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Creating value in the voluntary carbon market: opportunities for small-scale coffee producers in Latin America to access carbon capital.

Ruby Woodside
rwoodside@clarku.edu

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And accepted on the recommendations of

Denise Humphreys Bebbington, Ph.D.

David Correll, Ph. D.

ABSTRACT

Creating value in the voluntary carbon market: opportunities for small-scale coffee producers in Latin America to access carbon capital.

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Agroforestry producers have not participated on a large-scale in carbon markets. This paper assesses the potential for small-scale coffee producers to access the voluntary carbon market. A review of the current market including standards, trends, and how value is created is followed by an overview of Latin American coffee production. Drawing on tools from the conceptual framework of global production networks I explore how coffee producers can benefit from the development of carbon credits. Current carbon credit projects under development with coffee producers are considered, and one case study presented. The tools and conditions necessary for full access to carbon markets, potential benefits, and avenues for action are identified. Coffee producers must be members of pre-existing cooperatives in order to access the voluntary carbon market. Producers who are able to communicate a powerful story regarding the co-benefits of projects, particularly climate resilience, are most successful and earn higher prices for credits.

Denise Bebbington, Ph.D.

David Correll, Ph.D.

ACADEMIC HISTORY

Ruby Woodside **May 2016**

Bachelor of Science in Chemistry
University of North Carolina at Chapel Hill **December 2009**

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1. Introduction

In the past decade, market mechanisms to address climate change have gained popularity and markets for carbon offsets have expanded exponentially[1] (World Bank, 2014). Most recently in December 2015 at the 21st Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris, support for carbon markets as an international climate change mitigation mechanism was renewed (UNFCCC, 2015). This means that global attention and finance towards carbon offsetting projects will continue and likely increase, building upon schemes such as the United Nations Clean Development Mechanism and the concept of Reducing Emissions from Deforestation and Forest Degradation. This also means that the demand for carbon offsets will increase, coming from nations striving to meet emissions reductions goals as well as companies and individuals voluntarily seeking to reduce their environmental footprint. With all of these resources flowing into climate change solutions, there are emerging questions regarding fairness and equitable distribution of benefits (Agrawal, Nepstad, & Chhatre, 2011). Who decides the value of carbon credits, and who is able to access this capital? Small-scale agriculture producers across the globe are the most vulnerable to climate change, but

[1] While carbon markets are expanding, it is important to note that a comprehensive international carbon market has not materialized on the scale that was hoped for in the Kyoto Protocol (Newell, Pizer, & Raimi, 2013; World Bank, 2014).

often do not participate in developing climate policy. What do carbon credit markets mean for smallholders?

This paper assesses the potential for small-scale agroforestry producers, coffee growers in particular, to access the voluntary carbon market. To date, little has been written about the involvement of this group with carbon markets, and coffee producers have yet to develop carbon credit projects on a significant scale. This paper will analyze the conditions and tools necessary for participation in this network. First, the voluntary carbon market will be explained. I will then explore its potential for small-scale agroforestry. This includes a review of the current market, including standards, trends, and how value is created. I will draw on tools from the conceptual framework of global production networks to analyze the voluntary carbon market.

The paper will then review coffee production in Latin America and climate change, and discusses the possibility of coffee producers benefitting from the development of carbon credits. Current carbon credit projects under development are considered, and a case study of one project in Peru is presented. Some of the barriers and challenges faced by coffee producers developing carbon credit projects are discussed. Drawing from the examples, the tools and conditions necessary for full access to carbon market potential benefits and avenues for action are identified.

1.1 Research Questions

- What is the current state of affairs regarding the voluntary carbon market and coffee production?

- Is there potential for small-scale coffee producers to participate in the voluntary carbon market?
- What conditions, skills, and technologies are necessary for small-scale coffee producers to access and benefit from the voluntary carbon market?

1.2 Project Context

This work was carried out as part of an interdisciplinary graduate degree program, combining a Master of Business Administration with a Master of Science in Environmental Science & Policy. Climate change is a cross-sector challenge and I view voluntary carbon markets to be the intersection of the business, science, and development worlds. The paper fulfills the requirements of a program capstone, combining elements of the management, environmental science, and international development disciplines.

