

An Analysis of Forest-Based Offset Production in Oaxaca, Mexico Based on Critiques of the
Forest Carbon Market

by

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ABSTRACT

Forestry carbon offset projects are potentially viable solutions for reducing greenhouse gas emissions. However, these projects have been heavily critiqued for perceived failures in creating real, additional, measurable, permanent and independently verifiable carbon credits. The central focus of this study is to test the validity of these critiques against the context of a specific voluntary forest carbon offset project in Oaxaca, Mexico. Ten rural communities are implementing the project with the assistance of two Mexican non-profit organizations, Environmental Services of Oaxaca (SAO) and ProNatura. To study these issues, I conducted case studies in three of the participating communities, with interview data collected from participants, the intermediary non-profit organizations and the carbon credit buyers. Based on my analysis of this data, the program seems to have avoided many of the common pitfalls of forest carbon offset projects.

The program seems to have promoted conservation activities that might not have otherwise occurred and has also provided additional economic resources to support forest monitoring programs and improved management techniques. The program also emphasizes education and a utilization of local technical advisors, both of which appear to be fostering a culture of conservation in the communities. I also found that the development of land-use plans seem to play an important role in helping to protect the permanence of forest conservation, as well as preventing leakage by designating conservation areas and preventing the encroachment of other activities into these areas. Based on interviews with program participants, it appears that if the program were to disappear, the community would likely attempt to maintain the forest cover and sequestered carbon through either continued conservation or some type of sustainable harvesting system such as a community forestry enterprise. Despite the lack of international certification, SAO is attempting to ensure high quality credits by carefully selecting the communities that can participate in the program as well as through the use of monitoring plots that measure annual tree growth. In combination with ProNatura's positive reputation, this seems to be sufficient for the buyers to trust that the project is producing legitimate credits. The program also appears to have a number of social and secondary environmental benefits. The lessons learned from this study have implications for the design other forest carbon offset projects in Mexico or on an international scale.

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INTRODUCTION

The Carbon Market Background

It is the general consensus of the scientific community is that the concentration of carbon dioxide and other Green House Gases (GHGs) in the atmosphere is rising and is the main cause behind global climate change. The Intergovernmental Panel on Climate Change (2007) claims that, “global GHG emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004” (p.36). There are already signs that climate change is having negative impacts on social and ecological systems (Agrawal et al., 2011) and if emissions continue to grow over the following decades as predicted, we could see further warming, sea level rise and other devastating effects (IPCC, 2007). Humans are currently emitting around 47 billion tons of CO₂ per year (Dhanda et al., 2011) and have increased the average CO₂ concentration in the atmosphere to around 393 ppm (New Scientist, 2012). This is already above the recommended 350 ppm upper limit target that is recommended by many climate scientists (350.org, 2013; Hansen et al., 2008; IPCC, 2007). As a result of this increased GHG concentration, the earth’s surface temperature has risen by about 0.9 degrees centigrade over the past 50 years (Global Green Carbon, 2013). If this trend continues, it is estimated that over the next hundred years the earth will warm an additional 3-6 degrees centigrade (New Scientist, 2012; Global Green Carbon, 2013) and sea level could rise between 3 to 18 feet (Bray, 2012). “In order to constrain the impacts of climate change within limits that society will reasonably be able to tolerate, the global average temperatures must be stabilized within two degrees Celsius” (UN-REDD Programme, 2013).

The drive to reduce carbon emissions has led to the creation and rapid expansion of a global carbon market. The carbon market provides an economic solution to the CO₂ emissions dilemma by allowing for both the trade and sale of emissions permits and offsets. This process will be described in further detail in the next section. Proponents of the carbon market claim, “research has shown that market-based solutions might be the most efficient method for cutting emissions and achieving sustainability” (Dhanda et al., 2011, p. 123). The idea behind these market-based solutions is that industries are producing and profiting from a valued commodity, while at the same time releasing polluting byproducts into the commons free of charge. The ability to profit from the commodity and not be penalized for the harmful byproducts encourages the industry to produce as much of the commodity as possible. Issuing pollution permits and capping the amount of emissions is one market-based approach that can be used to confront this issue and put a price on the contamination (Dhanda, 1999).

The title of ‘carbon market’ is slightly deceptive because CO₂ is not the only GHG the carbon market aims to reduce. Other natural and anthropogenic gases included are nitrous oxide (N₂O), methane (CH₄), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) (Kill et al., 2010). Classifying it as a ‘market’ is also deceptive because there is not one single, unified market structure under which these permits and offsets are traded and sold (Kill et al., 2010). It is important to understand the complexity of

the market and the different trading schemes and project types that exist before I discuss my research project.

Carbon Trading and Offsets

As mentioned above, carbon trading (cap-and-trade) and offsetting are the two main ways in which the carbon market works to reduce GHG emissions. In both the trading and offsetting schemes, each credit or permit represents one metric ton of carbon dioxide equivalent (CO₂e) sequestered or not emitted, which is a “measure of the global warming potential of all greenhouse gases in terms of their equivalence to CO₂” (Galatowitsch, 2009, p. 564). This is important because some GHGs have a much stronger ability to trap heat, and therefore a higher global warming potential, than CO₂ (ClearSky Climate Solutions, 2012).

In a carbon trading system, a government or intergovernmental body sets a cap on the amount of GHG pollution units or carbon permits that an emitter can release. If one emitter falls below the cap, it can trade its unused permits to another entity that is unable to meet its cap and wants to continue emitting without being penalized legally (Galatowitsch, 2009; Kill et al., 2010). The idea for these GHG emissions caps originated from existing cap-and-trade programs, such as the SO₂ Acid Rain Program (ARP), that were designed to reduce sulfur dioxide (SO₂) emissions which were creating acid rain problems (Conniff, 2009; Dhanda, 1999). The ARP was one of the first examples of emissions trading and was used as a model for the carbon market schemes currently in existence in the US and Europe (Hansjurgens, 2011). Currently, carbon trading schemes are the primary focus of international climate change policy and the principle way in which many governments are electing to combat climate change (Kill et al., 2010), however it will “remain so only as long as carbon sequestration remains the most economically efficient form of emissions mitigation” (Phelps et al., 2010, p. 91).

In addition to trading systems, carbon credits can also be purchased. This system allows an emitter to “offset” their emissions by paying someone else to implement projects that reduce or absorb GHGs elsewhere (Barnsley, 2008). The principle reasoning behind these offset schemes is that when GHGs are released in one location, they disperse throughout the atmosphere, creating a shared global problem (Kollmuss et al., 2008). It is the overall concentration of GHGs that impacts the climate (ClearSky Climate Solutions, 2012), suggesting that it doesn’t really matter where emissions reductions are occurring, only that the global GHG concentration is being reduced (Kill et al., 2010). So, instead of companies incurring large costs to reduce their own emissions, they look for these less expensive “offsetting” solutions to reduce GHGs, often from projects located in the global South where the developing nature of the countries’ economies makes it possible to produce cheaper credits (Kill et al., 2010).

In addition to reducing emissions, carbon offset projects can also have environmental benefits such as the restoration or conservation of: hydrologic function, soils and native species diversity (Stickler et al., 2009). These projects also have the potential to produce social and economic benefits for the communities (Galatowitsch, 2009).

Compliance vs. Voluntary Markets

There are two types of carbon-offset markets, the compliance market, and the voluntary market. Both markets function under the same basic principle of reducing GHG emissions in one location in order to “offset” emissions that are being released in another location (Kollmuss et al., 2008). The two markets also use very similar strategies and methods for determining the volume of credits being produced by an offset project (Kill et al., 2010). However, there are also several differences between how the two markets operate.

Compliance Market

The compliance market, also referred to as the regulated market, is “created and regulated by mandatory regional, national and international carbon reduction schemes” (Kollmuss et al., 2008, p.v) such as the European Union’s Emissions Trading Scheme and the Kyoto Protocol. The European Union’s Emissions Trading Scheme is the largest trading scheme and functions by setting a cap on emissions and allowing trade of emissions permits between countries (Kollmuss et al., 2008).

The Kyoto Protocol is the other main compliance scheme. It was adopted in 1997 and is the main driver behind the compliance market because it not only created a market demand for carbon credits but also outlined ways to fill that demand. The two main mechanisms the Kyoto Protocol uses to generate offsets are the Clean Development Mechanism (CDM) and Joint Implementation (JI) (Kill et al., 2010; IPCC, 2007). The CDM encourages countries with emissions goals (generally developed countries) to purchase credits produced from countries without emissions goals (generally developing countries). These types of cap-and-trade projects allow companies to offset a portion of their emissions to comply with emissions targets while also supporting sustainable development in the countries producing the offsets (Kill et al., 2010; Peters-Stanley et al., 2012). The JI program is similar to the CDM but it is developed, not developing, countries that are producing the credits (Kollmuss et al., 2008).

The purpose of compliance markets is to provide different actors (businesses, governments, etc.) with ways to meet the emissions reduction targets created by these “cap and trade” schemes (Barnsley, 2008). This can be done using a credit trading system or through the purchase of offset credits as described above (Barnsley, 2008). In the compliance market, each project that wishes to sell offset credits has to present a Project Design Document (PDD) that outlines a strategy for producing additional emissions reductions that would not have occurred under “business as usual” circumstances and ensure that emissions are actually reduced and not simply transferred at another location. The credits produced in this market are then sold to the buyers as certified emissions reductions (CERs) (Kill et al., 2010). One CER offset credit represents a reduction of one ton of CO₂e (Kill et al., 2010). Around 95% of the credits produced in the carbon market are CERs, and most are regulated by the Kyoto Protocol (Galatowitsch, 2009).

In 2011, the majority of projects in the CDM were renewable energy projects (70%), which will be described in more detail later on. Forest carbon projects, however accounted for only 1% of CDM projects, producing 5.9 million MtCO₂e from 40 different projects worldwide

(Peters-Stanley et al., 2012). There are a number of reasons there are so few forest carbon projects in the CDM. One is that it is difficult and prohibitively costly for small projects to comply with the required standards. Another is that there are a number of concerns over the validity and permanence of forest carbon sequestration that often cause the projects to be rejected by the CDM (Peters-Stanley et al., 2012). This will be discussed in more detail further along in this report.

Voluntary Market

The voluntary market, also referred to as the over-the counter (OTC) market, functions independently from the regulatory systems of the compliance market. The credits produced in this market are called Voluntary Emissions Reductions (VERs) and, similarly to CERs, one VER credit represents a reduction of one ton of CO₂e (Kill et al., 2010). Voluntary markets do not rely on emissions caps, as in the compliance market, but instead rely on buyers that are not legally bound to reduce their emissions but, because of either public image considerations or a sense of moral obligation, decide to offset their emissions anyway (Barnsley, 2008; Hunt et al., 2008). The ability to voluntarily reduce emissions could be producing additional GHG emissions reductions that would not have occurred if this voluntary offset option were not available (Kollmuss et al., 2008). Because participation by the buyers is voluntary demand for VERs is fairly low, resulting in the voluntary market operating on a much smaller scale than the compliance market (Kollmuss et al., 2008), accounting for only 1.5% of the carbon credits on the global market in 2011 (Peters-Stanley et al., 2012). The voluntary market and the CDM are currently the only active markets that function on an international scale (Peters-Stanley et al., 2012).

There are several differences between the compliance and voluntary market, one being that the voluntary market has fewer and less demanding rules and standards than are required by the compliance market. For instance, the majority of voluntary carbon offset projects do not follow externally imposed rules for monitoring and verification and are not certified by a third party. Of the ones that are certified, they have to choose from over a dozen different standards, none of which has so far been established as the industry standard (Kollmuss et al., 2008). Each of the existing standard systems has different rules and requirements, some that resemble the standards in the compliance market and others that are not as strict, allowing more projects to be able to enter the market and sell credits (Kollmuss et al., 2008).

The voluntary market also does not have a central database, as is present in the CDM, that tracks the sale of credits and prevents them from being sold twice or “double counted” (Kill et al., 2010). The added flexibility from the lack of a strict standard system makes it possible to test procedures and methodologies in voluntary projects and could prepare these projects to eventually enter either the compliance market (Kollmuss et al., 2008) or initiate a countrywide REDD+ project as will be discussed in more detail below. However, the lack of a single standard, and the variation that exists between existing standards, is confusing and makes it difficult for the carbon credit buyers to determine the quality of the offsets they are purchasing (Dhanda et al., 2011).

The strict standards and rules in the compliance market often make the costs of

participation prohibitive for small-scale carbon capture projects. The lack of these costly requirements in the voluntary market makes it possible for small-scale, community-based projects to enter the market and sell carbon credits (Russell, 2007). These community-based projects can also have co-benefits of achieving emissions reductions in areas that otherwise would not have been included in the market, as well as producing economic benefits and knowledge of environmental issues in several smaller areas.

