


Spring 2017

## Public Perception of Environmental Programs in the Sierra Gorda Biosphere Reserve, Landa de Matamoros, Queretaro, Mexico

Danielle Marie Salisbury  
*Bard College*

Follow this and additional works at: <https://digitalcommons.bard.edu/bcep>

 Part of the Biodiversity Commons, Civic and Community Engagement Commons, Community-Based Research Commons, Demography, Population, and Ecology Commons, Natural Resources and Conservation Commons, Natural Resources Management and Policy Commons, Nature and Society Relations Commons, Policy Design, Analysis, and Evaluation Commons, Recreation, Parks and Tourism Administration Commons, and the Sustainability Commons

---

### Recommended Citation

Salisbury, Danielle Marie, "Public Perception of Environmental Programs in the Sierra Gorda Biosphere Reserve, Landa de Matamoros, Queretaro, Mexico" (2017). *Bard Center for Environmental Policy*. 5. <https://digitalcommons.bard.edu/bcep/5>

This Open Access is brought to you for free and open access by the Bard Graduate Programs at Bard Digital Commons. It has been accepted for inclusion in Bard Center for Environmental Policy by an authorized administrator of Bard Digital Commons. For more information, please contact [digitalcommons@bard.edu](mailto:digitalcommons@bard.edu).

PUBLIC PERCEPTION OF ENVIRONMENTAL PROGRAMS IN THE SIERRA GORDA  
BIOSPHERE RESERVE, LANDA DE MATAMOROS, QUERÉTARO, MEXICO

Master's Capstone Submitted to the Faculty of the Bard Center for Environmental Policy

By Danielle Salisbury

In partial fulfillment of the requirement for the degree of  
Master of Science in Environmental Policy

Bard College

Bard Center for Environmental Policy

P.O. Box 5000

Annandale on Hudson, NY 12504-5000

May, 2017



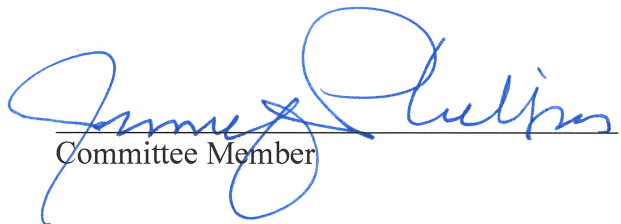
**Danielle Marie Salisbury**

We, the Graduate Committee of the above candidate for the Master of Science in Environmental Policy degree, hereby recommend the acceptance of the Master's Project.

Professor Monique Segarra  
Bard Center for Environmental Policy  
Bard College

  
\_\_\_\_\_  
Chair

Professor Jennifer Phillips  
Bard Center for Environmental Policy  
Bard College

  
\_\_\_\_\_  
Committee Member

Professor Gautam Sethi  
Bard Center for Environmental Policy  
Bard College

  
\_\_\_\_\_  
Committee Member

The Master's Project is accepted by  
Bard Center for Environmental Policy

  
\_\_\_\_\_  
Eban Goodstein, Director

## **Table of Contents**

|  |            |
|--|------------|
| <b>Abstract</b>  | <b>III</b> |
| <b>Executive Summary</b>   | <b>V</b>   |
| <b>Chapter One- Introduction</b>   | <b>1</b>   |
| <b>Chapter Two- Literature Review</b>  | <b>5</b>   |
| Biodiversity Loss and NPAs   | 5          |
| Biological and Ecological Corridors  | 11         |
| Stakeholder Perception and Conservation                                      | 15         |
| <b>Chapter Three- The Municipality of Landa de Matamoros</b>                 | <b>21</b>  |
| Location and Natural History   | 21         |
| Ecological Corridor of the Sierra Madre Oriental (CESMO)                     | 23         |
| Sierra Gorda Biosphere Reserve of Querétaro (RBSG)                           | 25         |
| Stakeholders   | 29         |
| Environmental Programs in Landa de Matamoros                                 | 33         |
| Data Collection Methods  | 37         |
| <b>Chapter 4- Results and Discussion</b>                                     | <b>41</b>  |
| Participants' Interview Results  | 41         |
| Program Managers' Interview Results  | 48         |
| Local Leaders' Interview Results   | 50         |
| Discussion and Lessons Learned   | 51         |
| <b>Chapter 5- Policy Recommendations</b>                                     | <b>57</b>  |
| Sierra Gorda Biosphere Reserve (RSBG)  | 57         |
| Ecological Corridor of the Sierra Madre Oriental (CESMO)                     | 60         |
| <b>Bibliography</b>  | <b>63</b>  |
| <b>Appendix A: Project Report for Biodiversity Conservation in the CESMO</b> | <b>71</b>  |
| <b>Appendix B- IRB Materials</b>   | <b>81</b>  |

## Abstract

Biological or ecological corridors have recently been sought out as a solution to biodiversity loss due to habitat fragmentation. In eastern Mexico, the Mexican and German governments are collaborating to connect fragmented landscapes and Natural Protected Areas (NPAs) over five states across a Madrean Pine-Oak biodiversity hotspot through the implementation of the Ecological Corridor of the Sierra Madre Oriental (CESMO). One of the ways the CESMO is accomplishing its conservation goals is by extending environmental programs that are currently in place within NPAs to other areas within the corridor, but outside of NPA borders. However, the success of the corridor can easily be undermined if the government and international conservation managers lack information about people's attitudes and satisfaction levels with current environmental programs that are already in place in the NPAs. Without an evaluation of the public perception of these programs, the CESMO could potentially be relying on unsuccessful programs to fulfill its goals.

This thesis evaluates stakeholder perceptions of success and satisfaction of six local environmental programs in one municipality within an NPA of the CESMO. Semi-structured verbal interviews were conducted with three different groups of stakeholders: environmental program participants, program managers, and local leaders. Results indicate that more than half of the participants are satisfied with the environmental programs and believe these programs are successful because they meet program goals as well as their personal expectations. The participants and program managers who were not satisfied with these programs attributed their lack of success to a lack of program evaluation, poor planning, lack of participant motivation, conflict of interest among program managers and possible participants, small program reach, and program length being too short. Policy recommendations for the NPA are twofold. First, extend program cycles to allow for better program planning and include an output and outcomes based evaluation system. Second, the programs should be sufficiently flexible so they can address the specific wants and needs of each community to improve participant motivation and lessen conflicts of interest. Third, for the CESMO as a whole to address these issues, more bottom-up land management practices should be considered that focus more on community involvement throughout the entire land management process.

## **Executive Summary**

Over the past 50 years, a range of drivers – from anthropogenic land use change to over-exploitation of natural resources – have caused biodiversity loss globally. High degrees of biodiversity loss negatively impacts environmental processes and services, many of which humans rely on or benefit from such as clean air, clean water, and crop pollination. While responses such as Natural Protected Areas (NPAs), designated areas managed for conservation purposes, can be effective, NPA management plans rarely include local community input, and by design, result in small fragmented protected parcels surrounded by development.

Biological or ecological corridors have recently been sought out as a solution to the fragmented protected landscape left by NPAs. Corridors facilitate the safe passage for species between NPAs and previously connected populations via physical land connections, or “corridors” to perpetuate gene flow. The creation of corridors means, however, that communities and municipal governments that fall within the newly specified area must alter their land use practices. To regulate and incentivize change, governments extend environmental programs that are offered in the NPAs into to the corridor zone.

In eastern Mexico, the Mexican and German governments are collaborating to implement the Ecological Corridor of the Sierra Madre Oriental (CESMO) over five states across a Madrean Pine-Oak biodiversity hotspot. The goals of the CESMO are to foster relationships and a consensus between stakeholders, the different levels of government, and civil society, to adopt sustainable ways of life. The main idea is that this approach will allow the corridor to generate ecological, social, cultural, and economic benefits within its boundaries, as well as in the surrounding areas.

One of the ways the CESMO is accomplishing its' goals is by extending environmental programs that are currently in place within NPAs to other areas within the corridor, but outside of NPA borders. These programs can range from reforestation programs, to forest fire prevention program, to wild *maiz* conservation programs, and can be managed by different levels of government. However, the success of the corridor can easily be undermined if the government and international conservation managers lack information about people's attitudes and satisfaction levels with current environmental programs that are already in place in the NPAs. Without an evaluation of the public perception of these programs, the CESMO could potentially be relying on unsuccessful programs to fulfill their goals.

This thesis evaluates stakeholder perceptions of success and satisfaction of local environmental programs in the municipality of Landa de Matamoros, Querétaro, Mexico. The specific municipality was chosen because it lies within the Sierra Gorda Biosphere Reserve (RBSG), an NPA within the CESMO, it has pre-existing environmental programs to examine, and I lived there for three years and gained the people's trust. The municipality resembles the structure of a U.S. county, and is comprised of mostly small, rural communities, with a total of 21,000 people. Approximately 17,000 people are living in poverty, 5,000 in extreme poverty, and only 60% of inhabitants have a job. Remittances from family members in the U.S. are high, reaching over 13.6 million USD in 2015 alone transferred just to the municipality of Landa de Matamoros.

Semi-structured verbal interviews were conducted with three different groups of stakeholders: environmental program participants, program managers, and local leaders. A total of 29 interviews were conducted in 10 different communities within the municipality of

Landa de Matamoros and one community outside of the county where the headquarters of the government branches in charge of the programs are located. Of the 29 interviews, 18 were with program participants, five were with program managers, and six were with local leaders. The participants answered questions about the goals, benefits, success, and satisfaction levels of the program they participated in and program managers answered similar questions along with background questions about the programs. The local leaders were asked about their perceptions on benefits, strengths, and weaknesses of the environmental programs they had witnessed.

Six local environmental programs were examined. The only state sponsored program is the Sustainable Natural Resource Program which provides reforestation and soil erosion prevention projects and is implemented by the Secretariat of Agriculture Development (SEDEA). The National Commission for Natural Protected Areas (CONANP) is a federal branch that employs three programs in the municipality: the Conservation Program for Sustainable Development (PROCOCODES) which has projects from wood saving stoves to providing technical training, the Temporary Employment Program (PET) which targets low-income families with projects such as community fire-breaks, and the Maiz Criollo Conservation Program (PROMAC), a program to conserve indigenous *maiz* (corn) breeds. The National Forestry Commission (CONAFOR) is a different federal branch that has two programs in the municipality: a Payment for Ecosystem Services (PSA) program, and a Forest Restoration and Productive Reconversion program which consists of reforestation and soil erosion prevention techniques.

The results of the interviews showed that almost half of the participants participated in the programs because of the economic benefit they would gain. When asked about the



benefits the municipality gains from the programs, the highest number of people for each stakeholder group belonged to the economic and environmental benefits categories. This information shows that economic incentives are a very important tool when implementing environmental programs, especially in an impoverished location.

Results indicate that 61% of the participants are satisfied and 67% think the programs are successful because they meet program goals as well as their personal expectations. However, the participants and program managers who were not satisfied or didn't think the programs were successful highlighted several problems with the programs. Participants complained about issues such as poor planning, lack of motivation, lack of follow up on the project, and not receiving enough money. Program managers also mentioned the fact that some of the programs were poorly planned, and that they could be made more efficient by taking out some of the unnecessary steps. Local leaders highlighted problems such as conflicts of interest such as reforestation programs in a community that only wants to harvest wood, small program reach, lack of environmental education, lack of proper evaluation, and program length being too short.

The general consensus is that the local people appreciate the short-term economic opportunities offered by these programs, take advantage of them when they know they exist, and eagerly request more opportunities. However, environmental benefits are not always recognized by the participants, and all parties involved see how flawed the programs can be. These flaws can majorly hinder the long-term goals of the programs, and possibly void them completely in some cases.

Policy recommendations for the RBSG, the NPA, are twofold. First, extend program cycles to allow for better program planning and include an output and outcomes based

evaluation system. Pre and post- tests can be implemented, along with other monitoring and evaluation tools, to see if the program impacted any change in attitudes, actions, and perceptions. An extended program cycle could also allow more time for follow-up activities and environmental education as well.

The second policy recommendation for the RBSG is to allow for more flexibility within the programs to be able to tailor them to the specific wants and needs of each community. Currently, state and federal programs have to be implemented in the same way throughout the state or country whether it's in an agriculture heavy zone, or an indigenous zone. Allowing the program managers the flexibility to slightly alter each program to better fit the community to which it is being applied can improve participant motivation, lessen conflicts of interest, and make the whole program more efficient.

The policy recommendation for the CESMO is to consider more bottom-up land management practices that focus more on community involvement throughout the entire land management process. Since the CESMO covers a lot of multi-use territory including agriculture, mining, and conservation land, and a wide array of stakeholders, the landscape approach should be considered as an alternative. The landscape approach to land management directly involves communities in the decision making processes and maps out clear principles to increase the chance of success. It could mitigate many of the problems brought up in the interviews such as the poor planning of certain projects, lack of motivation and interest among participants, and conflicts of interest.



## **Chapter One- Introduction**

Over the past 50 years, a range of drivers from anthropogenic land use change, to over-exploitation of natural resources have been leading causes of global biodiversity loss (IUCN, 2010). Mexico has not escaped these pressures, experiencing significant habitat fragmentation and consequently, species loss<sup>1</sup>. (Baena & Halffter, 2008). Since Mexico is home to an estimated 10-12% of the species of the world, biodiversity decline has national and international significance (Baena & Halffter, 2008). Within the country, such high degrees of biodiversity loss negatively impacts environmental processes and services that are crucial for clean air, clean water, and crop pollination (Baena & Halffter, 2008).

One solution promoted by conservationists to slow or reverse declining biodiversity, is to protect ecosystems and their species through the creation of Natural Protected Areas (NPAs). NPAs are designated areas that are managed for conservation purposes (Convention on Biological Diversity, 2016). Research suggests that NPAs can have a positive effect by reducing habitat loss and other threats, and some even argue it to be the best tested approach to conservation (Brooks, Wright, & Sheil, 2009).

However, the NPA model is a top-down approach, and as a solution to biodiversity loss poses a set of social as well as ecological challenges. In many cases, local communities lose land or access to important natural resources through the implementation of an NPA. Buffer areas surrounding the protected area can become degraded through an increase in harmful activity just outside the borders (Lele, Wilshousen, Brockington, Seidler, & Bawa, 2010). Communities, resentful of their loss of access, can ignore NPA rules (Lele,

---

<sup>1</sup> Mexico already has 84 confirmed species that are extinct, locally extirpated, meaning they are extinct from Mexico, but still exist in other countries, or virtually extirpated, meaning they no longer exist in the wild, live only in captivity, and have no hopes of successfully being reintroduced into the wild (Baena & Halffter, 2008).

Wilshousen, Brockington, Seidler, & Bawa, 2010). Finally, because of political borders and limited resources, mainly available land and money, NPAs are often small, scattered throughout a country, and surrounded by developed land (Bennett, 2003). This creates a fragmented system of small, often isolated pockets of conservation that do not necessarily meet the needs of all the species involved.

To address this last issue, biological and ecological corridors have been used as a conservation strategy to connect fragmented NPAs to prevent habitat loss, conserve biodiversity, and in many cases to prevent extinction (Rosenberg, Noon, & Meslow, 1997). Corridors achieve this by facilitating the safe passage for species between previously connected populations via physical land connections, or “corridors” to perpetuate gene flow (Rosenberg et al., 1997). The creation of corridors means, however, that communities and municipal governments that fall within the newly specified area must alter their land use practices. To regulate and incentivize change, in many cases governments extend paid environmental programs that are offered in the NPAs into to the corridor zone.

This thesis examines the potential role that these state and federal environmental programs could play in supporting the Ecological Corridor of the Sierra Madre Oriental (CESMO) in Mexico. The CESMO, designated in 2012- 2016, stretches across 5 states in eastern Mexico. The success of the corridor can easily be undermined if the government and international conservation managers lack information about people’s attitudes and satisfaction levels with current environmental programs that are already in place in the area that falls within the corridor. Without an evaluation of the public perception of these programs, the CESMO could potentially be relying on unsuccessful programs to fulfill their goals.

The analysis of the perceptions of environmental programs is part of a new movement in conservation science and management that focuses on stakeholder engagement (Pérez-Campuzano, Avila-Foucat, & Perevochtchikova, 2016). This thesis contributes to this work by analyzing a range of key stakeholders across 6 environmental programs in the municipality of Landa de Matamoros, Querétaro, Mexico. This municipality, located in eastern Mexico, falls within the CESMO and has a NPA biosphere reserve within its jurisdiction. The thesis asks what is the satisfaction level and perceived success of the environmental programs that have been implemented within the municipality from the perspective of small holder participants, local municipal authorities and state and federal environmental managers.

To address this question, I reviewed primary and secondary documents to gather background information on ecological corridors, environmental programs, and stakeholder perceptions of environmental programs. While serving in the Peace Corps in the area, I conducted semi-structured interviews over a period of eight months targeted at three stakeholder groups: environmental program participants, program managers, and relevant political leaders. Using these methods, this thesis finds that while over half of the participants are satisfied and find the programs successful, all three groups of stakeholders highlighted opportunities for improvement.

This thesis takes a snapshot of federally and state funded environmental programs in one specific rural location and identifies a set of factors that influence the stakeholder perceptions identified above, and the factors that shape success or gaps in those programs. Lessons learned from this research can be extrapolated and applied to other areas within the borders of the CESMO. These factors include environmental programs with economic

incentive, long cycles, program evaluation, and flexibility to tailor programs to each community.

The thesis is structured as follows. Chapter Two presents a review of the literature assessing the drivers and solutions to biodiversity loss, NPAs, biological and ecological corridors, and stakeholder perception of environmental programs. Chapter Three is a background chapter that lays out the larger project of the CESMO within which the thesis is set, and then turns to an ecological, socio-economic and political assessment of Landa de Matamoros which is the site of the thesis research. Chapter Four presents the methods, results of the study containing the perceived success and satisfaction levels of stakeholders, and an analysis of the results. Chapter Five offers policy recommendations for the environmental programs of Landa de Matamoros as well as for the CESMO in general.

## **Chapter Two- Literature Review**

This chapter briefly reviews the literature reviews on biodiversity loss and conservation models such as NPAs and biosphere reserves and the debates over the often contentious relationship of communities to these spaces and conservation goals. It includes a discussion within the literature on what factors lead to success or failure of NPAs to achieve their stated goals as well as new solutions to these problems within conservation circles. The chapter tracks shifts within conservation management, from the top down model, to more inclusive co-management strategies to the more recent focus on conservation within working landscapes. In addition, the chapter touches on the rationale and debates over biological corridors. Finally, it concludes with emerging work on perception and stakeholder engagement in supporting or undermining environmental programs that support biodiversity conservation.

### **Biodiversity Loss and NPAs**

The 1992 Convention on Biological Diversity that emerged from the United Nations Conference on Environmental Development (Rio Summit) formally recognized the importance and value of biodiversity for the well-being of humans, mainly in the form of ecosystem services (Cardinale et. al, 2012). Ecosystems services are benefits in the form of tangible goods and non-tangible services that humans receive, either directly or indirectly, from the ecosystem (Alcamo et al., 2003). They can be separated into four distinct categories: provisional services such as food, fiber, and fuel, regulating services including climate regulation, water purification, and pollination, cultural services such as recreation



and ecotourism, education, and cultural heritage, and supporting services like nutrient cycling and soil formation which support the other ecosystem services (Alcamo et al., 2003).

Correlations have been found between biodiversity and ecosystem services showing that higher levels of biodiversity are associated with improved ecosystem services (Cardinale et al., 2012). An example of this is that in areas of higher biodiversity there is greater production or higher yields in areas such as food crops, more stability, and increased longevity of the ecosystem service production (Cardinale et al., 2012; Díaz, Fargione, Chapin, & Tilman, 2006). Biodiversity loss, however, can decrease the efficiency of ecosystem services such as nutrient cycling (Cardinale et al., 2012). Thus, if the goal is to preserve the ecosystem services that humans depend on, biodiversity first needs to be protected (Díaz et al., 2006).

To protect and preserve biodiversity and consequently ecosystems services, NPAs, or protected areas (PAs), are a common conservation tool for national governments. The Convention on Biological Diversity (CBD) (2016) defines an NPA as a “geographically defined area which is designated or regulated and managed to achieve specific conservation objectives”. Because the term is so broad, the International Union for the Conservation of Nature (IUCN) has broken down NPAs into six categories based on their management objectives (IUCN, 2017).

On one end of the spectrum, conservation of pristine-like ecosystems and species occurs through the strict management of minimal human interaction in a category called a “strict nature reserve” where human interaction is primarily allowed for scientific research (IUCN, 2017). On the other end of the spectrum is a more human-inclusive category “protected area with sustainable use of natural resources” where the objective is to conserve

ecosystems and natural resources that have already had some human impact by promoting conservation that is compatible with economic and social dimensions (IUCN, 2017). In Mexico alone, there are 400 NPAs in this category comprising mainly of biosphere reserves and voluntary conservation areas (Protected Planet, 2017).