2. Background

2.1 Theoretical Framework

This section first presents two theoretical frameworks, the concept of global production networks and the theory of access. I chose these frameworks for their ability to connect development literature with some of the management considerations of this project. The concept of global production networks in particular can cross disciplines and overlaps well with notions of supply chain management. Tools and ideas from both the global production network and theory of

access frameworks are used to understand aspects of the carbon market in general and the voluntary carbon market in particular. These tools can also help illustrate what it means for coffee producers to participate in this network. This is followed by a brief review of carbon market literature, providing a general background on the concept of carbon markets and how they fit into the international context of climate change mitigation.

2.1.1. Global Production Networks

In 2002, Henderson *et. al.* introduced the idea of global production networks (GPNs) as an analytical framework that builds upon the concept of global commodity chains (Henderson, Dicken, Hess, Coe, & Yeung, 2002). This new framework was developed as a tool to analyze the global, regional, and local dimensions of economic development, taking into consideration the social, political, and geographic context of economic activity. The GPN approach has primarily been applied to manufacturing industries as a conceptual framework for understanding inter-firm relationships and implications for regional development. However, the framework can also be applied to other industries. Many of the GPN framework tools are useful in analyzing the development and outcomes of the global carbon market.

A production network can be viewed as a "nexus of interconnected functions, operations, and transactions through which a specific product or service is produced, distributed and consumed" (Coe, Dicken, & Hess, 2008). A global production network is a network in which the connections and nodes extend across multiple countries.

The central idea of the GPN framework is that in order to understand the dynamics of development in any given place, it is necessary to understand the social circumstances under which development happens. Places are being transformed by flows of capital, labor, knowledge, and power while at the same time these flows are being transformed by places (Henderson et al., 2002). This is certainly true for the carbon market; carbon projects are very influenced by the place where they are developed, while the projects themselves can lead to economic development and shifts in local power dynamics.

The original GPN framework was developed around three principal elements: value, power, and embeddedness. Value refers to the creation of value, the circumstances under which value can be enhanced, and the ability to capture value. The power exercised by different actors in the GPNs determines how value can be enhanced and captured. Embeddedness refers to the geographical and relationship aspects that influence the strategies and objectives of agents in the network (Henderson et al., 2002). In addition, the GPN framework includes dimensions through which value, power, and embeddedness can be employed or take effect. Among others these dimensions include firms, institutions, and industry sectors (Henderson et al., 2002). The structure of this GPN analytical framework facilitates the identification of network points where value is created, the understanding of complicated power relationships, and understanding territorial and network embeddedness (Coe et al., 2008). In addition, a GPN analysis can include all of the network actors. When applied to the carbon market, and the voluntary carbon

market in particular, the GPN framework can help explain how the market is developing as well as how and where value for carbon credits is created. Specifically, the GPN framework in the context of the voluntary carbon market may be useful in identifying conditions required for coffee producers to access carbon capital.

2.1.2. Theory of Access

In addressing questions of access to the carbon market, this paper will also draw upon Ribot and Peluso's 2003 definition of *access* as the ability to derive benefit from things. This theory and definition focus on the means by which people can benefit from resources, as opposed to simply having the right to a resource (Ribot & Peluso, 2003). It also addresses the mechanisms through which actors can gain, control, and maintain access to a particular resource (Ribot & Peluso, 2003). This is an important distinction in the case of carbon credits. For example, in agroforestry projects the owners of land or forests that capture carbon are not necessarily able to turn that right into a marketable carbon credit. Corbera and Brown in 2010 proposed that landowners often could not fully benefit from carbon sequestration on their land because they lacked many of the mechanisms to do so, including capital, expertise, technology, and knowledge (Corbera & Brown, 2010). Through three case studies, Corbera and Brown suggested that landowners could only derive benefit from carbon offsets after engaging with other actors (such as project managers and intermediaries) who could provide tools necessary to develop a certified carbon credit and participate in the global market (Corbera & Brown, 2010). This definition

of access is important when determining what market participation means for coffee producers. While in theory owners of coffee farms may be able to access the voluntary carbon market, they may not be able to successfully develop projects and benefit from sales without assistance. Thus, independently they may not have access to their resources in the Ribot and Peluso sense of the word.