The last major difference between these two markets is the percentage of credits originating from forestry-based projects. In the CDM, for example, not many forestry projects have made it through the approval process. This is mainly due to concerns of about the vulnerability of forests, including permanence and leakage issues, which will be described in more detail below (Bray, 2012). The voluntary market provides an opportunity for these types of forestry projects and is currently “the largest market for forestry-based carbon credit transactions” (Merger et al., 2011, p. 2). In fact, biosequestration is the most common type of offset project within the voluntary market (Hunt et al., 2008), making up 36% of the volume market as compared with only 7% volume of the compliance market (Kollmuss et al., 2008).

Types of Offset Projects

The Clean Development Mechanism (CDM) identifies over 200 different project types that can generate carbon credits (Kill et al., 2010). The main activities for these offset projects are energy efficiency, renewable energy, methane capture and storage, and biosequestration (Galatowitsch, 2009; Barnsley, 2008). These four main project types, along with REDD+, the global climate change mitigation mechanism, are described in more detail below.

Energy efficiency

Energy efficiency projects involve replacing older technologies with products and systems that use less energy (Barnsley, 2008). For example, a taxi company could replace old cars with newer more fuel efficient-models (Kollmuss et al., 2008). The quality and service have not been affected but the amount of GHGs being emitted has been reduced. An example of this is a project that was carried out in the Republic of Senegal from 2009-2013, which replaced 1.5 million incandescent light bulbs with compact fluorescents in rural communities. The project impacted 364,000 households, reducing their energy costs, and is expected to generate 40,000 tons of CO₂e offsets per year (The World Bank, 2013). These types of energy efficiency projects made up about 5% of credits sold on the voluntary market in 2011, 4% of which were generated by clean cook stove projects (Peters-Stanley et al., 2012).

Renewable energy

Renewable energy projects are by far the most numerous projects on the voluntary market, making up 45% of all credits sold in 2011 (Peters-Stanley et al., 2012). Similar to energy efficiency, renewable energy projects focus on replacing conventional energy sources, such as coal or petroleum, with energy from renewable sources (Kollmuss et al., 2008). These

sources include hydrologic, wind, solar, geothermal and waste decomposition. The benefit of these projects is that they help reduce dependence on fossil fuels and move the planet towards energy sources with lower GHG emissions (Barnsley, 2008). These projects tend to have high initial start up costs but once in place have very low operating costs (Kollmuss et al., 2008). One example of this was a project that was carried out in rural communities near Bushlight, Australia. Ninety-seven renewable energy systems were set up to replace the unreliable diesel and gasoline generators that they had previously used. This helped to create both a reliable source of energy for the communities, while also reducing their emissions for the old, non-renewable fuel generators (Barnsley, 2008). Another example is a large-scale wind plant project in Oaxaca, Mexico that is expected to generate 205,380 tons of CO₂e offsets per year (The World Bank, 2013).

Methane capture and storage

Methane gas, which originates from landfills, wastewater treatment facilities, petroleum, coal and natural gas systems, and agriculture and livestock, has a global warming potential that is about 21 times that of CO₂ (Kollmuss et al., 2008). Capturing it from these sources allows it to be used as energy instead of going directly from the source to the atmosphere (Kollmuss et al., 2008). One example of this is a project done in Durban, collecting methane gas from a landfill and using it to produce electricity (Boyd, 2009). Methane capture accounted for around 7% of all credits sold on the voluntary market in 2011 (Peters-Stanley et al., 2012).

Afforestation/Reforestation

Afforestation/Reforestation projects produce carbon offsets because trees naturally act as “carbon sinks,” taking up and storing CO₂ and other GHG’s in their biomass (biosequestration) during the process of photosynthesis (Barnsley, 2008; Galatowitsch, 2009). Afforestation/reforestation projects accounted for around 9% of all credits sold on the voluntary market in 2011 (Peters-Stanley et al., 2012). There are two main types of biosequestration projects, ones that focus on preventing deforestation and destruction of ecosystems and others that restore ecosystems that have already been destroyed or degraded through either afforestation or reforestation. Deforestation causes the GHG’s that were stored in trees, forest understory plants, and soils to be rereleased into the atmosphere (Bray, 2012). This process accounts for about 15% of global anthropogenic GHG emissions (Bray, 2012; Pettenella et al., 2011; Russell, 2007; Dhanda et al., 2011) and 12-20% of CO₂ emissions worldwide (Kill et al., 2010). Conserving existing forests prevents the rerelease of these GHGs back into the atmosphere.

In areas that have already been cleared or degraded, restoring vegetation provides a carbon “sink” for emissions in the atmosphere (Barnsley, 2008). There is some research that claims that restoring forests may be a more effective way to mitigate climate change than biofuel projects (Galatowitsch, 2009). These projects also have the benefit of being low cost compared to other types of projects, as well as achieving sustainable development in addition to environmental goals (Kollmuss et al., 2008). They can also encourage a more diverse array of income sources in the forestry sector that can help to reduce the pressure

on timber extraction (Madlener, 2003). A good example of this is a reforestation project carried out in Panama that focused on protecting forest and reforesting degraded areas. The project employs the local indigenous people and has an end goal of turning over the management of the forests to the local people (Barnsley, 2008).

Reducing Emissions from Deforestation and Forest Degradation (REDD+)

The first commitment period of the Kyoto Protocol did not include forest carbon capture schemes as allowable projects under the CDM because of several critiques, which will be presented in the next section (ClearSky Climate Solutions, 2012). However, emissions from deforestation and forest degradation are responsible for about 20% of the total global GHG emissions (UN-REDD Programme, 2013; Pettenella et al., 2011; Parker et al., 2008). As of 2012, over 75% of all forest carbon credits produced came from projects in the voluntary market (Peters-Stanley et al., 2012). However, as I mentioned previously, the voluntary market lacks the strict standards systems found in the CDM bringing up questions that the credits being produced may not be real or additional (Kollmuss et al., 2008).

Reducing Emissions from Deforestation and forest Degradation (REDD+) is an international climate change mitigation mechanism that was established by the Bali Action Plan at the 13th Conference of Parties (COP 13) in 2007. It is intended to prevent the release of carbon dioxide from deforestation and degradation by promoting forestry carbon projects that are regulated by international protocols and encourage the conservation of forest carbon stocks (Bray, 2012; Agrawal et al., 2011). It provides economic and performance-based incentives for the verifiable emissions reductions of forest-rich, developing countries, under the assumption that developed countries will provide financing (UN-REDD Programme, 2013). The “plus” was added in 2010, at the COP 16 in Cancun to extend REDD+ goals to include sustainable management and conservation and enhancement of forest carbon stocks (Kyoto Protocol, 1997).

While some countries have implemented pilot or early actions projects, REDD+ is not yet being implemented at a broad scale. Currently, many countries are preparing for REDD+ through REDD+ readiness programs that are supported by through bilateral and multilateral donors. The readiness process involves undertaking studies of forest carbon stocks and drivers of deforestation, stakeholder consultation, country policy alignment, development of a monitoring and evaluation framework, creation of a safeguard system, and eventually the development of a national REDD+ strategy which outlines a long-term approach for reducing forest carbon emissions (Parker et al., 2008; UN-REDD Programme, 2013).

Several challenges confront REDD+, one of which is that there is currently no mandatory international compliance mechanism with compulsory, binding greenhouse gas emissions reductions, which provides little incentive for country governments to commit funds to REDD+ initiatives. Although many countries and multilateral institutions have provided fast-start funding to initiate the REDD readiness process or undertake pilot projects, achieving the level of funding necessary to meaningfully address climate change will continue to be challenging without binding emissions reductions (Bank Information Center, 2013). There are several other challenges for REDD+ implementation, many of which align with the

critiques of the forest carbon market that will be discussed in the next section. A benefit of REDD+ is that if this international funding can be achieved, it could alleviate the financial pressure on small-scale community forest-carbon projects that are trying to comply with certification standards (Phelps et al., 2010). REDD+ and other avoided deforestation projects accounted for around 9% of all credits sold on the voluntary market in 2011 (Peters-Stanley et al., 2012).

Critiques of Forestry Carbon Offsets

The World Wildlife Fund (WWF) is one of many organizations that have concerns about the voluntary market and forest carbon capture projects and published a report to help companies and individuals better understand the market (Kollmuss et al., 2008). They argue that to be effective in reducing GHG emissions long term, a forest carbon offset needs to be, “real, additional, measurable, independently verifiable, permanent, unique and [have] sustainable development benefits” (Merger et al., 2011, p. 3). Forestry offset projects for both the compliance and voluntary markets have been heavily critiqued for perceived failures in all of these categories. The central focus of this research is to test these critiques against the context of a specific voluntary forest carbon offset project in Oaxaca, Mexico. In this section, I discuss these critiques and the ways in which they are specifically applied to VER offsets.

Additionality

One of the criteria for successful carbon sequestration projects is that they need to show that the GHG emissions reductions are additional to what would have occurred in the absence of the project (Dhanda et al., 2011; Barnsley, 2008). This is one of the most difficult criteria to measure because determining additionality tends to be very subjective (Kollmuss et al., 2008), and depends on the ability to know what would have happened if the project had not happened (Kill et al., 2010). To determine additionality, a baseline is developed to determine the amount of GHGs that would have been emitted under “business as usual” circumstances, which is then compared to amount of GHG sequestered with the project (Kollmuss et al., 2008).

Since the purpose of the carbon credit market is to reduce emissions in one area in order to offset them in another, it is critical that the credits being produced are actually additional and achieving their claimed emission reductions. If they are not then the net result will be increased levels of GHG being released into the atmosphere (Kill et al., 2010). According to a study of the CDM compliance market by Kill et al. (2010), between 30 to 50 percent of the GHG reductions being claimed have questionable additionality. In the voluntary market, where projects are not required to go through an external verification process, as in the compliance market, the percentage of claimed emissions that are not actually additional is probably higher (Kill et al., 2010; Russell, 2007).

Permanence

Another major concern with the viability of carbon offsets is permanence. Permanence refers to the amount of time that the GHGs will remain sequestered before being re-released into the atmosphere (Kollmuss et al., 2008). This is of particular concern in forestry sequestration projects because the carbon is being stored in trees, which are susceptible to destruction from natural and anthropogenic causes, such as, pests, disease, fire, decay and logging. Because of this, the concern is that forestry projects are only temporarily sequestering carbon and there is no guarantee about how many years it will remain captured in the tree (Kollmuss et al., 2008; Dhanda et al., 2011; Russell, 2007). The uncertainty of ‘permanence’ is the reason that forest carbon capture projects were originally excluded from the CDM (Kill et al., 2010) and very few have made it through the approval process (Bray, 2012). According to the Intergovernmental Panel on Climate Change (2007), credits are considered ‘permanent’ if they are guaranteed to remain sequestered for at least 100 years. In the voluntary market, however, many projects have shorter crediting periods of anywhere from 1 to 20, and occasionally up to 50 years (Galatowitsch, 2009). Such short-term contracts fail to guarantee the “100 year” minimum carbon sequestration requirement and therefore can’t guarantee permanence of the sequestered carbon.

Leakage (Slippage)

Forest carbon projects also face the danger of experiencing leakage (slippage). Leakage occurs when forestland enrolled in the program is conserved but overall deforestation activities are not decreased, simply pushing deforestation to land outside the project’s boundaries. If this occurs, then the project fails to achieve net reductions in global GHG emissions. In order to ensure that the credits are representing actual GHG reductions, land around the project zone should be monitored and any leakage should be subtracted from the project’s total amount of sequestered carbon (Kollmuss et al., 2008).

Lack of common standards

As mentioned previously, the majority of projects in the voluntary market are not verified by a third-party, and those that are have over a dozen different standards to choose from (Kollmuss et al., 2008). None of the existing standards used in the voluntary market has established itself as the industry norm and there is “no global agreement on which standard is the most credible measure of quality among the providers” (Dhanda et al., 2011, p.120). Even though these standards were created for the purpose of ensuring quality credits and transparency in the projects, they have also created a great deal of confusion among both buyers and sellers. This confusing array of standards makes it difficult for sellers to know if they are investing in good quality projects and that their money is having the intended impact. It also makes it difficult for project implementers to know if they should spend the extra money to certify their project under one of these standards (Dhanda et al., 2011; Merger et al., 2011; Bray, 2012). This huge and confusing diversity of standards could one day be beneficial but at the moment it is resulting in confusion among both buyers and sellers which can have negative impacts on the quality of the credits being produced (Merger et al., 2011).