In 1971, biosphere reserves were chosen as the launch pad for the United Nations Educational, Scientific, and Cultural Organization's (UNESCO) Man and the Biosphere Program (MAB), a program that aims to create a science-based approach for improving the relationship between humans and the environment (UNESCO, 2017b). From MAB came the delineation of the three basic functions of a biosphere reserve: to support biodiversity conservation, to balance the sustainable co-existence between the ecosystems in the reserve and the people who depend on them for their livelihood, and to provide field sites for research to take place (Batisse, 1997). Not until the Seville International Conference on Biosphere Reserves in 1995 was the idea of sustainability first integrated into the biosphere reserve plan (Stoll-Kleemann & Welp, 2008).

Analysts have begun to assess the impact of biosphere reserves, and all types of NPAs by examining conservation indicators such as hectares under conservation, and rates of deforestation in and around NPAs (Figueroa & Sanchez-Cordero, 2008; Nagendra, 2008; Naughten-Traves, Holland, & Brandon, 2005). In NPAs, success can also be shown through direct biodiversity conservation measurements. For example, NPAs and similar conservation efforts have been credited with slowing global bird extinction rates from predicted extinction rates over the past century (Rodrigues, 2006).

To help bring about these successful changes, NPAs often use a combination of enforcing rules and regulations and economic incentives, usually in the form of

environmental programs. Researchers have found economic incentives more effective at motivating people toward conservation than being reprimanded by rules and regulations (Anderson & Jenkins, 2006). The classic approaches to environmental programs have often been grouped into the categories of direct strategies or indirect strategies for conservation (Garcia-Amado, Perez, & Garcia, 2013). Direct strategies are programs like Payment for Environmental Services (PES) that directly link the local communities to the market of those who are willing to pay for conservation, while indirect programs, such as providing financial subsidies for land reforested, do not (Garcia-Amado et al., 2013; Lele, Wilshousen, Brockington, Seidler, & Bawa, 2010).

While many hail NPAs as the best solution to the biodiversity loss problem, some analysts argue that the NPA model is inherently problematic. Early NPA practices were top down and tended to view the people that had once lived within the boundaries of the NPA or directly around it as obstacles to effective conservation (Crawhall, 2015). Communities who relied on natural resources for their livelihood were automatically seen as unqualified to manage the land and also having a conflict of interest with the conservation of those natural resources (Crawhall, 2015). Some scholars and conservation managers argued that excluding people and communities from the NPA design, especially those living in the area before it was declared an NPA, was not a successful way to manage the area (Crawhall, 2015).

The 1992 Rio Summit sparked a new wave of thinking and an intense push among international scientists, NGOs, and governments to include a participatory approach in conservation management (Reed, 2008). According to a global survey taken in 2006 by biosphere reserve managers, participation factors were believed to be of the utmost importance (Stoll-Kleemann & Welp, 2008). Environmental education was ranked as the

most important factor, collaboration with local authorities was the second most important, and community participation was the sixth most important factor out of 27 factors (Stoll-Kleemann & Welp, 2008). The reasoning behind the importance of participatory approaches are threefold: one is to allow stakeholders to get involved in decisions that affect their lives, two is because the reserve will work more effectively if all major actors are in agreement, and the third reason is to increase the quality of management with different points of view and different knowledge (Stoll-Kleemann & Welp, 2008).

In some cases a lack of community involvement, along with other conflicts, has fostered negative environmental attitudes, especially towards NPAs. Bonaitu, Carrus, Martorella, and Bonnes (2002) highlight that these negative attitudes often result when a national level entity decides to implement an NPA instead of a local entity, and/or when there is a perceived conflict of interest over the natural resources. The same study also acknowledges that local people living in or near the NPAs generally have more negative feelings towards NPAs than non-local people, and that there are social subsets within the “local” category that also have varying degrees of negative feelings towards NPAs (Bonaitu et al., 2002).

Aside from the community vs. conservation conflict, another problem plaguing the NPA system is the ecosystem fragmentation inherent in their implementation. While the area inside of an NPA is protected, increasing anthropogenic land use changes such as agriculture, logging, mining, and residential development occur outside of the NPAs leading to fragmentation and habitat loss (Hilty, Lidicker Jr, & Merenlender, 2006). What is left are isolated “islands” of protected areas that are even more sensitive to the adjacent land surrounding them, which could threaten the NPA with anything from invasive species to

poaching and pollution (Hilty et al., 2006). Many scientists agree that maintaining small populations of species in the relatively small and potentially unsuitable NPAs is not a sustainable option (Hilty et al., 2006).

### *Possible Solutions*

Over the past decade, the concept of landscape approach/ working landscapes/ agriculture conservation models have gained increasing attention (Sayer et al., 2013). A landscape approach “seek(s) to provide tools and concepts for allocating and managing land to achieve social, economic, and environmental objectives in areas where agriculture, mining, and other productive land uses compete with environmental and biodiversity goals” (Sayer et al., 2013). Recent attention to the landscape approach is due to growing societal concerns about the conflict of the tradeoffs between environmental conservation and development (Sayer et al., 2013).

Biological and economic models have now been created to help find the most efficient balance between conservation and productive land uses (Polasky, Nelson, Lonsdorf, Fackler, & Starfield, 2005). Polasky et. al (2005) used these biological and economic models to discover that through careful land planning, many conservation objectives can be completed with little economic loss. The authors also determined that with this model, the estimated conflict between using land for conservation and for development, or economic returns, is significantly less than estimated in previous models (Polasky et. al, 2005).

Sayer et al. (2013) have identified 10 principles which should be considered when developing the landscape approach. The first principle, continual learning and adaptive management, focuses on the fact that landscapes are dynamic and constantly changing (Sayer et al., 2013). To make the most out of the landscape approach, information and outcomes

must be constantly gathered and incorporated into decision-making processes (Sayer et al., 2013). Another principle stresses the importance of the awareness of how outcomes are influenced on multiple scales by processes, policies, and issues (Sayer et al., 2013). Understanding these multiscale interactions can help improve the efficiency of the land management (Sayer et al., 2013).

One of the most basic principles to the landscape approach, which was previously mentioned, is understanding the multifunctional component to the land (Sayer et al., 2013). This means understanding tradeoffs of different landscapes with regards to physical space, ecosystem health, and stakeholder consideration (Sayer et al., 2013). The final principle highlighted here<sup>2</sup> is to include many and diverse stakeholders in the decision-making process (Sayer et al., 2013). To develop fair and just solutions there needs to be open communication between all possible groups of stakeholders (Sayer et al., 2013).

### **Biological and Ecological Corridors**

The most widely proposed solution to help mend the fragmented system that NPAs leave behind are biological or ecological corridors. Anderson and Jenkins (2006) define a biological or ecological corridor as a corridor “designed primarily to maintain or restore ecological services upon which biodiversity conservation depends, such as maintenance or restoration of soil or water quality.” (p.18). These large scale projects cover hundreds to thousands of square kilometers and take more of a landscape encompassing approach as

---

<sup>2</sup> Other principles not expanded upon in this thesis include: building trust among stakeholders, transparency and negotiation in planning the use of the landscape, being clear on rights and responsibilities of those involved, easy and participative monitoring progress, recognizing threats and vulnerabilities to increase resilience, and strengthened stakeholder capacity to participate throughout the entire process (Sayer et al., 2013).

opposed to a linear, direct connection between fragmented land (Anderson & Jenkins, 2006). More specifically, the term “corridor” has multiple interpretations in the literature including habitat, a greenbelt or buffer, biogeographic landbridge, underpasses and tunnels, or as most often defined, pieces of land intended to connect and facilitate species movement between habitats (Simberloff, Farr, Cox, & Mehlman, 1992).

The main goals of a biological corridor are to protect habitats and travel routes for resource access, mate access and migrations (Hilty et al., 2006). Biological corridors target specific areas where travel routes have been fragmented by anthropologic activity, and try to restore organism movement between isolated populations (Chetkiewicz, St. Clair, & Boyce, 2006). This protection not only enhances species’ survival in their own habitat, but it allows them to move safely across the land to reach other habitats, water, a food source, a mate, or to migrate (Hilty et al., 2006).

The scientific rationale for biological and ecological corridors is characterized by three different concepts: the equilibrium theory of island biogeography, the metapopulation theory, and principles of landscape ecology (Anderson & Jenkins, 2006). The equilibrium theory of island biogeography proposed by MacArthur and Wilson (1967) draws from the idea that the larger and closer an island is to the mainland, the more species it will have, compared to islands that are smaller and farther away from mainland. The reasoning behind this observation is that the distance from the mainland affects the immigration rate, the farther away, the slower the immigration rate, and the size of the island, the smaller the island, the less habitat there is for species, determines the extinction rate (MacArthur & Wilson, 1967). They argue that this can be applied to terrestrial parcels of isolated habitats (Anderson & Jenkins, 2006). A difference when applying this theory to terrestrial “islands” or isolated

habitat parcels, is that a physical corridor connecting these isolated parcels can be implemented to reduce the time and risk it takes for species to immigrate and establish or replace itself in a habitat (Anderson & Jenkins, 2006). Because these terrestrial “islands” clearly do not function the same as true islands, they are more susceptible to their surroundings such as fires, invasive species and other drivers (Anderson & Jenkins, 2006).

To help substantiate the biological corridor concept is the metapopulation theory, which supports the concept on a species level. The theory suggests that metapopulations, or smaller local populations that are separated physically but still interact with each other, help supply failing populations, recolonize in places where previous populations have failed, and colonize new habitats (Anderson & Jenkins, 2006). However, the safe movement among these populations is necessary. Fahrig and Merriam (1994) observed that extinction of populations in fragmented areas was very common and that recolonization of these habitats is crucial for the population’s survival. Stability and survival of the species depends upon a safe passage across the landscape in between populations, or ideally, a biological corridor (Bennett, 2003).

While metapopulation theory can explain why corridors are necessary on a species level, the framework for landscape ecology supports the biological corridor concept on a larger scale (Anderson & Jenkins, 2006). The landscape ecology concept examines the big picture. It takes a systematic approach to how the components of landscapes, or the physical terrain, affect species and ecosystem processes, while arguing that to understand one piece of the system (one fragmented piece of land) you have to examine all of the pieces to which it is connected (Anderson & Jenkins, 2006). Looking through the lens of landscape ecology, the functions of the landscape can be used to justify the biological corridor concept. These



functions include the physical corridor terrain acting as a conduit for natural resources and organisms to pass from one fragment to the next, acting as a habitat, acting as a barrier or a filter for unwanted organisms such as invasive species, and acting as a genetic population source or sink to promote genetic diversity among populations of organisms in different locations (Anderson & Jenkins, 2006).

To prevent detrimental activities from occurring within the biological corridor, environmental programs and regulations from NPAs within the delineated biological corridor area are often extended to the rest of the corridor (West, Cairns, & Schultz, 2016). Programs such as payments for ecosystem services have yielded promising results in halting deforestation, retaining forest cover, and even increasing forest cover in certain biological corridors (Morse et al., 2009). One example on how to incorporate NPA programs throughout an entire corridor is highlighted in the Alexander Skutch Biological Corridor in Costa Rica. This specific Costa Rican corridor is part of the larger, more commonly known and often criticized Mesoamerican Biological Corridor which connects Mexico and Panama (Daugherty, 2005). Created in 2004, this corridor uses a multifaceted approach to extend NPA programs throughout the corridor by including collaboration between the private, academic, and community sectors, and environmental programs. These types of partnerships include collaboration on research, local community participation in decision-making, and marketing green products (Daugherty, 2005). The corridor, however, still lacks evaluation to determine its success (Daugherty, 2005).

Creating and maintaining a corridor, however, presents a set of political and socio-economic barriers. Anderson and Jenkins (2006) identify five major obstacles to implementing a biological corridor. The first major obstacle is “threats to biodiversity” such

as land fragmentation caused by population growth and new infrastructure (Anderson & Jenkins, 2006). The second obstacle is “lack of understanding, awareness, or concern” on the part of the stakeholders and the general public as to the necessity and importance of a biological corridor (Anderson & Jenkins, 2006). The third obstacle is “resistance to decreased resource use and control” which is when private landowners and sometimes even the government, object to giving up land use rights (Anderson & Jenkins, 2006). The fourth obstacle is “corridor cost” because the actual cost of corridors is hard to measure, and can be expensive (Anderson & Jenkins, 2006). The fifth obstacle is the “uncertainty and complexity of implementing a corridor” due to the fact that there is still little evidence that it is a successful model (Anderson & Jenkins, 2006).

The authors offer three ways to overcome these objectives. The first is by defining leadership and getting motivated leaders onboard, preferably local leaders, so other stakeholders will get on board with the corridor idea (Anderson & Jenkins, 2006). The second is by involving institutions and coalitions so that they can be a driving force for the corridor (Anderson & Jenkins, 2006). The third is by broadening public support, especially that of stakeholders, and reducing resistance to the idea of a corridor by linking the threats to not having a corridor, such as declines in drinking water supply, or threats to culture and lifestyle (Anderson & Jenkins, 2006).

### **Stakeholder Perception and Conservation**

Within the literature there is a growing subset of scholars interested in understanding the perception of stakeholders involved in environmental programs (Mani-Peres, Xavier, Santos, & Turra, 2016). Perception theory is rooted in work on cognitive theories across many

disciplines including anthropology, psychology, and sociology, and was applied to the environmental realm in the 1970s (Whyte, 1977). Recently, the rise in stakeholder analysis has become increasingly important in project evaluation, both in the developed and developing world. Both sets of research argue that stakeholder perceptions can be valuable information for successful and sustainable project management (Mani-Peres et. al, 2016; Whyte, 1977).

Whyte (1977) studied environmental perceptions to support UNESCO's Man and the Biosphere program (MAB). The author describes environmental perception as:

A perception approach to man-environment relations recognizes that for each objective element and relationship in the biosphere, there are many perceived elements and relationships as seen and understood by different people and at different times and places. Man reaches decisions and takes action within the framework of his perceived sets of elements and links rather than any externally defined "objective set". (Whyte, 1977)

Studying environmental perception can allow researchers to get an internal view of the situation to compliment the traditional external information derived from the scientific approach (Whyte, 1977).

There are five goals when using environmental perception as a tool to improve conservation management and lessen conflicts of interest (Whyte, 1977). The first goal is to combine the internal stakeholder views gathered from environmental perception studies with external views from scientific conservation studies to find the right balance of sustainable natural resource use (Whyte, 1977). The second goal is to increase understanding among all stakeholders and parties involved in the conservation management area (Whyte, 1977). The third goal is to support inclusion of local stakeholders in development and planning to bring about more effective and realistic change (Whyte, 1977). The fourth goal aims to support the preservation of traditional perceptions, knowledge, and traditions (Whyte, 1977). The final

goal is that environmental perception acts as an educational tool and can be used as an agent change to help alter environmental attitudes in a positive manner (Whyte, 1977).

More recently, environmental perception has been studied in response to a push in the direction of grassroots participatory approaches to conservation. Pérez-Campuzano, Avila-Foucat, and Perevochtchikova (2016) studied beneficiary's perceptions of three environmental programs in place in the outskirts of Mexico City: payment for ecosystem programs, management units for conservation and sustainable use of wildlife (UMAs), and Communitarian Funds for Rural Sustainable Development Program. The results of their study highlighted that the beneficiaries perceived an overall positive impact of the programs on local conservation, but brought to light many important issues such as too much paperwork, lack of evaluations of the actual environmental impacts of the programs, and conflicts arising when the program rules not clear (Pérez-Campuzano et al., 2016). Overall the authors recommended that the information from the perceptions of the beneficiaries be used to help improve the efficiency of the programs as well as general urban and environmental planning within the city (Pérez-Campuzano et al., 2016).

In a different case study in the Purépecha region in central Mexico, the authors examined the opinions of people involved in implementing wood-saving stoves on behalf of an NGO project in rural Mexico (Troncoso, Castillo, Merino, Lazos, & Masera, 2011). One of the big problems that the people implementing the stoves perceived was that there was too much pressure from the NGO to fulfill the 1,500 stove quota in three years and implementers had to convince community members to try the stoves (Troncoso et al., 2011). When the project began, community members felt no need to change their cooking habits, and were weary to try the new stoves (Troncoso et al., 2011). The pressure to fulfill the quota, which

ultimately came from donors, led to the project being executed at the NGO's pace instead of the communities' pace which created tension between the NGO and the communities and produced an unfavorable work environment (Troncoso et al., 2011). This assessment helped the researchers realize that since the project was trying to solve a problem identified by people outside of the community, and the community itself was not aware of the problem, the NGO would have been more successful if they had followed the communities' pace and had an awareness campaign first, instead of trying to convince people to use a new stove with no context (Troncoso et al., 2011).

Both case studies show that stakeholder perceptions can bring to light both successful and unsuccessful elements of programs which can be used to enhance the effectiveness of the programs. The surveys and interviews carried out in this thesis are designed for this same purpose. The perceptions, attitudes, and information derived from the surveys and interviews will be used to make policy recommendations to improve the current environmental programs in Landa de Matamoros, of Querétaro, Mexico.

## **Conclusion**

The traditional top-down NPA model for conservation is not sufficient to achieve the level of conservation that needs to happen to stop or reverse biodiversity loss. Possible solutions include integrating the landscape approach, where conservation occurs in conjunction with economic practices such as agriculture, or a implementing a biological or ecological corridor. However, ecological corridors often use top-down NPA programs as example programs throughout the corridor. Stakeholder perceptions of these programs are widely unknown, and only recently have been of interest due to the rise of the participatory grassroots model for

environmental programs. This thesis will ascertain stakeholders' perceptions to then use them for policy recommendations for current environmental programs.



## **Chapter Three- The Municipality of Landa de Matamoros**

This chapter outlines the relevant information about the location under examination: the municipality of Landa de Matamoros. It begins with the broader context of the Ecological Corridor of the Sierra Madre Oriental (CESMO) and the environmental importance of the area. Next, it focuses on the formation and general history of the biosphere reserve in which the municipality resides. Following that is a description of the socio-economic state of the municipality and details about the environmental programs offered. Finally a description of the methods of the thesis are given.

### **Location and Natural History**

Mexico has a large number of “biodiversity hotspots”. Hotspots are areas of intense biodiversity that are under immanent threat due to development, urbanization, pollution, and subsequently affected more by diseases due to decreased health and resistance (Conservation International, 2016). One of the more famous hotspots in Mexico is the Madrean Pine-Oak Woodlands that stretch across the main mountain chains of Mexico starting from southern Texas, New Mexico, and Arizona. The Woodlands encompass the majority of the west coast into southern Mexico, with a few smaller chains on the East coast (Figure 1). The CESMO targets the biodiversity threats in the Sierra Madre Oriental; the eastern mountain chain that encompasses six states in the Madrean Pine-Oak Woodlands.





*Figure 1: Map of Madrean Pine-Oak Woodlands. Source ARCGIS Biodiversity Hotspots Revisited, Conservation International, 2004 (Data Basin Dataset)*

The high levels of biodiversity in the Sierra Madre Oriental (SMO) are due to the wide ranges in altitude and climate in the mountainous zone. The pine-oak forests of the SMO cover an area of about 25,300 square miles, range anywhere from 1000m- 3500m above sea level, and can receive between 250-1500 mm of rainfall annually (World Wildlife Fund, 2016). Among the abundance of inhabitants in this area, there are high levels of endemic species of flora and fauna including important pine, oak, and agave natives, as well as many species of birds (World Wildlife Fund, 2016).

The pine-oak forests across Mexico are under intense threat by land use conversion for logging and agriculture (World Wildlife Fund, 2016). Although these practices date back over hundreds of years, recently there is an acceleration in loss. For example, between 1993

and 2011 in Mexico alone, pine-oak forests have been deforested at a rate of 16,336 hectares per year (FAO, 2015). Some of the recent drivers for deforestation include resin extraction, cattle farming, hunting, and residential development (World Wildlife Fund, 2016).

### **Ecological Corridor of the Sierra Madre Oriental (CESMO)**

To conserve the natural resources and the biodiversity of the Sierra Madre Oriental (SMO), the Mexican agency Secretariat of Environment and Natural Resources (SEMARNAT), with help from the German government branch German Society for International Cooperation (GIZ), initiated the CESMO in 2012 (Annex A). The CESMO encompasses over four million hectares and covers portions of five Mexican states: Querétaro, San Luis Potosi, Hidalgo, Veracruz, and Puebla (Annex A). The five year conservation effort has a budget of seven million euros thanks to companies like Volkswagon (Annex A).



Figure 2: Map of the CESMO. Source data from [http://sig.conanp.gob.mx/website/cesmo/descargas/pag\\_descarga.htm](http://sig.conanp.gob.mx/website/cesmo/descargas/pag_descarga.htm)

Within SEMARNAT, the National Commission for Natural Protected Areas (CONANP) works closely with GIZ to oversee the CESMO. CONANP and GIZ note that the principal problem for conservation in the SMO is that “key actors in NPAs and their surrounding zones of influence do not have the capacity to develop and carry out stable and sustainable strategies for biodiversity protection and sustainable natural resource use” (Annex A). The leading causes of this problem included environmental programs that were not being taken advantage of in conjunction with environmental legislation that wasn’t clearly articulated (Annex A). The two agencies argue that this problem is what causes the

land use conversion previously mentioned and subsequent biodiversity and natural resource loss (Annex A).