2.2. Overview of Carbon Markets

The carbon market refers to the purchase and sale of greenhouse gas (GHG) emissions credits as a mechanism to reduce the overall amount of GHG in the atmosphere and thus mitigate climate change. The theory is that by putting a monetary price on what is typically an externality, carbon markets can incentivize businesses and governments to find the most cost efficient methods of reducing GHG emissions, move away from carbon-intensive technology, and preserve ecosystems that provide climate regulation services (Bayon, Hawn, & Hamilton, 2009). The idea of carbon markets and the underlying concept of payments for ecosystem services is not new. In fact, the first known carbon offset deal was brokered in 1989 when an American electricity company invested in an agroforestry project in Guatemala (Bayon et al., 2009; Corbera, Estrada, & Brown, 2009). Today the market for carbon can be split into two categories: compliance markets and the voluntary carbon market.

Compliance markets are schemes that exist under mandatory government or international regulations that limit the emissions of GHGs (Bayon et al., 2009; Forest

Trends & Ecosystem Marketplace, 2007). Under such regulations, companies or governments are required to limit their GHG emissions to below a mandated level. Most current compliance carbon markets are founded in some way in the Kyoto Protocol of 1997 (Bayon et al., 2009; Kumar, 2005).

The Kyoto Protocol was a product of the United Nations Framework Convention on Climate Change (UNFCCC) third Conference of the Parties (COP) and has currently been adopted by 192 parties (UN FCCC, 2014). The Kyoto Protocol set legally binding limits on GHG emissions and developed mechanisms for emissions trading and carbon offsets (Bayon et al., 2009; UN FCCC, 2014). The mechanisms defined by the protocol are 1) emissions trading, in which countries with emissions targets can sell and purchase carbon credits to meet their goals, 2) joint implementation (JI), in which developed countries can purchase carbon credits from projects that reduce GHG emissions in another developed country, and 3) clean development mechanism (CDM), in which developed countries can earn carbon credits by investing in emissions reduction projects in developing countries (UN FCCC, 2014).

While the Kyoto Protocol remains the core infrastructure for carbon trading, and CDM and JI are the most well known mechanisms for determining what constitutes a valid emissions reduction project, there have been recent setbacks as key countries (Japan, New Zealand, and Russia) pulled out of the commitment (World Bank, 2014). Several other players have also exited the market, including private sector intermediaries and financial institutions (World Bank, 2014). However, this

does not mean that compliance markets are shrinking. Many countries or regions have developed their own compliance markets, which in some cases can help them reach their Kyoto Protocol goals (Kollmuss, Zink, & Polycarp, 2008). The European Union's Emission Trading Scheme (ETS), which opened in 2005, is one such example of a compliance market that can help its member countries reach their Kyoto Protocol targets (Bayon et al., 2009; Kollmuss et al., 2008; World Bank, 2014). The ETS is presently the world's single largest carbon market, covering over 2,000 megatons of carbon dioxide equivalents (CO_2e) (World Bank, 2014). Other examples come from areas that did not ratify the Kyoto Protocol. The Regional Greenhouse Gas Initiative (RGGI) in the U.S. Northeast is an example of a compliance cap-and-trade program implemented to reduce emissions in the power sector (Kollmuss et al., 2008; RGGI, 2016). This program represents the first mandatory market-based GHG emissions reduction program in the US (RGGI, 2016). California also recently initiated a mandatory cap-and-trade program beginning in 2012 (Hsia-Kiung, Reyna, & O'Conner, 2014; World Bank, 2014). This program set a strict statewide cap, includes provisions for carbon offsetting, and plans to expand coverage in coming years (Hsia-Kiung et al., 2014). This includes plans to link with other regional regulatory carbon markets. Finally, China is a major global player as well with a carbon market of over 1,000 megatons CO_2e (World Bank, 2014).