Inadequate monitoring and verification

There is also a general lack of monitoring and verification in the voluntary market, which means that many voluntary projects might not actually be creating any overall emissions reductions. In fact, Kill et al. (2010) found that some projects that “have been rejected by the CDM, because they could not substantiate [additionality] have subsequently sold their credits in the voluntary offset market” (p. 58).

It is very complex to calculate GHG sequestration in forest systems (Merger, 2011) and because of this many projects use inaccurate accounting methods to determine the amount of GHGs that are actually being sequestered (Kollmuss et al., 2008). In one study, scientists found that “estimates of the carbon balance in Canadian forests could vary by 1,000 per cent if seemingly small factors, such as increased levels of atmospheric CO₂, are taken into account” (Kill et al., 2010, p. 71). Other factors that can lead to this variation in carbon sequestration include, tree age, local climate, climate change, growth rate, as well as soil type and quality (Kollmuss et al., 2008). This indicates that it could be very difficult to know if the amount claimed is actually being sequestered, even if the program is trying its best to make these estimates. Once we begin to understand these impacts and how they affect carbon sequestration, it is predicted that these calculations will only become more complex. Many monitoring systems also calculate carbon capture solely based on the number of trees but this can encourage maximizing the number of trees planted while ignoring tree growth and other ecosystem considerations (Galatowitsch, 2009).

Another major contributor to low project quality is lack of verification or a long-term monitoring component to make sure that the projects are achieving the claimed carbon sequestration (Kill et al., 2010). One example of this is in Oregon which has “one of the most ambitious GHG policies in the world, attempting to reduce the state's greenhouse gas levels to 10% less than 1990 levels by the year 2020 and 75% less than 1990 levels by 2050” (Wynn, 2009, p. 1). One way this is being implemented is through Climate Trust, one of the biggest and oldest purchasers of carbon offsets in Oregon. Analysis by the Cascade Policy Institute, a policy research center in Oregon, found that the procedures that the Climate Trust uses to quantify carbon sequestration are arbitrary and vary between their different programs. The carbon sequestration that the Climate Trust reports is monitored by the Energy Facility Siting Council, however this “monitoring” consists merely of a review the Climate Trusts’ annual report (Wynn, 2009).

Some voluntary carbon sequestration projects also sell future carbon offsets at the beginning of a project based on carbon capture expected over the course of the project. This “ex-ante accounting” method means that credits are being sold for carbon storage that might not actually take place for 70-100 years in the future, yet are being sold as if they are offsetting emissions that are being released in the present (Hunt et al., 2008; Galatowitsch, 2009). There are also instances in which inaccurate accounting methods have resulted in double counting credits, or selling a credit more than once (Kill et al., 2010; Dhanda et al., 2011). A study done in 2007 by E3 International, a green business think-tank, found that almost 18 million carbon emissions allowances were “double counted” under the European

Union's Emissions Trading Scheme (Murray 2007). By selling the allowances more than once, the more emissions reductions are being claimed than are actually achieved.

Negative environmental impacts

Many of the critiques of carbon offset programs focus on their potential negative environmental impacts. The first is that, while these programs claim to achieve global emissions reductions, there are no actual reductions being made. By design, the purpose of a carbon offset is to pay money for someone else to reduce their emissions so that you can continue emitting. Instead of creating an overall reduction in emissions, you are just moving the emissions from one location to another (Kill et al., 2010). This can help to prevent an increase in emissions but it does not lead to an overall reduction (Dhanda et al., 2011). Due to the additionality concerns mentioned above, they may not even be preventing the increase in emissions to the amount that is claimed (Kill et al., 2010). It also prevents emitters from investing in more renewable energy technologies and promotes the continued release of fossil carbon (Kill et al., 2010).

Offset programs are also criticized for promoting increases in deforestation prior to the start of an offset project. Young forests have a faster growth rate and take up carbon more quickly than mature forests. To be able to maximize the amount of carbon uptake and thus the number of credits sold, old growth forests may be cleared to make room for offset projects. Approximately two-thirds of the carbon in a forest ecosystem is stored in the ground, in soil and debris so if an older forest is cleared the carbon that was stored below ground will be released because of the disturbance and increased decomposition. Because of this, it can take up to several decades for a newly planted forest to grow and store enough carbon to replace what was lost from the clearing. This means that the biggest impact we could have on forest related emissions would be to stop deforestation and conserve old growth forests (Kollmuss et al., 2008).

Another environmental criticism of forest carbon projects is that they often focus solely on carbon capture and fail to take into account the other environmental factors of the system (i.e. biodiversity, soil and water quality, etc.). As a result, some projects have been shown to negatively impact the other components of the ecosystems where they are implemented. These negative ecosystem and biodiversity impacts have occurred in projects that plant trees on lands that were never originally part of a forest ecosystem (Galatowitsch, 2009), or use non-native species or plant monoculture plantations (Kill et al., 2010; Agrawal et al., 2011). One example of where it is already happening is in Brazil where native cerrado woodlands and savannas are being cleared and replaced with plantations of fast growing Eucalyptus. In addition to replacing native species, these plantations often require chemical fertilizer inputs and pesticides for them to survive and grow (Stickler et al., 2009).

Negative social impacts

Many critics of carbon offset projects and markets have focused on the negative social impacts these projects can have. Buyers are often looking for a source of inexpensive offset credits (Kill et al., 2010), making it very difficult to achieve both environmental and social

project goals (Galatowitsch, 2009). These additional costs as well as the challenges associated with participatory community involvement, mean that often times the local people are not consulted or involved in the process of forming and implementing these projects (Barnsley, 2008; Bray, 2012). Also, community members often lose the ability to access fuelwood, timber and pasture resources that they have come to depend on (Galatowitsch, 2009; Agrawal et al., 2011). This has happened in several countries including, Guyana, Panama and Indonesia where forest carbon programs have restricted the cultural practices of indigenous people instead of targeting the larger drivers of deforestation (UN-REDD Programme, 2013).

An even more serious concern is the displacement of local people from their land all together. There have been cases in which indigenous people have been evicted so that governments, corporations or other economic interests could be in control of the land to plant trees or biofuel crops or to develop renewable energy projects such as hydropower plants (Barnsley, 2008; UN-REDD Programme, 2013). This can easily occur in areas where the local people don't have legally recognized property rights to the land (Madlener, 2003; Larson, 2011). An example of this is in Peru where the government is planning on implementing REDD+ projects on 54 million hectares in the Amazon forest. Some of this forest is already inhabited by community groups, and these projects could encroach upon land that they depend on for survival without consulting them in the process (Carbon Trade Watch, 2010). Because of these issues, many carbon offset standards require a process of stakeholder participation in project design and implementation to minimize these impacts (Galatowitsch, 2009). The issue with this, as I will discuss in more detail below, is that not all projects in the voluntary market adhere to a set of offset standards. The result is that often, carbon capture projects are designed and implemented with little or no input or participation from the local people (UN-REDD Programme, 2013).

Another complaint is that the majority of the profits from carbon offset programs go to intermediaries instead of the communities where the project is taking place. One study showed that the communities "receive minute portion of the final price, and little remains to invest in community development" (Bray, 2012, p. 19). This can also happen in countries where corruption is present, resulting in ineffective program implementation and profits not reaching the communities (CIFOR 2012).

Additionally, the future of carbon capture projects, especially in the voluntary market, is filled with uncertainty. As I previously mentioned, the carbon market is currently one of the primary ways governments are attempting to combat climate change but they will only continue to do so as long as carbon sequestration remains the most economically feasible option to reduce emissions (Phelps et al., 2010). This uncertainty becomes even more of an issue in the voluntary market because businesses are not purchasing credits to comply with regulations and can stop at any time, especially if they are suffering from economic troubles.

Carbon projects, especially forest carbon projects, can be very slow to design and implement. It can take several years between the start of a project and the point at which the trees have sequestered enough carbon to be "quantified and sold" as offsets (Kollmuss et al., 2008). It can create an economic hardship for the community if they have to pay for these initial

project costs without receiving a payment for several years. Carbon offset projects, especially in the compliance market, can also have very high transaction costs resulting in part from initial negotiations, project documentation and certification as well as monitoring and enforcing contracts (Merger et al., 2011).

Offset buyers and market structure

There is also an argument that has nothing to do with the way carbon capture programs are designed but with the underlying idea of offsets themselves. Critics of carbon offsets claim that these programs promote the idea that developed countries don't need to change their lifestyle and reduce consumption and that they can simply pay someone else to reduce emissions for them (Dhanda et al., 2011). They are relying on their economic capacity to buy themselves out of any personal responsibility of reducing their consumption (Dhanda et al., 2011). This "hinders the introduction of greener and cleaner technologies" (Dhanda et al., 2011, p. 123), and also promotes "global economic discrimination" (Dhanda et al., 2011, p. 121). This ability to "offset" emissions and avoid reductions, but still promote an industry as environmentally friendly or sustainable is a form of "greenwashing" that distracts from the bigger issue of needing to reduce overall reduce emissions and GHG concentration (Carbon Trade Watch, 2010). These offset programs cannot successfully combat climate change alone. They need to be carried out in conjunction with significant emissions reductions in both developing and developed countries (UN-REDD Programme, 2013).

Another factor that can lead to lower quality credits is the economic incentive for offset buyers to purchase the most possible credits for the lowest possible cost. Choosing a project based on carbon credit price without encouraging quality, leads project implementers to try and produce the cheapest possible credits. This can eventually lead to a "race-to-the-bottom" in project quality (Merger et al., 2011). This lack of quality control, "may result in a loss of biodiversity and the displacement of local population" (Kollmuss et al., 2008, p. 21), as well as create or intensify several of the other critiques mentioned in this section.

Environmental Services of Oaxaca (SAO) voluntary offset program

History of Community Forestry in Mexico

Within the context of this project it is important to mention the unique community forestry system in Mexico. As a result of the Mexican Revolution (1910-1970), the government began redistributing land and forests back into the hands of communities (Bray, 2010). Currently, around half of the land and 80% of the forests in Mexico are held by communities with collective land grants. These include *ejidos* (rural peasant associations) as well as indigenous communities (Bray, 2005). These land grants give the *ejidos* and communities fixed rights and autonomy in governance over their land and forests. The community elects a group of community leaders (*comiseriado*) and makes decisions through an *asamblea*, or democratic community assembly (Bray, 2010).

This structure of governance allows the communities and *ejidos* to manage their land in a

communal way that is distinct from many other countries. It allows for participation from a wide range of community members and allows them to create rules, monitoring plans and well-defined punishments for anyone who violates the rules (Bray, 2010). This type of strong land-tenure system is crucial in order for a community to share the benefits produced from carbon offset projects (Agrawal et al., 2011) and is one of the major obstacles for developing carbon offset projects. Because of Mexico's unique communal system, not all of the aspects of the voluntary carbon capture project presented in this report will be transferable to other countries. It may be most applicable to countries that have communities living in large tracts of forest, such as Indonesia and countries in the Amazon Basin and Central Africa (Bray, 2010). Having this basic structure in place would make it more feasible to implement communal forest management or voluntary carbon capture projects.

Another characteristic of community forestry in Mexico that is important to mention is that around 2300 communities have legal logging permits and have created community forestry enterprises (CFEs) to sustainably harvest timber from their forests (Bray, 2010). One of the requirements for communities or *ejidos* to start a CFE is that they must develop a management plan for their timber resources that complies with Mexico's federal forestry regulations. These management plans limit the total volume that can be logged annually and the minimum diameter of the timber harvested (Snook, 2005). Not only are these communities managing the forests for the production of timber but in some cases they are producing value added timber products (Bray, 2003). Mexico is unique because it appears to have more communities managing their forests for commercial timber production than anywhere else in the world (Bray, 2005). This is an important characteristic to consider because studies have shown that Mexican communities with mature CFE enterprises have either lower deforestation rates or an increase in forest cover as compared to communities without CFEs (Bray, 2010).

Project Description

For this study I examined these forest offset critiques in the context of a voluntary forest carbon offset project in Oaxaca, Mexico. The project is being carried out by *Servicios Ambientales de Oaxaca* (SAO), translated as Environmental Services of Oaxaca. SAO is a consortium of six organizations and communities and was legally incorporated in 2000, to work towards building capacity in rural and indigenous communities, promoting the conservation and management of natural resources and identifying alternative sources of income (Bray, 2012). Once formalized as an organization, SAO hired technical advisors that visited communities in Oaxaca to hold informational sessions with the communal assemblies, educating them on the topic of carbon capture and seeing if they were interested in participating. The concept of carbon capture through biosequestration was difficult to get across to the communities and initially there was a lot of mistrust that the project was a way for the government to take away their communal land rights (Bray, 2012; *Servicios Ambientales de Oaxaca*, 2010). Eventually, SAO was able to clarify the goal of the project and they now work with ten indigenous communities in the region of Oaxaca, training them in natural resource management and helping to increase their income through the sale of carbon offsets (Barnsley et al., 2008).

