Improving Community Tree Planting Projects in Heredia, Costa Rica

By: Jenny Encarnacion

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EMPRESA DE SERVICIOS PUBLICOS DE HEREDIA, S.A.

December 11, 2008

Señor Juan Diego Bolaños Picado
Unidad de Gestión Ambiental
Empresa de Servicios Públicos de Heredia
Heredia, Costa Rica

Dear Señor Bolaños:

Enclosed is our report entitled *Improving Community Tree Planting Projects in Heredia, Costa Rica*. We have prepared this report during our time with ESPH from August 28, 2008 to December 12, 2008. Copies of this report are being submitted simultaneously to Professor Isa Bar-On and Professor Thomas B. Robertson for evaluation. Upon faculty review, the original will be catalogued in the Gordon Library of Worcester Polytechnic Institute. Thank you very much for the time and resources that you dedicated to our group.

Sincerely,

Jenny Encarnacion
Claire Piard
Carol Wood

Improving Community Tree Planting Projects in Heredia, Costa Rica

Report Submitted to:

Isa Bar-On
Thomas B. Robertson

Costa Rica Project Center

By

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In Cooperation With

Sr. Juan Diego Bolaños, Environmental Education Program Coordinator
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Improving Community Tree Planting Projects in Heredia, Costa Rica

December 11, 2008

Abstract

This project provided Empresa de Servicios Públicos de Heredia (ESPH) with recommendations on how they can help the communities of Heredia improve their tree planting projects. ESPH donates trees to communities who wish to participate in urban reforestation projects, but does not know about the long term care and maintenance of the plants. We were able to identify that participation, community member empowerment, and methods for long term evaluation were the major components most communities were missing from their tree planting projects. We recommended that ESPH address these problems by requiring communities to demonstrate proper planning before they receive trees. We also developed several methods to help the communities improve the structure and execution of their projects.

Authorship Page

Each member made equal contributions to the completion of this project.

Acknowledgements

We would like to take a moment to thank all of the people who helped make this project happen. Over the last four months they have been incredible sources of information, guidance, and support, and without them we never would have been able to accomplish all that we did.

We would first like to acknowledge our sponsor, Señor Juan Diego Bolaños, for dedicating his time and resources towards supervising our project. He was wonderfully patient and supportive while working with us and took time out of his busy schedule to accompany us on all of our site visits. He also helped us navigate the bus system in and out of Heredia, a service we were extremely grateful for.

We would also like to thank the many community leaders we interviewed. Their insight and thoughtful responses helped us to understand the situation in a way that could never have been achieved through other means. We are very thankful that they were so willing to make time for us.

In addition, we would like to thank the community members of Heredia who generously agreed to show us their tree planting sites and answer our questions. We were very impressed by the work that they had been doing.

Finally, a huge thanks goes to our WPI advisors Professor Isa Bar-On and Professor Thomas Robertson. They challenged us, stimulated our minds, and made us continually strive for perfection. There is no doubt that our project would not be what it is if had they not helped us every step of the way. We would also like to thank Professor Susan Vernon-Gerstenfeld for her numerous contributions to our project and for coordinating the San Jose project center.

Executive Summary

While the Earth was once half covered in forests, only about twenty-two percent of that original cover remains (University of Michigan, 2006). This deforestation negatively affects lands by decreasing air quality, land stability, and biodiversity. While it is occurring in various parts of the world, Costa Rica had the worst deforestation rate in Latin America in the 1990's (Butler, 2006). The Costa Rican government has recently made public their goal to reverse these effects, and in recent years, numerous programs of reforestation have been created for this purpose. In the province of Heredia, many communities have organized urban reforestation projects as their contribution to the national reforestation goals.

The Empresa de Servicios Públicos de Heredia (ESPH) has assisted the communities who undertake urban reforestation projects by providing trees to plant and instruction on how to do so effectively. However, while ESPH has been donating trees to communities for over three years, they have not closely monitored the effectiveness of their support. Once the trees are given out to the communities, neither ESPH or the communities keep an inventory of the trees that are planted or a record of their condition. Additionally, in order for this type of project to succeed, there are several key principles of community-based projects concerning project structure and community mindset that should be taken into consideration, and there was no indication that these principles have been applied. The goal of our project was be to help communities of the Heredia province plant and maintain trees in a way that is ecologically sustainable and incorporates the principles of successful community-based projects.

METHODOLOGY

In order to accomplish our goal, we followed five objectives:

- Assess the status of Heredia's current tree planting efforts in order to identify possible problems with the conditions of the trees and the maintenance programs in place
- Identify how business owners, developers, community leaders, schools, and other community members participate in the community tree planting projects
- Identify how ESPH, the local government, and community members share ownership of the tree planting projects
- Identify if the national government, community leaders, or schools are working to empower community members during the tree planting projects
- Identify if ESPH or the tree planting communities have a system to evaluate the long term success of the tree planting projects

From the first objective we hoped to identify any successes or problems that had occurred with the trees and the maintenance programs in place at each site. The other four objectives were created to identify the reasons behind the technical problems of the tree planting projects, which we believed to be shortcomings in the fulfillment of the community-based project principles. For each objective we focused on identifying the role of the stakeholder groups who were most relevant to the community-based project principle that we were investigating.

Our investigation involved studying thirteen tree planting project sites and the communities responsible for them using a combination of direct observations and interviews. Our direct observations involved visiting each of the tree planting sites and evaluating the conditions of the trees and maintenance program in place there. A forestry engineer was able to explain to us what to look for during tree condition assessments and the different problems that

we could find. We interviewed a selection of community leaders, the on-site contact person for each site, and a government official. From the community leaders, we learned about the current tree planting projects in their area and the projects' impacts on their community. This information helped us identify major stakeholders as well as their interests and perceptions. We used interviews with the on-site contacts to improve the quality of our on-site observations and supplement the information from the community leaders. Lastly, a government official provided us with information on how communities of Heredia have executed environmental projects in the past.

FINDINGS

By analyzing the information gathered from our site visits and interviews, we developed the following findings concerning the tree planting projects in Heredia province, and the various stakeholders and principles which affect their success:

1. **Most of the thirteen tree planting sites we visited contained trees that were correctly placed and watered, but were harmed by pests or other isolated incidents**

   Each site varied in type, size, and location. We created a GPS map to display the location and an image of each site. At all of the sites, the planting and watering instructions were respected. The most common problems were pests and other isolated incidents.

2. **Tree maintenance programs varied among the sites and the quality of tree maintenance in the private planting sites was superior to the quality of tree maintenance in the public planting sites**

   The tree maintenance programs varied at each site not only by who was performing the tasks, but also by how the program was organized. Most maintenance programs involved tasks based on the maintenance and care instructions that ESPH provided to the communities. Of the thirteen sites we visited, the nine that were located in

private areas such as schoolyards or gated communities generally had a maintenance system superior to that of the four sites located in public parks or other open areas. We evaluated this theory based on the amount of weeding and accidental damage.

3. **Participation was low among business owners, developers, and the ordinary community members but was high among community leaders and schools**

Most business owners and developers do not participate in the tree planting projects because these projects use land that could otherwise be used for business expansion and construction. Adult community member participation was a problem mentioned by all interviewees. Community leaders are the members of the community who initiate the programs and have one of the highest levels of participation. The leaders have succeeded in involving the youth through educational systems at schools.

4. **Community members do not participate in their community's tree planting projects because there is no confidence in the national government's reforestation efforts, sense of ownership, or opportunity for social interactions**

Some government actions cause community members to lose confidence in the national tree planting efforts because they speculate that the government is only planting trees as a way to gain quick international attention. Additionally, the communities do not participate when they do not have a sense of ownership over the trees of the sites. Lastly when people in the community do not know one another, they have a weaker desire to collaborate on community projects.

5. **Communities have the main control over their tree planting projects**

The communities of Heredia have internal motives for initiating the tree planting projects. Although they receive funding and resources from the municipalities and ESPH, the communities do not share the decision making authority of the project with any outside agents and feel essentially independent.

6. **There were three cases where community members were being empowered, but it appears this is not a widespread occurrence**

The government is giving the communities the power to contribute to the nation's carbon neutrality goal through local projects. In two of the cases we studied, there were efforts to empower the community members during the tree planting projects. In one community, the members were made godparents of the trees that they planted, and in the other, the students were taught to take care of the trees as part of an environmental education project.

7. **We did not observe that long term evaluation methods were being used**

Despite the variety of sites and conditions that we found, our sponsor established they were all "successful." We could not identify clear criteria for success that were applied to all of the sites. Furthermore, there was no indication that any of the communities had a plan to evaluate their success or progress. It has been suggested that this lack of long term vision is caused by the Costa Rican tendency to only think of short term solutions and ignore the long term consequence of their actions.

RECOMMENDATIONS

1. **Modify ESPH's tree distribution process to include an assessment of the communities' project plans**

We recommend that ESPH adjoin to their existing tree request form the questionnaire we created (Appendix E) to evaluate whether the requester is prepared to undertake a long term tree planting project. Our supplement requires the requester to (1) describe his or her long term vision for the project and his or her plan for long term care and maintenance, (2) establish his or her criteria for success, and (3) describe the anticipated level of participation from her or his

community or the methods he or she will use to gain its support. If the requester is unable to answer these questions it would indicate to ESPH and the requester the gaps that exist in the project plan. Based on our recommendations that follow, ESPH could assist the communities in improving the structure of their projects.

2. **Require the communities to submit a regular inventory and assessment of the tree planting sites to ESPH**

We recommend this inventory include pictures as well as incident reports that are submitted to ESPH when they occur. The communities should annually submit pictures of the whole site and of individual plants, so ESPH can update the GPS map that was created during this project. Communities should also report to ESPH any major incidents such as any large number of trees that are cut, stolen, or otherwise harmed, the presence of a particularly problematic disease or pest, or any other suspicious activities or conditions that the community members may find. The frequency and nature of the reporting format should be tailored to make the process as simple as possible, both for ESPH and the communities.

3. **Increase the participation of the community members by:**
    a. **stressing a sense of ownership of trees**
    b. **using their strengths and skills**
    c. **increasing the opportunity for social interactions to unite the community**
    d. **creating partnerships with the uninvolved stakeholders**

We recommend for communities to use communication methods that promote a sense of ownership for the site and the trees by using language such as “your trees” instead of “the trees.” In addition, we recommend a focus on how the existing skills or strengths of the community members can contribute to the project. To bring the community together, community leaders could organize social events such as tertulias and picnics to promote community interaction and

build friendships. Communities can convince the stakeholders to participate by demonstrating the benefits that they could receive from the tree planting projects as well.