Since the Kyoto Protocol, carbon markets have also evolved to include different types of projects and trading mechanisms (Bayon et al., 2009). Of particular importance

due to its influence on forestry and agroforestry projects is the concept of REDD. REDD stands for Reducing Emissions from Deforestation and Forest Degradation and the concept was first introduced at the eleventh COP in 2005 (Agrawal et al., 2011). This was in order to address the fact that the original Kyoto Protocol did not include avoided deforestation as a viable emissions reduction mechanism, only allowing afforestation and reforestation as eligible CDM projects (*Governing the Provision of Ecosystem Services*, 2013; Phelps, Webb, & Agrawal, 2010). REDD was formally accepted as a UN program at COP 13 in 2007, and later expanded to include other land use options that reduced emissions (known as REDD+) (Agrawal et al., 2011). Through monetization of forest carbon, REDD+ aims to increase the economic value of standing forests and therefore provide incentive to protect and sustainably manage them (*Governing the Provision of Ecosystem Services*, 2013; Phelps et al., 2010). Since its introduction, REDD+ has evolved to include both the formal UN REDD Programme and a myriad of voluntary REDD+ initiatives.

The concept of REDD+ is a broad research topic in and of itself, most of which is outside of the scope of this paper. REDD+ projects have been the subject of much analysis and criticism concerning topics ranging from governance and implementation to its impact on gender and indigenous communities (Alcorn, 2014; Corbera & Schroeder, 2011; Phelps et al., 2010). Despite ongoing controversy, there is no denying the influence that REDD+ initiatives have on carbon markets and potential agroforestry carbon credit projects such as coffee farming. Ecosystems Marketplace has tracked a collective $5.1 billion in REDD+ and general forest carbon

finance commitments from governments, companies, and individuals across all years of initiatives (Goldstein, Neyland, & Bodnar, 2015).

Despite the ambitions of the Kyoto Protocol, a comprehensive international carbon market has not materialized (Newell et al., 2013). There remain many industry sectors and regions of the globe that are not covered by any type of mandated carbon pricing or GHG emissions controls. In the absence of clarity regarding binding international agreements to address climate change, governments, companies and individuals are pursuing voluntary investment in carbon offsets. This is outside of the United Nations state-based framework for addressing climate change through carbon trading and offsets, and outside of any similar national or regional regulatory carbon markets. In the past decade, governments, companies, and individuals have voluntary spent almost $4.5 billion to support projects that reduce GHG emissions and remove GHGs from the atmosphere (Hamrick & Goldstein, 2015). This market for carbon offsetting projects, known as the voluntary carbon market, is growing and includes a wide range of both project types and buyers.

As the name suggests, purchases of offsets on the voluntary market are entirely voluntary. Buyers include individuals, private corporations, higher education institutions, and nonprofits, among others. The U.S. in particular does not regulate emissions on a national scale; as a result most of the carbon offset purchases in the US are voluntary (Arnoldus & Bymolt, 2011; Goldstein, 2015a). Voluntary offsets may be developed according to CDM methodologies, however they may also

adhere to a number of standards developed by independent organizations and companies.

While the voluntary carbon market remains outside of the UNFCCC framework, it is still greatly influenced by international climate change talks and the potential for increased emissions regulation (Hamrick & Goldstein, 2015). For example, the first formal voluntary carbon market was the Chicago Climate Exchange, founded in 2003 in anticipation of the US beginning to regulate emissions(Arnoldus & Bymolt, 2011; Bayon et al., 2009; Hamrick & Goldstein, 2015)). When the US government failed to implement any kind of GHG emissions policy, the Chicago Climate Exchange was eventually closed. However, most of the carbon offset projects that were part of the Chicago Climate Exchange transferred to other carbon registries, where demand increased (Hamrick & Goldstein, 2015). This illustrates the sensitivity of the voluntary carbon market to changes in the political and private sector landscape.

