that gives texture, improves the appearance, feel and flavor of processed foods) represent a large part of the other millions of dollars, while the rest corresponds to various minor uses, such as fertilizers and additives.

The industry uses between 7,500 and 8,000 million tons of wet algae per year, which are taken from the natural environment (natural beds) or from cultivation (aquaculture). At a world level, the cultivation of algae has rapidly increased to meet demand since the supply from natural sources was surpassed.

Many factors contribute to the growth and optimal development of the cultivation of algae. Among them are water, nutrients, light intensity and temperature.

Cultivation for algae research has two clearly differentiated stages. One of them is indoor, which corresponds to the initial phase of development cultivation in a laboratory and where it is possible to control environmental factors, where the goal is to generate the inoculum necessary for exterior (outdoor) massification, the last stage of the process.

FIGURE 9: CULTIVATION STAGES OF MICROALGAE



23. Primera etapa cepas micro algas.
Fuente: Elaboración propia.



25. Cultivo inicial micro alga.
Fuente: Elaboración propia.



24. Cultivo intermedio micro alga.
Fuente: Universidad Católica del Norte.



26. Cultivo masivo micro alga en ponds.
Fuente: Benjamín González Z.,

Source: AllScience G.U.&V LLC

3.1.1.2 Installation requirements

According to the Food and Agriculture Organization of the UN (FAO), for research and technology development of algae it is necessary to have a basic, group 115 laboratory, in

which biological, chemical and physical agents constitute a low risk for individuals and the community, which makes it possible to locate them in urban centers.

This laboratory must have:

- Seeding room: a compartment within the laboratory where algae are inoculated to create strains.
- Indoor cultivation room or laboratory: Maintenance of algae strains, cultivation growth in small and medium volumes. The cultivation containers commonly used in indoor processes are of non-toxic plastic materials that allow flexibility in the space for the various experiments that could be carried out.

The room should have the following characteristics: controlled temperature between 18-25°C; cold, white florescent lights installed (20W-37W), glass windows for better light capture, and washable surfaces.

- Outdoor cultivation: For large volumes of cultivation, containers of non-toxic plastic, wood or concrete are recommended. The method most used in temperate climates are tanks or buried lakes and raceway systems. In the latter, the water is in constant movement by a motor that rotates the biomass to capture light and nutrients. Both methods are buried in earth from 50cm to 1 meter deep, to improve light capture of the cultivated biomass.

3.1.1.3 Management model

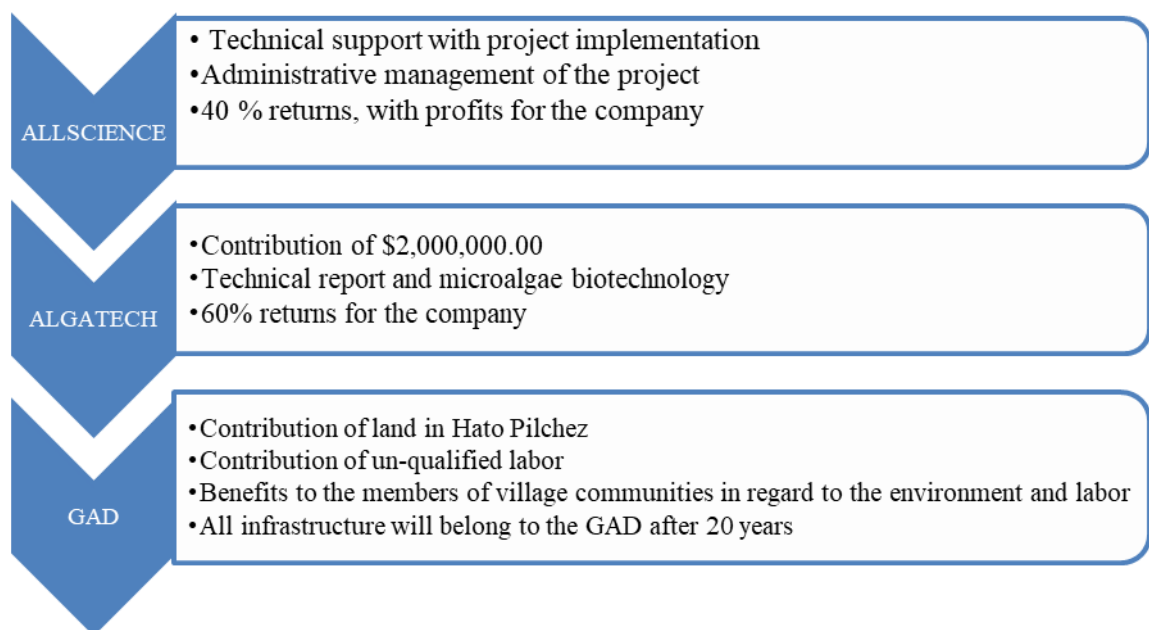
The proposed management models are economic-administrative, territorial, of water, soil, energy, and waste.