4. **Empower the community members with the belief they can make a difference in the project**

The community leaders can empower the community members by creating advertisements that emphasize each individual's power to make a difference in the project. Community members will be empowered if they have greater responsibility and role in the project's decision making process. Another method of empowering the community is to hold conferences that inform, excite and engage the community members.

5. **Create a method for long term evaluation before a tree planting project is started**

Long term evaluation is a two step process: the community must first establish what success means to them and then establish criteria for evaluating their progress over time. The community's definition of success, or goal, should be feasible and not only concern the trees that they plant, but the structure of project that they undertake. Goals for the trees that the community plants could include how many trees survive at their site, the condition of these trees, how often maintenance is performed, or what kind of maintenance is performed. Goals for the community's project could include how many people they would like to participate in their project, the methods that they will use to advertize, or various groups that they would like to form partnerships with. Finally, they should have a regular evaluation method that includes an examination of what has been accomplished, what did or did not work and why, what could have been done differently, and what changes are required to move forward.

6. **Alter the national government's tree planting programs to 1) emphasize "growing" trees during communication to the public 2) assign qualitative instead of quantitative goals, and 3) give information on how to accomplish the goals**

We recommend that the national government change their messages from “planting trees” to “growing trees for a lifetime.” This new message emphasizes both the additional maintenance requirements and time commitments involved in healthy tree growth and development. In addition, the national government should refrain from only assigning quantitative planting goals. Instead, there should be a greater focus on the long term survival and health of the trees. Furthermore, the government should provide information to these communities on how they can “grow trees for a lifetime”. Otherwise, we have found that both the people’s confidence in the government and the tree planting programs will suffer.

We hope this project will raise awareness of the complexity of these types of projects so that all involved groups will feel the desire to dedicate the necessary time and effort to accomplish the set goals. Furthermore, utilizing these recommendations could help community members view their tree planting project as more than just planting trees but as an opportunity to work together to improve their community while helping the environment.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

According to the *World Environmental Encyclopedia* (2003), half of Earth's tree cover has vanished since the end of the last Ice Age. This loss of tree cover harms the environment by causing landslides, flash floods, severe weather conditions, and droughts (WWF, 2005b). Additionally, a lack of trees results in the loss of the social, communal, environmental, and economic benefits that they provide (International Society of Arboriculture, 2005). Deforestation also causes the release of approximately 1.6 billion tons of greenhouse gasses each year according to the UN FAO (2006). The UN Food and Agriculture Organization (2006) attributes about eighty percent of this deforestation to an increase in farmlands. The WWF (2005b) also points to additional causes such as illegal logging, forest fires, and climate change.

In the 1990's, Costa Rica had the worst deforestation rate in Latin America (Butler, 2006). According to the UN Food and Agriculture Organization (2005), this rate decreased by 117.2 percent between 2000 and 2005. However, Thomas Rudel (2005) still estimates that approximately 57,000 hectares of rain forest are removed in Costa Rica each year. The causes of deforestation in Costa Rica are mainly, but not limited to, government property laws, agricultural practices, and the actions of farming and logging companies. According to one source, Costa Rican property laws have encouraged people to clear forested lands to settle (Santa Elena Cloud Forest Reserve, n.d.). Another source claims that logging companies have not been functioning in an eco-friendly way; they clear out areas in search of one or two species of trees leaving the rest of the trees to rot (Viva Costa Rica, n.d.). Forested land is also cleared for agriculture farms. This occurs because Costa Rica's economy greatly benefits from the exportation of coffee, pineapples, and beef. Furthermore, when the price of crops increases, farmers are more inclined to use their increased profit to expand their land and clear more forest (Giddy, 2004).

In order to reverse the effects of deforestation in Costa Rica, groups such as the Foundation for the Development of the Central Volcanic Mountain Range (FUNDECOR), the Ministry of Environment and Energy (MINAE), and Finca Leola support managed reforestation efforts, where humans replant seeds, seedlings, or juvenile plants to aid in natural forest regrowth (Fred Morgan, 2004). Programs such as Ecological Blue Flag encourage urban reforestation projects, which restore the vegetation in cities and the areas surrounding them. The Ecological Blue Flag Program is a program coordinated by the Institute of Aqueducts and Sewage (A y A) for communities, schools, and other organizations who are interested in contributing to the larger reforestation effort by creating tree planting projects. The communities that are involved in the Ecological Blue Flag Program are responsible for preventing negative human and natural actions on the forests through education and surveillance in the community (Finca Leola, 2008).

In order for this type of community project to succeed, there are four key elements about the project structure and community mindset that should be taken into consideration (Frank &Smith 1999; Horn, McCracken, Dino, & Brayboy, 2008; Kellert, Mehta, Ebbin & Lichtenfeld, 2000). Successful projects often 1) encourage the participation of a variety of people, 2) are mainly controlled by community members, 3) empower the community members, and 4) include a method for long term evaluation. A community reforestation case study done by the International Council of Local Environmental Initiatives (1998), found that properly involving communities in a tree planting project guarantees the long term success of healthy tree growth because otherwise the community members will not value the effort.

Heredia is a northeastern province of Costa Rica that has many communities and schools who are involved in urban reforestation projects. The Empresa de Servicios Públicos de Heredia (ESPH) is a utilities company that has gained notoriety for initiating a “Tarifa Hidrica” which is

an environmental fee charged monthly to the clients. The collection of these fees allows the environmental unit to perform various environmental services and provide the interested communities with the trees and knowledge to plant them. Some of these communities seek the support of ESPH to obtain the Ecological Blue Flag while others have different motivations. While ESPH has been donating trees to communities for over three years, they have not closely monitored the effectiveness of their support. There is no indication that the previously mentioned project concepts have been applied. Once the trees are given out to the communities, neither ESPH or the communities keep an inventory of the trees that are planted or a record of their condition.

The goal of our project was to help several communities of the Heredia province plant and maintain trees in a way that is ecologically sustainable and incorporates the principles of successful community-based projects. To accomplish this goal we followed five objectives:

- Assess the status of Heredia's current tree planting efforts in order to identify possible problems with the conditions of the trees and the maintenance programs in place
- Identify how business owners, developers, community leaders, schools, and other community members participate in the tree planting projects
- Identify how ESPH, the local government, and the communities share authority of the tree planting projects
- Identify if the national government, community leaders, or schools are working to empower community members during the tree planting projects
- Identify if the communities have a system to evaluate the long term success of the tree planting projects

We accomplished these objectives by performing field work at the tree planting sites, creating a map of all the sites, and interviewing the associated community members and stakeholders. We hoped to create a plan for ESPH that would allow the communities to increase the effectiveness of their tree planting projects as well as any other community-based projects.

Chapter 2: Background

In this chapter, we will present and discuss five subjects: 1) deforestation's negative effects on the world, 2) the causes of deforestation in Costa Rica, 3) efforts against deforestation in Costa Rica, 4) Heredia province and its community tree planting projects, and 5) the keys to successful community-based projects.

DEFORESTATION'S NEGATIVE EFFECTS ON THE WORLD

Forests are one of Earth's complex and important ecosystems, and their existence is continually threatened. While the Earth was once half covered in forests, only about twenty-two percent of that original cover remains (University of Michigan, 2006). Forests play a vital role in protecting air quality, biodiversity, and land stability. Therefore, the loss of trees can have devastating effects in those three areas.

Deforestation eliminates trees' natural ability to filter pollutants such as ozone and other health-damaging contaminants (Reaves, 2005). Trees store carbon from the atmosphere in their tissues in a process known as carbon sequestration (World Resources Institute, 2008). The Global Research Assessment (2005) found that approximately 283 gigatons of carbon dioxide are stored in forests around the world. The destruction of trees would result in the increase of carbon dioxide in the atmosphere, which contributes to climate change and global warming (World Resources Institute, 2008).

Deforestation is also threatening the world's biodiversity. According to National Geographic (n.d), seventy percent of land animals and plants reside in the Earth's forests. If their habitat is destroyed they may become extinct, which would leave the world at a loss for many medicinal and chemical resources. For example, in the United States, twenty-five percent of all

prescription drugs sold and genetic material used to create certain types of pest-resistant crops are found in tropical forests (Sandler, 1993). In addition, there may be plants or animals with undiscovered beneficial characteristics; however, deforestation may cause them to become extinct before scientists have had a chance to thoroughly study them (Laurance, 1999).

Finally, land stability decreases due to deforestation. Trees help retain water in soil and stall runoff water; this implies that the absence of trees may cause floods. While a study conducted by the Food and Agriculture Organizations and the Center for International Forestry Research (2005) claims there is no scientific proof that demonstrates a direct relationship between deforestation and flooding, two 1998 floods in Central America and China were intensified by deforestation at the headwaters of the rivers and resulted in numerous deaths (Laurance, 1999). Furthermore deforestation is also known to cause erosion. When trees are not present in the soil, there is nothing holding the sediment together which makes it easily displaced by outside forces such as rain, wind and gravity (Laurance, 1999).

THE CAUSES OF DEFORESTATION IN COSTA RICA

According to Rosero-Bixby & Palloni (1998), deforestation in Costa Rica started in the 19th century when coffee farmers began clearing lands in the central valley. By the next century, these areas were almost completely saturated, and colonization of the surrounding forests began to take place on a larger scale. The population began participating in cattle ranching and more extensive agricultural cultivations such as bananas, which resulted in the elimination of large areas of natural forest. Sources identify several reasons why deforestation continues in Costa Rica today. The three main causes are government property laws, population increase, and farming and logging.

During the 1960's and 1970's, property laws in Costa Rica were a major factor that contributed to the clearing of land (Roserio-Bixby & Palloni, 1998)**.** According to one source, any person could gain the rights to an unoccupied plot of land as long as they worked to "improve" it (Santa Elena Cloud Forest Reserve, n.d.). Finca Leola (2006) claims that the easiest way to demonstrate these land "improvements" was to cut down the trees, build a fence, and raise cattle. They go on to add that the current legal system still grants people legal ownership of the lands they clear. In fact, many squatters abuse this law by invading and clearing forests which they then sell to farmers or developers.

While Rosero-Bixby & Palloni (1998) and Finca Leola (2005) both stress that deforestation is mostly a human process, they are unsure of the exact role that population growth plays. Studies into the effects of population growth on deforestation have come to mixed conclusions. A 1998 study completed by Rosero-Bixby & Palloni (1998) noticed a possible connection between the four fold increase in Costa Rican population after 1945 and the fifty percent loss of forest cover during the same period. They found that people rarely exist where trees are; however, only a strong correlation and not a cause effect relationship could be established. Additionally, while Rosero-Bixby & Palloni (1998) found that only the number of landless peasants affected the deforestation rate, a previous study in 1991 done by Lutz & Daly (1991) indicated that most of the deforestation at that time was not being done by squatters but by profit driven industries such as timber or cattle ranchers.