From 2001-2002, with support from the Ford Foundation and Mexico's conservation and forest management program (PROCYMAF), SAO performed studies to evaluate the potential to realize carbon storage projects in local communities in Oaxaca (Servicios Ambientales de Oaxaca, 2010). The Mexican National Forestry Commission (CONAFOR) financed the initial stages of the project starting in 2003 (Bray, 2012) and a market study, supported by the Inter-American Foundation (IAF), was done in 2006-2007 to help SAO to identify possible carbon credit buyers. The project was also initially designed to attract international buyers under the CDM but that turned out to be too complicated and economically not feasible (Bray, 2012). SAO was able to partner with ProNatura, a well known Mexican conservation organization, which started a GHG mitigation initiative called *Neutralízate* (Servicios Ambientales de Oaxaca, 2010). As part of the *Neutralízate* program, ProNatura conducts a carbon inventory for companies and individuals, informing them of strategies to reduce their GHG emissions and suggesting they buy carbon credits for the emissions that they cannot reduce (ProNatura, 2013).

SAO initially planned on selling four different ecosystem services: biodiversity, water quality and quantity, scenic beauty and carbon capture. As of now they have only been able to find a market for the carbon capture ecosystem service. The SAO project has a large educational component and employs local technical advisors to work with and train the program participants. These advisors are knowledgeable about forestry, speak the local language and live in or near the community in which they work. The technical advisors work with the community to develop a calendar of management activities for their enrolled forest parcels (personal communication with Carlos Marcelo Perez González 6/27/13). There are a few rules and activities that the community must follow or implement to participate in the program (Appendix A) but they can expand upon these in their management plans.

According to a report by *Servicios Ambientales de Oaxaca* (2010), the communities reinvest about 70% of the funds back into these forest projects, while 20% are used for social projects and 10% go towards covering administrative costs. The funds that are reinvested in the forest are used for management activities, some of which include: reforestation, pruning, forest thinning, firebreaks, soil erosion barriers and tree nurseries.

In all of the communities except for San Juan Metaltepec the project is being carried out by the *comiseriado*. In San Juan Metaltepec, the project is being implemented through the local coffee cooperative on their coffee agroforestry parcels (personal communication with Carlos Marcelo Perez González 6/27/13).

While I was in Oaxaca conducting interviews, Carlos Marcelo Perez González, one of SAO's founders and the main technical coordinator for the organization, split off from SAO to form a new organization, *Integradora de Comunidades Indígenas y Campesinas de Oaxaca* (ICICO), translated as Integrator of Indigenous and Peasant Communities of Oaxaca. The communities participating in the carbon offset project and ProNatura will continue to work with Mr. Perez Gonzales under this new organization of ICICO. Because this is a new transition and for reasons of clarity, I will continue to refer to the organization as SAO throughout the remainder of this paper.

Research Questions

Due to the above-mentioned critiques of forest carbon capture projects, many people feel that that they should be excluded from the carbon market (Kill et al., 2010). For this study, I analyzed the data to evaluate to what extent these critiques apply to the SAO projects in Oaxaca. I aimed to answer the following questions:

1. How does the case of SAO support or contest the common criticisms or perceived benefits of other forestry offset programs?
2. To what extent can SAO's program structure and lessons learned be applied to other forest carbon offset projects?

METHODS

Many of the criteria that are indicative of "good" offset programs would be very difficult, if not impossible, to measure quantitatively. Using permanence as an example, there is nothing physical that you can measure to determine what people plan to do with the forests in the future. The only way to get this information is to talk to people and learn if there is a long-term plan for forest conservation. I choose a qualitative approach because it was the only way to learn about the experiences each community has had with the program, what they perceive the impacts to be and their future plans for their forests. I chose to examine the SAO forest carbon offset project because it was one of the only voluntary projects in existence in Mexico and appeared to be relatively successful.

Prior to the start of the project, relevant gray and academic literature was reviewed to gain a better understanding of the carbon offset market and the common critiques. The information gathered through the literature review aided in the development of three interview guides (Appendix B), one for SAO and ProNatura, as intermediary organizations, one for participants in the communities enrolled in the voluntary carbon offset project, and one for external agencies that are buying the carbon credits. The interview guides for each of the three groups were structured to gather information about the project in general as well as specific information about each of the common forest carbon critiques as they related to the SAO project.

All of the interviews with program participants and SAO intermediaries were carried out in Oaxaca, Mexico, from May 29th to August 7th, 2012. One of the interviews with ProNatura was conducted in their office in Mexico City and the other was done via Skype. The three communities in which I conducted interviews were Santa Maria Tlahuitoltepec, San Juan Metaltepec and La Trinidad. I did not have time to do interviews in all ten participating communities so I chose these three because they each had different characteristics. Santa Maria Tlahuitoltepec has a history of higher timber extraction and seemed to be more dependent on external funds to support forest conservation; San Juan Metaltepec is carrying out the project using agro-forestry techniques with coffee; and La Trinidad has a community-forestry enterprise system. By choosing communities with a range of characteristics I felt I could get a better sense of how the project as a whole holds up to the forest offset critiques. A table comparing the three communities (Table 1) and a map

showing their locations (Figure 1) have been provided to better understand the location and the context of where the interviews were done.

Table 1: Community characteristics

Community	Community group carrying out project	Unique community features
La Trinidad	Comiseriado	The community has an active community forestry enterprise (CFE) system and is sustainably harvesting timber from forest parcels that are not enrolled in the carbon capture project.
San Juan Metaltepec	Coffee Cooperative	Land enrolled in the carbon capture includes forest parcels as well as agroforestry, coffee-forest parcels. There are around 57 members in the coffee cooperative with land enrolled in this program.
Santa Maria Tlahuitoltepec	Comiseriado	No CFE or agroforestry, only forest parcels enrolled in the program. History of timber extraction.

Figure 1: Map of study sites in Oaxaca



I speak Spanish at an advanced level and was able to conduct the majority of the interviews directly in Spanish. In San Juan Metaltepec, four of the interviewees did not speak much Spanish, so a local translator was used when necessary to translate between Spanish and

Mixe, the local native language. The main purpose of the interviews with the intermediary organizations and program participants was to gain a better understanding of how the program functions as well as their perceptions whether the common forest carbon critiques apply to this specific project. The interviews with the external agencies purchasing the credits as well as one of the ProNatura interviews were done through phone or Skype interviews from mid-August of 2012 and February 2013. The main purpose of these interviews were to better understand buyers' motivations for participating in the project, gauge their level of understanding of the program's impacts in Oaxaca and gather feedback that could help SAO improve the project.

In total, I completed 33 interviews with program participants, 6 with SAO intermediaries, 2 with ProNatura intermediaries and 5 with credit buyers. All of the interviews were transcribed and then coded for particular themes (Appendix C), based on the common critiques of the carbon offset market, using the qualitative research software program, NVivo. Once the interviews were coded I was able to analyze the interview text coded for each theme and summarize my findings to help answer my two research questions.

RESULTS

Additionality

As mentioned previously, demonstrating the additionality of a carbon-offset program is very difficult because determining if the conservation would have happened in the absence of the program is very subjective (Kollmuss et al., 2008).

In the three communities where I conducted interviews, I heard similar stories about the reforestation process they went through and the impact the program has had on forest conservation. The majority of program participants emphasized that the carbon capture project was not the main motivation behind their conservation efforts and that they had been reforesting their land long before this program began. All three communities mentioned that they had a history of deforestation, clearing the land using slash and burn agricultural techniques. They had started to see the impacts that deforestation was having on the environment and realized that they needed to do something to reverse the trend. This motivated them to begin the reforestation process and eventually seek to enter some of the reforested areas into the carbon capture program. Interviews with SAO intermediaries and technical advisors confirmed that the process of reforestation began in some communities before the start of the carbon offset program, since the 1980's in some cases.

It does appear that the level and strength of the pre-existing reforestation varies between communities. Program participants from La Trinidad, which had previously organized a sustainable logging CFE, mentioned in their interviews that caring for the forests had already become a part of their communal culture before the initiation of the program. One program participant, who was not directly involved with the implementation of the program, stated:

“We [participate in the program] because it truly interests us. It interests us

because our forests are a part of who we are. It's a part of us because we live in this place. We are a part of the forest and the forest gives us many things. It gives us money, it gives us food, it gives us fertilizer, it gives us wood...it gives us many things... So, is it because of this that we are taking this path to protect the forest, to care for it, to ensure it is permanent ... That is our idea.”

This culture of conservation was mentioned in the other two communities as well, although it may not be as strong. This could be due to the fact that their reforestation and conservation efforts have begun more recently. In Santa Maria Tlahuitoltepec, a community leader who is currently involved in the implementation of the project, mentioned that:

“Tlahuitoltepec started a reforestation initiative because we were realizing that the forests were disappearing, there were no trees left... it wasn't because of the project, or because of economic incentives, it was because... we realized we needed to reforest.”

However, another program participant from the same community worried that in the future the forests would once again be cleared because the people “haven't been trained to care for them,” even with the presence of this project.

Using this pre-existing reforestation process as a sole gauge of additionality might suggest that this program does not meet the additionality requirement, however there are several other themes that came up in the interviews that need to be taken into account. In 20 of the 33 interviews that I conducted with program participants, the interviewee specifically stated that the offset payments are helping them to conserve and maintain the forest in a way that would not be possible if they were to stop receiving these funds. One of the SAO technical advisors in the communities said, “yes, we have a lot of trees, but here what we always lack are funds. Caring for [the trees] is expensive.”

Interviewees mentioned that the funds allowed them to implement activities such as: creating tree nurseries, transporting trees to reforestation areas, creating soil erosion barriers and firebreaks and pruning the trees for optimal growth. Some of these activities are done by program participants through a voluntary communal work obligation called *tequio*. In addition to this voluntary work, the funds have also allowed the participating communities to occasionally pay community members for this work, generating household income.

When asked what would happen to the forest if the project were to leave, the program participant interviewees were split between what they thought would occur. About half of the program participants claimed that they would continue caring for the forests, demonstrated in a comment from a program participant that works in the community forestry enterprise in La Trinidad:

“If the program disappears and there is no more economic support, we would continue on the same path. We would continue anyway and give the same benefits to the forests... we will not abandon it because we do not have a program pushing us forward. We will implement the program ourselves and move forward.”

However, the other half of program participants interviewed were less certain of this continued forest care. Some commented that the forest would remain, but that it would not receive the same maintenance. Others commented that if the program were to disappear the communities would no longer be able to fund monitoring and vigilance activities and the forest would face direct threats from people entering to illegally extract timber. This is an important point because even though the land is communal, and all of the communities participating in this project have developed land management plans that set guidelines on forest extraction, the *comiseriado* is operating with a very limited budget. They may not have the money to enforce the rules that have been set in place. One of the SAO technical advisors mentioned just how important these funds are for the community:

“Of the total income of Tlahuitoltepec, the funds from the carbon offset project represent 80% of that total income. In the case of San Bartolome Loxicha, it represents between 60-70% [of the total income].”

These are most likely rough estimates of the amount of income the program is providing, however they demonstrate approximately how much the community is receiving from the program that they were not receiving previously.

There was also concern in San Juan Metaltepec that the coffee producers that are practicing agroforestry on the land enrolled in the program would stop caring for the trees. One of the coffee producers in the association said that if the program left:

“Some people wouldn’t protect their land. They could burn or cut down their parcel... they wouldn’t continue [to maintain it], they would abandon it. That is why we keep working [with SAO], because the payments help to conserve the forest”

A few participant interviewees also mentioned that the program is instilling the idea of conservation in the community, even if the amount of money they receive is minimal. This educational component of the program is teaching community members about the ecological value of the forest and altering their behavior and long-term goals for the forested land in their community. One of the program participants working in the community forestry enterprise in La Trinidad said:

“The amount we receive from the program is not a lot, but in the community it is creating a culture of investing in the forest. We are seeing that we are benefitting... so, if we destroy [the forest]... we will soon have a desert... So, what helps us [prevent] this are the environmental services. The little that we receive, we invest in the forest to continue conserving.”

This perception was supported by one of the SAO intermediaries who mentioned:

“The community had already started the process of reforestation but this project has allowed them to expand [the reforestation] and has provided them with the education of how to do it correctly.”