To fix the principle problem, CONANP and GIZ designed an inclusive ecological corridor whose goal was to foster voluntary consensus among stakeholders in affected sectors (agriculture, forestry, mining, etc.), different levels of government (municipal, state, federal), landowners (ejidos, private owners, indigenous tribes), and other key actors in civil society (Annex A). The main idea is that this approach will allow the corridor to generate ecological, social, cultural, and economic benefits within its boundaries, as well as in the surrounding areas (CESMO, 2017).

More specifically, CONANP and GIZ have targeted 23 “priority zones” where example demonstrations, projects, and programs are carried out through GIZ funds with the assumption that these programs will then be replicated by other actors such as NGOs, universities, or local governments in other locations throughout the CESMO (Annex A). Included in these programs to be replicated by other actors are programs already place in NPAs in the CESMO. The goal is to make connections with NGOs, universities, and other local governments who will be able to carry out and extend NPA programs on a regional level outside of the NPA boundaries.

### **Sierra Gorda Biosphere Reserve of Querétaro (RBSG)**

As noted above, the CESMO connects many of the pre-existing NPAs in the Sierra Madre Oriental (SMO). This thesis examines one municipality, Landa de Matamoros, which is located within a biosphere reserve, in the CESMO. Created in 1997, the Sierra Gorda Biosphere Reserve of Querétaro (RBSG) is located in the state of Querétaro. It was formed to protect the area's natural resources and biodiversity from over-exploitation (Figure 3). The reserve contains natural resources such as mercury, silver, lead, petroleum, potable water, three types of forests, and two types of scrub ecosystems and performs a long list of important ecosystem services including carbon capture and storage and water filtration (CONANP, 2017a).



*Figure 3: Location of the Sierra Gorda Biosphere Reserve (RBSG) in the state of Querétaro, Mexico. Source: QGIS data from CONANP.*

The founding of the RSBG is relatively unique in Mexico's NPA program. This biosphere reserve is the only case in Mexico where an NPA was created due to pressure from the grassroots level rather than a top-down creation by the government<sup>3</sup>. In 1987, concerned members civil society residing within the Sierra Gorda came together with the common purpose of protecting the biodiversity and natural resources of the area. Their goal was to gain NPA status through the federal government. The benefits of being declared an NPA include federal protection through the Federal Agency for Environmental Protection (PROFEPA), as well as a constant source of federally funded environmental programs.

This small local goal-oriented group formed an NGO to represent the hundreds of communities from the five municipalities residing in the proposed area of 383,567 hectares (one third of the state). The NGO persistently petitioned the government with proposals and conferences and did not rest until the area was federally declared protected in 1997 and officially registered as a biosphere reserve. Since many communities and even small cities existed within the proposed area, it was designated as a biosphere reserve. The goals of a biosphere reserve are to conserve both cultural and biological diversity, promote sustainable economic and human development, and to facilitate logistical support for environmental programs and environmental education (UNESCO, 2017a).

Once the RBSG was established, a National Commission of Natural Protected Areas (CONANP) office was set up in Jalpan de Serra, Querétaro to manage the natural resource

---

<sup>3</sup> In Mexico, communities can now register protected areas as formal Volunteer Conservation Areas (VCAs) if they meet the national biodiversity conservation goals. VCAs are established, administered, and managed by the community or indigenous population with federal recognition. This federal recognition not only means they are included on a map as a protected area, but also in certain circumstances it allows for benefits such as a federal seal of approval for sustainability on certain products produced in these areas, giving them an edge in the market (Robson & Berkes, 2010).

and biological conservation in the 600+ communities. The vision of CONANP is to conserve the natural history and ecological wealth of Mexico by using NPAs while simultaneously conserving the livelihood of the people who live there (CONANP, 2016a). To meet these goals, CONANP executes eight programs in the Reserve. The NGO still maintains its presence and position of power in the reserve influencing community actions towards their own set of conservation goals. In addition to CONANP and the presence of NGOs, the RBSG also receives environmental Peace Corps Volunteers from the USA who often bring with them funding from the United States Agency for International Development (USAID) for environmental projects.

To regulate what goes on inside of the reserve, CONANP has identified multi-use zones that take into account previous land uses, future needs, and conservation goals and mirror a multifunctional landscape. Some of the zones mirror “working landscapes” and include urban use, sustainable ecosystem use, sustainable natural resource use, protected zone, and traditional use zones. While the zoning gets reassessed about every 10 years, people get grandfathered in to new zoning regulations. For example, if a farmer was previously planting his *milpa*, a traditional method of planting corn, beans, and squash, in a location that CONANP decided to make a “protected zone”, he would still be able to farm there, but no new people could start farming inside of the zone.

Even though the land in the RBSG is protected by the federal government, none of it is actually state or federal land. In Landa de Matamoros, the municipality under review, land rights are broken down into two categories: privately owned land or *ejido* land. Private land, the category with the most stakeholders, can be bought, sold, and personally managed, such as it is in the US. In contrast, the *ejido* is a federally initiated communal land system dating

back to 1930 in which a portion of land is divvied up for multi-use purposes (agriculture, housing and development, forested land, etc.) and managed by local *ejidatarios*, members of the *ejido* (Perramond, 2008). However, since the constitutional reforms in the 1992 and 1993, *ejidos* are allowed to privatize their land due to reforms made to the Mexican Constitution. The ability to privatize ejido land as a federal response to a decline in Mexico's economy and part of a larger set of neo-liberal reforms (Perramond, 2008).

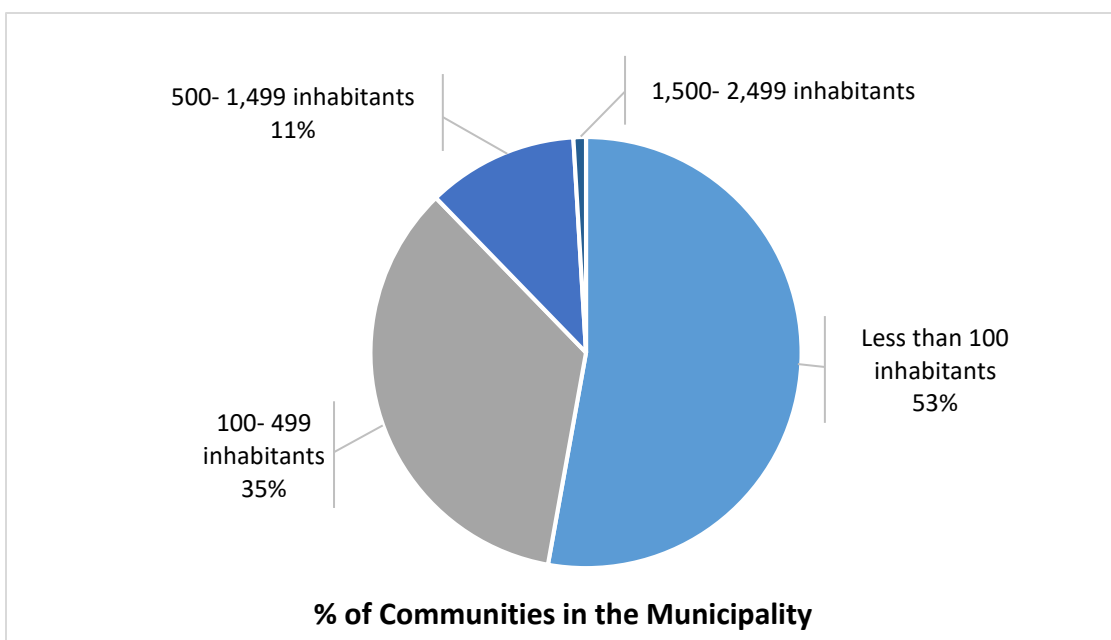
The political structure of the municipality of Landa de Matamoros parallels that of a typical county in the US. There is a municipal president, which would be the equivalent of a county executive for a county in the US, who is elected for a term of three years. Within the municipality there are towns or small, rural communities run by *delegados*, or *sub-delegados* for the smaller communities, which is a mayor-like figure elected by the people to lead for a term of three years. These elected leaders work together to improve the region by bringing developmental programs and projects to the area, including environmental programs.

### **Stakeholders**

The RBSG of Querétaro encompasses the five municipalities of Arroyo Seco, Pinal de Amoles, Peñamiller, Jalpan de Serra, and Landa de Matamoros, which in 2010 had a population of approximately 104,000 people. Landa de Matamoros was chosen as the subject of this thesis for four reasons. The first reason is that Landa de Matamoros is a municipality within an NPA. The second reason is because this specific NPA falls within the CESMO. The third reason is that it implements environmental programs, and the fourth reason is because I lived there for three years and had gained the trust and respect of many people in the area.

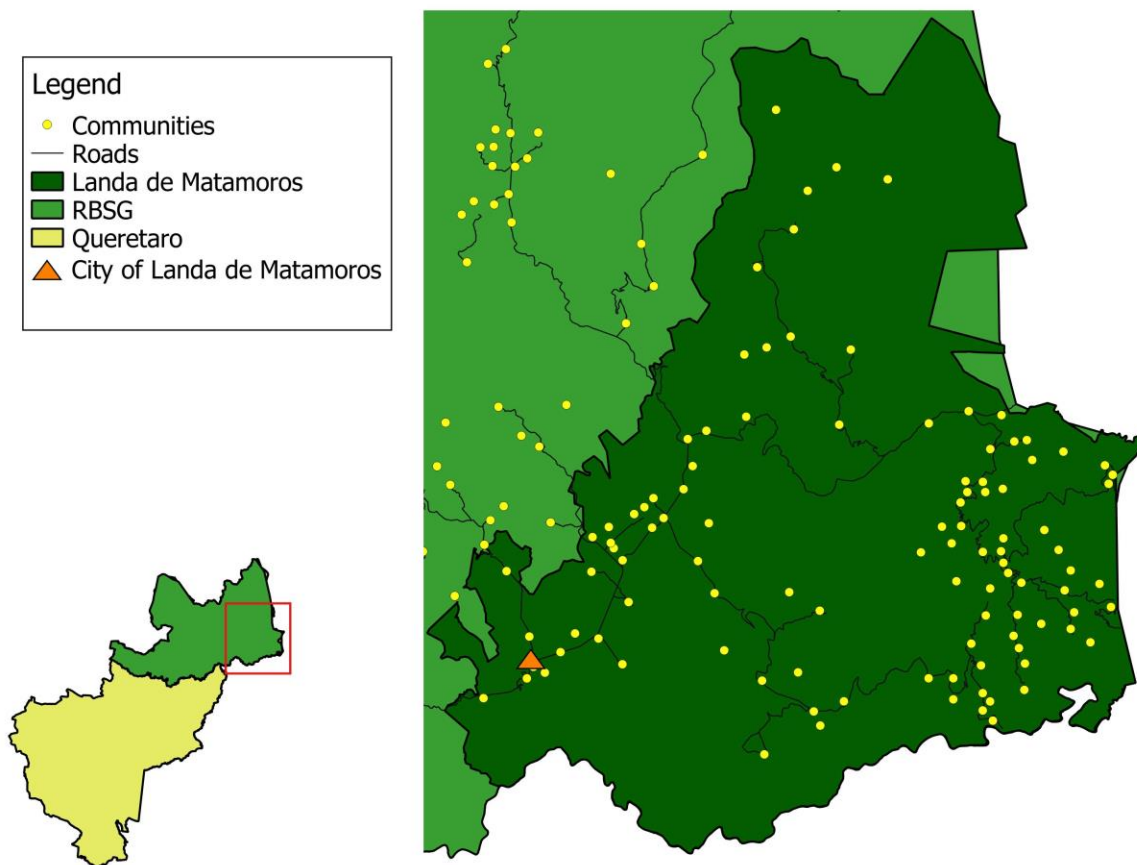


As of 2010, Landa de Matamoros had a population of roughly 21,000 people in 106 communities (Secretaria del Desarrollo Social (SEDESOL), 2013a). About 17,000 people were living in poverty, 5,000 of which were in extreme poverty<sup>4</sup> as defined by income, education, access to appropriate health and social services, living conditions, basic household amenities like electricity and running water, and access to food (SEDESOL, 2013b). Also in 2010, over half of the communities consisted of 100 people or less, and the largest city was only 1,609 people (SEDESOL, 2013a) (Figure 4). Public transportation between communities is limited or nonexistent, and the biggest city in the municipality is the city of Landa de Matamoros which is not in a central location within the municipality (Figure 5). Small community size, low income, and remoteness are all factors that influence stakeholder behavior and environmental perceptions.



*Figure 4: Ranges of community size measured by inhabitants out of the 106 communities in Landa de Matamoros. Source: Secretaria de Desarrollo Social (SEDESOL) (2013a). Unidad de microrregiones cedulas de información municipal: Landa de Matamoros: Datos generales*

<sup>4</sup> To qualify for extreme poverty the person must lack three or more of the poverty criteria (mentioned above) and generate a monthly income of less than \$684 pesos (Consejo Nacional de Evaluación de la Política de Desarrollo Social (CONEVAL), 2014).



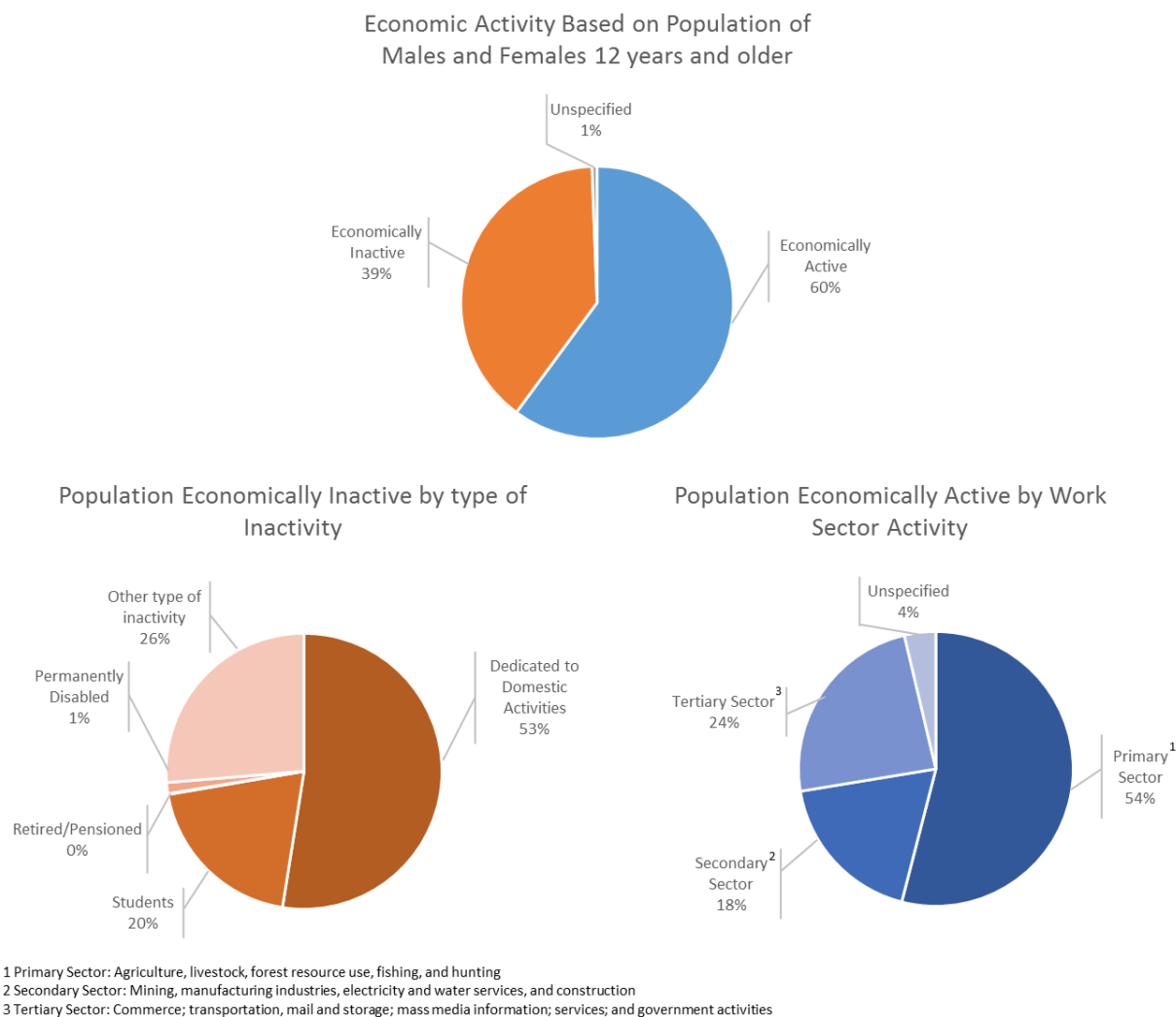
*Figure 5: Location of the municipality of Landa de Matamoros including communities within the county and the city of Landa de Matamoros. Source: QGIS data from CONANP*

Approximately 18% of the municipal population ages 15 years and older are illiterate, 70% have not completed basic education through high school, and 5% of children ages 6-14 do not even attend school (SEDESOL, 2013b). Only 4% of the houses in the municipality have dirt floors, 5% do not have electricity, 13% do not have bathrooms in the house, 25% are not connected to a sewer system, and 40% are not connected to the local water system (SEDESOL, 2013b). When cooking, 64% of houses still use wood and charcoal instead of gas or electric stoves (SEDESOL, 2013b). Based on observation, the majority of houses are made from concrete while a very small portion are made from adobe or mud-type mixtures or

wood. These types of pressures shed some light as to why inhabitants might take advantage of illegally harvesting timber.

Economically, Landa de Matamoros is similar to the other municipalities in the Reserve, with the majority of its money coming from remittances from the United States. Remittances are sent from family members who are working there either legally or illegally. In the year 2015 alone, over 13.6 million USD were transferred from the U.S. to residents of the municipality of Landa de Matamoros (El Banco de Mexico, 2017).

Out of the population living in Landa de Matamoros deemed fit-to-work in 2000, 60% earned an income while the other 40% dedicated themselves to domestic activities, or were either students, retired, incapacitated, or unspecified (Figure 6). Of the 60% who earn an income, more than half earned their living from agriculture, livestock, forest resources, fishing, and/or hunting where the resources were both used at home and sold on the market (Figure 6). As a result, over 20% of the land that should be protected pine-oak forest is used for agriculture and livestock (Instituto Nacional de Estadística y Geografía (INEGI), 2009). Limited income availability and limited or traditional job options can help explain why people continue to take economic advantage of protected land.



*Figure 6: Employment statistics in the municipality of Landa de Matamoros, Querétaro, México, 2000. Source: Graphs based on information from INEGI Cuaderno estadístico municipal: Landa de Matamoros, Querétaro de Arteaga (2002).*

## **Environmental Programs in Landa de Matamoros**

In Landa de Matamoros, environmental programs are offered through the municipal delegation or through state or federal agencies. The delegation offers environmental programs based more on the wants and needs of the people in their region while the federal agencies have pre-determined programs that focus more on the needs of general environmental problems. For example, a delegation sponsored reforestation program might

consist of giving out free fruit trees to make a small scale fruit tree plantation in hopes that the owners of the land could sell the fruit to make a profit, while a federally sponsored reforestation program would consist of payment for planting native trees<sup>5</sup>.

There is one state agency and one federal agency that support environmental programs in Landa de Matamoros. The first is the Secretary of Agriculture Development (SEDEA) which is a branch of state government that supports agriculture, aquaculture, livestock, and forestry programs. They have one program in the municipality which is a Sustainable Natural Resources Program that helps conserve water, soil, and forests through reforestation and erosion prevention techniques (Table 1). The Sustainable Natural Resources Program is a sub-program of Push to Productive Forestry, a program of SEDEA's that aims to help conserve and restore different ecosystems throughout the state and help offset the carbon emissions from deforestation and forest degradation (SEDEA, 2017).

---

<sup>5</sup> Information taken from surveys with *delegados* and employees of the RBSG

*Table 1: Environmental Programs Evaluated in Landa de Matamoros*

| <b>Agency</b>  | <b>Name of the Program</b>                                    | <b>Program Type</b> | <b>Program Goal</b>   |
|----------------|---|---------------------|---|
| <b>SEDEA</b>   | Sustainable Natural Resources Program                         | State               | Conserve water, soil, and forests   |
| <b>CONANP</b>  | Conservation Program for Sustainable Development (PROCOCODES) | Federal             | Promote ecosystem and biodiversity conservation in priority zones   |
| <b>CONANP</b>  | Temporary Employment Program (PET)                            | Federal             | Contribute to the socioeconomic well-being of people living in NPAs that have been affected by adversity  |
| <b>CONANP</b>  | The Maiz Criollo Conservation Program (PROMAC)                | Federal             | Promote the conservation and recovery of a variety of indigenous <i>maiz</i> (corn) breeds and their wild relatives in their natural habitat                                |
| <b>CONAFOR</b> | Payment for Ecosystem Services (PSA)                          | Federal             | Compensate landholders for the cost of sustainable land management practices incurred on their land to promote ecosystem services   |
| <b>CONAFOR</b> | Forest Restoration and Productive Reconversion                | Federal             | Support actions and projects to recover the capacity and natural potential of forest soil and forest cover and the gradual recuperation of environmental goods and services |

*Source: Program manager interviews and respective government websites*

The second agency is the Secretariat of Environment and Natural Resources (SEMARNAT), which is the governmental branch in charge of the environmental management of the country. SEMARNAT uses two of its own agencies to help manage the environmental programs; the National Commission for Natural Protected Areas (CONANP) and the National Forestry Commission (CONAFOR).