The agricultural and timber industries adversely affect Costa Rican forests. Agriculture alone accounts for 2.28 billion dollars of the nation's GDP (US Department of State, 2008). According to one source, banana plantations take up 130,000 acres of formerly forested land (Viva Costa Rica, n. d.). Furthermore, these plantations are mostly larger farms which deplete

soil nutrients. Similarly, clear cutting for cattle ranches damages the surrounding area. Eventually the land can no longer support either type of farming, and the ranchers must move on to clear other lands (Finca Leola, 2005). Since the 1950's, cattle ranchers have destroyed sixty percent of Costa Rica's forestry (Viva Costa Rica, n. d.). In addition, Finca Leola (2005) claims that in the last four decades, the demand for precious tropical woods have multiplied nearly twenty-five times. The high value of these trees has caused illegal logging, and ninety-nine percent of these tropical hardwoods are taken from virgin rain forests instead of specialized plantations.

EFFORTS AGAINST DEFORESTATION IN COSTA RICA

As the world becomes more aware of deforestation's negative effects, an effort towards reversing it has begun. This brought forth the practice of managed reforestation. While the natural regeneration of forests may take years, human-driven reforestation efforts to restore lost tree cover occurs more rapidly (Sloan, 2006). The Costa Rican government believes that reforestation is a viable option for preserving their ecosystem. President Oscar Arias has recently unveiled the Peace with Nature initiative, a proposal that all countries of the world should unite to fight environmental degradation. In this, the President announced plans for Costa Rica to become carbon neutral by 2021 (Sanchez, 2007a). In order to do so, they would need to compensate for the amount of carbon dioxide they emit by producing equal amounts of oxygen through the increase of forest cover and protected areas. In the same speech, he committed Costa Rica to plant five million trees in 2007, which according to *OneWorld* (2008), the country was able to achieve.

Several organizations are helping to accomplish these goals through programs that encourage the planting of trees and preservation of natural resources. Since the 1990's, the National Forest Finance Fund (FONAFIFO) has had an Environmental Service Payment Program to compensate forest owners for the environmental benefits that their lands provide (Rodriguez, 2003). Additionally, the Ministry of Environment and Energy (MINAE) began offering incentives for national parks to preserve more rainforests (Viva Costa Rica, n. d.). Also, the Foresta Project of the Foundation for the Development of the Central Volcanic Mountain Range (FUNDECOR) has helped manage forests in a sustainable way by creating management plans that have a significantly smaller impact on the forests (Mongabay.com, n. d.). As a result of such programs, approximately twenty-six percent of the country was under some form of environmental protection in 2007 (Sanchez, 2007b).

Reforestation does not only concern uninhabited, remote forests. Urban reforestation projects are done inside or around cities and work to restore the cities' vegetation (Perkins, A. and others). The presence of trees is desired in cities because it benefits the inhabitants' health, welfare and quality of life by improving not only the air they breathe but the aesthetics and comfort of their habitat (Burlingame municipal code). In Costa Rica, programs such as Ecological Blue Flag have encouraged the creation of community urban reforestation projects.

The Ecological Blue Flag (ProBAE) was created to promote the ecologically responsible growth of beaches, schools, communities and protected natural areas (A y A, 2008). The ProBAE 2006 annual report (2006) states that 164 schools, 58 beaches, and 29 communities were awarded the certification that year. These groups must accomplish a set of requirements and submit a report to the National Interinstitutional Committee in order to be awarded a Blue

Flag certification. Communities in particular must fulfill requirements in fields such as disposing of wastes, improving security and health, and planting trees.

Though actively planting trees is a valuable step in restoring the tree coverage of the country, ensuring the trees development is just as important and even more demanding. The American Forests Organization (2008) estimates that a young tree requires regular care and maintenance for three to five years after it is planted. They further stated in "Create a Community Tree Planting Project" that in addition to ensuring the tree's development, it is important to integrate it into the community's life.

HEREDIA PROVINCE AND ITS COMMUNITY TREE PLANTING PROJECTS

The province of Heredia

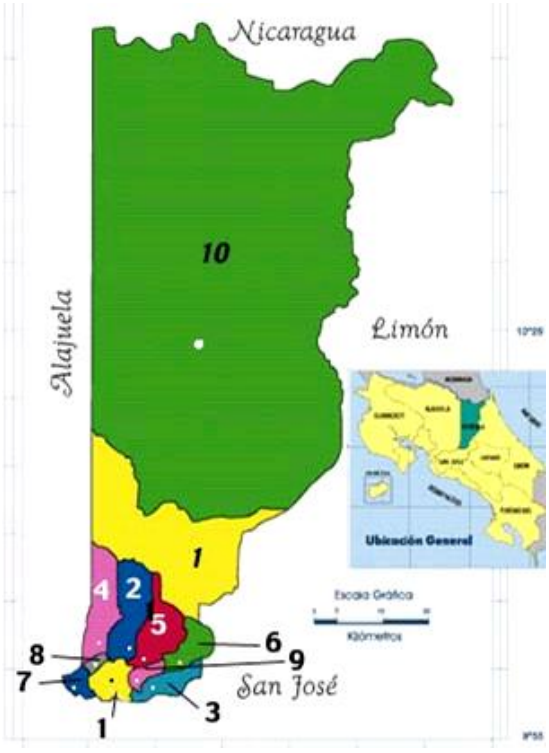


Figure 1: Cantons of Heredia (Guias Costa Rica, n.d.)

- 1. Heredia
- 2. Barva
- 3. Santo Domingo
- 4. Santa Bárbara
- 5. San Rafael
- 6. San Isidro
- 7. Belén
- 8. Flores
- 9. San Pablo
- 10. Sarapiquí

The province of Heredia is one area in Costa Rica contributing to the worldwide reforestation movement. The Heredia province is divided into ten cantons; each canton is then divided into districts and further subdivided into neighborhoods, as seen in Figure 1. The communities of Heredia that make up these neighborhoods vary from highly populated, downtown areas to marginalized squatter camps bordering rivers. While Heredia province has a population of 352,000 inhabitants, a third lives in the central canton of Heredia (Guias Costa Rica, 2006).

Most of the communities we worked with were situated around the canton of Heredia, the capital of Heredia province. Although it was originally known for the coffee plantations, it now contains many businesses, bars and restaurants, and is the home of the National University, the second largest university in Costa Rica (PNUD, 2008). From a study conducted by the National University in partnership with the municipality of Heredia, ESPH and other institutions (Sanchez, Camacho, Sommarribas, & Obando, 2008), over the past decades this region has significantly developed economically and industrially. However, the same study showed that while this urbanization created jobs for the increasing population, it also brought about problems specific to big cities such as heavy traffic, delinquency and pollution.

Aware of the degrading environmental situation, several communities are trying to reverse the negative effects of the city's growth by initiating urban reforestation projects in their respective neighborhoods. For example, in the year 2008, the community of Los Angeles planted close to one thousand trees (community leader, personal communication, October 29, 2008), and the community of Mercedes Sur planted twenty five (community leader, personal communication, November 5, 2008).

Planting trees in partnership with ESPH

When communities organize tree planting projects, it is often necessary for them to seek outside assistance from professional organizations. This external support provides the community with resources and expertise that would not otherwise be available. One such organization is the Empresa de Servicios Públicos de Heredia (ESPH), which provides trees to the various communities in Heredia province that request assistance. ESPH is a utilities company formed in 1998 to respond to health crises of the people in Heredia. Since then, they have expanded to provide the Heredia region with quality services, such as electricity, street lighting and water. They have gained notoriety for initiating a "Tarifa Hidrica" which is an environmental fee charged monthly to the clients. With the collection of these fees, the environmental unit conducts environmental programs at schools and other community associations, buys the lands in which the water stream originates in order to better protect them, and amongst other things, provides interested communities with the trees and knowledge to plant them.

Our liaison, Juan Diego Bolaños, informed us that ESPH's main interest in the tree planting programs is the water source protection. However, much like the federal government, ESPH cannot achieve their environmental goals without the support of their clients. Providing the communities with the tools they need to effectively contribute to reforestation allows them to further their water basins' protection. ESPH not only gives out the trees and provides land to plant them on, but organizes field trips and other environmental learning experiences and provides information on how to maintain the trees once they are planted. Some communities request as little as five trees and some request upwards of 200. The trees are planted by

community members in lands within the community, such as parks and schools, or ESPH's conservation areas.

Regardless, our liaison states that there is no indication of the conditions of the trees after planting or whether the planting efforts have been successful. When two community leaders (personal communications, October 29, 2008; November 5, 2008) were asked about the outcome of their reforestation efforts, both had the same response: "We don't know what happened to the trees." According to Simon Bolivar Elliot (1912), the numerous menaces to the development of healthy trees make natural growth difficult without carefully studied and executed human monitoring (FAO, 2008). A case study of the Davenport Iowa Tree Planting program (2006) noted that important factors of their tree planting program's success were the systematic inventorying of trees and a regulated maintenance program. There is a concern in the communities of Heredia that while they are planting trees, the overall long term goals of successful urban reforestation are not being fulfilled. Additionally, there is no indication of whether or not these tree planting projects are utilizing the principles of successful community-based projects.

THE KEYS TO SUCCESSFUL COMMUNITY PROJECTS

Community-based action is often triggered by a crisis which threatens the community and provides an opportunity to enhance the community's quality of life. Before these problems can be addressed, the community needs to be identified. Frank & Smith (1999) define a community as a group of individuals who want to achieve something collectively rather than separately. Communities can also be defined by geography or the sharing of common interests, beliefs, and social ties (Frank &Smith 1999; Horn, McCracken, Dino, & Brayboy, 2008).

There are different types of community-based projects such as research, development, and conservation management (Frank &Smith 1999; Horn, McCracken, Dino, & Brayboy, 2008; Kellert, Mehta, Ebbin & Lichtenfeld, 2000)**.** These projects share similar goals and requirements for successful completion, and the general principles behind them could be applied to all types of community-based work. Successful community projects should fulfill four basic principles in order to effectively use community values and expertise to create locally relevant solutions for their internal problems. Successful community projects often 1) encourage the participation of a variety of people, 2) are mainly controlled by community members, 3) empower the community members, and 4) include a method for long term evaluation.

It is important that community members be motivated to participate in the programs. The community project process requires the active participation of a variety of people because a mixed group will provide a better representation of the widespread community interests (Frank &Smith 1999). Getting the community involved should be an objective of the project, and even if people are not interested in participating, they should be kept well informed of any progress. However, Frank & Smith (1999) warn that having people involved is not enough; they must be organized to fulfill the right positions using the appropriate skills, knowledge, and abilities.