The project proposes to be carried out through direct management, by the companies ALLSCIENCE and ALGATECH, as private institutions that manage the availability of the land and building construction, an investment of approximately \$2 million, supported by the Santa Isabel GAD, with whom an international cooperation agreement will be signed.

ALLSCIENCE and ALGATECH will be the owners of the facilities, being the co-operators of the project along with the Santa Isabel GAD. The administration of the project falls to ALLSCIENCE. The financing of research projects will use increasing research and development funds, strategic alliances with companies, universities and local governments. A

plot of land has been proposed for the construction of the laboratory which is found in a zone of Santa Isabel County, in order to generate ties and benefits to the county and its communities. The land where production will largely take place is located in a rural zone, with a desert-like climate ideal for cultivating algae. The connection with the laboratory located in the town of Santa Isabel is fundamental, and large-scale cultivation, since a service network and consolidated equipment are required. Figure 10 shows how the management model of this project will play out.

FIGURE 10: MANAGEMENT MODEL



Created by: Carla Samaniego G.

This project has an amphibian program, which is why both water and land are of equal importance. The project plans for cisterns to store water necessary for the cultivation process. The water to be used for cultivating algae should pass through a series of filters that trap both organic and inorganic matter, leaving it in condition to be maintained and derived for the various indoor and outdoor cultivation methods. After its investigative use, it is filtered again to be reused up to 90% to reinitiate the same process.

Due to the importance of water to this project, gravity will be used as a passive method to move water, reducing operating costs. To the same end, new uses will be found for this water before being recirculated, one of them being to have the water pass through the interior of the building to improve its temperature, to later be returned to the community in

the form of an external aquarium (educational and hands-on) as a finish touch to the center dedicated to marine life, to later be recirculated for the study.

The building and countryside will work together through passive and active systems to create optimal habitation conditions and permit the cultivation of algae, achieving a sustainable project. Some considerations to take into account:

- Isolation of the building's surroundings: The project will be enclosed, thermally isolating the roofs which are the main source of radiation, and filtered windows will be considered to let light through but not heat, improving control of environmental conditions.
- Ventilation: This will be produced in two ways. Each window pane will have protective modules on the top and bottom, to produce an upwards current to keep air moving. The same technique will be used on the opposite side of the room, to produce counter-currents that can regulate temperatures in the summer.
- Orientation: The cultivation zone will have an upper terrace directed for maximum sun without shadows. Aligning the capacity to capture the most amount of natural light and taking advantage of the sun's heat. This allows for better indoor temperature control of the premises, as well as saving on energy costs.
- Heating: Geothermic energy will be used for the distribution of hot water through high-density PEC pipes to end at radiators or radiant tiles, according to the enclosure.
- Solar energy capture: Due to the radiation in Santa Isabel, solar panels will be used to capture energy which will be stored in batteries that can be used for interior cultivation, during night processes.
- Lighting: A high-powered system will be designed with automatic exterior and interior lighting on an automated system.
- Water circulation: Using height differences and gravity to move water through the building will allow for better temperature of the facility.

Correct environmental protection should consider the management and control of waste, classifying three types of waste:

- Urban waste: paper, cardboard, uncontaminated materials. These will be taken to existing recycling facilities.

- Dangerous waste: chemical substances or contaminated materials are collected by a private company authorized to collect such materials from hospitals, laboratories and educational centers in Santa Isabel.
- Biological or organic waste: for algae treatment, it is proposed to develop products from organic residuals by composting.

For this reason, ALLSCIENCE and ALGATECH will hire Biochemistry B&B, an Ecuadorian consulting company trained to carry out the Environmental Impact Study (EIS) of the “Microalgae Production Plant Project”, a project that consists of the construction of a greenhouse plant for algae production. The project will be carried out on a 10 hectare property located in the Hato Pilchez sector of Santa Isabel County, Azuay province.

The application processes, equipment and installations with advanced clean technology that offers the most operational security and compatibility with the environment will be considered for the construction, operation and abandonment phases of the project.

Microalgae and cyanobacteria are unicellular microorganisms that are capable of photosynthesis. That means that they are capable of generating organic biomass from CO₂ and light, using water as an electron provider, changing it to O₂.

These species contribute high nutritional content to fish, crustaceans and mollusks, as well as offering a way to manage cultivation systems both in laboratories and large-scale production for commercial ends. Large-scale cultivation of microalgae and the practical use of its biomass as a source of certain constituents has been very important.