As previously mentioned, CONANP currently executes eight subsidiary programs in the Reserve, but only three are implemented in Landa de Matamoros. These programs include the Conservation Program for Sustainable Development (PROCOCODES) which is a program that promotes ecosystem and biodiversity conservation in NPAs, zones of influence to the NPAs, and Prioritized Regions for Conservation (RPCs) (CONANP, 2017b).

Participating in a PROCODES project means that participants apply in the beginning of the year with a project proposal, and if accepted they have until the end of December to complete the project. One specific recent PROCODES project in Landa de Matamoros was to make rock walls in specific areas to stop soil erosion during the rainy season. In the words of one participant the people directly benefitted, “because (the rock walls) lock in the land and the land then gives better *maiz*”. In Landa de Matamoros, PROCODES fulfills a variety of government perceived needs including community training on environmental topics, conservation and restoration projects, research, and supporting environmental brigades (CONANP, 2015).

A second program in the Landa de Matamoros is the Temporary Employment Program (PET). PET was created to contribute to the socioeconomic well-being of people in NPAs who are living in poverty by providing them with paid opportunities through environmental projects or activities that promote conservation, restoration, and sustainable natural resource management (CONANP, 2016b). PET in Landa de Matamoros consists of short-term projects lasting only a few months comprising of forest fire prevention projects, enforcement programs, and the conservation and sustainable harvest of wildlife (CONANP, 2015). The majority of the people interviewed who had participated in the PET program said they were in charge of cleaning the underbrush and making firebreaks to prevent forest fires from spreading.

The Maiz Criollo Conservation Program (PROMAC) promotes the conservation and recovery of a variety of indigenous *maiz* (corn) varieties and their wild relatives in their natural habitat (CONANP, 2016c). Similar to PROCODES, PROMAC participants apply at the beginning of the year and work the whole year in the program. In Landa de Matamoros,

PROMAC reimburses community members for creating seed banks and planting indigenous species of corn (CONANP, 2015). Interviewees stated that duties included planting, harvesting, and storing corn.

CONAFOR also has a very conservation heavy program agenda, but with more of a focus on forestry. The National Forest Program (PRONAFOR) has four components that constitute environmental programs, two of which are implemented in Landa de Matamoros (CONAFOR, 2015). The first is Forest Restoration and Productive Reconversion which includes a five year commitment to reforestation and soil restoration programs for areas that have less than 40% forest coverage. The second component, also a five year commitment, is a payment for environmental services (PSA) program that focuses on carbon sequestration and biodiversity.

### **Data Collection Methods**

Information was gathered to assess satisfaction levels with federal and state government-sponsored environmental programs to ultimately decide whether they would be useful tools for an ecological corridor like the CESMO. A total of 29 interviews were conducted in 10 different communities within the municipality of Landa de Matamoros and one community outside of the county where the headquarters of the government branches in charge of the programs are located. Of the 29 interviews, 18 interviews were taken from a random selection of hundreds of local people in 8 different communities in the municipality of Landa de Matamoros who currently participate in a program or have participated in one within the last five years. Five interviews were conducted with program managers who were in charge of implementing some of the environmental programs and six interviews were conducted



with local leaders including local public officials and the director of the biosphere reserve (Figure 7). The programs that the participants were chosen from included PET, PROCODES, and PROMAC sponsored by CONANP, and the Sustainable Natural Resources Program from SEDEA.

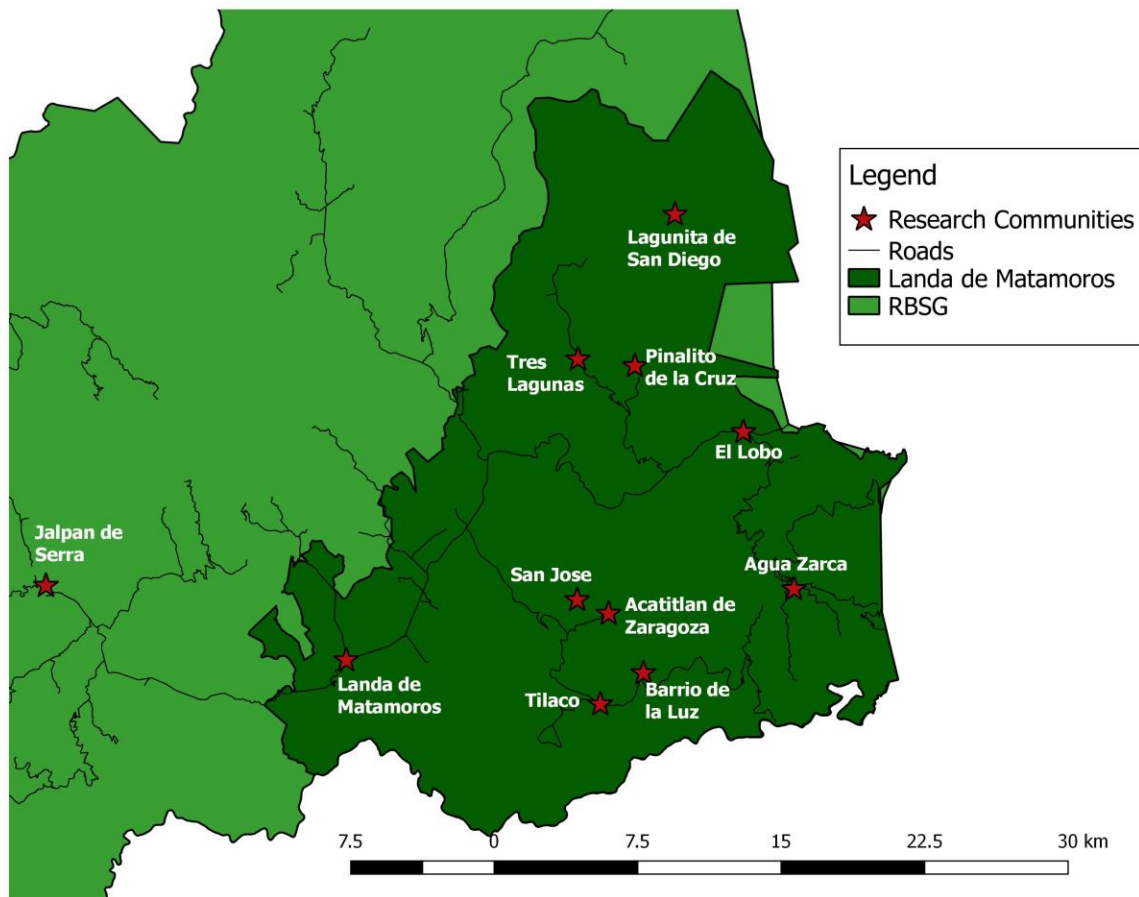


Figure 7: Research communities in the municipality of Landa de Matamoros. Source: QGIS files from CONANP and Google Earth

The 18 participants took part in a short, one page interview, where they answered questions about the goals, benefits, success, and satisfaction levels of the program they participated in (See Appendix B). The style of the survey was to collect both qualitative and quantitative data by using open questions, multiple select questions (choose all that apply), questions with set ranges to choose from, and a Likert scale to rank success and satisfaction.

The interviews with the program managers had similar questions, along with some different background questions about the programs. Interviews with local leaders asked about their perceptions on benefits, strengths, and weaknesses of the environmental programs they had witnessed.



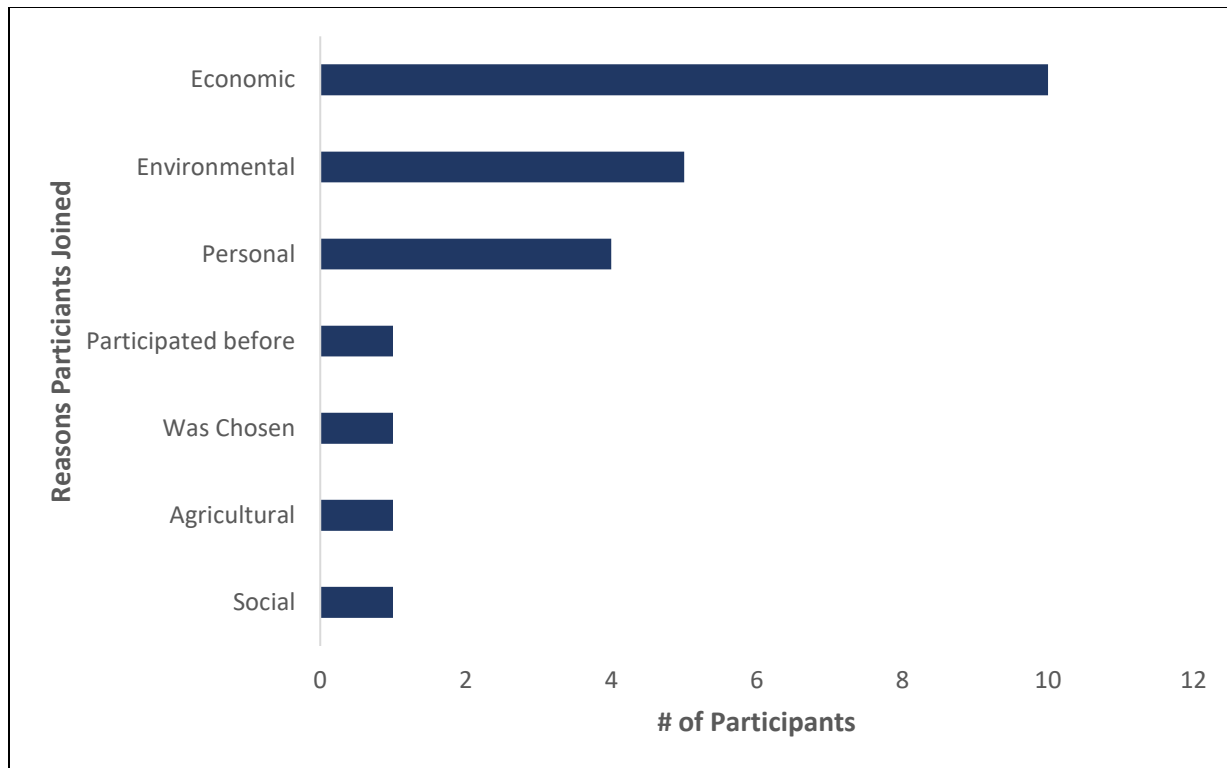
## **Chapter 4- Results and Discussion**

This chapter begins with the results of the interviews with each of the three stakeholder groups: participants, program managers, and local leaders. Next is a discussion about the results including how perceptions of each of the three stakeholder groups intersect and differ. Included in the discussion are lessons learned that inform the thesis' policy recommendations.

Originally, 30 participants were selected at random to be interviewed. Because the lists that the interviewees were selected from contained people who had participated from 2012-2016, some people had passed away or had moved and were not able to be interviewed. However, the most interesting interviews were with people who were on the list of beneficiaries, but did not recall participating in a program. This could have been from old age, lack of education about the program, or that they did not actually participate in the program. Due to the fact that at least one program had a mandatory gender quota of at least half female participants, and the other programs had the same suggested quota, it is possible that female names of family members were written down, but the males actually did the physical labor.

### **Participants' Interview Results**

When asked how each participant became involved with the program, all 18 responded that they had heard about the program from another person, either from a *delegado*, or from person in charge of the program's visit to the community, or a neighbor, a family member. The reason the participants actually decided to participate in the environmental programs were mainly economic, closely followed by environmental reasons (Figure 8).



*Figure 8: Reasons for Participation in Environmental Programs in Landa de Matamoros, Querétaro, Mexico. Source: Local interviews, 2016*

Out of the 10 people that stated they joined because of economic benefits, only two reported earning 25-50% of their annual household income from the programs (Figure 9). Three chose not to specify by stating “Not applicable”, which could mean they declined to answer, or they did not earn any money from the program. Still, in an open-ended question, eight participants out of the 10 who joined for economic benefit, almost half of the total participants, cited “economic benefits” as a specific personal benefit from participating in the program (Figure 10).

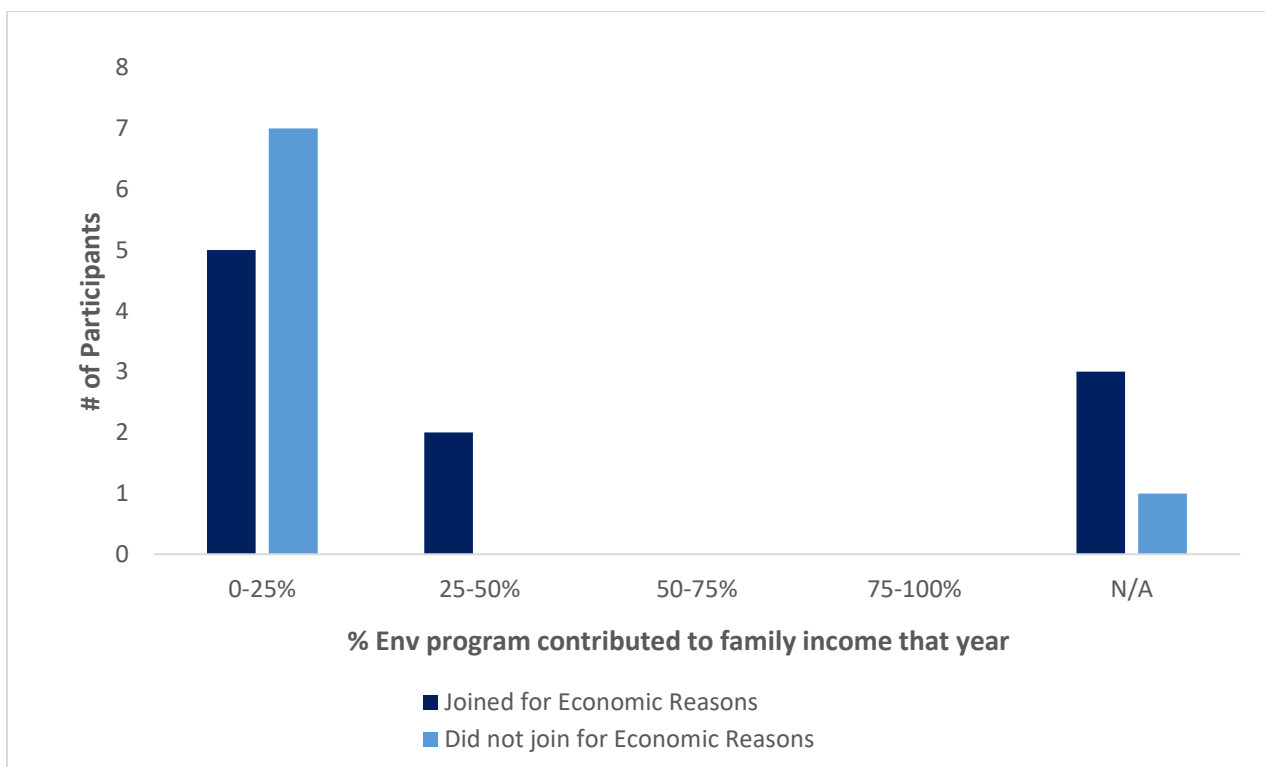


Figure 9: Comparison of participants' response to "How much does this program contribute to your family's annual income?" based on whether or not they joined for economic reasons.

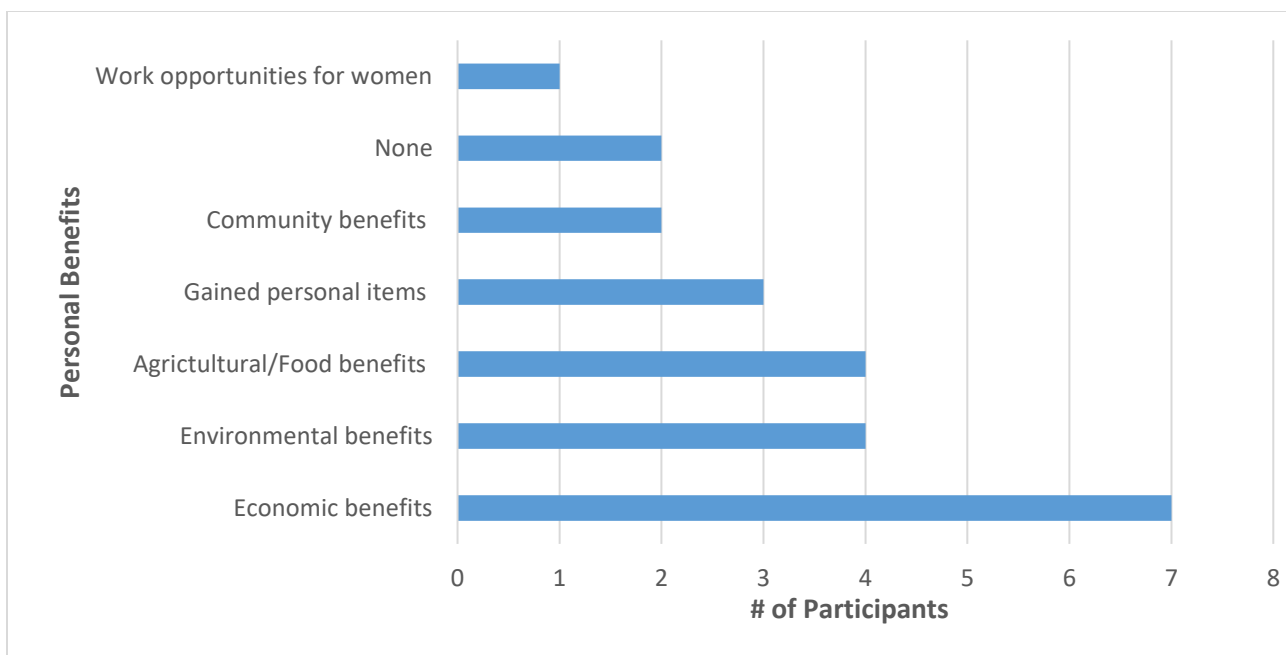
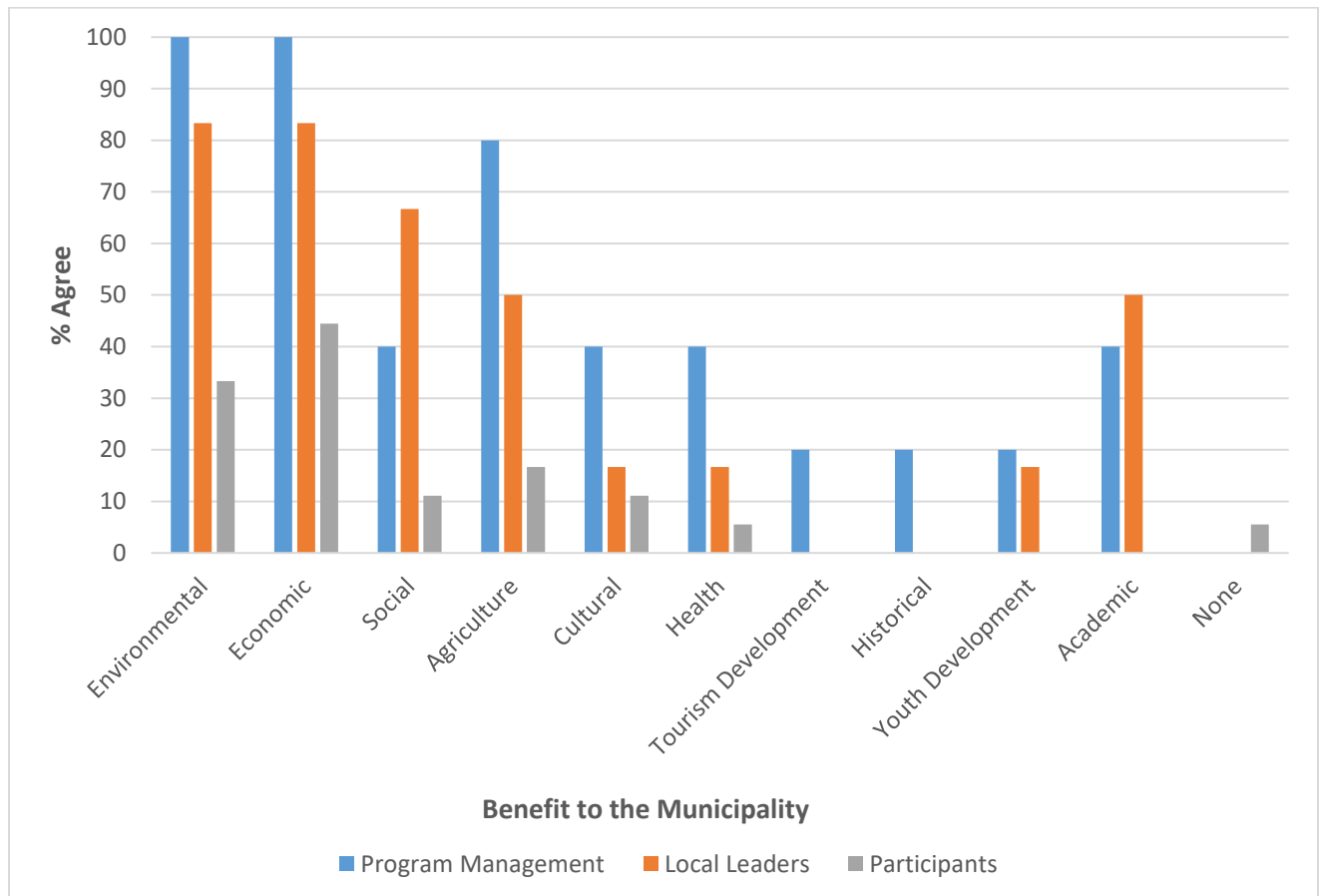