Scholars also believe that to develop solutions that are effective and culturally competent, the community should have authority (Horn, McCracken, Dino, & Brayboy, 2008). In order for the project to be mainly controlled by community members, they must come together to collectively take action in order to generate these solutions (Frank &Smith 1999**).** This authority to propose and initiate change can be shared with local institutions or outside specialists, but only the communities can decide the final actions (Kellert, Mehta, Ebbin & Lichtenfeld, 2000).

Additionally, community members must be convinced their actions are significant. When promoting the project, the community leaders should emphasize the individual's power (Kellert, Mehta, Ebbin & Lichtenfeld, 2000**),** so that he or she believes in their ability to bring about change. Each member must be aware that he or she is an expert in the needs, hopes, and dreams of the community, and therefore he or she has knowledge to contribute. In general, if people believe the solution is beyond them, there is a lower chance of success (Frank &Smith, 1999**)**.

Lastly, it is important to include a method of long term evaluation. This ensures that the community knows what successes will look like and guarantees that it has a long term goal which it is moving towards (Frank & Smith, 1999). The first step is to have a clear plan that outlines where the community would like to be in the future and includes a common vision and goals. Frank & Smith (1999) stress the importance of doing this during the initial planning stages and not as an "after-thought." Then there must be a method of evaluating the community's results so the community is aware of its success. This should include what did or did not work and why, what could have been done differently, and what changes are required. This process can be difficult to introduce because communities often view it as a form of negative judgment. However, Frank & Smith (1999) emphasize the fact that it is simply a tool to help communities.

Horn, McCracken, Dino, & Brayboy (2008) and the Encientro Internacional de la Ciudad de Mexico (1998) claim that there is a greater likelihood of the long term effectiveness and sustainability of projects when the previously mentioned concepts are applied. As a result of projects' adherence to these conditions, communities can gain the skills and knowledge to address future problems (Horn, McCracken, Dino, & Brayboy, 2008).

Chapter 3: Methodology

The goal of our project was to help the communities of Heredia plant and maintain trees in a way that is ecologically sustainable and incorporates the principles of successful community-based projects. In order to accomplish this goal, we followed five objectives:

- Assess the status of Heredia's current tree planting efforts in order to identify possible problems with the conditions of the trees and the maintenance programs in place
- Identify how business owners, developers, community leaders, schools, and other community members participate in the community tree planting projects
- Identify how ESPH, the local government, and community members share ownership of the tree planting projects
- Identify if the national government, community leaders, or schools are working to empower community members during the tree planting projects
- Identify if ESPH or the tree planting communities have a system to evaluate the long term success of the tree planting projects

ESPH believed the two largest technical problems with the community tree planting projects were a lack of long term maintenance and a failure to follow given planting instructions. From the first objective, we hoped to verify this hypothesis and identify any other problems that had occurred with the trees or the maintenance programs in place. The other four objectives were created to identify the reasons behind the technical problems of the tree planting projects. Since we believed that the technical problems of the tree planting projects stemmed from the way the communities were executing the projects, we chose to examine aspects of the current tree

planting projects that would indicate shortcomings in the fulfillment of the previously discussed community-based project principles.

For each objective we focused on identifying the role of the stakeholder groups who were most relevant to the community-based project principle that we were investigating. For instance, in objective three we wanted to determine if community members had the main authority in the tree planting projects. This led us to focus our investigation on the community members and the two stakeholder groups who provide them with resources, ESPH and the local government. Our investigation into these principles and their presence in the tree planting projects of Heredia helped us determine how the projects can be modified to better fulfill the principles of community-based projects, and in turn be more successful.

Our investigation involved studying thirteen tree planting project sites that we chose with our sponsor based on their proximity to ESPH and the time constraints of our project. Table 1, below, lists all of the sites we visited along with the on-site contact person. We used a combination of direct observations and interviews to study each location and the communities responsible for it.

We used direct observation to identify the technical and maintenance problems of the trees and fulfill our first objective. In order to make informed observations of the trees, we conducted a semistandardized interview with a forestry engineer. He explained what to look for during tree condition assessments and the different problems we could find. We used this knowledge to create a standardized form (Appendix B) for organizing and collecting quantitative and qualitative data at each of the thirteen sites we visited. At each site we carried out the following tasks:

- Examined the areas that the trees were planted in

- Evaluated the condition of the trees by looking for damage, disease, abnormal growth, and other important parameters
- Took pictures of the sites and the trees
- Used a GPS device to map their location

We used this data to create a detailed inventory and map of the sites that allowed ESPH to keep track of the planting locations.

Table 1: List of Community Tree Planting Sites

	Site Location	Site Description
1	Bello Horizonte	Playground and public park
2	Los Lagos park	Public park
3	El Parque Norte de Residencial	Public park
4	Colegio Auxiladora	Side street property
5	Urbanizacion Armaranto	Gated community private park
6	Colegio Clarantiano	School park
7	Guarari	Squatter camps
8	Escuela Palmar	School yard
9	Villa del Cipres	Large property
10	Escuela de Calle Hernandez	Schools perimeter
11	Ebais Los Angeles	Health Clinic yard
12	Primer Rescate	Nature Reserve
13	Finca Promesa	Nature Reserve

We also interviewed a selection of community leaders, the on-site contact person for each site, and a government official from MINAE. The community leaders were the head of their

area's tree planting projects, and were recommended to us by our sponsor. Most sites we visited had an on-site contact person who accompanied us during our visit to their site and was directly involved with the tree planting project. The government official had experience working with environmental community projects in Heredia province. Table 2 lists the interviewees and the dates of the interviews. A list of the interview questions can be found in Appendix C.

Table 2: List of Interviewees

Interviewee Title	Interview Date
Community leader A	October 28, 2008
Community leader B	October 29, 2008
Community leader C	November 5, 2008
Community leader D	November 5, 2008
Forestry Engineer	November 6, 2008
Government Official	November 11, 2008
Site contact A	November 12, 2008
Site contact B	November 12, 2008
Site contact C	November 12, 2008
Site contact D	November 12, 2008
Site contact E	November 13, 2008

From semistandardized interviews with community leaders of several communities in Heredia, we learned about the current tree planting projects in their area and the projects' impacts on their community. This information helped us identify major stakeholders as well as their interests and perceptions. We also learned about the community leaders' motivations for undertaking the tree planting projects, the challenges they faced, the maintenance procedures in place, and the attitudes of their community towards the tree planting efforts.

We also held unstandardized interviews with the on-site contact person at most sites to learn about the community responsible for the site, any incidents involving the trees, and the tree maintenance system that was in place. We used these interviews to improve the quality of our on-site observations and supplement the information from the community leaders. These people were either the person who requested the trees from ESPH, the caretaker of the site, or another member of the community who was involved in some other way with the site.

Lastly, our unstandardized interview with the government official allowed us to gather general information on how communities of Heredia have executed environmental projects in the past. She identified common problems that they often face, trends in participation, and overall mindset of the community members regarding these projects.

Chapter 4: Results and Discussion

This chapter presents our findings based on the interviews and research we completed. We will present seven main findings in which we identify and discuss the gaps in the various communities' tree planting projects.

Finding 1: Most of the thirteen tree planting sites we visited contained trees that were correctly placed and watered, but were harmed by pests or other isolated incidents

We created a GPS map (Appendix D) of the thirteen sites we visited to show how the sites vary in setting and condition. At all of the sites the trees were correctly placed and watered, but most had problems with pests or other isolated incidents.

Placement. 100 percent of the sites displayed proper placement of the trees, both in relation to how close the trees were to each other and how close the trees were to landmarks such as rivers and roadsides.

Watering. There was no indication that the trees at any of the sites were not receiving the proper amount of water. However, we saw the sites during Costa Rica's rainy season, so it was not clear if the plants were receiving water naturally or by human action. One of the sites had previously experienced problems during the dry season. At Colegio Clarentiano, 100 trees planted in February, the dry season, died due to a lack of water, even when the caretakers watered them regularly. For this reason, ESPH normally does not give out trees during the dry season (forestry engineer, personal communication, November 6, 2008).

Pests. One or two trees at most of the sites had been affected by some kind of pest. There was evidence of sompopos (killer ants) at two of the sites, even when the caretakers had used insecticides. Additionally, one site contained several parasitic trees, matapalos or "killer trees,"

that were killing the healthy native trees. While the “killer trees” were not directly affecting the recently planted trees from ESPH, they could pose a problem in the future. No specific diseases were identified, but Figure 2 shows an example of a suspicious residue found on one of the plants.

Figure 2: Suspicious residue found on one of the plants

Isolated Incidents. Some sites were affected by what appeared to be exceptional circumstances. For example, at the Urbanizacion Amaranto, approximately 100 of the trees planted in one area were removed by the municipality to fix a pre-existing drainage problem that affected the nearby homes. Additionally, one site reported that almost thirty of the trees that they had originally planted were stolen, and the cause was unknown. While there was no report of thefts in any of the other locations, three of the community leaders we spoke to (personal communications, October 29, 2008; November 5, 2008; December 4, 2008) had mentioned this to be a usual problem. They speculated it may be due to common mischief from kids or used as a way to make money.

Finding 2: Tree maintenance programs varied among the sites, and the quality of tree maintenance in the private planting sites was superior to the quality of tree maintenance in the public planting sites

The tree maintenance programs varied at each site not only by who was performing the tasks but also by how the program was organized. The people performing the required maintenance tasks were usually schoolchildren, adult community members, or hired professionals. At ten of the thirteen sites there was a team of caretakers who worked together to care for the trees. At two of these locations, the trees were divided up into sections and each participating member was responsible for their own section. At three sites there was a single hired professional caring for the trees. Most of the maintenance programs involved tasks based on the maintenance and care instructions that ESPH provided to the communities when the trees were planted. These tasks included requirements such as regular watering and weeding.

Though each tree planting site did have a maintenance program in place, there was variance in the quality of maintenance that was performed, particularly in relation to the public or private nature of the site. The nine sites that were located in isolated, private areas such as schoolyards or gated communities generally had a maintenance program superior to that of the four sites located in public parks or other open areas. Private sites contained trees that were taken care of by a responsible maintenance person or group of people. At public sites on the other hand, those who were supposed to be taking care of the trees were not doing so properly. The main indicators of this trend were the amount of weeding and accidental tree damage.

Private sites contained trees whose immediate surroundings were cleared and their branches were pruned, but all of the public planting sites contained trees that were surrounded by weeds. As mentioned by the forestry engineer (personal communication, November 6, 2008), this overgrowth is problematic because it prevents nutrients from reaching the young trees. The

presence of these weeds is an indication that regular, proper maintenance was not being performed at the public planting sites.