An example of this was the use of the green algae *Chlorella vulgaris* that can be used as a food supplement, for aquaculture, a purifier of residual waters in bioremediation, among others.

Given the properties attributed to this microalgae, this project aims to elaborate an edible product from its biomass and encapsulate it. Three different laboratory cultivation methods for algae were evaluated: Bold’s Basal Medium (BBM), Chu’s Medium No. 10 and Knop’s Solution. The best growth results came from Bold’s Basal Medium, with a growth velocity of 0.541 divisions per day, due to the amount of nutrients it possesses.

To verify the nutritional content of *Chlorella* and to make the product edible, tests were done to identify Vitamin C, monosaccharides and proteins, which resulted positive. Therefore, it is a good option as a nutritional supplement for human consumption. To

encapsulate it and create an edible product from its biomass, a bacteriological analysis and the importance of the sterilization of the algae before being encapsulating or manufacturing the product – in this case it was “*Chlorella* happiness” - were considered.

3.1.2 Justification

According to the technical report presented by ALLSCIENCE G.U.&V LLC., the main purpose of this microalgae cultivation project is the practical application to obtain some products which are especially relevant in our current century, since they propose solutions to dull the effect of climate change produced from CO₂ emissions into the atmosphere and the depletion non-renewable energy. This experience consists in cultivating microalgae in a laboratory, observing its growth during a period of two weeks, and then studying the data for the advantages of using clean, cheap technology, which allows for:

- Taking advantage of it as a raw material for the **production of biofuel**, from the oil extracted from the microalgae.
- The **purification of residual urban water**, rich in nitrogen and phosphorous, which are the primary nutrients of microalgae.

The geographical reach of the socio-environmental management plan of the project is framed within the area of environmental impact included in the required activities for the construction of the plant, which is located in lower Hato Pilchez, a few kilometers from Jubones River, in Santa Isabel County.

In the technical report of the agreement, the socio-environmental management plan (EMP) is detailed. It will include a description, a base-line analysis of the area of environmental impact and an evaluation of the applicable national and local environmental regulations and an analysis of the institutional competency framework in the area of study.

The socio-environmental management plan contains methods of mitigation, prevention and control, as well as monitoring and follow-up of the application of methods associated with management programs, plans and follow-up programs. The EMP contains a matrix with indicators, verification methods and those responsible for the methods, and includes the referential budget with a cost analysis, timeframe for the implementation of the methods to be carried out, technical environmental specifications of the proposed methods which should be included in the technical specifications particular to the civil work.

3.1.3 Background

To describe the development project in a manner easy to understand, as a special International Cooperation agreement between companies such as ALLSCIENCE, ALGATECH and the Municipal GAD of Santa Isabel in the Azuay province, we must turn to the direct source and we will describe each one of the components and phases of this project.

In this description it is completely necessary to know which regulations and laws the project is based on, so the most important of these current legal regulations to the development of the project will be briefly described. First, the regulations on environmental impact stipulated in the country's Constitution will be reviewed.

In our Ecuadorian legislative system, we can find a significant number of provisions contained in the Political Constitution of the Republic of Ecuador, in force since 20 October, 2008, International Instruments signed by our country, Organic Laws, Ordinary Laws, Regulations, Decrees, Agreements, Ordinances and other compendiums of regulations on environmental management. Those cited are those of great importance to the agreement; so, we have in Constitution of the Republic of Ecuador, reformed and amended by the National Assembly (2015), the following articles:

Art. 395. – The Constitution recognizes the following environmental principles: The State will guarantee a sustainable method of development, environmentally balanced and respectful of cultural diversity, which conserves biodiversity and the ability of natural ecosystems to regenerate, and ensures the satisfaction of the needs of present and future generations.

Art. 396. – The State shall adopt policies and appropriate measures to avoid negative environmental impacts, where there is certainty of harm. In case of doubt about the environmental impact of any act or omission, although there is no scientific evidence of harm, the State shall take effective and appropriate protective measures. Liability for environmental damage is objective. Any damage to the environment, as well as the corresponding sanctions will also involve an obligation to fully restore ecosystems and compensate the affected individuals and communities.