One requirement of participating in the carbon capture program is that communities develop a communal land use plan. These land-use plans allow the communities to map out

their land and designate areas for different uses, for example, conservation, agriculture or urban development. According to SAO, only 3 of the 10 communities that are participating in the program had communal land-use plans prior to the program. One of the SAO intermediaries mentioned the importance of creating these land-use plans, by explaining what it was like in the communities previously:

“Anyone was able to enter, cut down the trees and remove them without permission from the *comiseriado*. Now it’s different. There are now internal land use zoning rules in the communities that say what you can do in the interior of the forest and who you have to report to in order to do these activities.”

Each of the seven communities that didn’t already have a land-use plan developed one with the assistance of their SAO technical advisor. All ten communities worked with their advisors to develop strategies to enforce the land-use plans including activities to maintain and protect forests on a community level. The other important factor to consider with this land-use plan is that it is encouraging improved management and conservation of forestland outside of the small parcels that are enrolled in the program. Even though these forests are not a part of the carbon capture project, these land-use plans are allowing the communities to monitor and regulate the communal land and forests as a whole. This means that not only is the program meeting the additionality requirement in the enrolled carbon capture land parcels, but it appears to be helping to protect non-enrolled forests as well. These non-enrolled forests are capturing additional capture than the community is not selling as part of this voluntary program. Also, the enrolled and non-enrolled forests are generating other environmental services, such as hydrological and biodiversity services, that are not counted in this program. One of the SAO intermediaries said that:

“From 2000 to 2010, there are communities that, instead of a soil loss, they have seen an increase in the soil layer... they are recovering agricultural land and converting it to forest. Degraded areas are recovering... on a community level.”

From the themes that emerged from the interviews it appears that the forests in these communities were not under immediate threat of deforestation. Many of the communities were already reforesting and they would likely try to continue conserving the forest in the absence of the program. However, it also appears that this program has provided the communities with the economic resources needed to strengthen and increase their reforestation efforts, support forest monitoring programs, and train community members in improved forest management techniques. These activities probably would not have been possible without the economic income from the carbon credit sales. The educational component of the program also appears to be helping to foster a culture of conservation in the communities that did not previously exist.

Permanence

The SAO carbon offset project sells credits on a year-to-year basis and does not have any long-term contracts so there is no guarantee that the community will continue to participate

in the program. According to one of the ProNatura intermediaries:

“This is a problem. I think that this is the part that is still not assured. Even though there are contracts, there is nothing to assure this permanence... that, even if they stopped receiving payments they would continue to conserve. On one hand, they are selling the carbon captured during the year. There is not a lot of risk, as with other programs where they have to conserve for 30 years but every year are paid very little. Here, everything... is captured in one year... But yes it is a risk that the moment that the buyer leaves, whether or not [the community] will continue to conserve. It continues to be a risk and... we need to continue looking for clients.”

In Tlahuitoltepec, a community leader who is currently involved in the implementation of the project mentioned that there was a risk that future community leaders might come into power and decide not to continue with the program.

“We are not all the same, right? So, other leaders could enter into power and say ‘I don’t like this type of project’ and then what would happen? That would be the end of it. It would not continue.”

The community *asamblea* process would not allow community leaders to end the project without the community being in agreement with this decision first. However, the lack of a long-term written contract does mean that one day the community could decide to end the program and stop conserving the areas. This is not to say that simply because these contracts do not exist, the community will not continue their conservation efforts and ensure the permanence of the forest of their own volition.

Due to the lack of written long-term guarantees, I felt that it was important to interview program participants about their long-term vision for their forests. I did not directly ask them if they planned on harvesting the wood because I did not want to influence their responses, but rather I asked them questions about the value they see in the forest as well as what they envisioned the long-term goal of the project to be and what would happen if this project were no longer present in the community.

There were several comments by both program participants, as well as intermediaries, about how the educational focus of this program is helping to change people’s perception and attitudes towards the environment and leading to changes in behavior. A program participant from La Trinidad commented:

“There is increasing awareness about the forest... about needing to take care of the forest. That you can harvest resources but they need to be replaced, need to be taken care of.”

Another program participant from La Trinidad that works in the forestry sector mentioned:

“In the communities enrolled in [the carbon offset project] you can see the difference. Because, in others that are not, [they have the perception of] ‘I am going to harvest, harvest, harvest and I don’t care if [the trees] regenerate.’ But here, we have... developed this culture of...strengthening the

environmental services.”

Another program participant from La Trinidad, who works with the CFE, made a similar comment:

“If the program disappears or there are no more payments from the program, we will continue with the same mission. We will continue to give the same benefit to the land... we will not abandon it because we don’t have a program pushing us forward. No. We will carry out the program ourselves and continue moving forward.”

From comments made by program participants, it appears that part of this behavior change has resulted from an increase in knowledge of ecosystem services as well as proper forest management techniques. Many interviewees mentioned that they did not understand the concept of carbon capture when the program began, but that they now better understand how the trees sequester carbon as well as the other environmental services that the forests are providing. One of the SAO technical advisors mentioned their work trying to teach the community about carbon capture and the confusion that surrounded the process:

“[The program participants] would say things like... ‘well, what is [carbon capture]? They tell us that we are selling oxygen but how are we going to sell oxygen? If we are going to sell it, we will need to package it... put it in a bag and everything, right?’ ”

SAO was able to clarify the process and teach the community about carbon capture and other environmental services through their educational campaigns.

This increased awareness and ability to make not only economic, but also environmental and health connections to these ecosystem services, has helped to provide an impetus for this behavior change. An important component on this educational process is the program’s emphasis on educating youth and actively involving them in the program. In La Trinidad, one program participant said that,

“[We are trying to] instill this culture of conservation in the youth... so that it is not lost. [We want] our children to have this knowledge about the importance of the forest. [The program] is not just about our economic situation. No. Its more about social factors, our internal processes.”

It is important to point out that there were also worries by a few of the program participants that, if the carbon capture project were to disappear, some people in the community might want to return to their old ways of unsustainable timber extraction. An older, female program participant in San Juan Metaltepec commented on this: “Some people see these conservation areas and want to enter and cut down the trees... they think they can harvest these trees. That is why we are taking care of [the land].” This suggests that there is still additional education and community work that needs to be done to reach a communal level of behavior change and ensure forest permanence over the long-term.

Several program participants mentioned that prior to the program they were able to plant or harvest without many restrictions. This doesn’t mean, however, that if the program were

to disappear, community members couldn't simply revert back to the old, unrestricted harvesting system. The program required that the communities create or strengthen communal land-use plans, as I discussed in the 'additionality' section. Now, the *comiseriado* in each of the communities has a land-use plan that lays out which areas can be used for agriculture, conservation, urban development, etc. A newer program participant and coffee cooperative member in San Juan Metaltepec commented about these changes:

“Before, we practiced slash and burn agriculture and planted corn. Some of this land lasted about 2 or 3 years and then we would start again [in another place]... but now [we] have specific places for conservation and for the corn. We have different areas, but where there is conservation, it is only for conservation. Now they can't burn or plant corn.”

Even if the program were to end, this communal land-use plan would still be in place, outlining the different land-use zones in the community and preventing the encroachment of other land-uses into the designated “forest areas”.

As mentioned in the above section on additionality, both program participants and intermediaries mentioned that there was already a reduction in agricultural land prior to the initiation of this program. However, in addition to this, many also commented that the communal land-use plan that the communities had to develop to participate in this program is impacting how the remaining agricultural land is managed. There were several comments about how in the past people in the community would practice slash and burn agriculture without controlling the spread of the fire. They would simply let the fire continue burning until it stopped on its own. Through this program they have begun to regulate this agricultural practice so that the fires do not spread outside of the designated agricultural areas. One way they do this is by creating firebreaks to control the spread of both natural and anthropogenic fire. A program participant from Metaltepec that is very active in the project commented:

“Before, everyone used slash and burn. 100 percent. Not anymore... now they conserve, they don't burn... it is necessary to open firebreaks so that the land we aren't planting doesn't burn... this is what they do now.”

These firebreaks are just one example of a forestry management skill that program participants are learning through this program. They are also learning to create soil erosion barriers, and manage the forest for pests and diseases. These skills are allowing community members to help reduce the threats to forest health and increase the likelihood of forest permanence.

In all three communities there were comments about the unsustainable ways in which past generations harvested resources from the land. They also mentioned that they had learned from this and wanted to prevent the community from reverting back to this system. This suggests that if the program were to disappear, and the communities decide to harvest timber in the future, they might now have the environmental awareness and management skills to harvest in a controlled and sustainable way, such as through a CFE system. In Santa Maria Tlahuitoltepec and San Juan Metaltepec, the two communities in which I conducted

interviews that don't currently have a CFE, 9 of the 26 people interviewed specifically mentioned that they saw the trees as a future resource that they or their children could access if needed. In Metaltepec one coffee producer and program participant commented:

“The trees serve a double purpose. Apart from the carbon capture, they can provide us with wood... in the future they will be useful to us. [The project] is not only for carbon capture. It can help us as well.”

There were many other similar comments that gave me the impression that program participants in Santa Maria Tlahuitoltepec and San Juan Metaltepec would like to move toward some type of CFE system in the future, although this was never specifically mentioned. Starting a CFE timber-harvesting program does not necessarily mean that these communities will revert to the unsustainable harvest practices they may have had in the past.

Another consideration for permanence is that the SAO offset projects are not certified by an international voluntary offset standard. This means that they are mostly limited to selling credits within Mexico to buyers that are familiar with ProNatura and trust their reputation. Without certification it would be very difficult for them to sell credits on an international level and expand beyond the Mexican market. If the demand were to decrease or disappear in Mexico then it is unlikely that the program would continue which could have impacts on the permanence of the forests in the participating communities. However, based on interviewee comments, it seems that even if the program were to disappear, the forest cover and sequestered carbon would likely be maintained through either continued conservation or some type of CFE system that sustainably harvests the timber. As mentioned previously, in Mexico, a study has shown that where CFE systems are mature, deforestation is either low or there is expansion of the community forests (Bray, 2010). In addition to maintaining the forest cover, the timber that is being extracted is often going into long-term carbon storage products, such as furniture. The impacts of the behavior change, improved management practices and land-use plan extend beyond just the forests enrolled in the carbon capture program. This suggests that not only is the program helping to achieve “permanent” carbon storage in the enrolled forest parcels, but also in forests on a community level.

Leakage (slippage)

The leakage of displaced activities into new areas is difficult to measure with any certainty using qualitative data alone, however, interviews with program participants as well as SAO and ProNatura intermediaries provided some interesting insights into this issue in the context of this program. As mentioned earlier, much of the land that was reforested was either abandoned agricultural land or current agriculture land that they decided to convert back into forest. A program participant that works in the forestry sector in La Trinidad explained why the agricultural land was abandoned:

“People have been losing interest in farming. Not only here but in other areas. The youth are leaving. They go to the cities or leave the country. They leave to try and improve their lives.”

The communities did not have enough people to work the land or were finding other sources of income instead of agriculture. Some program participants said that there is currently less agricultural land than there was in the past while others think it is about the same but is located in very specific areas.

Also, as mentioned in previous sections, program participants and SAO and ProNatura intermediaries emphasized that now the communities have a communal land-use plan that outlines the various land-uses in the community. This makes it very clear which land is for agriculture, conservation, urban development, etc., and prevents various communal land-uses from encroaching on the forested areas. A ProNatura intermediary also commented on this, “the project has been around for several years and the communities are now very organized, so I don’t think that there has been any displacement of activities.”

The reduced demand for agricultural lands seems to have reduced deforestation pressures on standing forests. Also, the communally enforced land-use plan appears to be helping to prevent leakage by preventing the encroachment of other activities into both enrolled and non-enrolled forest parcels.

Standard system and monitoring and verification

The SAO carbon capture project doesn’t have set activities that the communities must do to participate in the project beyond protecting the enrolled land. They do, however, have a number of recommended activities that the community can implement in order to maximize tree growth and the amount of carbon being sequestered, as well as protect the forests from fire or disease. It is up to each community to coordinate with the SAO technical advisor that works in their community and come up with a work plan that will help them manage and protect the enrolled forests. They are also very cautious about which communities to accept into the community, wanting to ensure that they will maintain the project quality standards that ProNatura and SAO set. This was mentioned during an interview with one of the SAO intermediaries:

“The idea is to grow but in an organized way. For example... there is a process for new communities to be accepted into [the program]. We don’t want a new community to contaminate the others. There are requirements for them to be able to enter.”