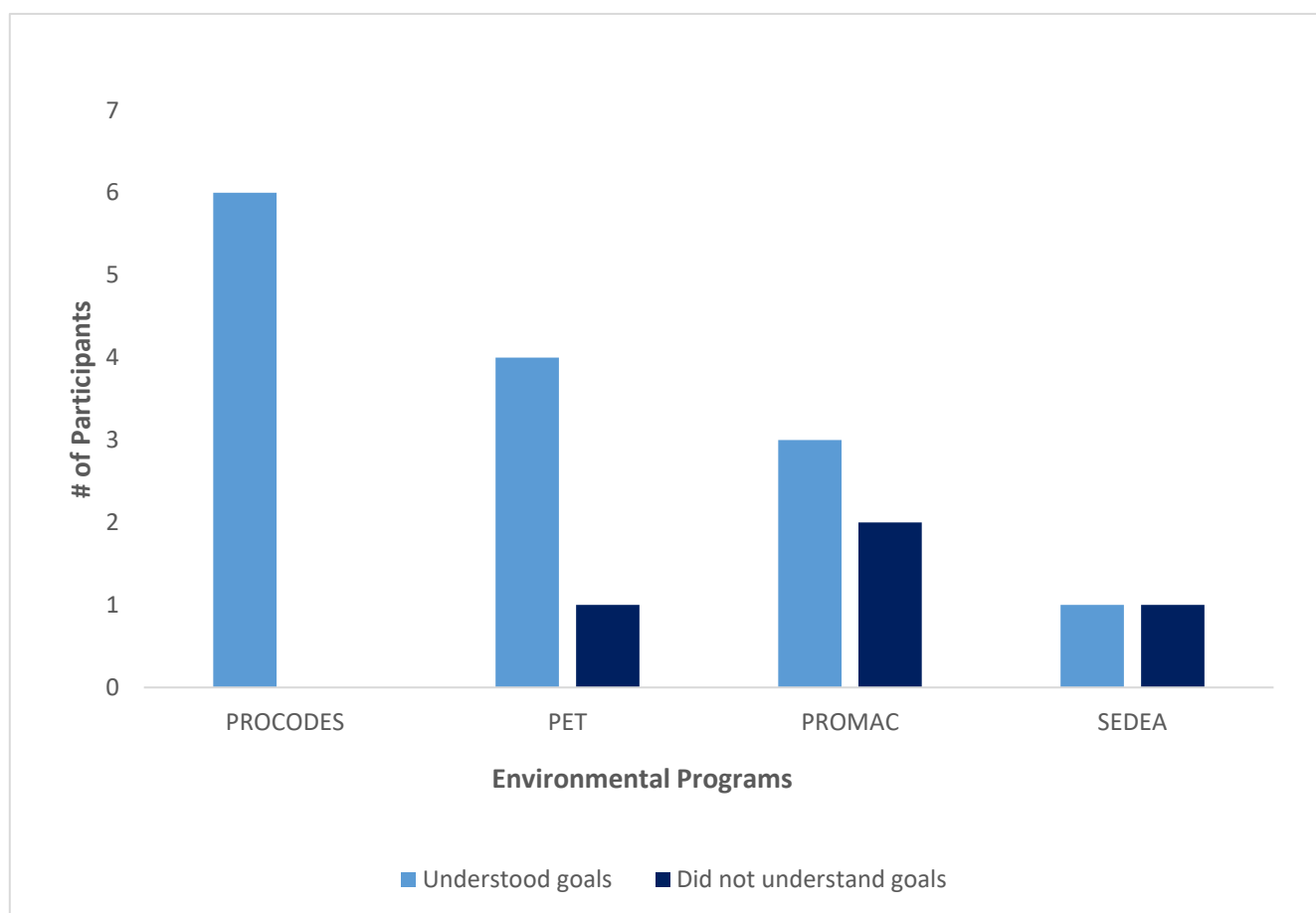
Figure 10: Personal benefits from participating in an environmental program in Landa de Matamoros, Querétaro, Mexico. Source: Local interviews

All three stakeholder groups were asked about the benefits they perceive the municipality receives from these environmental programs (Figure 11). The majority of both program managers and local leaders agree that the municipality receives environmental as well as economic benefits from the programs, while less than half of the participants agreed with those specific benefits (Figure 11). However, when just the responses among participants are examined, their highest categories of benefits to the municipality are still both environmental and economic benefits (Figure 11).



*Figure 11: Perceived benefits to the municipality from local environmental programs in Landa de Matamoros, Querétaro, Mexico.*

The participants were asked to rate the level of success based on the goals of the program. However, not all participants fully understood the goals of the program to begin with (Figure 12). When asked the goals of the specific program, only those from the PROCODES program all answered correctly (Figure 12). Still, only four out of the 18 participants were not clear on the goals of the program (Figure 12). Three stated the activity the program entailed such as making a fire brake, or planting trees, and only one person declined to answer.

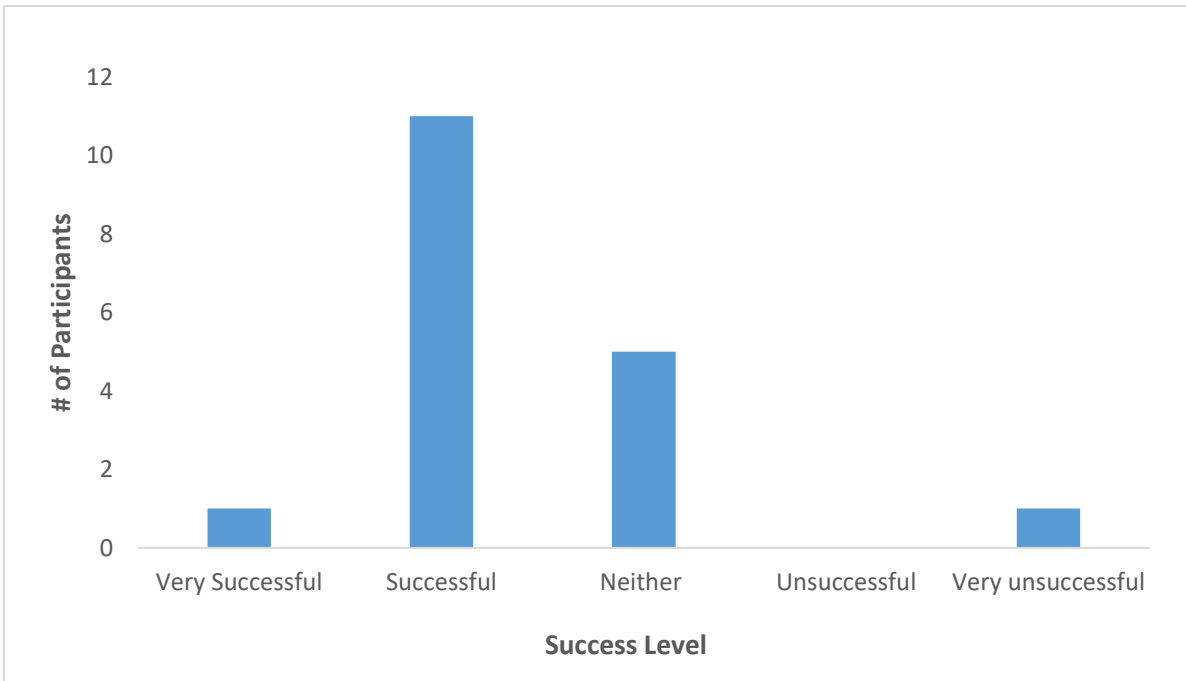


*Figure 12: Number of participants per program who understood the goals of the program in which they participated.*

Perceived levels of success ranged from “very successful” to “very unsuccessful” across the programs (Figure 13). Overall, 67% of the participants viewed the programs as either “very



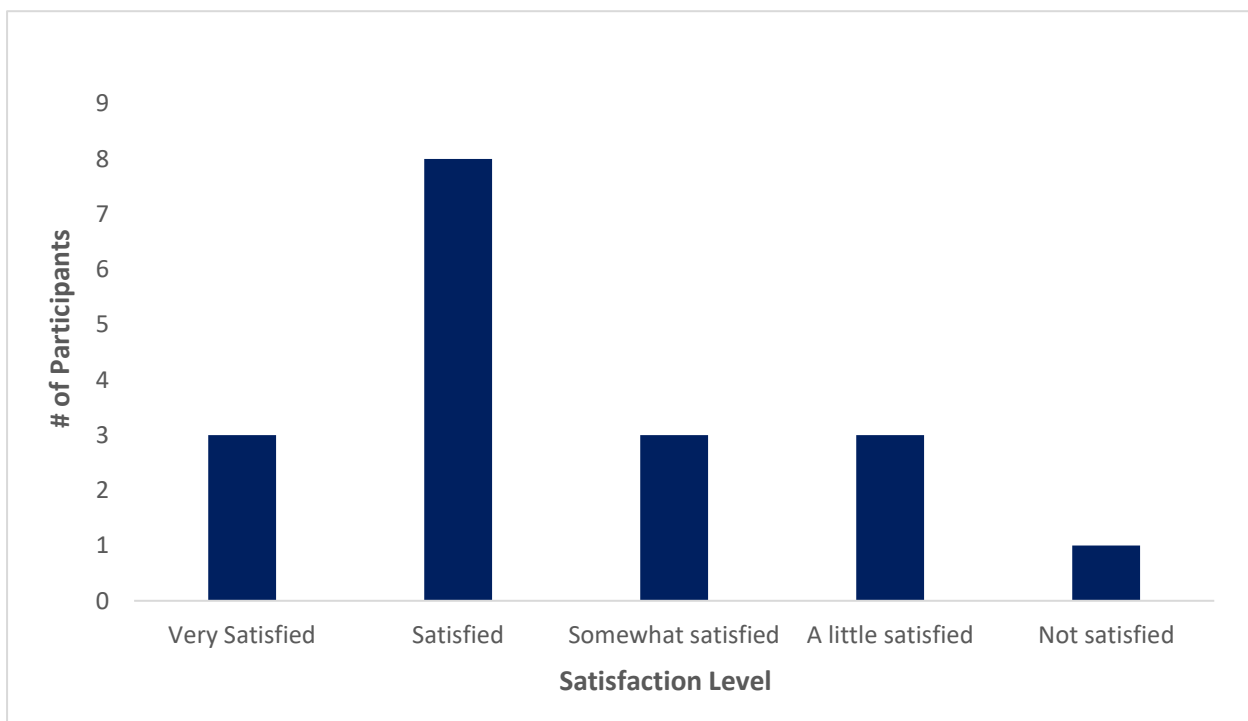
successful” or “successful”. About half of the participants believed the programs were successful because the program met its goals, with statements such as “Everything turned out well”, or “It helped protect the milpa [from fire]”, or just simply, “It worked”. Very few people felt that reason for success was due to improved environment or a specific product or provided job opportunities.



*Figure 13: Participants' perceived level of success for the environmental programs in Landa de Matamoros.*

Approximately 25% of the feedback was negative with some explanations of why some of the programs were not so successful. With the PROCODES program one interviewee noted that “the people were not motivated enough to continue [the project]”. Other reasons included poor planning on the part of a PROMAC program that wanted to plant native corn in a place that did not have a water reserve to water the crops, and a disgruntled participant who spent more money on the program than he received. There were also a few people who said the program could be expanded to cover a larger area and employ more people.

Satisfaction levels ranged from “very satisfied” to “not satisfied” throughout the program (Figure 14). Among the participants, 61% were “satisfied” and “very satisfied” with reasons almost exactly the same as the reasons people thought the programs were successful including many responses of “Everything worked out fine” and “[The program] is very effective”.



*Figure 14: Participants' perceived levels of satisfaction for the environmental programs in Landa de Matamoros.*

Dissatisfaction was due to similar reasons people thought the programs unsuccessful.

Complaints such as the program could have been longer, participants could have received more money, and the program could have been planned better were comments among the less satisfied participants. Others wished that there had been more follow-up with the program such as follow-up visits, activities, or ways to continue the project on their own.

### Program Managers' Interview Results

Five interviews were conducted with three different program managers about the specific program or programs they were in charge of in Landa de Matamoros. Interviews consisted of questions about the length of the program, number of current participants, and about how many of the current participants were reoccurring participants, meaning they participated in the same program in a previous cycle (Table 2). The interviews also contained questions about the goals of the program, how they monitor the program, how they measure success of the program, and whether or not they thought the program was successful and why or why not.

*Table 2: Information on cycle length and participation data from program managers on five of the six programs offered in Landa de Matamoros.*

| <b>Program</b>   | <b>Cycle length</b> | <b># Current participants from the municipality</b> | <b>% Reoccurring participants</b> |
|--|---------------------|---|-----------------------------------|
| <b>Conservation Program for Sustainable Development (PROCOCES)</b> | 1 year              | 64  | 0-25%                             |
| <b>Temporary Employment Program (PET)</b>                          | 1-2 months          | 60  | 25-50%                            |
| <b>The Maiz Criollo Conservation Program (PROMAC)</b>              | 1 year              | 56  | 75-100%                           |
| <b>Payment for Ecosystem Services (PSA)</b>                        | 5 years             | 75  | 50-75%                            |
| <b>Forest Restauration and Productive Reconversion</b>             | 5 years             | 75  | 50-75%                            |

To find out about how many people each program ultimately reaches, there was a question about reoccurring participants (Table 2). The question was “How many of the people currently participating in the program have participated in the same program in a previous?” Programs like PROCOCES try to keep their numbers of reoccurring participants low because

one measure that the program is successful is if they do not have to go back and implement the same project with the same people again.

All five programs have very simplified ways to measure success (Table 3). The CONANP programs, which are the PROCODES, PET, and PROMAC, consider the program a success if the project was completed. The CONAFOR programs, which are the PSA and the Forest Restoration and Productive Reconversion programs, are considered a success if there is a visual difference of forest recovery and if the demand and enthusiasm for the programs among the people is high (Table 3).

*Table 3: Information about the way the programs are monitored and how success is measured.*

| <b>Program</b>   | <b>Monitor Method</b>          | <b>Measure of Success</b>                             | <b>Success Rating</b>               |
|--|--------------------------------|---|-------------------------------------|
| <b>Conservation Program for Sustainable Development (PROCODES)</b> | 3 visits during implementation | Completion of the project                             | Neither successful nor unsuccessful |
| <b>Temporary Employment Program (PET)</b>                          | 3 visits during implementation | Completion of the project                             | Neither successful nor unsuccessful |
| <b>The Maiz Criollo Conservation Program (PROMAC)</b>              | 3 visits during implementation | Completion of the project                             | Neither successful nor unsuccessful |
| <b>Payment for Ecosystem Services (PSA)</b>                        | Hire a tech                    | Visual assessment and level of demand from the people | Successful                          |
| <b>Forest Restoration and Productive Reconversion</b>              | Hire a tech                    | Visual assessment and level of demand from the people | Successful                          |

In three out of the five programs, the program managers stated the programs were “neither successful nor unsuccessful”. The program manager for PET detailed a specific problem that highly affects the effectiveness of the fire brake program. “The program is half as successful as it could be because the fire brakes come at the wrong time; they practically come right after the rainy season. If it continues to rain after they are implemented, bushes and woody

plants grow back and dry out again for the next fire season.” Another opportunity for improvement included the environmental programs could be better linked as there is much repetition among programs. Finally, a few program managers stated that there are too many steps for documentation. They noted that some of the steps were unnecessary and could be left out to make the programs run smoother.

### **Local Leaders’ Interview Results**

Local leaders were asked a set of similar, but broader questions to help gain insight and background from a different point of view. A total of six interviews were conducted with local *delegados* (mayors), the president of the county, the director of the biosphere reserve, and members of the SEDEA and CONANP offices who were not program managers for a program in Landa de Matmamoros.

One of the interview questions asked about how receptive the people have been to these environmental programs. Four of the six local leaders view the people as receptive due to the fact that they get money for participating. The two people who had different opinions mentioned the fact that many people still did not know about the programs, and sometimes the programs were not widely accepted because of a conflict of interest. The example given was of a reforestation program in a place where people only want to cut down the trees once they are mature.

Another set of questions asked about the strengths and weaknesses of the environmental programs. Many different strengths were listed, but the ones that reoccurred the most included an improved environment and economic benefit. One *delegado* sums up these benefits by stating, “There is an economic benefit for the entire family and the forest

gets protected at the same time”. An employee from the CONANP office highlighted the fact that the federal programs are economically reliable in the fact that the government sets aside money for these programs every year. Other strengths included having trained people to help carry out these programs, and having a level of synergy with some institutions.

Two common weaknesses perceived were a lack of environmental education and that the programs were not sufficient to meet the demand of the people. This means that there were more people who wanted to participate in the programs, but no more spaces available. On the contrary, a different interviewee mentioned that there were many opportunities for productive projects that the people did not take advantage of because they did not organize themselves within the community. For example, there was an opportunity to start an edible mushroom greenhouse in the communities of a certain region and needed a minimum of 8 people, but no one took advantage of the program because only 4 people were interested. Another weaknesses that was mentioned was not having a strong evaluation system to see the impacts of the programs. A few interviewees echoed the sentiments of the program managers by mentioning a lack of follow-up on the projects, as well as too much documentation during the process. Finally, one interviewee stated that it is very hard to establish links and relationships with other organizations because of legal reasons. This could include clarity over who gets to use resources, who is responsible if something goes wrong, and keeping track and justifying how every single peso is used.

### **Discussion and Lessons Learned**

In a rural municipality such as Landa de Matamoros, stakeholder perceptions of environmental programs are vital for program longevity. These perceptions can help

determine what existing tools or types of incentives really work to help shift behavior toward a more environmentally sustainable way of life. Ideally, these tools can then be expanded to other municipalities, and eventually throughout the CESMO.

The participants' perception that partaking in these programs leads to economic gain is a driving force for the enrollment and permanence of these programs. Economic benefits were the number one reason that people participated in the program, both in terms of personal benefit gained as well as the highest perceived benefit to the municipality, with environmental benefits falling into second place for each category. The severe rate of poverty in the municipality sheds some light as to why economic interest is higher than environmental interest in environmentally specific programs. This information shows that economic incentives are a very important tool when implementing environmental programs, especially in an impoverished location. This supports the findings by Anderson and Jenkins (2006) that were previously mentioned.

Success and satisfaction levels in the programs among participants were largely positive, with a 67% success rating of "very successful" to "successful" and a 61% satisfaction rating of "very satisfied" to "satisfied". Perceived success and satisfaction were due to the fact that participants felt the programs met their goals and the expectations of the people. The goals, as most agreed, were environmental driven and specific to the program, and the expectations were mainly that they would receive money for their participation (Figure 11; Figure 7).

In contrast, program managers were more critical of the programs than the majority of the participants, exemplified by three out of the five programs marked as "neither successful nor unsuccessful". This is due to several reasons. One reason is that program managers have

a different understanding of how the program should ideally work. While the generic agency success indicator for the programs is whether or not the project was completed (it is a success if the program was completed, and unsuccessful if not), the program managers can see more room for improvement beyond that indicator.

One program manager stated that the program could be more successful if connected with other programs, both environmental and non-environmental. Another program manager mentioned that less red tape would help improve timing of certain programs saying, “There is still too much documentation and micromanaging [from the regional and national offices]. They could reduce some of the steps and it would be better.” A local leader also suggested better internal organization for these agencies to be able to get rid of some unnecessary steps.

Some of the program managers have identified an additional measure of success that should be included in the program evaluation. Ideally if a project is successful, the same people should not ask for the same program repeatedly. If the same people are asking for the same program each year, it means that the program either wasn't completed properly in previous years, or they are dependent on the income of the program. Also, since there are only a limited number of available positions in each program in a given year, it means that the scope of the program is limited and does not cover any new areas. Given data that shows that at least one of the program has 75-100% of the same people participating every year in the same location, this goal seems unattainable in the near future.

The program managers from these federal and state government run agencies also see a lack of monitoring and evaluation in the program cycle that hinders success. For example, the CONANP programs only require three visits for monitoring the program per cycle, whether that be annually or within the span of months, depending on the program. The



federal program structure also requires very little evaluation as to how well the program was executed, limited time to do additional evaluation, and no long-term evaluation.