Art. 397. – In the case of environmental damage, the State will act immediately and would subsidize to guarantee the health and restoration of ecosystems. In addition to the corresponding sanction, the State will reiterate against the operator of the activity that caused the damage the obligations entailed in complete restoration, in the conditions and with the procedures established by law. Responsibility will also fall on the officials responsible for environmental controls. To guarantee the individual and collective rights to live in a healthy and ecologically balanced environment, the State commits to: Establish effective mechanisms for prevention and control of environmental contamination, the recuperation of degraded natural areas and the sustainable management of natural resources. Regulate the production, importation, distribution, use and final disposition of materials that are toxic and dangerous to people or the environment. (National Assembly, 2015)

Likewise, the Law for Environmental Management will be taken into account, in which some important articles appear that were the basis for this cooperation agreement, among them the following:

Art. 19. – “Public, private or mixed works and investments in public or private projects that can cause environmental impact, will be pre-qualified before execution, by decentralized control organizations, according to the Unique System for Environmental Management, whose guiding principal will be the precautela thorium.”

Art. 20. – “To begin any activity involving environmental risk, the respective license must be obtained from the Ministry of the Environment.”

Art. 21. – “Environmental management systems shall include baseline studies; environmental impact assessment, risk assessment; management plans; risk management plans; monitoring systems; contingency plans and mitigation; environmental audits and abandonment plans.”

Art. 23. – “The environmental impact assessment shall include: The estimate of the effects on human populations, biodiversity, soil, air, water, landscape and the structure and function of the ecosystems in the area predictably affected; The conditions of public peace, such as: noise, vibration, odor, light emissions, temperature changes and other environmental damage arising from their execution; and, the impact that the project, work or activity will have on the elements of historic, scenic and cultural heritage.

Also included in this legal framework are some regulations such as the Health Law, Public Contracting Law for works to be carried out at the plant, the Industrial Security Law, Water Law, among others, and as a required regulation the COOTAD Law, which governs the Decentralized Autonomous Governments, and which is summarized in the following articles:

Art. 54. – Duties. – The duties of the decentralized autonomous municipal government are the following: Promote the sustainable development of their territorial county districts, to guarantee wellbeing through the implementation of county public policies, in the framework of their constitutional and legal competencies; regulate, prevent and control environmental contamination in the county territory in the manner set forth in national environmental policies;

Art. 55. – Exclusive competencies of the decentralized autonomous municipal government. – Decentralized autonomous municipal governments shall have the following exclusive competencies notwithstanding the others determined by law:

d) Provide the public services of potable water, sewer system, purification of residual water, solid waste management, environmental health activities and those established by law;

Art. 136. – Exercise of environmental management competencies.– In accordance with the provisions in the Constitution, the exercise of state protection over the environment and the co-responsibility with citizens of its preservation, shall be expressed through a national decentralized environmental management system, which shall be responsible for defending nature and the environment through concurrent management and subsidy of the competencies of the sector, subject to policies, technical regulations and control of national environmental authority, in accordance with legal provisions.

The sixth section states: Works or projects that must obtain an environmental license are those that cause serious environmental harm, which pose environmental risk and/or that infringe upon the health and wellbeing of human beings, in accordance with the law.

The seventh section states: The decentralized autonomous governments of rural parishes shall promote activities that preserve the biodiversity and protection of the environment by ensuring in their territorial district the existence of programs and/or projects for the sustainable management of natural resources and the recovery of fragile ecosystems;

the protection of sources and flows of water; the prevention and recovery of soil degraded by contamination, desertification and erosion; forestation and reforestation with the preferential use of native species adapted to the zone; and environmental education, organization and citizen protection of environmental and natural rights.

These activities will be coordinated with environmental policies, programs and projects at all levels of government, on conservation and the sustainable use of natural resources. (COOTAD, 2006)

Furthermore, it must be approved by the Ministry of the Environment (MAE) which is the national guiding environmental authority, coordinator and regulator of the Decentralized National Environmental Management System, notwithstanding the competencies of other State institutions.

The Environmental Management Law establishes its responsibilities such as determining the projects that require going through an approval process of environmental impact studies and the corresponding environmental license, notwithstanding the entities accredited as environmental authorities on responsible application who have met requirements, for which they were given the respective permits for the project to be carried out, in accordance with the laws and regulations of the country.

3.1.4 Project Description

3.1.4.1 Geographic Location of the Project

The project will be located in Santa Isabel parish, in the sector known as lower Hato Pilchez, a few kilometers from Jubones River in Santa Isabel County in the south and southwest of the Azuay province, touching on Cuenca County in the north. It possesses a surface area of 10 hectares and the population in 2010 was 950 inhabitants.

The figure shows the geographical location.