The SAO voluntary offset project is not certified by any of the officially recognized voluntary standard systems. The standard system they use was developed by Benjamín Ordóñez Díaz, who currently works for ProNatura. He based them on those that were developed by the International Panel on Climate Change (IPCC). According to David Barton Bray, “Ordóñez’s method has not yet been validated or verified by an independent authority as international standards require. It’s only recognition comes from CONAFOR, which is well aware of the conflict presented by its interest in SAO’s success (2012).” This conflict of interest was mentioned by one of the ProNatura intermediaries:

“The CONAFOR certification has caused some problems with the project... CONAFOR invested a lot of money into the Payment for Ecosystem

Services carbon capture projects and the only one to advance was SAO's. Before, I think CONAFOR saw it as an opportunity to promote the projects they had invested in, but over time, they realized they were playing a complicated role and decided to stop signing the certificates. The program has been running for 5 years now and it is established enough now that SAO can find an external verifier, independent of CONAFOR."

The CONAFOR certification makes it possible for them to sell credits on the Mexican voluntary market but not on a wider international scale (Bray, 2012). They are currently looking into getting international certification, possibly under the California Action Reserve, which is in the process of developing a certification protocol for both compliance and voluntary offset projects in Mexico.

When interviewed, none of the buyers mentioned that the lack of an internationally recognized certification standard as a deterrent. Most commented on the reputability of ProNatura as an environmental conservation in Mexico, using that as a gauge to ensure the credits they bought were of high quality. One of the carbon credit buyers said:

"ProNatura is a civil asocial that has been working in Mexico for many years and it is the only organization certified to sell carbon offsets. That is why we work directly with them."

SAO carries out the monitoring and verification to ensure that the community is complying with the rules of the program and to calculate the amount of carbon being sequestered by the forest parcels. Each community that is enrolled in the program has monitoring plots to determine how much carbon the forest is sequestering. One SAO intermediary explained this:

"Every year we do the measurements in the land parcels and this allows us to determine the tree growth and development. Using this, we can determine the carbon capture that the enrolled land has had."

Several program participants also mentioned this step, demonstrating an awareness of the monitoring process. An older, female program participant from San Juan Metaltepec described this process:

"There is an area where the do the study, measure the size of the tree, the branches, the height... this allows them to calculate how much carbon there is... from how many hectares we have."

Another female program participant from Metaltepec who is actively involved in the program mentioned the importance of the verification process:

"Its good that they come to check to make sure that the program participants are actually working. There are people that don't like to work, but they have to do it. It is very important. We have to fight, we have to look out for our children."

The buyers are supposed to receive a report of the progress and results every 6 months, however, a few of the buyers commented they were either not receiving reports or that the

reports were not detailed enough for them to really know what was going on in the communities. When asked what could be improved with the program, one buyer mentioned:

“Share [the results] with the people that have participated so that they know what has happened and how the people in the communities are benefiting. We don’t have that much information about what is difficult to know what is happening”

Another buyer said that the information they receive is mostly about the environmental impacts and that they would like the reports to “focus a little bit more on the human aspect of it...in terms of the communities. That’s important. We don’t get much of it.”

If buyers are not receiving adequate reports of what is going on, it is hard for them to verify that their money is being used in the way that they are told. This could also have an impact on their willingness to continue with the program. The fact that there are no long-term contracts and that the community is dependent upon the buyer to be satisfied with the quality of the project and want to continue buying the credits the following year, seems like a big incentive for the communities to strive to achieve high quality credits. If buyers are feel unaware of the results of the project, feel that the communities are not completing their goals or perceive that they are producing low quality offsets, buyers will not return the next year and the payments will stop.

It appears that SAO tries to ensure that the communities participating in the project are completing the goals and objectives of the program and producing high-quality credits despite the lack of an internationally recognized standard system. Both program participants and intermediaries talked about the importance of the monitoring plots in calculating the amount of carbon being sequestered annually, however, these measurements are not verified by a third party source. Several buyers commented that they trust that the credits they are paying for are high-quality due to the good reputation of ProNatura. It is questionable if the buyers would continue to buy the credits directly from SAO if ProNatura and their good reputation were not involved in the project.

Environmental impacts

One of the criticisms of offset programs is that there are no actual emissions reductions being made, that the emissions are just moved from one area to another. As mentioned in the previous section, the *Neutralizate* program completes a carbon inventory for the business that participates in the program. The report that the businesses receive emphasizes changes they can make to reduce their emissions as well as promoting the SAO offset program. SAO’s partnership with the ProNatura *Neutralizate* program, and the initial emphasis on emissions reductions, is unique from other carbon offset programs and suggests that this probably helps to create an overall reduction in emissions.

As described above, SAO has four environmental service goals: carbon capture, biodiversity, water quality and quantity, and scenic beauty. As of yet, the only environmental service SAO has been able to market has been the carbon capture on the enrolled forested lands. However, even though the other services are not being marketed, many of the program

participants in all three communities commented that they were seeing animals returning to the area, increased water and also cleaner air as a result of the reforestation projects. A program participant and member of the coffee cooperative in Metaltepec mentioned these environmental changes:

“Through conservation and maintaining the forest, the animals that used to be here are starting to return. They are returning to the area. Why? Because there is an environment for them, a place where they can live.”

One of the ProNatura intermediaries mentioned these benefits also:

“When you talk to the people you realize that the program is not only about the money for them. They see changes in their quality of life, for example, there are people that talk about how the water is returning... these things are very important.”

One program participant also pointed out that that these projects allowed them to generate income without the health risks that accompany other potentially harmful economic activities, such as mining:

“Here in La Trinidad we have seen... in the Juarez Mountains... there was a mining company. When they finished mining, there were children born with birth defects. What caused this? All of the chemicals. [This projects helps us to] avoid all of this.”

It is possible that program participants have a perception bias about these changes from what SAO has taught them during educational training sessions, emphasizing that increases in forest cover will provide the community with environmental service benefits. SAO is not currently doing any data collection or analysis on the environmental or health impacts of the program, so it is unclear whether the claims of improved air quality or quality of life are real. However, the fact that program participants perceive these impacts to be occurring as a result of the program is likely influencing their attitudes and behaviors towards the forest, which could have positive future conservation benefits and increase the likelihood of forest permanence.

The communities were able to enroll either existing forests, or areas that they wanted to reforest, into the program. For areas that the community has reforested, there are currently no specific rules about what types of trees the community must plant. The majority of the program participants interviewed said that they respect the native species of the zone because non-native species would not grow well. One municipal worker and program participant from La Trinidad said that, “I think that here we plant species in accordance to the zone...nature is wise... every place has its species.” When asked if there were rules about the species that could be planted as part of this program, a community member from La Trinidad that was not directly involved with the program said, “I don’t know but the majority of the trees that we have here are almost all trees from this region.” One program participant and member of the coffee cooperative in Metaltepec said:

“Yes, there are rules about taking care of trees but we will decide [anyway] to chose native trees, trees that are suited to the climate, that will grow. We couldn't bring in trees from Michoacán, they wouldn't grow.”

In all three communities there were similar comments about choosing trees that were adapted to the region.

There were only three program participants that made comments that the program focused too much on only a few species of pine. One program participant thought they focused too much on pine as opposed to planting a mix of species, “The project accepts pines more than any other species.” Several of the program participants in Metaltepec mentioned that they liked to plant Chiapas Pine (*Pinus chiapensis*) because it grows quickly and therefore sequesters more carbon. In the community tree nurseries, they also mentioned that the focus is on growing only a few species, but also said that if there was a tree that was already naturally sprouting in the area, that they left it to grow.

Based on the perceptions of the interviewees, it appears that this program is having a number of positive environmental impacts. One of these is that the *Neutralizate* program encourages businesses to reduce their emissions as well as offsetting what cannot be reduced. While SAO doesn't have specific rules about the type of species that can be planted, the majority of interviewees mentioned that they focused on planting native species because that is what grows best in the region. Program participants also mentioned several environmental benefits they were seeing in their communities including: animals returning to the area and increased water that had been scarce in the past.

Social impacts

One of the complaints of the carbon market is that it can have negative social impacts on program participants such as, excluding them from the planning process, displacing them from their land or not achieving the co-benefits that were planned. In the context of the project in Oaxaca, SAO was formed by the communities with the goal of selling carbon offsets. Both the program participants and SAO technical advisors mentioned that for a project like this to go forward, it has to be approved in a community general assembly. A municipal worker and program participant from La Trinidad said, “I could have an idea, but in the end we are a community and we all make the decision together.” A ProNatura intermediary pointed out that:

“To participate in this program requires [the community] to work as a team, to make decisions together and to complete all of the activities so I believe it is promoting community governance.”

There were also a few comments, by both community members and SAO intermediaries, that the program was increasing, and in some cases helping to resurrect, the cultural practice of *tequio*, or voluntary communal labor. One of the ProNatura intermediaries elaborated on this practice, saying:

“Some communities use [*tequio*] and others don't ... There are times when workers are paid a salary and times when we use *tequio* so that the money

stays in the community for other activities.”

One of the SAO technical advisors also talked about how the use of *tequio* benefited the whole community, “The funds remain and can be used for the schools or if we need something in the government buildings. The funds are available to be spent on other things.”

In each community they went through a “time-consuming participatory processes of zoning land for agriculture and forests, drafting rules, creating nurseries and using hand-held geographic position systems to mark forest boundaries in remote images (Bray, 2012).” Each community also has a SAO technical advisor who is from either the same community or another nearby community and who speaks the native language. The technical advisors work with the communities to help them develop work plans for each of the enrolled forest areas. This ensures that the program participants are taking part in the planning and implementation of the offset activities happening on their land. The communities also have complete control over what they do with the money as long as they are completing the activities in their work plan.

There is the critique that communities are vulnerable to losing their land or land rights. A few program participants talked about why this would not happen in their case. An active program participant and *comiseriado* member from Santa Maria Tlahuitoltepec said:

“Since the beginning we have taken care of the forest because we want to. What we are receiving is an added bonus. But that doesn’t give [the buyers] the right to tell us in the future that the forest is theirs.”

The same program participant went on to say:

“It’s a beautiful game in the end... Now, they contaminate, but when they destroy the area they are contaminating, they will have to turn their attention to us. And that is the fear. That they are going to suddenly say ‘we have provided assistance and money so this land is now ours.’ No. It’s an issue that we try and clarify... the space is ours, the forest is ours and just because we are receiving some benefits from the companies, that doesn’t mean that in the future they can say that this is their forest.”

In order to prevent the carbon buyers from making future claims over the land or trees, the carbon offset contracts make it clear that the buyers are only paying for the carbon capture that is occurring every year. A ProNatura intermediary talked about this:

“I have heard this fear but in the contracts it is clearly stated that... they are not buying the land, they are buying the carbon capture environmental services.”

Another social concern is that the program goal of creating co-benefits does not always occur and in some cases negative social impacts can occur. In the case of the SAO project, benefits that the community mentioned receiving from the program include both environmental and social benefits. Among the social benefits interviewees mentioned seeing are: increased employment, improved health and quality of life, funds for community

projects, as well as the creation of other economic activities in the community. The program was able to help create these alternative economic activities because of SAO's focus on capacity building and the organization of groups (Servicios Ambientales de Oaxaca 2010). According to a SAO intermediary, "some [of the communities] have bottled water businesses... another has a women's group that makes... clay containers that they can sell."

In Metaltepec, two different program participants and members of the coffee association mentioned that the agroforestry carbon parcels helped increase profits for their coffee. One said, "The price of coffee is kind of low, so this program helps. It helps a little." And another mentioned, "If coffee is at 38, this adds 2 or 3 pesos. It gives the coffee a higher price."

The other social complaint that with offset programs is that the majority of the profits go to intermediaries and don't make it into the hands of the communities. According to both SAO and ProNatura, the way that this program is set up is that for each ten-dollar carbon credit that is sold, one dollar goes to both SAO and ProNatura, leaving 80% for the communities. The majority of program participants participating directly with the program are aware that the community is receiving this money, but one program participant voiced a concern that the intermediaries or the community leaders are keeping a larger share of the profits or are not distributing it to the community. In La Trinidad, one of the municipal workers that was not actively involved in the project commented:

"Sometimes the communities receive very little and the majority stays in administration. So, what we would like is for this money to arrive more directly to the communities. That is the thing, because the communities are the ones that are helping, working on all of this, caring for the forest for this program... The community does it because of tradition, through *tequio*, to care for the forest but, if there is an economic payment, it is necessary that it makes it to the community. Because, I tell you, that there are organizations involved in this carbon capture project but sometimes the money doesn't make it to the community, it stays in administration."

It is unclear whether this interviewee thought that SAO and ProNatura were keeping a larger percentage of money than they should be or if they thought that once the money reached the community it was being used up for administration costs and not reaching the wider community population.