Additionally, two of the public sites had trees that had been accidentally cut during mowing. At a clinic in Los Angeles, almost an entire section of young trees had been destroyed in this manner. None of the private sites had encountered this problem. It is important to mark or signal the presence of the young trees to prevent accidental harm (forestry engineer, personal communication, November 6, 2008). The poor weeding and lack of marking at public sites made it easier for the trees to be overlooked. The trees at private sites were well cleared, so they were more easily distinguished, and they generally had a stone, stick, or other marker. Again, the lack of proper marking and presence of damaged trees indicate that public sites were not being properly maintained.

Finding 3: Participation was low among business owners, developers, and the ordinary community members but was high among community leaders and schools

The literature illustrated that community projects profit from the participation of a wide variety of community groups. We have identified in the communities of Heredia four main groups that could contribute positively to the reforestation efforts in their respective area: business owners and developers, community leaders, other community members, and schools.

Two of our interviewees mentioned that most business owners and developers did not directly participate in the tree planting projects. They did not want to participate because these projects use land that could otherwise be used for business expansion and construction (community leaders, personal communications, November 5, 2008). For example, the owner of the property that borders ESPH's Finca la Promesa intended to use his land to build 25 houses,

but half of the land was already declared a protected area which prohibited the development (Juan Diego Bolaños, personal communication, November 24, 2008).

The other community members' participation was a problem that all of the community leaders, experts, and government officials we interviewed had mentioned. As one community leader put it, "You always have to be on top of it and bring people in" (personal communication, November 5, 2008). When participation is low, as in the case of one Mercedes Sur site (Figure 3), there is nobody to take care of the trees once they are planted (community leader, personal communication, November 5, 2008).

Figure 3: Mercedes Sur site with poor maintenance, a typical sign of low participation

The community leaders of Heredia are the people responsible for the tree planting activities and actively participate in their community's tree planting committee. They are usually the main motor of the project and one of the most involved groups of the community. As one community leader said, they executed their duties "with their hearts" (personal communication, November 5, 2008). However, they do not have enough people to perform all of the required tree maintenance tasks. When they do not succeed in gaining support from the members of their community, their project suffers.

However, the community leaders have successfully involved schoolchildren in their tree planting projects. They work with academic institutions to teach and spread environmental awareness among the children through classes and other programs. One community leader said that the children get easily excited about the projects and voluntarily participate (personal communication, November 5, 2008). The community leaders hope that the youth will communicate their enthusiasm to their families and in turn induce a wider participation.

Finding 4: Community members do not participate in their community's tree planting projects because there is no confidence in the national government's reforestation efforts, sense of ownership, or opportunity for social interactions

Communities of Heredia have used advertisement such as pamphlets, workshops, posters, personal invitations, and loudspeaker announcements to increase participation. It is unclear why some methods have worked or have not worked, or if these promotions have had an effect at all. For example, the Urbanizacion Amaranto community does not advertise their tree planting at all, yet almost fifty percent of the community participates. Generally, the promotions' content is mostly informative and does not focus in convincing the adult community members to join. We have found that there are three main reasons why people do not participate in the tree planting projects.

No confidence in the national government's reforestation efforts

The government of Costa Rica declared to the world a tree planting goal for the nation, but they do not provide instructions on where or how to plant the trees correctly (forestry engineer, personal communication, November 6, 2008). According to one community leader (personal communication, November 5, 2008), the only tree planting or care information that they receive is from ESPH and the National University. When the government does not provide

adequate explanations, some people begin to question the government's original intentions. They speculate that the government is only planting trees as a way to gain quick international attention (forestry engineer, personal communication, November 6, 2008). This undermines the credibility of the national government's efforts, and people's confidence in their reforestation programs.

No sense of ownership

The literature supports that it is important to instill proper interest and investment in the community members. In Heredia, when projects do not immediately concern them, community members are reluctant to participate (community leader, personal communication, November 5, 2008). Additionally, the community members do not participate when they do not believe that the project or the site is personally tied to them.

In Heredia, most community members sleep in communities situated at the periphery of the central canton and spend their days working outside of their community. Subsequently, they do not feel the need to participate in projects, such as tree planting, that aim to improve the quality of life in a place where they hardly live (government official, personal communication, November 11, 2008). Furthermore, we learned that "If a community member is asked to clean the front of his house, he will do it almost instantly" (community leader, personal communication, November 5, 2008). But when the member is solicited to go on a trip to plant trees, even when he or she is aware of the benefits of trees, he or she will generally not attend.

The previously identified trend in the quality of maintenance in public and private sites originates from the sense of ownership of the people over the sites and the trees. In the private and closed areas, community members share a closer relationship with the trees because they are the ones directly benefiting from their presence. However, in public parks, the associated community members will not invest in proper tree maintenance when anyone outside of the

community can access the area. The individual concern is felt more when a sense of ownership is established.

No opportunity for social interactions

An environmental historian and native of Heredia said that in the 1950's, Heredia central was a town that was united and small enough to allow everybody to know each other. But now, due to the development of the Heredia canton, the community members do not spend enough time in their communities to integrate properly into the community culture. Neighbors are strangers to one another and the community leaders are not always taken seriously (personal communication, December 4, 2008). According to the Hawthorne studies (Morgan, 1943), individuals are more motivated to work if friendships and unplanned social interactions can occur in the workplace or organization. As people naturally need to balance their work and extramural activities, when the tree planting projects do not address the social needs of people, participation is low.

Finding 5: Communities have the main control over their tree planting projects

The communities initiate these projects based on their own desires, which are independent of outside influences. Their personal motivations allow them to maintain decision making authority and control over the whole process. These motivations include, but are not limited to, a desire to improve the air and water quality in their community, bring the community together, or prevent squatter installation (community leaders, personal communications, October 28, 2008; November 5, 2008; November 12, 2008).

While the community tree planting projects in Heredia are in partnership with ESPH and the local government, also known as the municipality, these groups only provide the

communities with resources; the communities must take the initiative to request assistance. In fact, it was the communities' desire to perform environmental actions which helped form the partnership with ESPH. The municipalities provide funding to the communities, but the communities are otherwise "essentially independent" (community leader, personal communication, November 5, 2008). Each community must present the work they are doing to receive this assistance, but according to two community leaders, it is not difficult to obtain because the municipalities generally support groups doing this type of work (community leaders, personal communications, November 5, 2008). Even though the municipalities are in a position of financial power, the communities do not feel limited by this dependency.

Finding 6: There were three cases where community members were being empowered, but it appears this is not a widespread occurrence

Few actions are being taken to convince community members that they have the ability to create change in their community. One government official (personal communication, November 11, 2008) points out how problematic this lack of empowerment can be. Community members generally do not participate in projects when they are waiting for someone else to do something for them and lack confidence in their own abilities. We found that the national government has attempted to empower people throughout the country, but there were only two examples of community empowerment among schools and community leaders in the communities that we studied.

As mentioned, the national government wants Costa Rica to be carbon neutral by 2021 and requires the support of the entire country to reach this goal. On a small scale it attempts to empower community members through programs such as Ecological Blue Flag. These programs present people with the opportunity to contribute to the national effort through actions in their

local area. The national government provides the community with local tree planting goals that support the national reforestation movement.

Among schools and community leaders, there were two examples where groups were working to empower community members, and their tree planting projects showed successful results because of it. The community leader of Guarari makes each community member the godparent of the tree they plant. These members learn to take responsibility for these plants and report any incident to the community leader (community leader, personal communication, November 12, 2008). Each participant can watch their plant grow and understand the personal role he or she played in the tree's development. At the other site, Escuela Palmar, their empowerment method was an agriculture class. This weekly class taught students how to take care of the trees by putting them in charge of the trees' physical care and maintenance (students, personal communication, November 13, 2008).

Finding 7: We did not observe that long term evaluation methods were being used

We found during our site visits that none of the communities were performing regular evaluations. Without an evaluation process, a project can be executed without a long term plan, which makes it difficult to track any progress towards the goal. When this occurs, there is no indication of whether or not the communities' actions are effective. For example, at a local environmental fair, a group of schoolchildren offered a tree to anyone who would sign a contract and promise to plant it by the river in their community. They had no way to measure whether the tree had been planted correctly, taken care of, or even kept alive.

Several studies we consulted stated that clearly defining success is essential to any type of evaluation. During our site visits, we observed that some sites had lost two trees while others

had lost 100, but all were considered "successful" by our liaison. It was unclear exactly what, if anything, our liaison was basing these judgments on because the conditions at each site varied. The success of each site seemed to be ruled on a case by case basis. While it is important to take special circumstances into consideration, without a standardized system in place, it is difficult to make organized observations that can be compared over time.

A community leader and a forestry engineer (personal communications, November 5, 2008; November 6, 2008) believed that this lack of long term vision is a particular weakness of the Costa Rican people. In these types of projects, they tend to not plan for the long term consequences of their actions. Similarly, the national government's desires to plant trees might lead communities to do so without realizing or caring about the commitment the project requires from them. The people might not understand that it takes around five years for a tree to reach maturity and be able to survive on its own.

Chapter 5: Conclusions

Our project examined the tree planting communities in Heredia province who worked with ESPH to plant trees in their area. We assessed the physical status of the trees that had been planted and studied the communities that executed these projects. We found the most effective aspects of the tree planting projects were the communities' partnership with ESPH and authority of their projects. The least effective aspects were the participation of the community members, the long term planning, and the overall mindset of the community members.

Finding 1: Most of the thirteen tree planting sites we visited contained trees that were correctly placed and watered, but were harmed by pests or other isolated incidents

At the thirteen sites we visited, the trees were correctly placed and watered following ESPH's planting guidelines. However, a few sites contained pests and that were harmful to the trees. This included "killer trees" and sompopos (killer ants). Additionally, there were some isolated incidents that negatively affected the trees. For example, at one site 100 trees were cut down to fix a drainage issue in the neighborhood, and in two other sites, trees had been stolen.

Finding 2: Tree maintenance programs varied among the sites, and the quality of tree maintenance in the private planting sites was superior to the quality of tree maintenance in the public planting sites

The tree maintenance programs varied at each site not only by who was performing the tasks, but also by how the program was organized. Most maintenance programs involved tasks based on the maintenance and care instructions that ESPH provided to the communities. Of the thirteen sites we visited, the nine that were located in private areas such as schoolyards or gated communities generally had a maintenance system superior to that of the four sites located in public parks or other open areas. We evaluated this theory based on the amount of weeding and

accidental damage. In public areas, the plants' surroundings were not weeded, and because of careless maintenance, some trees were damaged during the mowing of the area. In private areas, trees were weeded and they were marked in a manner that signaled their presence which prevented accidents.