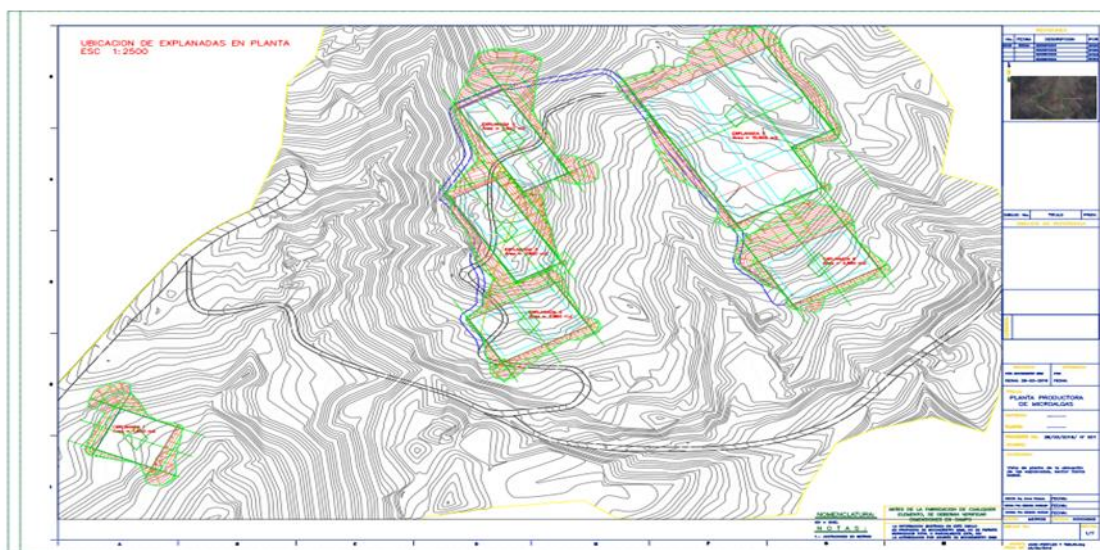


FIGURE 11: GEOGRAPHIC LOCATION OF THE PROJECT

Source: Municipal GAD of Santa Isabel

In the sector of Hato Pilchez, people are primarily dedicated to agriculture. The average annual temperature varies between 12° and 23°C, although in winter temperatures can lower notably. The land has deep, acidic soil or shallow and steep, rich in organic matter and moist all year round. The rainfall in the this zone is between 500 to 1000mm. The highest level of education of the population of this sector is elementary school, with 34%, and although illiteracy has lowered it still continues at a level of 15%.

Hato Pilchez is made up of three main communities, which are: Hacienda Jubones, Sulupally and Llacay Bajo. According to the project they will be the beneficiaries of a more sustainable environment due to the works to be carried out in the sector. In addition, the residents of the communities will be part of the unskilled labor, which will generate employment for their inhabitants.

Regarding housing, it is formed of houses built from local materials and house 4 to 6 person families. They do not have any kind of basic services, such as sewer systems; the water is piped in using a system built by the inhabitants of the sector with the help of a NGO.

In the socialization of the project, with the help of area residents an understanding was reached about considering the personnel of the place for unskilled labor in the construction of different modules of the project, moreover, those chosen to work in the plant will be trained on the development of the cultivations.

3.1.4.2 General characteristics of the Project

The microalgae cultivation project proposes building a plant that will be formed by the construction of six esplanades on which 16 greenhouses will be placed. Each greenhouse will have photobioreactors (ponds) installed for the cultivation of algae and will be connected in series.

Futhermore, offices will be built of administrative personnel. A workshop, a laboratory and a cafeteria will be built.

3.1.4.3 Technical Concept of the Project

Taken from the technical report of the ALLSCIENCE and ALGATECH project:

A) PROJECT OBJECTIVES:

- The objective of the project is the cultivation of indigenous microalgae in light, temperature and nutrient controlled conditions.
- The elaboration of raw material to obtain biodiesel, animal feed and bio-remediation.

- **PROJECT PHASES:** The following are the phases to be carried out for this project:

- Construction phase:

It should be mentioned that construction will be done jointly, among the participants of this agreement, taking into account the residents of Hato Pilchez in regard to unskilled labor, and in that the Santa Isabel GAD contributes machinery for moving earth.

- Operation and maintenance phase:

The production of algae does not have a negative impact on the environment; water will be recycled that will be used in the photobioreactors for the cultivation of microalgae.

In the office area the appropriate management of on-site waste will be practiced, as well as the recycling of paper and the appropriate use of water. A biodigester will be implemented for the treatment of waste water produced in the bathrooms and kitchen of the compound. All personnel that works at the plant will use the necessary personal equipment. Waste bins will be placed throughout the area to ensure the appropriate management of waste produced at the plant. This agreement is of indefinite duration and can be terminated only if the parties consider it no longer beneficial to its ends.

End Phase of the Project:

During the end phase of the project, all structures or facilities will be removed. The area will be adapted for a layer of green growth with characteristic similar to those present before the implementation of the project.