Despite a strong perception of success among 60-70% of participants, 30-40% were not very impressed with the programs either. One complaint was that they did not get paid enough, which was from people who either spent more on the program than they received (i.e. travel costs, banking costs, etc) or who believed that the payment from the program should be higher to compensate for the amount of work they do. Some believed the programs were poorly planned, such as implementing the PROMAC program in a place that had water problems, or once a year fire prevention programs that happened during the rainy season.

While many local leaders identified some of the same problems as participants and program managers, they also perceived different challenges to the programs. One *delegado* mentioned that the programs could be expanded to cover more of the municipality. Others mentioned that a lack of environmental education in the community threatens the longevity, sustainability, and overall success of the environmental programs. One of the biggest challenges cited, however, was having the program ideas come from CONANP and not come from the community.

One example of why the top down approach is a challenge is because even when programs are offered, they are not always the programs best geared toward the area. For example, a reforestation program might be offered in a place where, due to economic hardship, the people just want to harvest the trees for timber once they are mature. As a result of the lack of evaluation and environmental education, both parties would call the project a success, even though it technically wouldn't be considered a success in the long-term. This

is because a reforestation program is usually implemented with the plan that the trees will grow until they die of old age, leaving many years as a mature tree to provide the ecological processes it was intended to, such as carbon capture and storage, soil retention, and oxygen supply. This could also explain the lack of motivation one participant noted during the interview.

The general consensus is that the local people appreciate the short-term economic opportunities offered by these programs, take advantage of them when they know they exist, and eagerly request more opportunities. However, all parties involved see how flawed the programs can be. These flaws can majorly hinder the long-term goals of the programs, and possibly void them completely in some cases. The next chapter deals with the policy recommendations to improve the environmental programs as related to the additional challenges of the CESMO.



## **Chapter 5- Policy Recommendations**

Insight from the interviews shows that while many people perceive the environmental programs in Landa de Matamoros as successful, there is still much room for improvement.

All three stakeholder groups identified problems with the programs, many of which overlapped. This chapter first examines what can be done at the level of the RSBG and then how these tools and recommendations scale up to the larger CESMO.

### **Sierra Gorda Biosphere Reserve (RSBG)**

#### *Longer Program Cycles*

The first policy recommendation is to make the cycles of the environmental programs longer. Four out of the six programs have a cycle that lasts for a year or less. A longer cycle of two years, or even up to five years like CONAFOR's Payment for Ecosystem Services program and Reforestation and Restoration program, could help a few of the problems mentioned by all three groups of stakeholders. It could help fix the poor planning problems that were mentioned by both the participants and the program managers. An extension would also allow time for the program managers to follow up on projects with more environmental education activities, more troubleshooting, and more monitoring and evaluating.

Many of these problems could have been identified and fixed already if the programs had a better system of evaluation. As noted earlier, agency mandated evaluation for both the state and federal agencies interviewed consists of assessing whether or not the project was completed and a very output oriented data collection focus. Outputs describe the action completed such as numbers of trees planted, number of wood-saving stoves made, or number of hectares of indigenous corn planted; information that can often be gathered the day the

project is complete (Stem, Margoluis, Salafsky, & Brown, 2005). However, this ignores the larger question of whether or not change actually occurred. What was the outcome? Yes, 10 wood-saving stoves were installed in a community, but do the people actually use them? Yes, 1,000 trees were planted, but did they survive? Did people learn to curb their deforestation tendencies?

Outcomes are just as important for the longevity of a project (Stem, et. al, 2005). If the goal of a program is to “promote ecosystem and biodiversity conservation in priority zones”, it is hard to tell if the goal is being met when there is no data that people’s actions, attitudes and perceptions about conservation have changed. Since the ultimate goal of many of these environmental programs is to change behavior, outcomes need to be measured.

Tools like a pre and post- test, or a reflection about what participants learned should be required in every program structure. There are even tools that exist to do this type of evaluation with a mixed-literacy audience. These are just a few ways to quantifiably measure outcomes for the short, medium, and long-term of a project. This is the kind of data that will show whether or not behaviors, attitudes, or perceptions are being changed (Stem, et. al, 2005).

### *Improve program flexibility*

Even though Mexico has a decentralized framework, the environmental or agricultural agency programs tend to be top-down, often inflexible, and are usually follow a blue print model. This hampers the ability of local agency staff to tailor the program to fit local conditions and needs. One reason for this is that the programs are implemented by state and federal agencies, meaning they are designed to span the entire state, or even the entire country, which cover a wide range of ecosystems, biodiversity, cultures, geography, etc. For

example, program managers in regional CONANP offices, like the one in the RBSG, are able to select program options from an existing set of roughly 100 programs that are meant to cover the entire country. This allows the local CONANP office to choose the ten or so programs that will work best in their area. However, because the programs have to be implemented in the same way throughout the country whether it's in an agriculture heavy zone, or an indigenous zone, they are not as effective as they could be.

One recommendation that emanates from the research is to enable local managers to tailor programs to each individual community. For instance, a reforestation program that consists of planting only native trees could also enable some portion of the reforested land to be planted with fruit trees. This approach would generate income as well as address environmental concerns. Income generation was a strong motivation from the surveys for people to participate. Program flexibility could work in conjunction with a longer program cycle to correct mistakes such as implementing a fire-prevention program during the rainy season rather than later in the year to coincide with the dry season, when the risk of forest fires is highest.

Program flexibility would require a system of agency de-concentration to give local program managers who actually know their constituents more power. This would require an institutional reform that is outside of this thesis. Yet there should be a process in place for the program managers to request program adaptation. If the program managers themselves had the power to alter the programs, then they could incorporate information from participant evaluations into optimizing the programs.

### **Ecological Corridor of the Sierra Madre Oriental (CESMO)**

To imagine scaling up these types of programs to the level of the CESMO means first identifying the specific goals of the corridor. The CESMO aims to promote regional development in part of the Sierra Madre Oriental by means of conservation and sustainable natural resource use and management (CESMO, 2017). The corridor intends to stimulate not only ecological connectivity throughout the region, but also economic and institutional connection through actions that will benefit the inhabitants through an all-inclusive, respectful, and participative process (CESMO, 2017). There are two main ways in which the corridor plans to achieve these goals. The first is to successfully implement a handful of “demonstrative experiences of ecological, economic, and institutional connectivity” designed by GIZ that can be replicated in other locations across the CESMO and on any public policy scale (CESMO, 2017). The second, and previously mentioned, is to extend pre-existing NPA environmental programs to areas outside of the NPAs.

The information from interviews with stakeholders in Landa de Matamoros sheds some light as to why using the existing NPA programs might not be the best framework for an ecological corridor to follow. As previously mentioned, the programs as they stand now are successful to a degree, but could be drastically improved. If the CESMO did want to follow this path, they should have first done assessments in each state on the environmental programs they wanted to support, received feedback from all stakeholders involved, picked the top 5 programs for each state, and focused on improving them first. Then they could have worked on introducing their “demonstrative experiences” in the CESMO as alternative or additional options. When thoroughly examined against current literature, the classic

model of an ecological corridor seems outdated, and therefore might not be the most successful way for the CESMO to reach its goals.

One policy recommendation is that the CESMO should focus on more bottom-up approaches. Since the CESMO covers a lot of multi-use territory including agriculture, mining, and conservation land, and a wide array of stakeholders, the landscape approach should be considered as an alternative. The landscape approach to land management directly involves communities in the decision making processes and maps out clear principles to increase the chance of success. It could mitigate many of the problems brought up in the interviews such as the poor planning of certain projects, lack of motivation and interest among participants, and conflicts of interest. Up-to-date biological and economic models could be used to determine the most effective way to conserve while minimizing economic loss.





## Bibliography

- 1) Alcamo, J., Ash, N.J., Butler, C.D., Callicot, J.D., Capistrano, D., Carpenter, S.R., ... Zurek, M.B. (2003). *Millennium ecosystem Assessment: Ecosystems and human wellbeing; A framework for assessment*. Retrieved from: [http://pdf.wri.org/ecosystems\\_human\\_wellbeing.pdf](http://pdf.wri.org/ecosystems_human_wellbeing.pdf)
- 2) Anderson, A.B., & Jenkins, C.N. (2006). *Applying nature's design: Corridors as a strategy for biodiversity conservation*. Columbia University Press.
- 3) Baena, M.L., & Halfpter, G. (2008). Extinción de especies. *Capital natural de México, vol. I: Conocimiento actual de la biodiversidad*. CONABIO, México, pp. 263-282.
- 4) Batisse, M. (1997). Biosphere reserves: A challenge for biodiversity conservation & regional development. *Environment: Science and Policy for Sustainable Development*, 39 (5). Retrieved from: <http://dx.doi.org.ezprox.bard.edu/10.1080/00139159709603644>
- 5)
- 6) Bennett, A.F., (2003). *Linkages in the landscape: The role of corridors and connectivity in wildlife conservation*. Margate, UK: Thanet Press Ltd.
- 7) Bonaiuto, M., Carrus, G., Martorella, H., & Bonnes, M. (2002). Local identity processes and environmental attitudes in land use changes: The case of natural protected areas *Journal of Economic Psychology*, 23. DOI: 10.1016/S0167-4870(02)00121-6
- 8) Brooks, T.M., Wright, S.J., & Sheil, D. (2009). Evaluating the success of conservation actions in safeguarding tropical forest biodiversity. *Conservation Biology*, 23 (6). Retrieved from: [http://stri.si.edu/sites/publications/PDFs/STRI-W\\_Wright\\_2009\\_ConsBiol\\_Brooksetal.pdf](http://stri.si.edu/sites/publications/PDFs/STRI-W_Wright_2009_ConsBiol_Brooksetal.pdf)
- 9) Cardinale, B.J., Duffy, J.E., Gonzalez, A., Hooper, D.U., Perrings, C., Venail, P.,... Naeem, S. (2012). Biodiversity loss and its impact on humanity. *Nature*, 486. doi: 10.1038/nature11148
- 10) Chetkiewiez, C.B., St. Clair, C.C., & Boyce, M.S. (2006). Corridors for conservation: Integrating pattern and process. *Annual Review of Ecology, Evolution, and Systematics*, 37. Retrieved from: <http://www.jstor.org/stable/30033835>
- 11) Corredor Ecológico Sierra Madre Oriental (CESMO) (2017). *¿Qué es el CESMO?* Retrieved from: <http://www.cesmo.mx/que-es-el-cesmo.html>
- 12) Comisión Nacional de Áreas Naturales Protegidas (CONANP) (2015). *Programas de subsidio*. Retrieved from: <http://www.gob.mx/conanp/acciones-y-programas/programas-de-subsidio>
- 13) Comisión Nacional de Áreas Naturales Protegidas (CONANP) (2016a). *¿Qué hacemos?*

Retrieved from: <http://www.gob.mx/conanp/que-hacemos>

- 14) Comisión Nacional de Áreas Naturales Protegidas (CONANP) (2016b). *Programa de empleo temporal (PET)*. Retrieved from: <https://www.gob.mx/conanp/acciones-y-programas/programa-de-empleo-temporal-pet>
- 15) Comisión Nacional de Áreas Naturales Protegidas (CONANP) (2016c). *Programa de conservación de maíz criollo (PROMAC)*. Retrieved from: <http://www.gob.mx/conanp/acciones-y-programas/maiz-criollo>
- 16) Comisión Nacional de Áreas Naturales Protegidas (CONANP) (2017a). *Reserva de la Biosfera Sierra Gorda de Querétaro*. Retrieved from: <http://sierragorda.conanp.gob.mx/index.php>
- 17) Comisión Nacional de Áreas Naturales Protegidas (CONANP) (2017b). *Programa de conservación para el desarrollo sostenible (PROCOCODES)*. Retrieved from: <http://www.gob.mx/conanp/acciones-y-programas/programa-de-conservacion-para-el-desarrollo-sostenible-procodes-57997>
- 18) Consejo Nacional de Evaluación de la Política de Desarrollo Social (CONEVAL) (2014). *Metodología para la medición multidimensional de la pobreza en México*. Retrieved from: [http://www.coneval.org.mx/Informes/Coordinacion/Publicaciones%20oficiales/MEDICION\\_MULTIDIMENSIONAL\\_SEGUNDA\\_EDICION.pdf](http://www.coneval.org.mx/Informes/Coordinacion/Publicaciones%20oficiales/MEDICION_MULTIDIMENSIONAL_SEGUNDA_EDICION.pdf)
- 19) Comisión Nacional Forestal (CONAFOR) (2015). *Regla de operaciones*. Retrieved from: [http://www.conafor.gob.mx/apoyos/index.php/inicio/app\\_apoyos#/detalle/2015/51](http://www.conafor.gob.mx/apoyos/index.php/inicio/app_apoyos#/detalle/2015/51)
- 20) Conservation International (2016). *Hotspots*. Retrieved from: <http://www.conservation.org/How/Pages/Hotspots.aspx>
- 21) Convention on Biological Diversity (2016). *Protected areas and the CBD*. Retrieved from: <https://www.cbd.int/protected/pacbd/>
- 22) Crawhall, N. (2015). Social and economic influences shaping protected areas. In *Protected area governance and management* (chapter 5). Retrieved from: <http://www.jstor.org/stable/j.ctt1657v5d.12>
- 23) Daugherty, H.E. (2005). Biodiversity conservation and rural sustainability: a case study of the Alexander Skutch Biological Corridor in southern Costa Rica. *WIT Transactions on Ecology and the Environment*, 81. Retrieved from: <http://www.witpress.com/Secure/elibrary/papers/ECO05/ECO05017FU.pdf>
- 24) Díaz, S., Fargione, J., Chapin, F.S. III, & Tilman, D. (2006). Biodiversity loss threatens human well-being. *PLoS Biology* 4(8). doi:10.1371/journal.pbio.0040277

- 25) Eagles, P.F.J., McCool, S.F., & Haynes, C.D. (2002). *Sustainable tourism in protected areas: Guidelines for planning and management*. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/PAG-008.pdf>
- 26) El Banco de México (2017). *Sistema de información económica: Ingresos por remesas, distribución por municipio*. Retrieved from: <http://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadro&idCuadro=CE166&locale=es>
- 27) Fahrig, L., & Merriam, G. (1994). Conservation of fragmented populations. *Conservation Biology*, 8(1). Retrieved from: <http://www.jstor.org/stable/2386720>
- 28) Figueroa, F. & Sanchez-Cordero, V. (2008). Effectiveness of natural protected areas to prevent land use and land cover change in Mexico. *Biodiversity Conservation*, 17. DOI 10.1007/s10531-008-9423-3
- 29) Food and Agricultural Organization of the United Nations (FAO) (2015). *Evaluación de los recursos forestales mundiales 2015: Informe nacional México*. Retrieved from: <http://www.fao.org/3/a-az275s.pdf>
- 30) García-Amado, L.R., Pérez, M.R., & García, S.B. (2013). Motivation for conservation: Assessing integrated conservation and development projects and payments for environmental services in La Sepultura Biosphere Reserve, Chiapas, Mexico. *Ecological Economics*, 89. Retrieved from: <http://dx.doi.org/10.1016/j.ecolecon.2013.02.002>
- 31) Havard, L., Brigand, L., Cariño, M. (2015). Stakeholder participation in decision-making processes for marine and coastal protected areas: Case studies of the south-western Gulf of California, Mexico. *Ocean and Coastal Management*, 116. Retrieved from: [http://ac.els-cdn.com.ezprox.bard.edu/S0964569115001702/1-s2.0-S0964569115001702-main.pdf?\\_tid=58352eda-1647-11e7-b241-00000aab0f6b&acdnat=1490988313\\_f382b69c804dcb0088b2a5c384d331f2](http://ac.els-cdn.com.ezprox.bard.edu/S0964569115001702/1-s2.0-S0964569115001702-main.pdf?_tid=58352eda-1647-11e7-b241-00000aab0f6b&acdnat=1490988313_f382b69c804dcb0088b2a5c384d331f2)
- 32) Hilty, J.A., Lidicker Jr, W.Z., & Merenlender, A.M. (2006). *Corridor ecology: The science and practice of linking landscapes for biodiversity conservation*. Washington, DC: Island Press.
- 33) Instituto Nacional de Estadística y Geografía (INEGI) (2002). *Cuaderno estadístico municipal: Landa de Matamoros, Querétaro de Arteaga*. Retrieved from: <http://www.inegi.org.mx/est/contenidos/espanol/sistemas/cem02/estatal/qro/m010/index.htm>
- 34) Instituto Nacional de Estadística y Geografía (INEGI) (2009). *Prontuario de información geográfica municipal de los Estados Unidos Mexicanos*. Retrieved from: <http://www3.inegi.org.mx/sistemas/mexicocifras/datos-geograficos/22/22010.pdf>

- 35) International Union for Conservation of Nature (IUCN) (2010). *Why is biodiversity in crisis?* Retrieved from: <http://www.iucnredlist.org/news/biodiversity-crisis>
- 36) International Union for Conservation of Nature (IUCN) (2017). *Protected areas categories*. Retrieved from: <https://www.iucn.org/theme/protected-areas/about/protected-areas-categories>
- 37) Lele, S., Wilshousen, P., Brockington, D., Seidler, R., & Bawa, K. (2010). Beyond exclusion: alternative approaches to biodiversity conservation in the tropics. *Current Opinion in Environmental Sustainability*, 2. doi 10.1016/j.cosust.2010.03.006
- 38) MacArthur, R. H., & Wilson, E.O. (1967). *The theory of island biogeography*. Princeton, NJ: Princeton University Press.
- 39) Mani-Peres, C., Xavier, L.Y., Santos, C.R., & Turra, A. (2016). Stakeholders perceptions of local environmental changes as a tool for impact assessment in coastal zones. *Oceans & Coastal Management*, 119. DOI: <http://dx.doi.org/10.1016/j.ocecoaman.2015.10.005>
- 40) Méndez-Contreras, J., Dickinson, F., & Castillo-Burguete, T. (2008). Community member viewpoints on the Ría Celestún Biosphere Reserve, Yucatan, Mexico: Suggestions for improving the community/natural protected area relationship. *Human Ecology*, 36. Retrieved from: <http://www.jstor.org/stable/27654259>
- 41) Morse, W. C., Schedlbauer, J. L., Sesnie, S. E., Finegan, B., Harvey, C. A., Hollenhorst, S. J. ... Wulfhorst, J. D. (2009) Consequences of environmental service payments for forest retention and recruitment in a Costa Rican biological corridor. *Ecology and Society* 14(1). Retrieved from: [https://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/3061/http\\_\\_\\_www.ecologyandsociety.org\\_vol14\\_iss1\\_art23\\_.pdf?sequence=1&isAllowed=y](https://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/3061/http___www.ecologyandsociety.org_vol14_iss1_art23_.pdf?sequence=1&isAllowed=y)
- 42) Nagendra, H. (2008). Do parks work? Impact of protected areas on land cover clearing. *Ambio*, 37. DOI: <http://dx.doi.org/10.1579/06-R-184.1>
- 43) Naughton-Treves, L., Holland, M.B., & Brandon, K. (2005). The role of protected areas in conserving biodiversity and sustaining local livelihoods. *Annual Review of Environment & Resources*, 30. Retrieved from: <http://web.b.ebscohost.com.ezprox.bard.edu/ehost/pdfviewer/pdfviewer?vid=3&sid=a062a5c9-19e2-4b10-ad8f-07511751fb7e%40sessionmgr1>
- 44) Pérez-Campuzano, E., Avila-Foucat, V.S., & Perevochtchikova, M. (2016). Environmental policies in the peri-urban area of Mexico City: The perceived effects of three environmental programs. *Cities*, 50. Retrieved from: <http://www.sciencedirect.com/science/article/pii/S0264275115001249>