The majority of comments about the land-use changes and reforestation efforts were positive. Two of the thirty-three program participants interviewed expressed concern that the program was taking away their ability to access the resources they had once been able to harvest freely. One was a woman from Tlahuitoltepec who was not actively involved in the program said, "What I don't like about the program is that [the *comiseriado*] is encroaching and taking away our land." Another program participant from Tlahuitoltepec voiced a similar concern:

"Now, harvesting the trees is prohibited... but, if we don't harvest the trees and we don't do anything, how are we going to live?.. Where can we harvest

trees now that they are prohibiting that we touch them? Where are we going to go?... This is the doubt that I have.”

One concern is that, because this program has no long-term contract, the buyers could stop purchasing the credits leaving the community without this source of income. Three of the buyers interviewed specifically mentioned that if the communities continued completing the goal of the project and producing quality carbon offsets, then they would continue to buy credits from this program. One buyer said, “We would like to continue with this program on a permanent basis.” These verbal commitments do not guarantee for certain that they buyers will continue with the program but they suggest that the buyers are satisfied with the structure of the program and have the intention of continuing to purchase credits.

The last social concern I will talk about addresses the critique that forest carbon projects can be slow to design and implement and create a financial burden for the community. It was interesting that none of the program participants I interviewed complained that the program was slow to implement or created a stressful economic situation. This is likely because the studies for the program were funded by the Ford Foundation and PROCYMAF, and CONAFOR paid the community for the credits produced during the first several years of carbon capture while SAO was looking for a more permanent market. This seems to have helped to relieve the economic burden that many programs feel while waiting for the trees to accumulate carbon in sufficient amounts to be sold on the voluntary market. Had the program not had initial funding or had SAO not been able to connect with ProNatura and find a market for the credits, it is likely that the community would have felt more of these financial pressures and it is possible that the program would have failed.

Based on the perceptions of the interviewees, it appears that this SAO actively involves the communities in the planning and implantation of this program. The community has control over the management decisions for the enrolled forest parcels and the distribution of program funds. It also seems that the participants are seeing a number of social benefits in the community from the program.

Offset buyers and market structure

I was interested in examining the critiques that carbon offsets allow the buyers to avoid taking personal responsibility for lowering their emissions or by using the program as a way of “greenwashing.” ProNatura’s *Neutralizate* program encourages the businesses to take responsibility for their emissions. They conduct a carbon inventory for each business or group that participates in the *Neutralizate* program, and provide them with a detailed report of their emissions. Using the information from the report, they suggest different emission reduction strategies and then encourage the business to offset what cannot be reduced.

“We have two stages. One, is to suggest ways to reduce emissions and the other is to offer them the chance to offset their emissions through carbon credits. SO, once we have done the inventory, the client sometimes decide to offset everything or a certain percentage and we work with SAO to complete this transaction.”

The SAO and ProNatura interviewees mentioned that the buyers that are purchasing credits from this program are doing so for a variety of reasons, including: promoting an image of environmental responsibility, complying with policies of their larger parent companies or because of a moral desire to mitigate their environmental impact. I was not able to interview any of the major offset buyers in this program but I did interview five of the smaller scale buyers. When asked what their motivations for participating in the program were, all five gave environmental and social reasons for purchasing the carbon credits. All five also said that purchasing the credits is one of the main ways they are trying to reduce their environmental impact, although many were also taking additional actions (recycling, converting to more fuel efficient vehicles, etc) to reduce their emissions. It is important to mention that I was reaching out to these buyers through email and it is possible that the ones that are more environmentally conscious and want to promote this program are the ones that responded and agreed to interviews.

Another theme that came up during the interviews with the buyers is that some of them would prefer to buy credits from a local program in their region of the country, however this is one of the only voluntary offset programs that they were able to find. One of the carbon buyers explained this:

“I would like to see this program extended to other areas in Mexico. For example, I am here in [*name removed for anonymity*], which is an area where much of the water produced is used by the DF and the state of Mexico. We have many problems with deforestation and erosion...There is a lot of interest in this program from other businesses in the area but they always say ‘no, I would prefer that the money stays here in my river basin and doesn’t go to Oaxaca.’”

A ProNatura intermediary mentioned that they had also heard this from buyers, “even though global warming is a global issue, our clients want their offset payments ... to stay in their region.” This suggests that they buyers care about the environmental and social impacts this type of program could have in their local areas and are invested in seeing the results of the projects, not just focused on advertising themselves as a “green” or “carbon neutral” business.

From interviewees with ProNatura intermediaries and businesses that are purchasing the carbon offsets, it appears that “greenwashing” is not the main motivating factor for the participating businesses. Many are also taking active steps to reduce their emissions before turning to the offsetting program.

CONCLUSIONS

Summary of findings in the SAO project

Based on the comments and themes mentioned by interviewees, it seems that SAO has managed to develop a project that avoids, at least partially, several of the pitfalls that forest carbon projects are criticized for.

In regards to additionality, it appears that the community forests were not under immediate threat of deforestation, however, the program has promoted conservation activities that might not have otherwise occurred and has also provided the economic resources to support forest monitoring programs and improved management techniques. So it appears that at least some of the conservation that is occurring is additional. The educational component of the program also appears to be helping to foster a culture of conservation in the communities to a level that did not previously exist.

All contracts for the SAO carbon capture program are on a year-to-year basis and the project is not certified by any international voluntary offset standard. This means that they are mostly limited to selling credits within Mexico and that they rely on the buyers to return each year to purchase offsets. If they were to lose these buyers or the demand were to decrease or disappear in Mexico, then it would be unlikely that the program would be able to continue. The communities depend on the funding from this program to monitor and manage for the forests in the community so no longer receiving these funds could have serious implications for conservation, management and ultimately future forest permanence.

However, it also seems that even if program were to disappear, the community would attempt to maintain the forest cover and sequestered carbon through either continued conservation or some type of sustainable harvesting system such as a CFE. As mentioned previously, in Mexico, a study has shown that where there are mature CFEs, deforestation is either low or there is expansion of the community forests (Bray, 2010). In Oaxaca, recently deforestation rates have been high however in the Sierra Norte region where there are many CFEs, they have seen an expansion in forest cover over the past 20 years (Gomez Mendoza et al., 2007; Bray, 2010). This suggests that CFEs might aid in forest conservation and expansion while also producing timber products, such as furniture, that have benefits of long-term carbon sequestration. The communal land-use plan also helps to protect the permanence of trees, as well as preventing leakage, by preventing the encroachment of other activities into the non-enrolled forest parcels.

Even though the program is not certified under any standard system, SAO is attempting to ensure high quality credits and accurate accounting through the use of monitoring plots that measure annual tree growth. In combination with ProNatura's positive reputation, this seems to be sufficient for the buyers to trust that the project is producing legitimate credits.

The program also appears to have a number of social and environmental benefits. Among the environmental benefits mentioned were: an emphasis on emissions reductions before offsetting, focus on native species, and a perception by participants of positive hydrological impacts, and a return of animal species to the community. The social benefits include: active community involvement in program decisions and implementation, increased employment, improved health and quality of life, funds for community projects, as well as the creation of other economic activities in the community.

Application to other forest carbon programs

My second research question focused on how the lessons from the SAO program could be applied to other programs. This is a difficult question to answer because one of the reasons

the project appears to avoid many of the common critiques is because of Mexico's unique communal land tenure and strong local governance systems, both of which are often much weaker or not present in other countries. Even though it would probably be a slow and difficult process, I think working towards these communal land management systems and granting communities the legal rights and power to manage their own lands is an important component and first step for a project like this. It may make the most sense to focus these forest-carbon projects on countries that already have strong land rights and communal land management structures in place. In these areas, I would recommend that one of the project requirements be that the community develops a communal land-use plan. This has appeared to play an important role in the SAO program, helping to avoid many of the potential negative impacts of forest carbon projects including, leakage and permanence by establishing designated land-use areas within the community. This type of plan helps the community to better manage communal areas, and helps prevent activities (such as agricultural land or urban development) from expanding into areas that are ill suited for them or have been set aside for conservation. Having an established land-use plan also makes it easier for the community to monitor and enforce the rules that have been established.

Focusing on education and developing a culture of conservation is something that can be applied anywhere, even in places without the communal land management component. This can encourage community involvement and understanding of the process and issue, as well as increase their awareness of the ecological benefits of forests and the ecosystem services that they produce. Teaching the community about the benefits of forests and ecosystem services, as well as training them in proper forest management practices, can provide them with both the motivation and technical skills to continue to conserve and manage their forests even if the NGO and carbon capture project were to disappear. One reason that SAO has been successful in this educational process is because they employ local technical advisors that speak the native language and are familiar with the community. This seems to have played a role in encouraging community input and actively involving them in the planning and implementation of the project.

Another lesson that can be applied to other programs is that SAO is careful to select the communities that can participate in the program and has worked to establish long-term relationships with each. These two factors have helped to establish trust between SAO and the community and help to foster transparency in the program. SAO is active and aware of the activities and forest management practices being implemented in each community and the communities are included in the planning and implementation of the project and can see the process and results. This close relationship allows SAO and the communities to hold each other accountable for their role in the carbon capture program. It helps to ensure that the goals of the program are being met, both on the community level of producing quality credits and on the intermediary level of selling the credits and making sure that 80% of the profits are returning to the communities.

The CFE system in La Trinidad and the coffee agroforestry parcels in San Juan Metaltepec are both interesting examples of how carbon capture projects can be combined with other economic activities. In the case of the CFE, forest land that is not enrolled in the program is

being sustainably harvested and converted into value added, long-term storage products such as furniture. This could be done in forests that are not enrolled in the carbon capture program or could be a future option if carbon capture projects were to fail due to either a lack of buyers or a decrease in market price. CFEs appear to promote planning and sustainable management of forests in the community, as well as provide economic income and long-term carbon storage if done correctly. As seen in Mexico, mature CFEs have also been associated with lower deforestation rates or expanding forest area (Bray, 2010). The coffee agroforestry parcels provide another way to conserve forests while also allowing the community to benefit from a cash crop. However, it is also important to point out that the price of coffee can fluctuate greatly and if the price were to drop too low the farmers might choose to cut down the trees to grow the plants in full sun to increase coffee yields and income. Also, if the added funds from the carbon capture program were to disappear, it might be difficult for the coffee association to continue to grow their coffee crops in the shade.

An interesting component of the program that came out during the interviews with the carbon credit buyers is the importance of SAO's partnership with ProNatura. The reputation that ProNatura has developed in Mexico as a conservation organization was an important factor for many of the buyers in choosing to purchase credits from them. Because SAO is partnered with ProNatura, they trusted that the program was producing high quality carbon credits. If ProNatura were not acting as an intermediary, I think it would be much harder for SAO and the communities to find buyers outside of Oaxaca where buyers are not familiar with their work. Another factor that the buyers valued was receiving information about the social, environmental and economic results that the program was having in the communities. They expressed that this was important for them and a few also mentioned that they felt more businesses would purchase offset credits if the projects were located in their region, benefiting local communities. Having projects in different areas of the country might be a good way to increase the number of buyers, however you might sacrifice the ability to develop a close relationship between the NGO and community, which as mentioned above also has several benefits.

It is also possible to learn from some of the things that SAO is not currently doing but could potentially strengthen the program. One of these would be to obtain certification for the credits under an internationally recognized certification standard. While SAO has not yet done this, they have the benefit of ProNatura "certifying" their credits, which seems to be sufficient for many buyers in Mexico. For programs that do not have this type of partnership, it may be necessary to obtain certification in order to attract buyers. The SAO program is also currently functioning on year-to-year contracts which makes the program vulnerable and could threaten forest permanence as well as the economic income of the communities that are currently depending on the funds from this program. Establishing long-term contracts with buyers could help lessen these potential threats and provide a more stable partnership for both the communities and the buyers.

Future research

Using a qualitative approach allowed me to learn about the experiences each community has

had with the program and gain incite into different groups' perceptions of the forest carbon critiques. However, this study could benefit by further qualitative research in the other seven participating communities as well as quantitative and remote sensing data that could better measure leakage as well as numerical data on some of the specific environmental and social impacts that the program is producing.