3.1.5 Stages of Development

Once the design of the project is complete, it can be initiated through the following stages:

3.1.5.1 Socialization of the Project

With the presence of social actors, such as the residents of the area in which the plant is located, environmental authorities, governmental authorities, state authorities, representatives from ALLSCIENCE, ALGATECH and the Municipal GAD of Santa Isabel, under the direction of Mayor Rodrigo Quezada Ramón, the socialization of the project will begin in the City's Assembly Hall. During this meeting, the advantages of this International Cooperation agreement will be explained and the benefits that will be generated for the area's inhabitants. Considering that in the previous meeting these were already explained to the residents of the affected sector, the socialization will be done with the organizations involved in the agreement.

With the participation of authorities, representatives from different organizations and civil society, it can be seen that carrying out this project would benefit the inhabitants of the Hato Pilchez sector, the community in general, which is why it will be requested that those at

the meeting analyze the agreement proposed by the international agencies: ALLSCIENCE and ALGATECH.

3.1.5.2 Project Implementation

Construction Phase

- Stakeout and leveling

The locating of the work will follow the alignments and dimensions found in the blueprints, using topographic equipment such as total stations and GPS.

- Grubbing the property and clearing vegetation

Before working on the definitive stakeout, grubbing and clearing will take place, to dislodge and remove shrubs, stumps, fallen leaves, loose residue or any undesirable material existing in the work area. The work of grubbing and clearing will be carried out in a way that does not cause any damage to existing works, which is why the developer will place references on the sites where it is required.

- Earth removal and excavation

Includes the stakeout of the locations and the consecutive movement of earth. The volume of removed material is 150,000m³. The majority of this material will be used in refill zone and the rest will be placed in dumps designated by the municipality of Santa Isabel.

- Entrance of heavy machinery and light mobile equipment

This refers to the entrance and movement of equipment and machinery within the project area, where the excavations will take place, stockpiling of construction materials, debris, and the movement of personnel and equipment. The unloading and loading areas are signaled.

- Operation of machinery, equipment, transportation and hauling

The transportation of construction materials and debris; the transit of equipment and machinery and transportation of construction materials and removed materials will be carried out using the roadways and streets of the county center, for which authorized work routes will be defined by the municipality of Santa Isabel. Special care will be taken with the

maintenance of streets and roadways and all paths and access areas to the work zone will be clearly marked.

The materials extracted from the excavations and catalogued as debris are deposited at sites selected for this purpose, transported in dump trucks using authorized routes. Solid urban waste generated in the compound will be removed periodically and transported to the authorized landfill in closed vehicles that have the necessary safety measures to avoid spills.

- Final disposal of leftover material

The extracted materials that will not be used as fill will be removed outside of the work area and deposited in sites selected for this purpose. In the case of the project, the Municipality will designate dumps as authorized sites for the removal of excavation material.

- Opening and adaptation of provisional access roads

In the project area, a road to the office and greenhouse will be opened. The road will have the following dimensions: 7.2 meters wide by 500 meters long.

- Construction and operation of compounds, workshops, and fuel deposits

In order to maintain optimal planning of the foreseen activities, as well as the administration and execution of the project, the project merits a site in a strategically placed zone, with a view to optimize transport – minimum runs – and therefore omit social conflicts with the population. Due to the characteristics of the project, just one compound is needed which can be installed inside the areas of influence of the project, in the outskirts of the town, and can be located in the plots that have the basic services of water, electricity and sewage.

The construction of the project requires transportation and storage of fuels, for the machinery and equipment used to carry out the various activities of the work. The EMP establishes that the transportation and storage of fuel should be considered, as well as the emergency procedure in the case of spills of contaminating fuels and chemical substances.

- Construction of the civil work

This activity refers to the stages and actions necessary to the preparation of concrete, mortars, formwork, masonry, plastering, painting, etc. for the construction of the structural elements and installations of the project.

The structures to be built of simple concrete, stone or reinforced concrete will be prepared on-site with material measurements according to the concrete slab designs and technical specifications of the project.

The equipment that must be used for the concrete slabs are concrete mixers, vibrators and manual tools, as well as unskilled labor provided by the residents of Hato Pilchez.

Concrete slabs: The materials for making concrete slabs are the following:

Aggregates (sand, rock, gravel and processed aggregate): The aggregates to be used will meet ASTM-C33 requirements. The fine aggregate may consist of natural sand, or a combination of natural and manufactured sand, in which case the natural sand will not be less than 30% of the total fine aggregate. The thick aggregate will consist of natural gravel, crushed gravel, pebbles or crushed stones or a combination of them.

Cement: The cement to be used will be Portland cement, and should comply with the ASTM-C150 specification requirements or a similar regulation; the cement manufacturer is required to present certifications of compliance with established regulations to the Constructor.