Finding 3: Participation was low among business owners, developers, and the ordinary community members but was high among community leaders and schools

Most business owners and developers do not participate in the tree planting projects because these projects use land that could otherwise be used for business expansion and construction. Adult community member participation was a problem mentioned by many interviewees. Community leaders are the members of the community who initiate the programs and have one of the most involved groups of the community. The leaders have succeeded in involving the youth through educational systems.

Finding 4: Community members do not participate in their community's tree planting projects because there is no confidence in the national government's reforestation efforts, sense of ownership, or opportunity for social interactions

In general, community members do not participate in the tree planting projects for three reasons. Some government actions cause community members to lose confidence in the national tree planting efforts because they speculate that the government is only planting trees as a way to gain quick international attention. Additionally, the community members do not participate when they do not have a sense of ownership over the trees or the sites. Lastly when people in the community do not know one another, they have a weaker desire to collaborate on community projects.

Finding 5: Communities have the main control over their tree planting projects

The communities maintain all decision-making authority and do not allow outside influences to sway their goals or objectives. Communities are solely responsible for initiating their tree planting projects and they have their own motivations for doing so. ESPH only provides the communities with resources when the communities take the initiative to request them. Even though the municipalities are in a position of financial power because they provide funding for the projects, the communities do not feel limited and are still essentially independent.

Finding 6: There were three cases where community members were being empowered, but it appears this is not a widespread occurrence

Few actions are being undertaken to convince community members that they have the ability to create change in their communities. The government is giving community members the power to contribute to the nation's carbon neutrality goal through local projects. In two of the cases we studied, there were efforts to empower the community members during the tree planting projects. In one community, the members were made godparents of the trees that they planted, and in the other, the students were taught to take care of the trees as part of an environmental education project.

Finding 7: We did not observe that long term evaluation methods were being used

Despite the variety of sites and conditions that we found, our sponsor established they were all "successful". We could not identify clear criteria for success that were applied to all the sites. Furthermore, there was no indication that any of the communities had a plan to evaluate their success or progress. It has been suggested that this lack of long term vision is caused by the

Costa Rican tendency to only think of short term solutions and ignore the long term consequence of their actions.

Chapter 6: Recommendations

We recommend the following actions to improve the community tree planting projects in Heredia province.

1. **Modify ESPH's tree distribution process to include an assessment of the communities' project plans**

Currently, in order to receive trees from ESPH, the requester must fill out a basic informational form that includes the planting site location and the desired number of trees. In order to reinforce the principles of community-based projects and prevent communities from undertaking projects without them, ESPH should modify their tree distribution process to include an assessment of the communities' project plans.

We recommend that ESPH adjoin the form we created (Appendix E) to their existing form. Our form requires the requester to answer several questions about their project which will help demonstrate how prepared they are to begin an effective tree planting project. The requester will need to (1) describe his or her long term vision for the project and his or her plan for long term care and maintenance, (2) establish his or her criteria for success, and (3) describe the anticipated level of participation from her or his community or the methods he or she will use to gain its support.

If the requester is unable to answer these questions it would indicate to ESPH and the requester the gaps that exist in the project plan. Based on the recommendations that follow, ESPH could assist the communities in improving the structure of their projects.

2. **Require the communities to submit a regular inventory and assessment of the tree planting sites to ESPH**

A regular inventory and assessment of the tree planting sites would prevent problems that affect the trees' health from going undetected. For example, had an inventory been conducted regularly and shared with ESPH, the presence of "killer trees" at the Parque Norte Residencial site may have been detected and treated at an early stage. We recommend this inventory include pictures as well as incident reports that are submitted to ESPH when they occur.

There should be two types of pictures taken at the sites. Annual pictures should be taken of the whole site and of individual trees, and then submitted to ESPH in print or an electronic form so that ESPH can update the GPS map that we created during this project. The pictures will also keep ESPH informed of any major changes to the landscape and geography of the site itself.

Communities should also report to ESPH any major incidents that affect the condition of the trees or the site. Incidents that would require reporting include, but are not limited to, any large number of trees that are cut, stolen, or otherwise harmed, the presence of a particularly problematic disease or pest, or any other suspicious activities or conditions that the community members may find. The frequency, nature, and format of the reporting should be tailored to make the process as simple as possible, both for ESPH and the communities.

3. **Increase the participation of the community members by:**
    a. **stressing a sense of ownership of the trees**
    b. **using their strengths and skills**
    c. **increasing the opportunity for social interactions to unite the community**
    d. **creating partnerships with the uninvolved stakeholders**

As we have seen, the participation of community members is crucial to the continuing existence of the community tree planting projects. If the project is only driven by a small group

of people, they are generally unable to accomplish all that is needed. We propose four methods to gain participation among the community:

a. **Use communication methods that promote a sense of ownership of the site and the trees**. The messages displayed in advertisements or programs should attempt to make the community members believe that they will be the ones benefiting from the tree planting efforts, and that the trees are their responsibility. This can be accomplished by using language such as "your trees" instead of "the trees".
b. **Use the skills or strength of the member to involve them.** Though community members may not have a specific interest in tree planting projects, they may have other skills or strengths that can contribute to the project in one way or another. For example, even though this is a tree planting project, the community could recruit artists to help with designing signs or banners.
c. **Incorporate the opportunity for social interactions in the activities to bring the community together.** To bring the community together, community leaders could organize social events such as tertulias and picnics to increase community member interaction and build friendships. While these events might be incorporated into a tree planting activity or conducted independently, they are important for gaining participation.
d. **Create a partnership between the uninvolved major stakeholders to increase the participation of these groups**. Though the uninvolved stakeholders may believe they have conflicting goals with the communities' tree planting project, both groups could benefit from collaboration. Communities can convince the stakeholders to participate by demonstrating the benefits they could receive from the tree planting projects as well. For example, a case study of the Davenport Iowa Tree Planting program (2006) found that

the presence of green areas can increase the property value of urban areas. Areas such as San Joaquin and El Castillo, in Costa Rica, demonstrate this (environmental historian, personal communication, December 4, 2008). This type of information could be used to gain the support of the stakeholders such as developers.

4. Empower the community members with the belief they can make a difference in the project

The community members need to be empowered so they believe they have the ability to create change in their community. Communication techniques should incorporate this principle. One way is to create advertisements that emphasize each individual's power to contribute and make a difference in the larger effort. In addition, the community members can be empowered if they are given greater responsibility and included in the decision-making processes of the project. Another method of empowering the community, which has been successfully used in a past case study, is to hold conferences that inform, excite and engage the community members (Horn, McCracken, Dino & Brayboy, 2008). These conferences can be held at different venues and in different manners.

5. Create a method for long term evaluation before a tree planting project is started

A method of long term evaluation will allow the communities to gauge the success of their tree planting projects, and it is important that a plan be created before the project is started. This will give the communities a goal to work towards and a method for tracking measureable progress throughout the process. This is a two step process: they must first establish what success means to them and then create criteria for evaluating their progress over time.

The community's definition of success, or goal, should not only concern the trees that they plant but the structure of project that they undertake. These goals must be feasible and

suitable to the unique capabilities of the community. For example, a community with limited space cannot try to plant the same amount of trees as a community with open fields. Goals for the trees that the community plants could include how many trees survive at its site, the condition of these trees, how often maintenance is performed, or what kind of maintenance is performed. Goals for the community's project could include how many people it would like to participate in its project, the methods that it will use to advertize, or various groups that it would like to form partnerships with.

A regular evaluation must be then carried out to track the community's progress towards its goal. These evaluations should include an examination of what has been accomplished, what did or did not work and why, what could have been done differently, and what changes are required to move forward. The regularity of these evaluations will vary from community to community, but the important point is that a regular schedule be set up.

6. Alter the national government's tree planting programs to:

- **a. emphasize "growing" trees during communication to the public**
- **b. assign qualitative instead of quantitative goals**
- **c. give information on how to accomplish the goals**

In the communities of Heredia that we studied, we observed that there was a lack of long term planning. The national government can help combat this issue by changing the way that they portray the goals of the national tree planting projects. We recommend that the national government accomplish this by changing their messages from "planting trees" to "growing trees for a lifetime." This new message emphasizes both the additional maintenance requirements and time commitments involved in healthy tree growth and development. These points should be further reiterated and elaborated upon during communications with the public, such as speeches or pamphlets, to ensure full comprehension.

In addition, the national government should refrain from only assigning quantitative planting goals. Instead, there should be a greater focus on the long term survival and health of the trees. For example, the Ecological Blue Flag program requires communities to report the number of trees that they plant but do not ask for the number of trees that are still surviving at the planting sites. By holding community members accountable for the long term care of their trees, the government could help increase the quality of the growth and development of the trees. Furthermore, the government should provide information to these communities on how they can "grow trees for a lifetime". Otherwise, we have found that both the people's confidence in the government and the tree planting programs will suffer.

Chapter 7: Future Study

During our work on this project, we identified several areas where future research could be performed:

1. If our recommendations to enforce the presence of community-based principles in the community tree planting projects are implemented, we recommend ESPH do a study after several years to evaluate the impact of these changes.

Through our project, we were able to identify several problems with the tree planting projects and recommend ways to improve upon them. If these recommendations are utilized by ESPH, it would be beneficial to perform a future study which evaluates how the recommendations positively or negatively affected the tree planting projects. In this way, actions can then be modified to maximize the positive outcomes. Furthermore, situations change over time, so it would be beneficial to ensure that these recommendations are still relevant as time goes on. This can generally be achieved by using the same research methods employed in this project.

2. We recommend a study that examines the property laws regarding reforestation in Costa Rica to determine if they are still appropriate today.

Through our research, we discovered that Costa Rican property laws contributed to deforestation throughout the country by granting property rights to those who clear plots of land. We recommend a further study on such laws to determine why they were initially created, what problems and conflicts they have created, and if they are necessary and relevant today. In the new environmentally conscious world where people are told to plant trees and save resources, these types of laws may be outdated. This study can involve researching the history of these laws and their applications today. The researchers could conduct interviews with government officials

involved with these laws and the people who have been affected by them. The study should aim to identify the people who still use these laws, how often these laws are being exploited, and why the people are using them.

3. We recommend a study on the situation in the squatter communities.

We discovered that some marginalized communities plant trees to keep additional squatters from moving in and building houses. While this may help prevent the further expansion of these areas, it denies living space to others who may have nowhere else to go. We recommend a study be done to rectify the situation in these marginalized communities by creating an effective housing system for the squatters. The study should focus on the squatters, why they are there, and how outside groups can help to improve their situation. This study can be accomplished by interviewing the squatter communities and the major stakeholders in their settlements. There may need to be trust established between the researcher before they are able to obtain significant and accurate data.