This paper explores the voluntary carbon market in depth and focuses specifically on this market as a potential opportunity for coffee producers to access carbon capital.

A brief timeline of events important to the evolution of carbon markets and in particular the voluntary carbon market can be seen below in Figure 1.

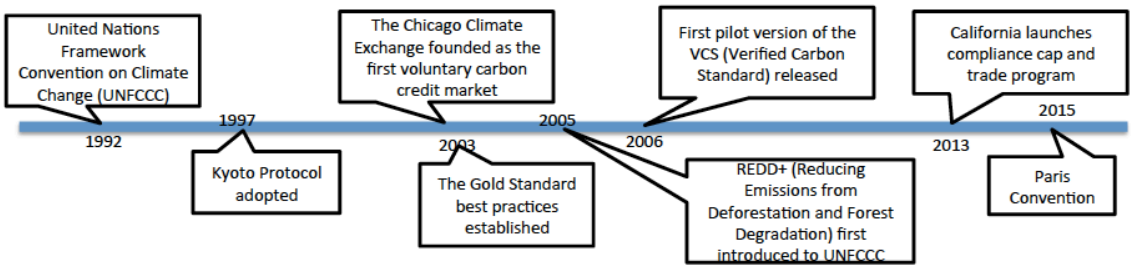

Figure 1: Timeline of Key Events in the Evolution of Carbon Markets

2.3. Understanding the carbon market through the lens of the GPN framework

Elements of the GPN framework outlined previously can be applied to the carbon market in general and the voluntary carbon market specifically in order to increase our understanding of the actors and relationships involved in the market. The purpose of a production network is to create value through the transformation of inputs into demanded goods and services (Coe et al., 2008). In the carbon offsetting industry the product is a carbon credit. This intangible good is created through the transformation of inputs including information, technology, capital, and material inputs specific to a project. For example, material inputs for a forest project may include trees and fertilizer.

In 2008 Bridge included carbon credits in a GPN analysis of the hydrocarbon extraction industry. In his analysis, the global oil production network included carbon trading as the "re-commodification" of carbon released from hydrocarbon use. He described carbon offsets as a potential means to redistribute value among

network actors, possibly even to new actors (Bridge, 2008). In other words through carbon offsetting, funds and resources can flow from large energy corporations back to communities and local actors. This aspect of the hydrocarbon value chain is unique compared to other global manufacturing production networks. The potential value transfer to those with carbon capture capabilities has implications for regional economic development (Bridge, 2008). While this paper focuses specifically on the voluntary carbon market and all related activities as a global production network in and of itself, Bridge's analysis highlights some important aspects of the carbon offset sector. The global carbon market has not developed in a vacuum. In particular, the voluntary carbon market is a combination and evolution of existing global production networks. For example, the network includes much of the extraction sector, international finance institutions, manufacturing sectors, and local organizations. Many of these sectors and actors have pre-existing relationships, histories, and power dynamics that influence how the voluntary carbon market develops and where benefits accrue.

At the most simple level, the actors in the carbon offset network include those who produce carbon credits, and those who purchase them. In reality, there are many more intermediaries and stakeholders. Participants in the carbon offset network include the owners of carbon credits, the project developers (who may also be the project owners), carbon brokers who aggregate credits and market them to buyers, and purchasers of carbon credits. The network also includes the organizations that create carbon standards and develop methodologies, the

verification firms, NGOs that may help facilitate the process, the carbon registry organizations, financers that invest in projects, and individuals who may be employed as the project is implemented. Through these firms and institutions, value is created, power is exercised, and territorial aspects of the network come to light. The dynamics in any particular circumstance determine access to the carbon market and the flow of benefits resulting from the transaction of carbon credits.