Water: The water to be used for washing the aggregates and the preparation of mixes and cures of fresh cement will be free of all substances that interfere with the normal process of hydrating cement. It is expressly prohibited to use contaminated water from sanitary or industrial sewage; water will be rejected that contains toxic substances such as: oils, acids, salts, alkalis, organic material, etc.

Additives: To use additives in concrete, their use and purpose must be specified in each of the designs and it will be the responsibility of the Contractor to authorize their use. The cost will be understood to be included in the unit prices of the concrete and the Contractor will not have the right to monetary claim.

Formwork: The framework may be metal or wood and understand the configuration of the element and support structure. They should be sufficiently rigid to maintain their position and resist the pressure of emptying and vibrating the concrete and not have any openings or broken joints, to avoid the loss of mortar.

Steel reinforcement: The steel reinforcement should meet the particular indications found in the project blueprints and each one of its components. In general, steel reinforcement to be used in work shall meet the specifications for “steel reinforcement” given by ACI 318-83, section 3.5 and those found in the regulations ASTM-A615 point 40, ASTM A617 point 40, or with the equivalent regulations accepted in Ecuador, by quality control organizations.

- Temporary recollection of entering and exiting materials

During the construction of the plant it will be necessary to collect dry aggregate materials (sand, gravel, enhancing material, cement, rebar, etc.) which should be located within the marked work zones in specific places without impacting the flora and water.

- The management of special/hazardous products

The management of special/hazardous waste at the work includes the guidelines, methods, infrastructure and systems relative to the generation, temporary storage, manipulation, transportation, final deposit/treatment of special or hazardous waste, which include use oils and filters, material impregnated with hydrocarbons, pathogenic wastes and other (liquid and solid) which will be generated as a consequence of the construction operations of the project.

- Generation and management of solid waste

Compound waste: The solid urban waste (household waste) are generated in the compounds, as well as those generally created around the work site, usually from food remains.

Potentially recyclable waste: In the case that within the compound and around work areas recyclable waste is generated, such as cardboard, paper, glass, plastics, scrap metal, etc., it will be taken to the landfill where the Municipality gives it to authorized recyclers.

Waste from excavations and debris: These are excavation materials that are not reusable as filler and must be removed, as well as the remains of broken concrete and construction materials.

General description of the operation and maintenance phase

Algae, like all vegetation, need three essential components for their development: light, carbon dioxide and water. Through photosynthesis, they are converted into chemical energy that captures sunlight, later using it to convert inorganic substances in carbohydrates, fatty acids, proteins and vitamins.

The most elemental infrastructure for cultivating algae is in ponds, usually built in canals. The algae, water and nutrients circulate throughout the canal, in which a waterwheel guarantees water flow, keeping the algae afloat. They are shallow in order for the sunlight to penetrate to the bottom of the pond.

An advancement in the intensification of the cultivation consists in covering the ponds with a greenhouse, which supposes a noticeable improvement in the temperature control of the water, of CO₂ and lighting, and allows for considerably increasing the number of cultivatable species.

The project consists in the cultivation of microalgae in tanks built of fiberglass, which are covered by a greenhouse. The water used for the cultivation of the microalgae will be reused by the system, thereby avoiding waste water in the cultivation system. A treatment plant (biodigester) will be implemented for waste water coming from the office bathrooms; this treated water will be returned to its natural course. Likewise, common waste produces in the greenhouse zone and the offices will be separated by type, temporarily stored and sent to the Santa Isabel city landfill. As explained in the operation and maintenance stage, the project does not produce significant environmental impact due to being a product produced by clean technology.

Organization and Responsibilities

The organization foreseen for the Environmental Management Plan during the construction, operation and maintenance of the project, proposed the following structure:

- A corporate level, which features the Municipal Government of Santa Isabel County and its organization, represented in the project by Audit department.
- An operative level, represented by the contractor carrying out the project.

The Audit of the project will include personnel specialized in environmental management. This personnel should be internal or contracted exclusively with qualified consultants for the development of such activities. The construction company should have a technician specialized in the environment. The competent environmental authorities should also form part of this organization, since they will receive and require information to carry out the corresponding supervision and monitoring of the environmental management plan during its development.

The communication of the proposed structure will take place directly and internally between the respective organizations at the corporate level (the municipal government of Santa Isabel County) and the operative level (Contractor), which is to say that they will inform about the compliance with and advancement in the implementation of the project's Environmental Management Plan.

The information between the respective organizations will come from direct verification during field visits by the corresponding inspectors. The both corporate and operative inspectors will act collaboratively in the field in order to collect clear, concise information for the respective levels of communication.