4. We recommend a study to determine if environmental education has a long-lasting effect on children.

Several schools in Heredia integrate environmental education in their regular curriculum. We recommend a study be done to identify how long this environmental consciousness stays with the children. At what point do they cease performing environmental actions? Is this influenced by particular factors such as age or economic status? Additionally, the study can assess if this environmental mindset is being transferred from the children to adults or other community members around them. This study can be conducted by sampling various age groups in Heredia who attended grade schools with an environmental education program and

interviewing them to identify how their views and feelings have changed towards environmental actions and why.

5. We recommend a study into how environmental education can be brought to the adult population.

There exists many environmental programs in schools, but the adult population has no such system. A study could assess the general environmental awareness of the adult population and work to provide an environmental education program in households or businesses that specifically targets these individuals. Similar studies done in the past have noted successful adult environmental education programs should be more experience-based and generally challenging with the opportunity for discussion and critical thinking (Clover, 2002). This future study may develop different types of environmental education programs and test their success on sample adult groups.

6. We recommend a study to examine how political ties affect community tree planting projects.

One issue we identified during our study was a lack of participation in community tree planting projects among community members who do not support the national government party. While it is unclear if this is a widespread issue, we believe that it merits further investigation. If tree planting projects could be disaffiliated from political ties and interests, there is a possibility that participation among the community members could increase. The study should examine if and how political ties and interests affect community tree planting projects and how ideals such as community authority and sense of ownership can be used to remove politics from the tree planting projects.

The goal of our project was to help the communities of the Heredia province plant and maintain trees in a way that is ecologically sustainable and incorporates the principles of successful community-based projects. We found that the most effective aspects of the ongoing tree planting projects were the communities' partnership with ESPH and their authority over their projects. A common problem we found was a lack of participation, community member empowerment, and long-term evaluation. To minimize these gaps, ESPH should re-evaluate their tree distribution procedure and require communities to demonstrate that they have envisioned an effective long term procedure for success including a goal and evaluation plan. We also recommended methods communities could use to improve various aspects of their community tree planting projects. Utilizing these recommendations could lead community members to view tree planting project as more than just planting trees but as an opportunity to work together to improve their community while helping the environment.

Appendix A: Empresa de Servicios Públicos de Heredia

(adopted from LaGare, Sierad, & Waugh, 2005)

LA EMPRESA DE SERVICIOS PÚBLICOS DE HEREDIA

The Empresa de Servicios Públicos de Heredia (Public Services Company of Heredia) [ESPH] sponsored this report, which was prepared by members of the Worcester Polytechnic Institute Costa Rica Project Center in 2008. The liaison between Worcester Polytechnic Institute and the ESPH for this project was Juan Diego Bolaños, the Environmental Education Program Coordinator for ESPH.

HISTORY AND DEVELOPMENT OF THE ESPH

When electricity services became necessary for Costa Rica in 1915**,** the State created a private enterprise called JASEMH (Joint Administration of Municipal Electrical Service of Heredia) to provide electricity to Heredia and its surrounding areas. JASEMH coordinated the construction of La Joya hydroelectric plant in 1915, and in 1926 expanded the plant to meet the needs of the country. In 1949, when the electricity demand exceeded the plant's capacity, the state authorized construction of the Carrillos hydroelectric plant (Empresa de Servicios Públicos de Heredia, 2003). JASEMH continued to provide electric energy and public lighting to the community of Heredia until 1976. In this year, Law 5889 was passed to initiate the creation of the ESPH (The Public Service Company of Heredia) that took charge of the administration, maintenance, and development of the aqueduct, sewage services, and energy services. This new company replaced JASEMH and functioned under state control (ESPH, 2003).

In 1998, ESPH petitioned for independence from State control, stating that the State's rigid regulations restricted the development necessary to expand and meet growing demands for electricity. The State granted the ESPH its independence, recognized by Law 7789 (Law of Transformation of the Company of Public Services of Heredia). The law transformed ESPH into a joint stock company governed by the private sector. Upon gaining independence, ESPH redefined its goals to satisfy increasing demands for electricity, public lighting, and sewer systems. Today, ESPH commits to providing a continuous supply of high quality drinking water, electricity, and street lighting for the public (Empresa de Servicios Públicos de Heredia, 2003).

ESPH MISSION AND VISION

ESPH website describes a vision "to be a company that is a leader in public service that improves the quality of life in the community, in harmony with the environment." In their mission statement, ESPH states, "We are an innovative company with social and environmental responsibilities to offer excellent service, supported by the people and seeking the satisfaction of our clients and the community at large" (Empresa de Servicios Públicos de Heredia, 2003).

ESPH GOALS AND OBJECTIVES

ESPH is also dedicated to promoting the development, education, and environmental conservation of Heredia's natural resources. The company has been researching and encouraging the implementation of clean technologies over the past few years (Empresa de Servicios Públicos de Heredia, 2003). Together with various other municipalities, such as the Central American Institute, ESPH has also devoted itself to providing technological opportunities for rural areas (Empresa de Servicios Públicos de Heredia, 2003).

To have enough safe drinking water it is important for the people to prevent its contamination by protecting the forests from where the water originates (Empresa de Servicios Públicos de Heredia, 2003). ESPH does this through a program called Procuencas. This program uses funds provided by donations of large corporations with similar interests in conservation as well as revenue from a water tax. In return, the Procuencas program pays landowners for their voluntary participation in either both the conservation and natural regeneration of forests or reforestation with native species (Empresa de Servicios Públicos de Heredia, 2003). The overall goal of the Procuencas program for ESPH is to increase the value of environmental conservation and to promote environmental awareness.

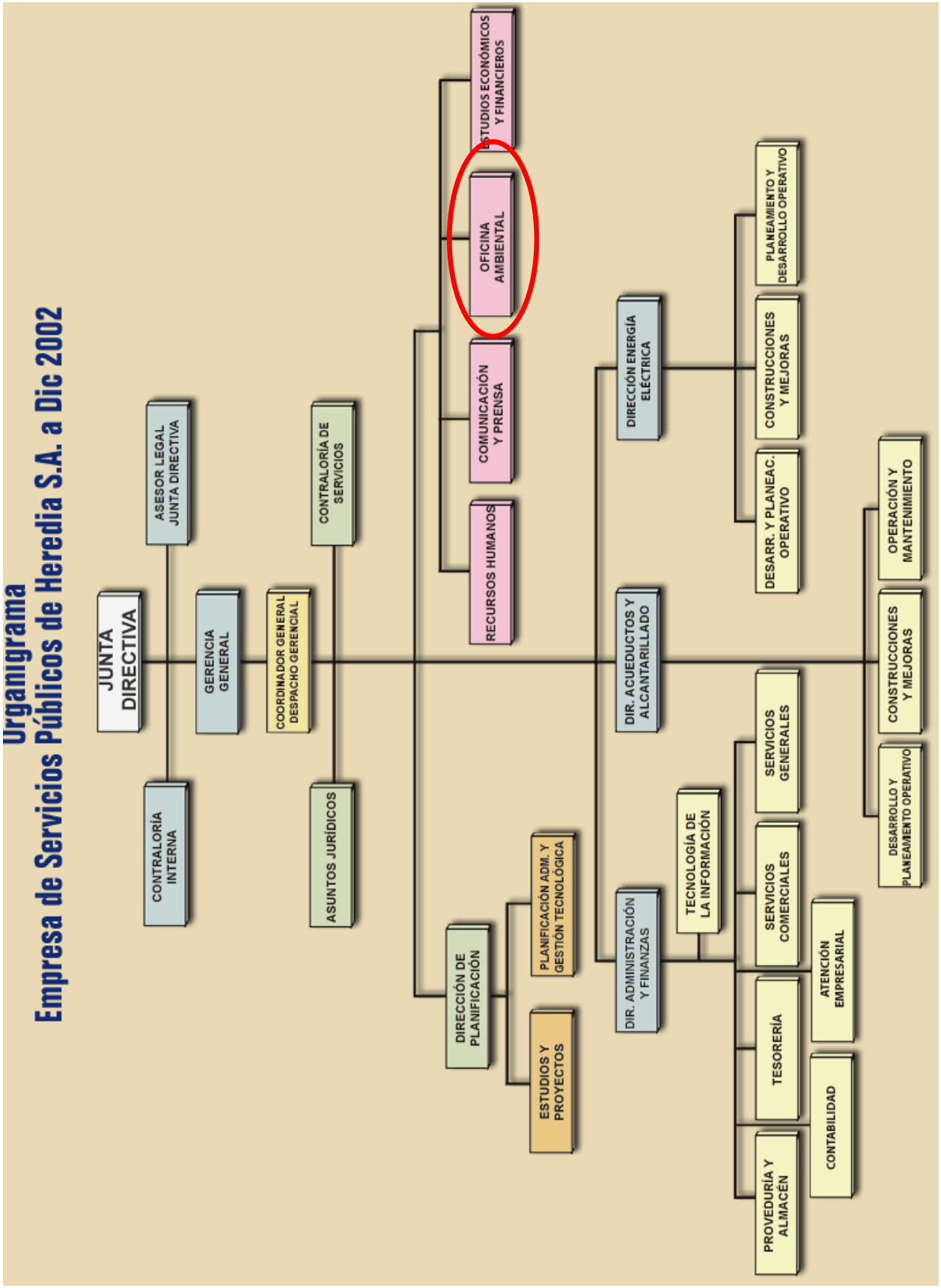
ESPH has several important objectives including, extending further the protection of the quality of surface and groundwater by reduction of the pollution risk posed by wastewater discharge, investigating clean technologies and renewable energy options to reduce energy consumption, and promoting environmental education throughout the community.

POSITION AND RESPONSIBILITIES OF JUAN DIEGO BOLAÑOS

Juan Diego Bolaños is the Environmantal Education Program Coordinator of Empresa de Servicios Públicos de Heredia. He is responsible for organizing different educational activities for schools and communities in Heredia such as field trips to forest and water reserves, awareness walks, training programs for teachers, and forms for environmental guards.

PROJECT IMPACT ON ESPH

ESPH values forests for their ability to protect water sources. This project aims to get communities more actively involved in the long term maintenance of trees in their community. If community members learn to care for and protect the trees in their community, they may be more involved in preserving trees in areas where they have a higher impact on water sources. Moreover, this project contributes to ESPH's main goal of increasing the value of environmental conservation and promoting environmental awareness.