3. Methodology

To address the research questions I began with a systematic review of the current state of the voluntary carbon market. Information was gathered primarily from secondary reports and analyses of the voluntary carbon market. In particular I drew heavily from data collected by Forest Trend's Ecosystem Marketplace, one of the few organizations that comprehensively tracks transactions on the voluntary carbon market and publishes this information. The review also included academic literature, information from the various standards that exist as part of the market, and data from carbon registries where current projects are publicly posted. In addition, I drew generally upon my personal experience working for a nonprofit developing US based carbon credits. One of the challenges in assessing the current state of the voluntary carbon market is that it is a relatively new and rapidly evolving phenomenon. There is no single authority or organizing body that collects real time market data, and

many of the transactions are not public information. As such, there are gaps in the literature and a lack of transparency in many areas.

In order to assess the current state of carbon credit projects using coffee production, I primarily used official project documents posted to carbon registries. I also considered media publications related to these projects. I reviewed and present here 5 examples of coffee projects that generate or plan to generate carbon credits. I used one of these examples as an in-depth case study, and informally interviewed one of the project developers.

4. The Voluntary Carbon Market

4.1. Background on the Voluntary Carbon Market

The first voluntary carbon offset organizations were established in the 1990s, and until approximately 2005 there were relatively few organizations developing and selling voluntary carbon offsets (Lovell, 2010). Because the voluntary carbon market aims to reduce emissions not required under the Kyoto Protocol or other mandatory regulations, this market is often considered to be parallel to compliance markets (Corbera et al., 2009; Lovell, 2010). Rather than a centralized authority setting standards, a number of independent standards organizations, offset registries, and verification protocols have emerged as methods to determine the quality of an offset project (Corbera et al., 2009). While the voluntary market is significantly smaller than the compliance market and only represents approximately one tenth of global offset demand, in the past decade the voluntary carbon market has grown rapidly

(Hamrick & Goldstein, 2015; Lovell, 2010). In some years voluntary offsets have even exceeding the volume of offsets transacted through CDM (Benessaiah, 2012).

4.2. Current State of the Market

The voluntary carbon market has matured significantly since it first began expanding rapidly in approximately 2005. While there is still no single regulating authority, the market has evolved and consolidated around a small number of accepted standards (Hamrick & Goldstein, 2015). These standards essentially act as regulating bodies and market-making intermediaries (Merger & Pistorius, 2011). They provide guidance and protocols for the development, verification, monitoring, and reporting of carbon credit projects. They also define the rules for third party independent auditing of the claimed carbon sequestration or emissions reductions. Through facilitating the transactions of carbon credits, and making information regarding projects and market participants easily available, these standards provide a level of transparency and credibility that strengthens the voluntary carbon market (Hamrick & Goldstein, 2015; Merger & Pistorius, 2011).

The standard with the largest number of transactions and the greatest variety in types of projects accepted is the Verified Carbon Standard (VCS). In 2014 VCS alone captured 33 percent of the entire voluntary carbon market. VCS in combination with the Climate, Community, and Biodiversity Standard (CCB) captured an additional 22 percent market share (Hamrick & Goldstein, 2015). VCS has over 40 approved methodologies for carbon sequestration or emission reduction projects, ranging from

the energy efficiency sector to improved land use (VCS, 2015c). VCS also recognizes any projects developed under CDM, or the Climate Action Reserve (VCS, 2015c). The second largest standard is the Gold Standard (GS). In 2014 GS accounted for 15 percent of voluntary carbon market transactions. The Climate Action Reserve (CAR) and the American Carbon Registry (ACR) are also common standards, taking over 3 percent of the market each (Hamrick & Goldstein, 2015). Beyond the four major standards, there are a wide variety of smaller standards, including internal proprietary standards used by corporations that purchase offsets. Each standard has a unique value proposition; some smaller standards focus on a particular type of project while other's focus on geographic regions (Corbera et al., 2009). The graph below shows the general breakdown of standards by their percent of market share in 2014 as reported by Ecosystem Marketplace.