- 45) Perramond, E.P. (2008). The rise, fall, and reconfiguration of the Mexican ejido. *Geographical Review*, 98 (3). Retrieved from: <http://www.jstor.org/stable/40377336>
- 46) Polasky, S., Nelson, E., Lonsdorf, E., Fackler, P., & Starfield, A. (2005). Conserving species in a working landscape: Land use with biological and economic objectives. *Ecological Applications*, 15 (4). Retrieved from: <https://nctc.fws.gov/courses/alc/alc3149/resources/Articles/Polansky%20et%20al%202005.pdf>
- 47) Protected Planet (2017). Search results for “Mexico”. Retrieved from: <https://protectedplanet.net/search?q=mexico>
- 48) Reed, M.S. (2008). Stakeholder participation for environmental management. *Biological Conservation*, 141. DOI: 10.1016/j.biocon.2008.07.014
- 49) Robson, J.P., & Berkes, F. (2010). Sacred nature and community conserved areas. In *Nature and culture: Rebuilding lost connections* (Chapter 8). Retrieved from: [http://www.era-mx.org/biblio/Robson-Berkes\\_2010.pdf](http://www.era-mx.org/biblio/Robson-Berkes_2010.pdf)
- 50) Rodrigues, A.S.L. (2006). Are global conservation efforts successful? *Science*, 313. Retrieved from: <http://www.jstor.org.ezprox.bard.edu/stable/pdf/3847061.pdf>
- 51) Rosenberg, D.K., Noon, B.R., & Meslow, E.C. (1997). Biological corridors: Form, function and efficacy. *Bioscience* 47. Retrieved from: <http://links.jstor.org/sici?sici=0006-3568%28199711%2947%3A10%3C677%3ABCFFAE%3E2.0.CO%3B2-0>
- 52) Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J.L., Sheil, D., Meijaard, E., ... Buck, L. E. (2013). Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 110, 8349–8356. doi: 10.1073/pnas.1210595110
- 53) Secretaria de Desarrollo Agropecuario (SEDEA) (2017). *Impulso a la productividad forestal*. Retrieved from: <http://sedea.Querétaro.gob.mx/impulso-forestal>
- 54) Secretaria de Desarrollo Social (SEDESOL) (2013a). *Unidad de microrregiones cédulas de información municipal: Landa de Matamoros: Datos generales*. Retrieved from: <http://www.microrregiones.gob.mx/zap/datGenerales.aspx?entra=zap&ent=22&mun=010>
- 55) Secretaria de Desarrollo Social (SEDESOL) (2013b). *Unidad de microrregiones cédulas de información municipal: Landa de Matamoros: Pobreza y rezago*. Retrieved from: <http://www.microrregiones.gob.mx/zap/rezago.aspx?entra=zap&ent=22&mun=010>
- 56) Simberloff, D., Farr, J.A., Cox, J., Mehlman, D.W. (1992). Movement corridors: Conservation bargains or poor investments? *Conservation Biology* 6. Retrieved from:

<http://www.jstor.org/stable/2386359>

- 57) Stem, C., Margoluis, R., Salafsky, N., & Brown, M. (2005). Monitoring and evaluation in conservation: A review of trends and approaches. *Conservation Biology*, 19 (2). Retrieved from: <http://www.fosonline.org/wordpress/wp-content/uploads/2010/06/Stem-et-al.2005MEinConservation-ReviewTrendsApproaches.pdf>
- 58) Stoll-Kleemann, S. & Welp, M. (2008). Participatory and integrated management of biosphere reserves: Lessons from case studies and a global survey. *GAIA- Ecological Perspectives for Science and Society*, 17 (1). Retrieved from: <http://www.ingentaconnect.com/content/oekom/gaia/2008/00000017/a00101s1/art00014>
- 59) Troncoso, K., Castillo, A., Merino, L., Lazos, E., & Masera, O.R., (2011). Understanding an improved cookstove program in rural Mexico: An analysis from the implementers' perspective. *Energy Policy*, 39. Retrieved from: <http://www.sciencedirect.com/science/article/pii/S0301421511003533>
- 60) UNEP-WCMC (2016). Global databases to support ICCAs: A manual for Indigenous Peoples and Local Communities 1.0. UNEP-WCMC: Cambridge, UK.
- 61) United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2017a). *Main characteristics of biosphere reserves*. Retrieved from: <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/main-characteristics/>
- 62) United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2017b). *Man and the Biosphere Programme*. Retrieved from: <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/man-and-biosphere-programme/>
- 63) United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2017c). *World Heritage List*. Retrieved from: [http://whc.unesco.org/en/list/?search=strict+nature+reserve&searchSites=&search\\_by\\_country=&region=&search\\_yearinscribed=&themes=&criteria\\_restriction=&type=&media=&order=country&description=](http://whc.unesco.org/en/list/?search=strict+nature+reserve&searchSites=&search_by_country=&region=&search_yearinscribed=&themes=&criteria_restriction=&type=&media=&order=country&description=)
- 64) West, S., Cairns, R., Schultz, L. (2016). What constitutes a successful biodiversity corridor? A Q study in the Cape Floristic Region, South Africa. *Biological Conservation*, 198. Retrieved from: <http://www.sciencedirect.com/science/article/pii/S0006320716301562>
- 65) Whyte, A.V. T. (1977). Guidelines for Field Studies in Environmental Perception. Retrieved from: <http://unesdoc.unesco.org/images/0002/000247/024707eo.pdf>
- 66) World Wildlife Fund (WWF) (2016). *Southern North America: Eastern Mexico into southwestern United States*. Retrieved from: <http://www.worldwildlife.org/ecoregions/na0303>

- 67) Young, E. (1999). Local people and conservation in Mexico's El Vizcaino Biosphere Reserve. *Geographical Review*, 89 (3). Retrieved from:  
<http://www.jstor.org/stable/216156>





## Appendix A: Project Report for Biodiversity Conservation in the CESMO



**giz**

### **Informe de proyecto Conservación de la Biodiversidad en el Corredor Ecológico Sierra Madre Oriental (COBIO)**

Junio 2015

Contraparte principal: Comisión Nacional de Áreas Protegidas  
Duración: 5 años (2012-2016)  
Ambito de intervención: porción centro sur de Sierra Madre Oriental  
Recursos disponibles en asistencia técnica: 7 millones de euros

#### **Descripción breve del proyecto**

Las principales amenazas a la diversidad biológica en México incluyen el cambio de uso de suelo de áreas forestales y humedales a usos agropecuarios, urbanos e industriales, la tala ilegal, la sobre explotación de especies, el impacto ecológico de especies invasoras, el cambio climático, la falta de acceso a alternativas sustentables de producción, entre otros. La biodiversidad en la Sierra Madre Oriental (SMO), fuente de importante servicios eco sistémicos como servicios hídricos, se encuentra ya reducida y además amenazada por las áreas de protección fragmentadas, escaso entrelazamiento y la insuficiente cooperación entre los actores responsables.

Para las instituciones y la población local faltan conceptos e instrumentos para afrontar los problemas anteriormente mencionados. La legislación vigente y los programas de fomento para la protección de la biodiversidad no son suficientemente aprovechados y articulados con el resto de programas sectoriales (causa principal del problema). En consecuencia los actores claves en las áreas protegidas y sus zonas de influencia no son capaces de desarrollar y poner en práctica estrategias sostenidas y estables para la protección de la biodiversidad y el uso sostenible de los recursos naturales de la SMO (problema central). La progresiva degradación de la biodiversidad y la reducción de los recursos naturales disminuirán las bases de la subsistencia humana (consecuencia negativa del problema central).

El objetivo principal del proyecto es apoyar la conservación de la biodiversidad en la SMO, especialmente en las áreas naturales protegidas (ANP), voluntarias, municipales, estatales y federales y aquellas áreas que aseguran la conectividad entre estas ANP a través de la articulación e implementación de medidas e instrumentos eficientes.

Como grupo meta se ha identificado la población rural de la SMO (alrededor de 720.000 personas). Indirectamente también se beneficiará de la protección y conservación de la biodiversidad, la población de las aglomeraciones urbanas y de las áreas agropecuarias de alta productividad, por ejemplo con servicios ambientales sostenibles (fuentes de agua potable, prevención de inundaciones, formación de suelos, control del clima, espacios de recreación y esparcimiento, entre otros).

Con la participación de los estados de Hidalgo, Puebla, Querétaro, San Luis Potosí y Veracruz, con un alcance de alrededor de 4 millones de hectáreas y casi 250 municipios, esta iniciativa constituye una contribución crucial de México para alcanzar los objetivos de la Convención sobre la Diversidad Biológica (CDB), a través de la gestión integrada de los ecosistemas y sus territorios. Este enfoque innovador e integral busca un equilibrio justo y equilibrado entre la protección, la conservación y el uso de recursos naturales, destacando la importancia de balancear las decisiones sobre su uso y beneficio entre todas las partes interesadas, mediante procesos de planeación y gestión territorial, así como en el acceso y uso de instrumentos económicos para el desarrollo sustentable.



## Estado de la ejecución

El proyecto "Conservación de la Biodiversidad en la Sierra Madre Oriental" se basa en la implementación de un instrumento moderno de la conservación de la biodiversidad, como lo es un corredor ecológico. Este concepto no trata las áreas naturales de forma aislada sino las incluye en una **estrategia regional de manejo integrado del paisaje para el desarrollo sustentable**. Para lograr este objetivo es decisivo el **consenso y voluntad política** entre los sectores (agrícola, forestal, minero, de infraestructura vial, entre otros), los diferentes niveles del gobierno (federal, estatal, municipal), los propietarios de la tierra (incluido los grupos indígenas) y los diversos actores sociales de la región.

Los avances y efectos del proyecto se resumen hasta la fecha a continuación.

### *Primer año: Construcción participativa de la estrategia*

Hasta el comienzo del proyecto, la intervención en la Sierra Madre Oriental sólo era una idea planteada por la Comisión Nacional de Áreas Naturales Protegidas (CONANP), pero aún no existía un consenso político.

Después de su comienzo en mayo de 2012, el proyecto apoyó a la CONANP en el establecimiento de una red de partes interesadas y a desarrollar los fundamentos de un consenso alrededor de un Corredor Ecológico en la Sierra Madre Oriental (CESMO). Este proceso se realizó en tres etapas que consideraron particularmente el sistema gubernamental federal:

1. Desarrollo de las **áreas prioritarias para la conservación de la biodiversidad** a nivel de estados federales, fundado en un análisis científico de objetos y valores de conservación relevantes, e **identificación de instrumentos de planificación** de los diferentes sectores en cuanto a sinergias y áreas de conflicto.
2. **Integración regional** de las prioridades de los cinco estados implicados (Hidalgo, Puebla, Querétaro, San Luis Potosí y Veracruz) hacia una visión conjunta del *Corredor Ecológico de la Sierra Madre Oriental* con diez directrices estratégicas.
3. **Viaje de estudios** con 30 participantes mexicanos de instituciones gubernamentales y académicas a Brasil con el objetivo de analizar el *Corredor Ecológico de Mata Atlántica (Área de proyectos de la cooperación alemana para el desarrollo)* y la **transferencia de conocimientos** a México.

Estas medidas se ejecutaron hasta el cambio del gobierno en diciembre 2012, y se lograron los siguientes efectos:

- Los cinco **estados federales apoyan explícitamente el proyecto** de implementar un corredor ecológico. De tal manera se ha hecho un paso hacia un proyecto "conjunto" entre los estados y las instituciones federales.
- Existe un análisis científico del trazado del corredor que es la base para **priorizar las áreas participantes**.
- Desarrollo de las **diez directrices estratégicas para el desarrollo del corredor**, que corresponden en un 80% con los servicios del proyecto de la cooperación técnica y forman una base importante para cumplir con los indicadores (cooperación entre múltiples niveles de gestión y administración, ordenamiento territorial, instrumentos del financiamiento, monitoreo, gestión del conocimiento, etc.).



- El proceso de la formación del corredor constituye el **marco conjunto** para la integración eficiente de la **cooperación técnica y financiera alemana** en la región. Eso fue considerado en la planificación del proyecto de la cooperación financiera.

*Segundo año: Integración de nuevos actores y búsqueda de arreglos institucionales idóneos*

Durante 2013 se buscó **afianzar los espacios de diálogo técnico político en los estados** participantes. Para ello fueron impulsados Comités de Seguimiento a la estrategia del CESMO y grupos de trabajo temáticos, los que lograron en su momento álgido la presencia de un promedio de 6 instituciones federales y estatales. Con ellos **se afinó la selección de 23 áreas prioritarias** (aproximadamente 1.7 millones de hectáreas) en las cuales se pretende generar experiencias demostrativas para los fines del corredor, de forma tal que sus resultados e impactos alcanzados a través de proyectos piloto puedan ser replicados posteriormente en otros territorios y sobre todo, puedan ser escalados a un nivel de políticas públicas permanentes.

Un mejor conocimiento de las zonas prioritarias de arranque (nombradas como "zonas prioritarias uno" y que incluyen a 91 municipios) fue impulsado a través de **diagnósticos integrales de las condiciones de gobernanza y los instrumentos económicos** disponibles para cada zona.

Como otra medida **se definió una estrategia de comunicación para el CESMO** con una amplia participación de diversos actores.

Como efecto de dichas medidas, es posible identificar para el 2013:

- La **integración de nuevos actores, particularmente de la sociedad civil, academia, sector privado y nivel municipal de gobierno** al CESMO. Éxitos iniciales fueron el establecimiento de un grupo de investigación académica, que acompaña el diseño del corredor con investigación e innovaciones en sus ofertas de enseñanza, así como un primer compromiso de responsabilidad social por parte de una industria manufacturera presente en el corredor, Volkswagen.
- El **inicio de un proceso de acercamiento con el nivel central de instituciones ambientales, agropecuarias y turísticas** para identificar posibles proyectos pilotos.
- Conformación de un **sistema SIG** de la Sierra Madre Oriental, así como **identificación de especies prioritarias emblemáticas del CESMO**.

Simultáneamente a la formación del corredor a nivel territorial, en 2013 se apoyó un **proceso de formación y apoyo al desarrollo organizacional de la CONANP**, con el fin que pueda satisfacer todas las exigencias de la cada vez más compleja gestión de reservas naturales y adquirir una posición de liderazgo en cuanto a instrumentos modernos de conservación. Las medidas implementadas fueron las siguientes:

1. Asesoría para el desarrollo de la Estrategia de la institución hasta 2040 y del programa de trabajo de la CONANP para el nuevo período legislativo, como un fortalecimiento de los instrumentos de la planificación de la institución.
2. Desarrollo organizativo y la interacción entre la estructura interna y externa de la institución.
3. Fortalecimiento del *Ecosystem Based Approach* y el enfoque de valoración económica en la CONANP



*Tercer año: Fortalecimiento de las capacidades locales y arranque de proyectos concretos*

Con la red de actores y socios interesados, en 2014 el proyecto se concentró entre otros, en:

**Fortalecer las capacidades técnicas y gerenciales de actores relevantes**, para responder a los desafíos de gestión del CESMO.

**Promover la vinculación de actores públicos, privados y sociales** a través de los primeros proyectos específicos territoriales y multisectoriales.

Medidas relevantes fueron:

1. La realización de un **Diplomado en Habilidades Gerenciales** para 23 miembros de grupos de seguimiento, provenientes de 12 instituciones y organizaciones de 5 estados, acreditado académicamente por una universidad local de la región del CESMO.
2. La **formación de 17 facilitadores locales en gestión territorial de eco sistemas** del Estado de Hidalgo, provenientes de 4 municipios de la zona prioritaria uno, 3 instituciones gubernamentales, 1 institución académica y 2 asociaciones de silvicultores.
3. El lanzamiento de la primera versión del **Premio a la Innovación Productiva Sustentable** que involucra a 2 secretarías federales (SEMARNAT – SAGARPA), la CONANP, los 5 estados y 22 organizaciones y fundaciones civiles y privadas destacadas en el país, para buscar y premiar a organizaciones y empresas que sobresalgan en las categorías de agricultura y ganadería sustentable en el CESMO y en cuya primera edición se presentaron 53 organizaciones y empresas.
4. Diseño y arranque del **Proyecto Piloto para el fortalecimiento de productores sustentables en Puebla** en conjunto con la SEMARNAT Puebla, SAGARPA y la Fundación Produce Puebla.
5. Diseño y arranque del **Proyecto Piloto para el establecimiento del primer eje turístico sustentable de México en Veracruz a partir del CESMO**, en conjunto con la SECTUR, SEMARNAT, CONANP, Gobierno estatal, 5 municipios, 3 asociaciones privadas del sector turístico, 2 organizaciones civiles y 2 académicas.

Como efectos directos de estas medidas se destacan:

1. **Compromiso activo de estos actores con el CESMO** y participación en sus espacios de conducción local.
2. Fortalecimiento de una **identidad regional**.
3. **Mejora en la calidad de sus procesos de trabajo**.
4. **Implementación de 23 proyectos** propios de los participantes del Diplomado vinculados a distintas líneas estratégicas del CESMO: procesos de OT, productos de comunicación sobre valores de conservación y sitios de interés turístico, promoción de actividades de producción sustentable, recopilación y articulación de información académica sobre el territorio.
5. **Arranque del proceso de planeación participativa de medidas de conectividad** en 3 municipios de Hidalgo.
6. **Diseño de criterios de sustentabilidad** como principio rector para el fomento de actividades productivas de bienes y servicios en el CESMO.

Medidas previas para el involucramiento de nuevos actores, también dieron sus frutos en 2014 tale como:

- Arranque de una **co financiación de 300 mil euros al CESMO por parte de VW para apoyar la línea de educación ambiental con jóvenes** a través de proyectos específicos. Esta iniciativa fue nombrada como Eco chavos y representa el escalamiento de una



iniciativa de educación ambiental iniciada en la Reserva Biológica de la Sierra Gorda en Querétaro, promovida por la misma CONANP.

- **Selección del área CESMO como un piloto para la implementación del Programa Especial de Producción y Consumo Sustentable** de la SEMARNAT.
- **Reorientación de recursos de inversión de varias dependencias gubernamentales para zonas prioritarias CESMO** (Caso de SEMARNAT en Puebla, SEMARNATH en Hidalgo), así como lanzamiento de una convocatoria especial de los programas de subsidio de CONANP orientados a la conservación de especies prioritarias en el CESMO (jaguar, psitacidos y bosque mesófilo).

Los procesos de desarrollo organizacional con CONANP también se vieron reflejados en **buenos resultados** de las dependencias involucradas **en los procesos de la Auditoría Superior de la Federación**, así como en la **publicación de la estrategia de largo plazo** (hasta 2040) para la gestión de áreas protegidas.

Finalmente, en este año también se terminó de acordar la **inclusión de 40 puntos adicionales de muestro de la biodiversidad en la región del CESMO**, como parte del Sistema de Alta Resolución de Monitoreo de la Diversidad (SAR-MOD), iniciativa conjunta entre CONABIO, CONANP y CONAFOR y la cual permitirá contar con información valiosa para poder reportar sobre la degradación eco sistémica, según lo establecido en la Ley General de Desarrollo Forestal Sustentable (LGDFS).

*Cuarto año (actual): Se empiezan a cosechar algunos frutos y perfilar más claramente el apoyo a procesos de institucionalización.*

#### **2015 está considerado el año de la implementación operativa del CESMO a nivel territorial.**

En este año se pretende alcanzar resultados concretos a partir de los procesos de planeación y monitoreo territorial iniciados; la implementación de la estrategia de acompañamiento a las empresas ganadoras del Premio a la Innovación Productiva Sustentable, a los que se sumará una segunda convocatoria en las categorías forestal y turismo, ciertos pilotos territoriales para la generación de modelos y buenas prácticas de conectividad, así como las iniciativas de grupos de jóvenes de Eco chavos.

Específicamente se esperan resultados entre otros en:

- Implementación de medidas de conservación, restauración y desarrollo sustentable derivadas de los ordenamientos territoriales en dos municipios de la Sierra Norte de Puebla, de las agendas locales de conectividad en tres municipios de Hidalgo y de los acuerdos de colaboración con al menos 3 ANP de San Luis Potosí.
- Implementación del proyecto piloto para desarrollar el eje turístico sustentable en Veracruz.
- Impulso a los procesos de producción sustentable a 20 empresas ganadoras de las dos ediciones del Premio a la Innovación Productiva Sustentable y 15 productores en el proyecto Piloto para el fortalecimiento de productores sustentable en Puebla.
- Implementación de 10 Parcelas Permanentes de Monitoreo (PPM) en Puebla y Veracruz
- Una veintena de proyectos ambientales implementados por grupos de Eco chavos.
- Dos levantamientos de información para el sistema de monitoreo de la diversidad en los 40 puntos del CESMO.

En el **ámbito de desarrollo de capacidades** está previsto también una segunda edición del Diplomado en Habilidades Gerenciales para tomadores de decisión del CESMO; la colaboración con un Diplomado en Gestión Ambiental para 22 gobiernos municipios en Puebla y el inicio del proceso de mentoría con las empresas ganadoras del premio. Encuentros regionales vinculados a



giz

gestión territorial, monitoreo de la diversidad, procesos de producción sustentable en el marco de restauración y educación ambiental son también parte de la planeación 2015.

Finalmente, en el **ámbito del desarrollo institucional y mejora de los instrumentos de gestión** se prevé fortalecer el proceso de asesoría a CONANP en el tema de manejo integrado de paisaje (MIP) y fortalecer así las capacidades para la implementación de varios de los indicadores relacionados de la Estrategia 2040 y el Programa Nacional de Áreas Naturales Protegidas.

**El lanzamiento de la página web, así como la publicación de métodos y resultados** generados en el marco del programa son parte de los insumos en esta dirección, también pensados para 2015.

### **Perspectivas y retos**

El principal reto es asegurar la sostenibilidad e institucionalización del CESMO, particularmente a través de la implementación de un mecanismo de **gobernanza de nivel regional** que permita la articulación intersectorial a esta escala.

Para **CONANP** resulta particularmente importante definir con claridad su rol en una estrategia de conectividad que incluye espacios fuera de sus áreas protegidas, así como las capacidades y mecanismos propios que necesita fortalecer para dicha tarea.

Como tarea de gestión interna del proyecto, será importante también documentar los procesos, resultados y acuerdos logrados hasta su conclusión.

Una perspectiva prometedora sería lograr una **presentación de las buenas prácticas de CESMO en la COP 13**, cuyo tema central es *mainstreaming* de biodiversidad en distintos sectores.