Source: La Empresa de Servicios Públicos de Heredia, 2003

Appendix B: Tree Inventory Form

Tree Inventory Site Analysis

Date_____Location_____District_____Contact_____

Area Description	GPS Coordinates_____
Trees Donated	Donation Date_____
Trees Present	Dimensions of Planting Area
Tree Conditions	Height
Maintenance Procedures and Frequency	
Information on Surrounding Community (Participation, Mindset, Space)	
Recommendations and Additional Comments	

Appendix C: Interview Questions

Interview Questions

C.1 Community Leaders

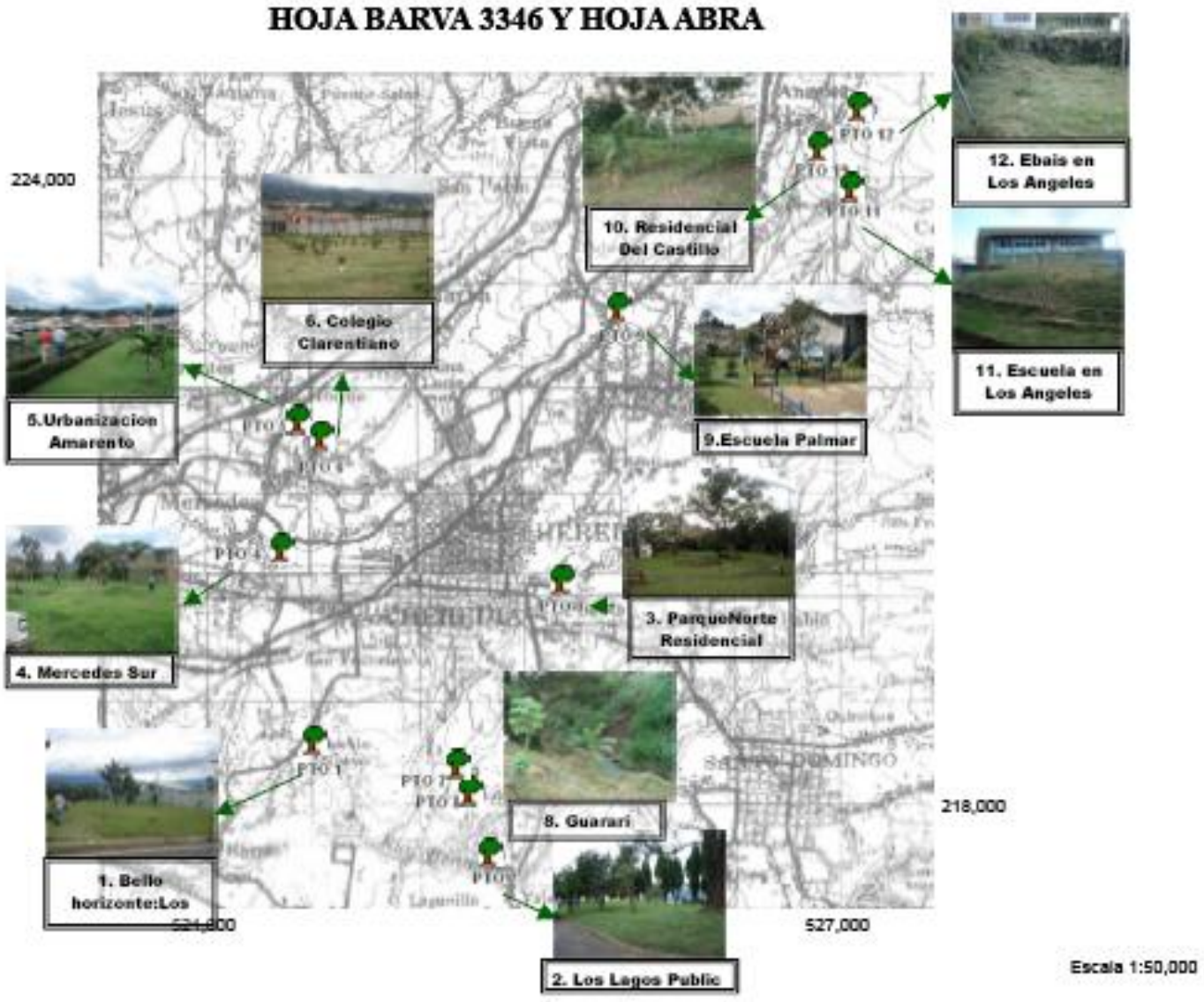
1. Why are trees important to your community?
2. What kind of information do you receive and provide to the community members about reforestation? Do you feel that the information is sufficient?
3. What difficulties does your community face? What discourages them?
4. What is your community's motivation for participating in a reforestation effort?
5. What type of community members are most involved?
6. How do you get people to become more involved?
7. How and why did your committee form?
8. Who designs the reforestation program? Do the community members and government have a say in its design?
9. What is the decision making process between the community members and the government?
10. How is conflict handled between the community members, committees and governments?
11. How does your community function with respect to the community members' wishes and the government's requirements?
12. What do you think the government could be doing better to help this effort?
13. What do you think the community members could be doing to help this effort?
14. Is there a maintenance program for the trees that are planted?
15. What external issues affect the maintenance of the reforestation? Ex. Diseases, animals, funding, natural disasters, loggers
16. What internal issues affect the maintenance of the reforestation? Ex. Not enough people, communication (among members or committees), age groups, fighting, neglect
17. How does the committee assign jobs? How many people have roles?
18. Is there a way for people to be held accountable for their responsibilities?
19. What do you think are some unique aspects about your community? Ex. Businesses, layout, natural landscapes, demographic (ethnicity, wealth, gender, age)
20. How do these aspects affect your reforestation effort?
21. Who are the major stakeholders in the community/Who has the most to gain or lose from the reforestation program? Ex: Local government member, landowners, businesses, farmers
22. If you could change something about your reforestation efforts to improve it, what would it be?

C.2 Forestry Engineer

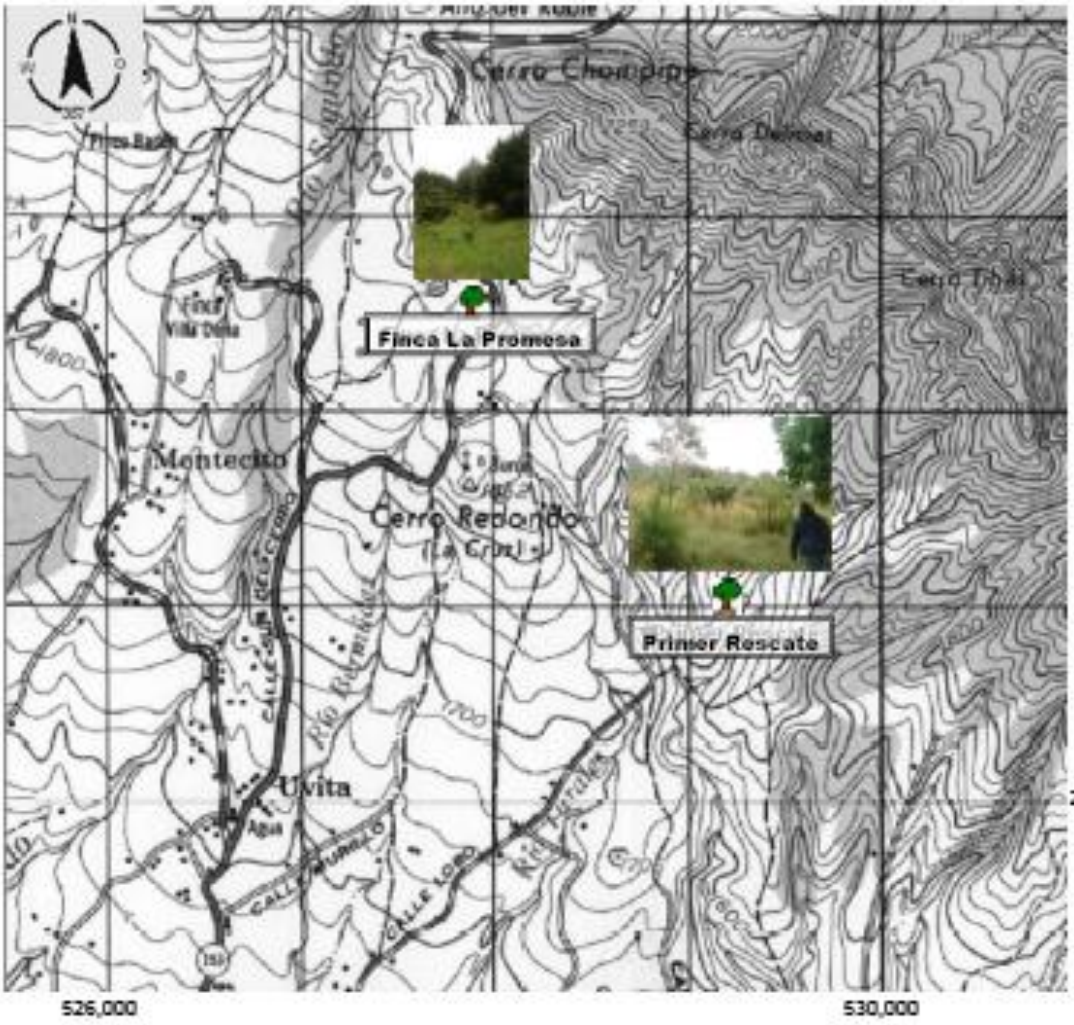
1. What are some important things for a successful forestry program?
2. Where should trees be planted?
3. When should they be planted?
4. What can affect reforestation efforts?
5. How can we prevent the menaces such as animals, disease, and loggers?

6. We are doing a tree inventory, what should we look for in terms of their conditions?
7. What are indicators of a healthy/unhealthy trees and incidents to the trees?
8. How do you indicate the age of a tree?
9. What is the most important thing for a community to consider before they begin a forestry program?
10. What are the necessary long term maintenance activities needed for the trees?
11. What do they need to know ahead of time?
12. How can they prepare?
13. When people plant trees do they generally follow the recommended guidelines?
14. What is unique about reforestation in communities here as opposed to anywhere else you worked?
15. How do you know if a tree has been cut?
16. What characteristics of the site that the trees are planted in should/should not have?
17. Do you think the government is doing enough to support reforestation?
18. What information does ESPH give to communities who are planting trees?

Appendix D: GPS Map



HOJA BARVA 3346



Escala 1:50,000

Appendix E: Modified distribution form

EMPRESA DE SERVICIOS PUBLICOS DE HEREDIA, S.A.
Desarrollo Inteligente

procuencas

UNIDAD DE GESTION AMBIENTAL

ORDEN DE ENTREGA DE ARBOLES DEL VIVERO

Who is responsible for the project?			
Telephone:	Cell:	E-mail:	Other:
What is your long term goal for planting the trees?			
How will you evaluate your progress towards this goal?			
What level of participation from the community do you expect to receive?			
What techniques will you use to increase participation and inform the communities?			
Who will be responsible for the long term care and maintenance of the trees?			
What will the maintenance schedule be?			
How will the maintenance assignments be enforced?			

By signing this form, I commit to the long term care of the given tree for at least five years. I also agree to send an annual picture and condition updates of the trees to ESPH.

Signature_____ _____Date_____

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