All forms of inspection, follow-up and monitoring reports and reports from project representatives at different levels will be filed, controlled and distributed according to the system of documentation established by the Municipal Government of Santa Isabel County. The systems of documentation at the levels previously described should be compatible.

Training for the implementation of the Environmental Management Plan for the project will primarily consists in becoming familiar with and disseminating the Environmental Impact Study and the corresponding plan created for the project. It will include all topics related to the current environmental regulations, contractual issues and those of environmental impact in the area of influence of the project.

According to the previous paragraph, both Corporate and Operative levels should organize and carry out workshops to make known the previously indicated information. The results of the Environmental Evaluation, developed during the elaboration of the project's Environmental Impact Study, have led to the establishing of the objectives on which the design of the Socio-Environmental Management Plan was based.

The Environmental Management Plan proposed contains the methods of mitigation and prevention of impacts as well as the tracking and monitoring of the application of the methods and the final evaluation of the effects caused by the project in all its phases.

3.1.6 Project Expectations

According to the agreement to be signed between ALLSCIENCE, ALGATECH and the Santa Isabel GAD, the following objectives have been anticipated:

- Involve the population where the project will be implemented, in order to produce sources of employment that can mitigate the economic situation of the people living in that sector of Santa Isabel
- Market the products elaborated in the plants built so that the project will quickly become self-sustaining, to the benefit of the population of Santa Isabel, which will have resources for its development.
- Generate development with the civil construction that in time will serve the project, as well as be beneficial to the residents of the area and the whole county and its parishes.

3.1.7 Project Timeline

Table 5 indicates the time necessary to execute the project.

TABLE 5: PROJECT PHASES

ACTIVITY TIMELINE	YEAR I												YEAR II											
	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12
ACTIVITY																								
Construction Phase																								
Surveying																								
Location stake-out																								
Design of greenhouses and offices																								
Construction																								
Operation Phase																								
Selection of microalgae species and reactor type																								
Securing and Reproduction of Inoculum																								
Implantation of the reactors																								
Planting microalgae																								
Harvesting microalgae																								
Marketing																								

Created by Carla Samaniego G.
Source: ALLSCIENCE project technical report

CONCLUSIONS

The international cooperation project between the company ALLSCIENCE G.U.&V LLC and the Santa Isabel GAD to produce photosynthetic organisms to obtain lipids, metabolites and inoculum has been a challenge for the population and administration of the Municipality of Santa Isabel, in that it deals with an innovative project that generated a source of employment for the inhabitants of Hato Pilchez, the sector where the project will take place. Likewise, the collaboration of those in charge of city administration as well as the residents of the sector where the project is located in Santa Isabel, have allowed that this experience be carried out successfully, in regard to the help from the foreign company.

International cooperation in the country has developed important projects that have come to fruition thanks to the economic, methodological, and technological contributions given by international counterparts, together with the cooperation of the national counterparts in regard to ease of paperwork, availability of spaces to develop agreements, openness and flexibility of regulations, and contributions of technicians and unskilled labor.

The international cooperation project between ALLSCIENCE G.U.&V LLC and the Santa Isabel GAD strengthens the potential of the county and its inhabitants, which is achieved by the tremendous labor to disseminate the project. Socialization has been one of the most effective tools so that the inhabitants of Santa Isabel, mainly those who live in the area where the project plant is located, displayed an important collaboration. This permitted the generation of work for many people, respecting the regulations that rule the country for this kind of international cooperation agreement, with studies that respect the environment to avoid impacting the habitat where the project was implemented.

RECOMMENDATIONS

Based on the conclusions of this study, the following recommendations can be given:

- International cooperation projects are successful, if they are carried out following the current norms and regulations of the countries in which they implemented, which is why it is of great importance to carry them out in an organized manner, respecting each and every stage that must be implemented, with the corresponding permits, and respecting the criteria of the organizations involved and the people living where the project is to be implemented, and a well-directed socialization that not only informs but also permits suggestions to improve the final design.
- This kind of project helps benefit the population of the sectors involved. They take care that development is achieved by uniting efforts, with the collaboration of authorities, international organizations and the support of the population, attaining better results with a participative organization of all the actors involved; to that effect, what is achieved is through opportune socialization and media.
- Santa Isabel is a county with a privileged location in a valley where agriculture, livestock, mining and other fields of production can be carried out favorably, which is why it is recommended that this potential be strengthened in the county through self-sustaining projects such as this one, in which international cooperation plays a new supporting role in its development.
- It is of great importance to follow up on international cooperation agreements, in order to observe the strengths and the opportunities that help future processes in each sector of the country in which they are implemented. Moreover, any negative experiences can be used to correct any shortcomings and aim for more beneficial results.

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