### Anexo: Avances de cumplimiento de los indicadores

| Resultado   | Valores   | Comentarios   |
|---|---|---|
| En por lo menos 80.000 ha se detiene y/o revierte la degradación de la biodiversidad en el marco de una estrategia del CESMO                                    | Línea base: 0 ha<br>Meta: 80.000 ha<br>Logrado hasta la fecha: 19,532.26 ha<br>Proyección hasta 2016: 52,784.26 ha  | Se han contabilizado Ha dentro del polígono CESMO en las cuales se han iniciado procesos de mejora de la biodiversidad atribuible a la delimitación del polígono y/o procesos de asesoría de COBIO a partir de 2013. Incluye procesos de ordenamiento territorial, zonas colocadas bajo algún esquema de manejo, aprovechamiento o conservación, incluyendo programas de manejo, parcelas bajo alguna modalidad de producción sostenible entre otras.<br><br>El número de Ha proyectado puede crecer una vez se definan ciertos apoyos.   |
| Al menos 5 proyectos están en ejecución en 3 de los Estados de influencia del programa, basándose en acuerdos de cooperación entre tres niveles administrativos | Línea base: 0 ha<br>Meta: 5<br>Logrado hasta la fecha: 5  | Se tratan de proyectos resultantes directos de la cooperación en el marco del CESMO:<br><ul style="list-style-type: none"> <li>▪ Premio a la Innovación productiva Sustentable</li> <li>▪ Proyecto piloto para el fortalecimiento de productores sustentables en Puebla</li> <li>▪ Proyecto piloto para el impulso de un Eje Turístico Sustentable en Veracruz</li> <li>▪ Sistema de monitoreo SAR MOD en CESMO</li> <li>▪ Diplomado en Gestión Ambiental Municipal para la Adaptación al Cambio Climático en 24 municipios de Puebla.</li> </ul> De los mismos podrán derivarse otros sub proyectos. |
| El número de proyectos locales solicitados a los mecanismos financieros del Estado para la protección de la biodiversidad en el CBSMO se aumentó en 10 %        | Línea base: 520 proyectos (de 7 programas públicos)<br>Meta: 10% (52 proyectos)<br>Logrado hasta la fecha: 168 proyectos documentados atribuibles a lógica CESMO y/o asesoría COBIO (32%)                             | Los programas públicos considerados son:<br><ul style="list-style-type: none"> <li>▪ Programa de Conservación para el Desarrollo Sostenible (PROCODES) - CONANP</li> <li>▪ Programa de Conservación de Especies en Riesgo (PROCER) CONANP</li> <li>▪ Programa de Vigilancia Comunitaria (PROVICOM) CONANP</li> <li>▪ Programa de Pago por Servicios Ambientales (PSA) CONAFOR</li> <li>▪ Programa Desarrollo Forestal Comunitario (DFC) CONAFOR</li> <li>▪ Programa de Empleo Temporal (PET) de CONANP y SEMARNAT Puebla</li> </ul>   |
| Actores clave toman en cuenta el enfoque de género de la estrategia general del CESMO.  | Línea base: 0<br>Meta: El proceso de selección de participantes en diferentes líneas de trabajo del CESMO ha tomado en cuenta la equidad de género<br>Logrado hasta la fecha: 52% participantes hombres y 48% mujeres | Considerando los sesgos de género en la zona de intervención del proyecto (zonas rurales, provincia), así como en el ámbito de los actores participantes (administración pública, tomadores de decisión, técnicos de campo) se considera que se ha logrado promover una proporción relativamente equitativa de mujeres y hombres.   |





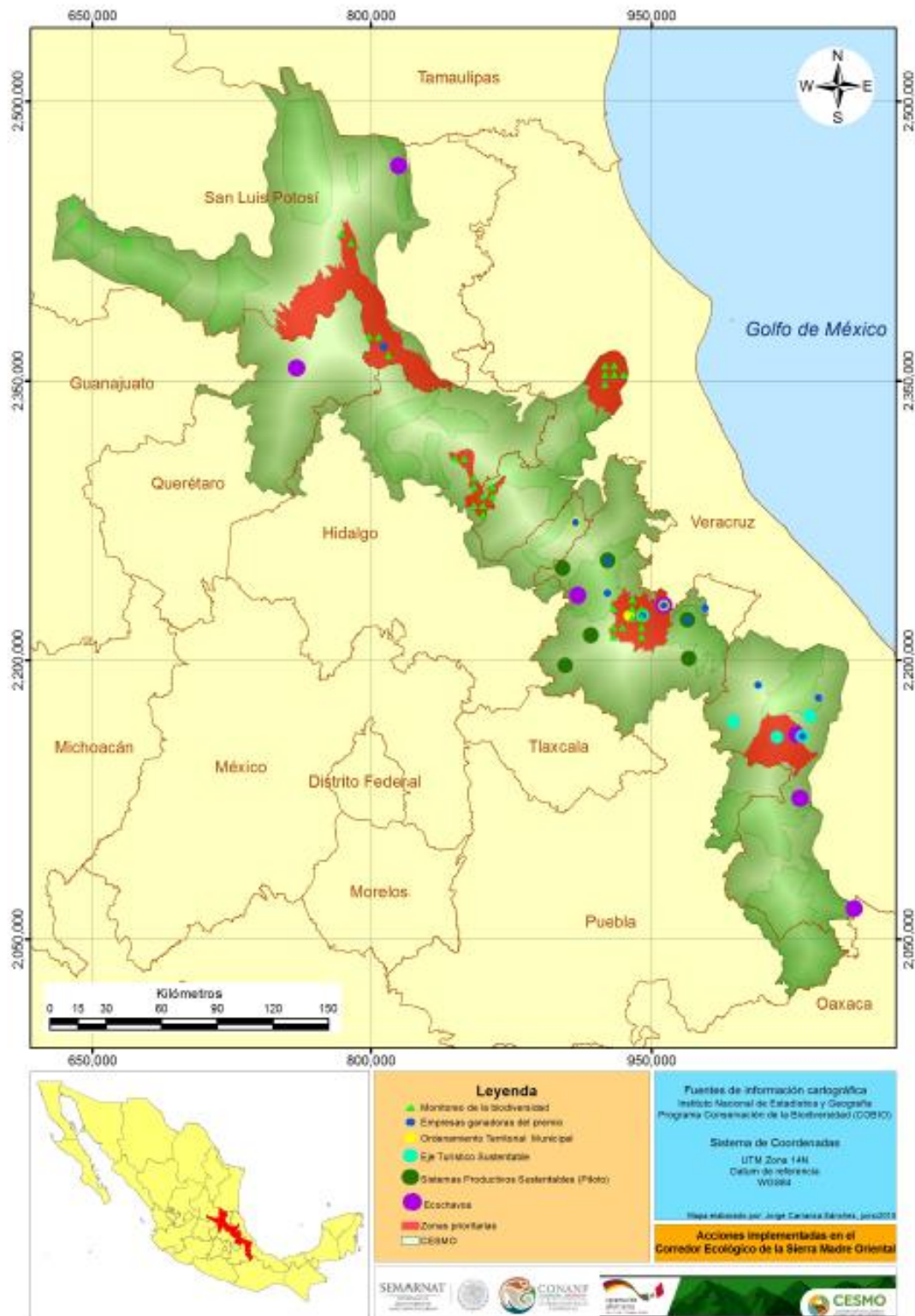
| Resultado  | Valores   | Comentarios  |
|--|---|--|
| Sistema de monitoreo entrega datos confiables y transparentes a todos los actores clave sobre el estado de conservación de la biodiversidad en áreas protegidas y prioritarias en el CBSMO como base de toma de decisión                                 | <p>Línea base: <i>No hay sistema</i></p> <p>Meta: <i>Utilización de un sistema de monitoreo como base de toma de decisiones</i></p> <p>Logrado hasta la fecha: Integración y 1er levantamiento de 40 puntos de muestreo CESMO en el marco de un Sistema Nacional de Monitoreo de la Diversidad.</p> | <p>Área de Intervención:</p> <p>San Luis Potosí: ZP1 (Aquismon y Xilitla) y ZP6 (Sierra de Álvarez-EI Potosí).</p> <p>Hidalgo: ZP1 (Zacualtipan, Xochicoatlán, Calnali, San Agustín Mezquitlan, Tianguistengo, Loloña)</p> <p>Puebla: ZP1()</p> <p>Veracruz, ZP3 y ZP4 (Alamo Temapache, Cerro Azul, Chicontepe, Chontal, Citlaltépetl, Coatepec, Tamañín, Tancoco, Tantima, Tepetzintla, Misantla, Chiconcuaco)</p> <p>Contrapartes: CONANP, SEDEMA (Veracruz), SEMARNATH (Hidalgo), SEGAM (SLP), SEMARNAT (Puebla), Universidad Interserrana (Puebla), Tecnológico de Misantla (Veracruz), Fundación Pedro y Elena (Veracruz), Profauna (SLP), Azul y Verde, SC (Puebla), CONAFOR (Hidalgo).</p> |
| Existen por lo menos en 3 de 5 estados acuerdos de cooperación coordinados entre 3 niveles de gestión (Federal, Estatal, Municipal, Sociedad civil/Comunidad) bajo el marco de una Estrategia General de la Conservación de la biodiversidad en el CESMO | <p>Línea base: 0</p> <p>Meta: <i>3 acuerdos mínimos</i></p> <p>Logrado hasta la fecha: 5 en proceso</p>   | Se refiere a los acuerdos relacionados con los proyectos.  |
| Por lo menos 4 municipios desarrollaron un ordenamiento territorial (OT) que facilita la conservación de la biodiversidad en el CBSMO y sirve como modelo para la promoción de este instrumento a nivel estatal  | <p>Línea base: 0</p> <p>Meta: <i>4 OTs</i></p> <p>Logrado hasta la fecha: <i>2 municipios en proceso (Puebla)</i></p>   | Apoyo a los OTE de los municipios de Amixtlán y Huehuetla (Puebla)   |
| Tres instituciones de educación superior o técnica a nivel federal y estatal incluyen conceptos innovadores sobre la conservación de la biodiversidad, generados por el programa, en su currículo  | <p>Línea base: 0</p> <p>Meta: 3</p> <p>Logrado hasta la fecha: <i>1 alcanzado (COLVER) y 2 en proceso (UAEH y COLPUE)</i></p>   | Con el COLVER se logró la acreditación del Diplomado en Habilidades Gerenciales. Con UAEH se acreditará a los facilitadores de agendas locales de Hidalgo y con COLPUE se colabora con el Diplomado en Gestión Ambiental Municipal.  |
| Se ha aumentado el número de programas de financiamiento para el desarrollo, en el CESMO que integran la conservación y uso de la biodiversidad como criterios principales de asignación, tanto federales como estatales y municipales                   | <p>Línea base: 0</p> <p>Meta: 3 federales y 2 estatales</p> <p>Logrado hasta la fecha: En proceso inclusión de criterios de sustentabilidad en 2 programas: PRODERETUS (Turismo) y programas Fundación PRODUCE.</p>   |  |



| Resultado   | Valores  | Comentarios |
|---|--|-------------|
| <p>Se ha aumentado la cantidad y calidad (acceso e impacto) de instrumentos económicos para la conservación de la biodiversidad en la SMO</p> | <p>Línea base: 0<br/>           Meta: <i>min.</i> 3<br/>           Logrado hasta la fecha: <i>En proceso inclusión de criterios en 3 programas: Producción y Consumo Sustentable y Programa de Empleo Temporal de SEMARNAT, además de la institucionalización del Premio a la Innovación Productiva Sustentable.</i></p> |             |



### Anexo Mapa de medidas territoriales implementadas en CESMO



## Appendix B- IRB Materials



## **Forma de Consentimiento del Cuestionario de la Evaluación del Programa del Medio Ambiente**

Están pidiendo a Ud a participar en una investigación organizado por el parte de la estudiante Daniela Salisbury de la universidad Bard's Center for Environmental Policy en Nueva York. Por favor lee esta forma completamente antes de ponerse de acuerdo de participar.

**Objeto:** El objeto de este estudio es evaluar los programas actualmente implementados en el municipio de Landa de Matamoros, Querétaro, Mexico.

**Lo que piden de Ud:** Si Ud se ponga de acuerdo a participar en este estudio, va a contestar unas preguntas en una manera de entrevista. Solo tardara 15 a 20 minutos. El cuestionario incluye preguntas sobre el programa del medio ambiente en que Ud esté involucrado, incluyendo el tiempo que lleva con este programa, los beneficios que ha recibido, y su opinión del éxito del programa.

**Riesgos y Beneficios:** Hay riesgos potenciales para participar en este estudio. Le van a pedir que de información sensible como su opinión del éxito del programa en que esté involucrado, que quizá le haga incómodo. También, hay una posibilidad que si la organización supo si Ud contesto algo negativo en algunas preguntas que no le darían el chance de participar en este programa otra vez.

No hay beneficio directo para participar en este estudio.

**Confidencialidad:** Sus respuestas estarán guardado en confidencialidad completo y solo yo las veré y en ninguna manera las enseñara a ninguna organización. Su nombre no estará anotado en el cuestionario porque le darán un código para poner en el cuestionario en vez de su nombre para asegurar confidencialidad. Solo yo tendré la llave que contiene cual código va con cual nombre. Los cuestionarios estarán cerrados con llave en mi departamento y solo yo tendrá acceso. Cualquier documento electrónico será protegido con contraseña, lo cual solo yo sabrá. Si publican un reporte, no habrá ninguna información incluida en el reporte que pueden usar para identificarle.

**Participación Voluntario:** Su participación en este cuestionario es completamente voluntario. Ud. puede no contestar cualquier pregunta que Ud. no quiere contestar. Si Ud. decide participar, puede detenerse en cualquier momento. Si Ud. participa en este estudio o no, o también si decide no contestar algunas preguntas, o decide empezar y luego parar, no va a afectar su participación en el programa del medio ambiente en que está involucrado.

**Información de Contacto:** Las investigadoras haciendo este estudio son Daniela Salisbury y Profa. Monique Segarra. Por favor pregunta cualquier pregunta que tenga antes de decidir participar. Si tiene preguntas sobre la investigación en el futuro, o quiere ver los resultados de la investigación, por favor contacta Daniela Salisbury por email [danielle.salisbury@gmail.com](mailto:danielle.salisbury@gmail.com) o telefono 442-469-4442, o Monique Segarra por email [segarra@bard.edu](mailto:segarra@bard.edu). Si tiene preguntas sobre sus derechos como participante, por favor contacta el Institutional Review Board Chair de Bard College Pavlina Tcherneva [tchernev@bard.edu](mailto:tchernev@bard.edu).

Le darán una copia de esta forma de consentimiento para sus archivos.

**Declaracion de Consentimiento:** Yo he leído y entiendo la informacion arriba. He recibido respuestas para todas las preguntas que pregunte y por mi propio voluntad quiero participar en este estudio.

Su Nombre y Firma \_\_\_\_\_

Fecha: \_\_\_\_\_

## Appendix C- Survey Questions

**Entrevista Comunitaria**

- 1) ¿En cuál programa participa Ud?  
 PROMAC  PET  
 PROCODES  SEDEA (Conservación de suelo, agua, y bosque)  
 PRONAFOR PSA  PRONAFOR Restauración Forestal  
 Sanidad Forestal
- 2) ¿Por cuánto tiempo Ud. ha participado en este programa?  
 0-2 años 2-4 años 4-6 años 6-8 años 8-10 años +10 años
- 3) ¿Cómo se aprendió de este programa?
- 4) ¿Cuáles son las metas de este programa?
- 5) ¿Cuáles beneficios le da este programa a Ud. personalmente?
- 6) ¿Por qué decidió Ud. a participar en este programa?  
 Razones personales  Razones Económicas  Razones Sociales  
 Razones Medio Ambientales  Razones Culturales  Otro
- 7) ¿Cuánto contribuye este programa a su ingreso familiar?  
 0-25% 25%-50% 50%-75% 75%-100%  
 N/A
- 8) ¿Cuál beneficios tiene este programa para el municipio? Elige todos que pertenecen.  
 Medio ambiente  Económico  Cultural  
 Social  Académico  Salud  
 Desarrollo juvenil  Agricultura  Otro
- 9) ¿Considerando las metas de este programa, que tan exitoso cree Ud. es el programa?  

|             |         |                          |            |                |
|-------------|---------|--------------------------|------------|----------------|
| 1           | 2       | 3                        | 4          | 5              |
| Muy exitoso | Exitoso | Ni exitoso ni no exitoso | No exitoso | Muy no exitoso |
- 10) ¿Por qué cree Ud. que este programa tiene éxito o no?
- 11) ¿Ud. tenía afiliación político?  Sí  No
- 12) ¿Hay más programas del gobierno/ medio ambiente de que Ud. ha escuchado y quiere intentar?
- 13) ¿Si fuera posible, aplicaría otra vez para este programa?
- 14) ¿Tiene Ud. sugerencias para mejorar este programa?
- 15) ¿Qué tan satisfecho esta Ud. con este programa?  

|               |                    |                 |            |                |
|---------------|--------------------|-----------------|------------|----------------|
| 1             | 2                  | 3               | 4          | 5              |
| No satisfecho | poquito satisfecho | algo satisfecho | satisfecho | muy satisfecho |
- 16) ¿Porque está satisfecho o no satisfecho con este programa? Por favor sea específico y dar ejemplos si es posible.

## Entrevista Gerente del Programa

- 1) ¿Para cual organización/ agencia trabaja Ud?
- 2) ¿En cuál programa del medio ambiente está involucrado Ud. en el municipio de Landa de Matamoros?
- 3) ¿Cuántas personas en este municipio están involucradas en este programa?
- 4) ¿Cuánto dura un ciclo de este programa?
- 5) ¿Cuál porcentaje de la gente actualmente en el programa ahorita ha participado en años o ciclos pasados?

0-25%                      25-50%                      50-75%                      75-100%

- 6) ¿Cuáles son las metas del programa?
- 7) ¿Cuánto dinero gasta su organización en este programa en el municipio Landa de Matamoros anualmente?
- 8) ¿Cuál es el promedio cantidad de dinero que recibe una persona para participar en este programa por año?
- 9) ¿Cuáles son los beneficios para un individual participando en este programa?
- 10) ¿Cuáles son los beneficios esperados para el municipio participando en este programa?

|   |                                      |                                   |
|---|--------------------------------------|-----------------------------------|
| <input type="checkbox"/> Medio ambiental    | <input type="checkbox"/> Económico   | <input type="checkbox"/> Cultural |
| <input type="checkbox"/> Social             | <input type="checkbox"/> Académico   | <input type="checkbox"/> Salud    |
| <input type="checkbox"/> Desarrollo juvenil | <input type="checkbox"/> Agricultura | <input type="checkbox"/> Otro     |

- 11) ¿Cómo monitorea los participantes del programa?
  - 12) ¿Cómo mide el éxito del programa?
  - 13) ¿Considerando las metas de este programa, que tan exitoso cree Ud. es el programa?
- |             |         |                          |            |                |
|-------------|---------|--------------------------|------------|----------------|
| 1           | 2       | 3                        | 4          | 5              |
| Muy exitoso | Exitoso | Ni exitoso ni no exitoso | No exitoso | Muy no exitoso |
- 14) ¿Por qué cree Ud. que este programa tiene éxito o no?

## Entrevista Lideres Locales

- 1) ¿Cuál es su título y posición?
- 2) ¿Por cuánto tiempo ha tenido esta posición?
- 3) ¿Cuáles programas del medio ambiente están ofrecidos ahora o han estado ofrecido en el pasado en la reserva biosfera/municipio/comunidad?
- 4) ¿Qué tan receptiva ha sido la gente con estos programas del medio ambiente entre la reserva biosfera/municipio/comunidad?
- 5) ¿Más o menos cuantas personas en la reserva biosfera/municipio/comunidad benefician directamente de estos programas del medio ambiente cada año? ¿Indirectamente?
- 6) ¿Cuáles son los beneficios esperados para la reserva biosfera/municipio/comunidad quienes participan en estos programas?
 

|   |                                    |                                   |
|---|------------------------------------|-----------------------------------|
| <input type="checkbox"/> Medio ambiental    | <input type="checkbox"/> Económico | <input type="checkbox"/> Cultural |
| <input type="checkbox"/> Social             | <input type="checkbox"/> Académico | <input type="checkbox"/> Salud    |
| <input type="checkbox"/> Desarrollo juvenil | <input type="checkbox"/> Agrícola  | <input type="checkbox"/> Otro     |
- 7) ¿Cuáles son las fortalezas que Ud ha identificado de los programas del medio ambiente aquí en la reserva biosfera/municipio/comunidad?
- 8) ¿Cuáles son las retas y oportunidades para mejorar los programas del medio ambiente que Ud ha encontrado en la reserva biosfera/municipio/comunidad?
- 9) ¿Cuáles impactos positivos o negativos han visto de estos programas del medio ambiente?
- 10) ¿Tiene sugerencias para mejorar los programas?
- 11) ¿Qué le gustaría ver pasar con estos programas en el futuro?