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APPENDICES

APPENDIX A: SAO'S RULES FOR PARTICIPATING COMMUNITIES

***Translated from Spanish (Servicios Ambientales de Oaxaca, 2010, p. 49).*

1. No agrochemical use
2. Don't throw inorganic trash in project areas
3. Livestock is not permitted to enter the enrolled area
4. Changing the soil use inside the project area is not permitted
5. Harvesting trees is prohibited, except for domestic use.
6. Hunting is prohibited
7. Starting forest fires is prohibited
8. Removing wild plants, mushrooms or fertilizer is prohibited
9. Attend meetings and *tequios*
10. Protect natural springs
11. Establish monitoring patrols in all of the communal territory
12. Implement the activities required by the project
13. Design and place informational signs in strategic areas in the community to announce project activities
14. Conserve the community forests and coffee parcels
15. Protect the animals that inhabit the area
16. Supervise the growth of the trees
17. Monitor the areas constantly to obtain information related to the growth and development of the forests and agroforestry systems.
18. Educate the student and youth community about the communities' experience with sustainable natural resource management.
19. Maintain forests and agroforestry systems
20. Fulfill all of the work programs
21. Fulfill the goal of reforestation
22. Follow the established norms
23. Reduce contamination
24. Maintain biodiversity
25. Monitor that trash is not thrown in the community and implement separation of solid waste.

APPENDIX B: INTERVIEW GUIDES

Program Participant Interview Guide

Demographic information

- Community: _____
- Age of respondent: _____
- Occupation of respondent: _____ (Lider cargo? time in cargo?)
- Gender of Respondent: Male / Female
- Respondent's role in the program:
 - Community level participant
 - Community level leader
 - SAO member
 - Buyer
- What is the highest level of schooling you have completed?
 - No schooling completed
 - Some primary school (not completed)
 - Primary school graduate
 - Some secondary school (not completed)
 - Secondary school graduate
 - Trade/technical/vocational training
 - Bachelor's degree
 - Master's degree
 - Doctorate degree

What are program participants' motivations for participating in the carbon offset program?

- Are you aware that your community is participating in the voluntary carbon offset program? If so, could you please describe the program?
- What organization(s) is working with your community to implement this project?
- How long has your community been participating in the carbon offset program?
- How did you first find out about the program? How have you gotten information about the program since?
- Why do you think your community decided to participate in the program?
- Do you agree with the community's decision to participate in the program? Why or why not? Do you have any doubts?
- What activities does your community need to complete as part of this program? What do you think is the purpose of each of these activities?
- How much land is enrolled in the carbon credit program?

What do program participants perceive to be the main goals of the program?

- Why do you think SAO started this program? What are they trying to achieve?

- Who is purchasing the carbon credits produced by your community? Have they visited the community?
- Why do you think they are interested in buying your carbon credits? What benefits do they receive by doing so?
- What do you hope the program will achieve?

What do program participants perceive to be the current social and environmental impacts of the program?

- Did the community use the forest before it was enrolled in the program? If so, how?
- Are there activities that you could do in the forest before it was enrolled in the program that now you cannot do? If so, do you do them in a different area?
- Do you, your family or community receive any benefits from participating in this program? Why or why not? If so, what benefits?
- Are there any costs to your family or your community in participating in the program? If yes, what are they?
- Has the program had an impact on the health of your forests or other parts of your environment? If yes, what are they?
- Does the program have a rule about the forest tree species composition of land enrolled in the program (native vs. non native or biodiverse vs. plantation)?
- If SAO left and was no longer working in the community, what do you think would happen to the forest and the projects that they helped to start?
- What is the value of the forest to you?

Feedback

- What do people in your community think that the program does well?
- What do people in your community think could be improved to make this program more effective?

SAO/ProNatura Interview Guide

Demographic information

- Age of respondent: _____
- Occupation of respondent: _____
- Gender of Respondent: Male / Female
- Respondent's role in the program:
 - Community level participant
 - Community level leader
 - SAO member
 - Buyer
- What is the highest level of schooling you have completed?
 - No schooling completed

- Some primary school (not completed)
- Primary school graduate
- Some secondary school (not completed)
- Secondary school graduate
- Trade/technical/vocational training
- Bachelor's degree
- Master's degree
- Doctorate degree

What are SAO's motivations for participating in the carbon offset program?

- Could you please describe the voluntary carbon offset program?
- How/why did SAO decide to start a voluntary carbon offset program?
- How long have communities been participating in the program?
- How did SAO present the program to the communities?
- What were the communities' reactions to the program?
- Why do you think the communities decided to participate in the program?
- What activities does the community have to complete to participate in the program?
- What percentage of each communities' land is enrolled in the carbon credit program?

What does SAO perceive to be the main goals of the program?

- Why did SAO start this program? What is SAO hoping the program will achieve?
- Who is purchasing the carbon credits produced by the communities?
- Why do you think they are interested in buying the carbon credits? What benefits do they receive by doing so?

What does SAO perceive to be the current social and environmental impacts of the program?

- Did the community use the forest before it was enrolled in the program? If so, how?
- Are there activities that community members could do in the forest before it was enrolled in the program that now they cannot? If so, do they do them in a different area?
- Do participants receive any benefits from participating in this program? If so, what benefits?
- Are there any costs to the families or community in participating in the program? If yes, what are they?
- Has the program had an impact on the health of the forests or other parts of the environment? If yes, what are they?
- Does the program have a rule about the forest tree species composition of land enrolled in the program (native vs. non native or biodiverse vs. plantation)?
- If SAO left and was no longer working in the communities, what do you think would happen to the forest and the projects that SAO helped to start?

- What is the value of the forest to the local communities?

Feedback

- What do you think that the program does well?
- What could be improved to make this program more effective?

Credit Buyer Interview Guide

Demographic information

- Age of respondent: _____
- Job title: _____
- Gender of Respondent: Male / Female
- Respondent's role in the program:
 - Community level participant
 - Community level leader
 - SAO member
 - Buyer
- What is the highest level of schooling you have completed?
 - No schooling completed
 - Some primary school (not completed)
 - Primary school graduate
 - Some secondary school (not completed)
 - Secondary school graduate
 - Trade/technical/vocational training
 - Bachelor's degree
 - Master's degree
 - Doctorate degree

What are credit buyer's motivations for participating in the carbon offset program?

- Could you please describe SAO's voluntary carbon offset program?
- How did you first find out about the program? How have you gotten information about the program since?
- Why did you decide to purchase carbon credits? What benefits do you receive by doing so?
- How long have you been purchasing carbon credits from this program and more broadly?
- En algún lugar están promocionando que están neutralizando sus emisiones?
- Why did you choose to buy them from this particular program and not another (or switch to this program from another)?
- Why do you think the community enrolled in the program decided to participate?
- What activities do the communities need to complete as part of this program? What do you think is the purpose of each of these activities?

What do credit buyers perceive to be the main goals of the program?

- Why do you think SAO started this program? What are they trying to achieve?
- What do you hope the program will achieve?
- Apart from your organization/company, who else is purchasing the carbon credits produced by the community?
- Is this the primary way the company is reducing their environmental impact or have there been other efforts?

What do credit buyers perceive to be the current social and environmental impacts of the program?

- Do participants receive any benefits from participating in this program? If so, what benefits?
- Do you think there any costs to the families or the community in participating in the program? If yes, what are they?
- Do you think the program has had an impact on the health of the forests or other parts of the environment? If yes, what are they?
- Sabe Ud. si hay actividades que antes las personas en la comunidad realizaban en el bosque que ahora, por su participación en el programa, no pueden realizar (Ej. recolectar leña, pastar los animales, etc.)? Si es que sí, ahora hay otro área en que realizan estas actividades?
- Sabe Ud. si este programa tiene alguna regla sobre la composición del bosque (Ej. bosque nativo vs. un plantación)?

Feedback

- What do you think that the program does well?
- What could be improved to make this program more effective?

Additionality:

- **Absence of program or before program**– What would happen in absence of program if didn't receive payments. Comments that this is the only source of funding for conservation projects. Was conservation already happening? Are they also conserving land that is not enrolled in the program?
- **Changes in land use** - How has land use changed as a result of this program or preparing to enter the PES market.

Background:

- **Description of ProNatura** - description of the organization. What are the PN's goals or project goals as described by PN?
- **Description of SAO** – description of the organization. What are the SAO's goals or project goals as described by SAO?

Environment:

- **Changes in the environment** – as a result of the program. (If changes were already happening, code under additionality). What changes has the community, SAO or ProNatura seen? Is the community aware of these changes?
- **Forest Value** – what do people perceive to be the value of the forest? Is the program impacting the way they value the forest? Comments about realizing the importance of the forest in ways they hadn't realized before. Moving towards a more economic valuation of the forest?
- **Plantation or monoculture** - Comments about monocultures, plantations, loss of biodiversity (focus on native trees?). (Also, review stuff coded under 'standards' to see what environmental impact a lack of a standard system could have). Comments about whether or not there is a rule about this.
- **Program impact on existing forests** - Were existing forests or old growth trees removed in anticipation of enrolling land in this program? Are they attempting to preserve existing stands of forest or only reforesting new areas?

Buyers:

- **Buyer motivations and current promotion** - Are companies using this primarily as a way to greenwash or be "guiltfree" about their emissions. Are they doing it as part of their mission. Principle goals of the buyers. Are they promoting the fact that they are buying credits? Are they doing anything else to reduce their emissions? ProNatura comments about carbon emissions inventory. what does the community perceive the buyer's motivations and benefits to be?
- **Buyers understanding of program – perceptions of SAO or ProNatura** – Does the community know about the program in the communities or the impact it is having? Do they receive reports? What do they think SAO and ProNatura's goal is? Why do they think community is participating?
- **Contact with the community** – Has the buyer visited? Are they aware of the results/impacts in the community?
- **Process buyers went through** – did they explore CC options? What do they have to

- do for the inventory?
- **Why buyers chose ProNatura** – why did they choose them? How did they hear about them?

Leakage:

- **Displacement of past activities** - What activities were done on enrolled land in past and have they moved to new areas?
- **Land use zoning** - Comments about land use zoning. General comments about rules created restricting the area where people can plant or hunt animals.

Level of quality control:

- **Certification or standards** - Comments about standard system used or CONAFOR verification. Comments about trying to get international certification. Methods used to keep track of credits sold.
- **Monitoring or verification** - Comments about monitoring/verification or lack thereof.
- **Program requirements** - Program rules and requirements that directly relate to ensuring program effectiveness.
- **Project quality** – general comments about project quality that were not mentioned above

Other codes:

- **Community member awareness of program** - Do they know it exists? Do they understand what it is? Do they know how long it has been going on or exactly which land is enrolled? Do they know who is buying the credits? How did they hear about it/where do they get information now? How did they hear about the program and how do they receive information now? Comments that they don't receive benefits from the program.
- **Community motivation for participating** - Why did the community enter this program instead of doing something else with the land? What is their main goal? Thoughts of people that haven't heard of the program before –what they think of the program. SAO or PN's perception of community motivations
- **Participants perceptions of SAO broadly and the offset project specifically** - What do participants think of SAO and the project. What do they think SAO's motives are? How does this make it different than other projects out there? Comments about program timeframe and impact on community (was it slow to design or implement?)
- **Suggested program changes**
- **What does this program have that others don't** -Comments from buyers (of ProNatura) about what they like about this program and why they chose to buy credits from SAO as opposed to someone else.

Permanence:

- **Behavior changes** – Program resulting in behavior changes towards environment or changes in how people see/value the forest.
- **Future demand** – Comments about future demand for credits from buyers or others.

- Do the plan on continuing? Expanding? Are others interested?
- **Long-term goal of project** – what do community members want to see happen as a result? Is end goal conservation or do they mention removing trees in future. What people think will happen in the future. Do people want to continue with their forests in this project. Do they want to add more land? Comments about forest conservation for benefit of future generation.
 - **Tree vulnerability** – Are there any major threats to the forest that could release CO₂ captured (fire, pests, disease, logging)

Social Impacts:

- **Alterations in governance or land security**– Increase in *tequio*. Changes in community governance based on program. Threats to community land tenure from outside organizations. More people from the community can get involved with caring for the forest/land than before.
- **Conflict** – Are people in agreement over participating in the program or is there conflict?
- **Costs** - Costs to community of participating in project. Uneven distribution that results in a cost for some families (ie. people don't have access to community land anymore and are not seeing income from program).
- **Distribution of funds and economic impacts** – How are program profits distributed (or perceived to be distributed. Is there a perception that the majority of the money doesn't reach the community. Usage of profits from the program for community uses. Increased funds for community projects Effects of program on migration (to other cities, US). Employment resulting from program. Perceived future income.
- **Food security** - Effects of program on amount of food they produce in the community vs. importing from outside.
- **Health Impacts** – Comments about health benefits resulting from program
- **Knowledge or skills gained** – are they gaining any knowledge or skills as a result of participating in the program? Do they have a better understanding of ecosystem services or environmental functions? Do they understand the reasons for the activities that are required by the program? Comments about increases in conciencia of how to care. People that already had this knowledge