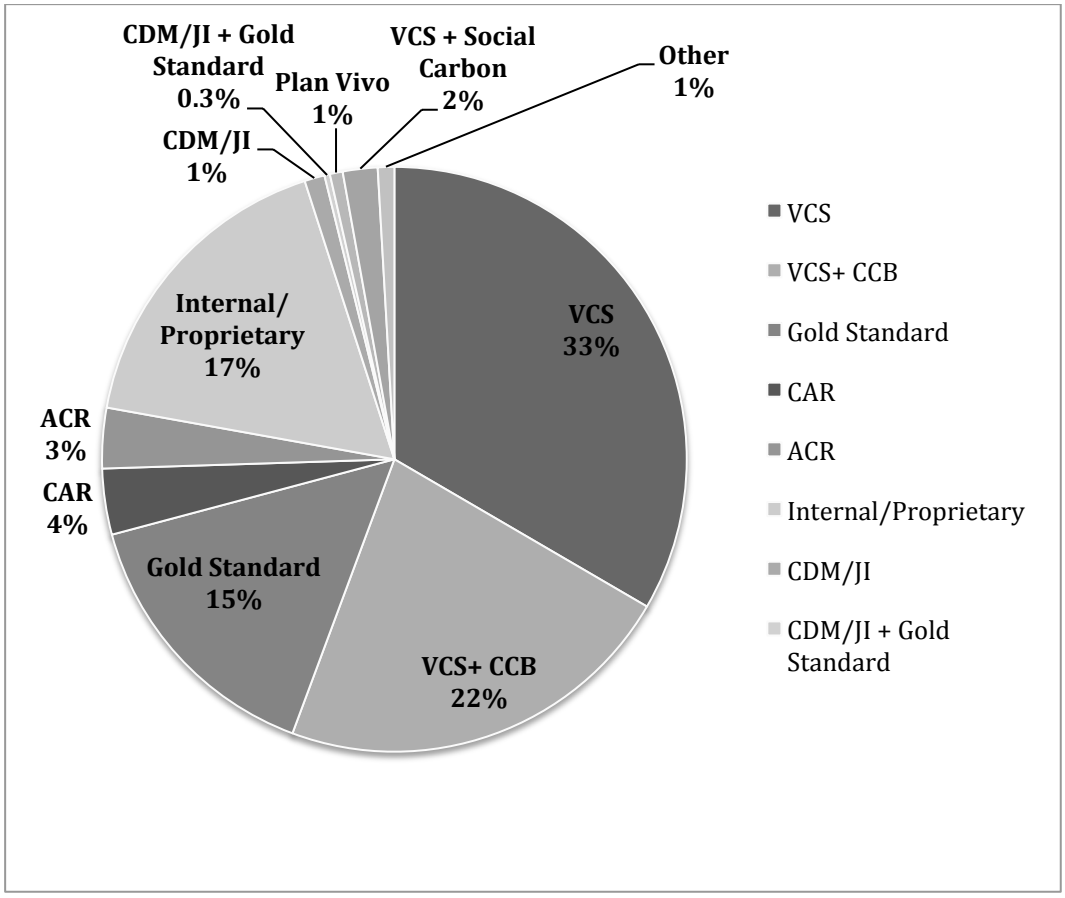

Figure 2: Voluntary Market Share by Standard. Data from Forest Trends' Ecosystem Marketplace State of the Voluntary Carbon Market 2015.

The average price of a carbon credit varies on the voluntary carbon market. Unlike compliance markets where the price of carbon can be predicted through marginal analysis of abatement costs and costs of regulation (Conte & Kotchen, 2010), prices on the voluntary market fluctuate depending on the standard used, type of project, and general market conditions. This means that value can be created in a number of different ways. For example, many buyers purchase offsets not solely for climate change mitigation but also for co-benefits such as poverty alleviation or biodiversity

that may be associated with the offset project (Conte & Kotchen, 2010; Harris, 2007). In 2014 the average sale price per ton of CO_2 equivalent was $3.8 (Hamrick & Goldstein, 2015). This incorporates a range from approximately $2/t$CO_2$e to over $10/t$CO_2$e depending on type of project (Hamrick & Goldstein, 2015). The chart below shows a breakdown of prices per tCO_2 by type of offset project in 2014 as reported by Ecosystem Marketplace.

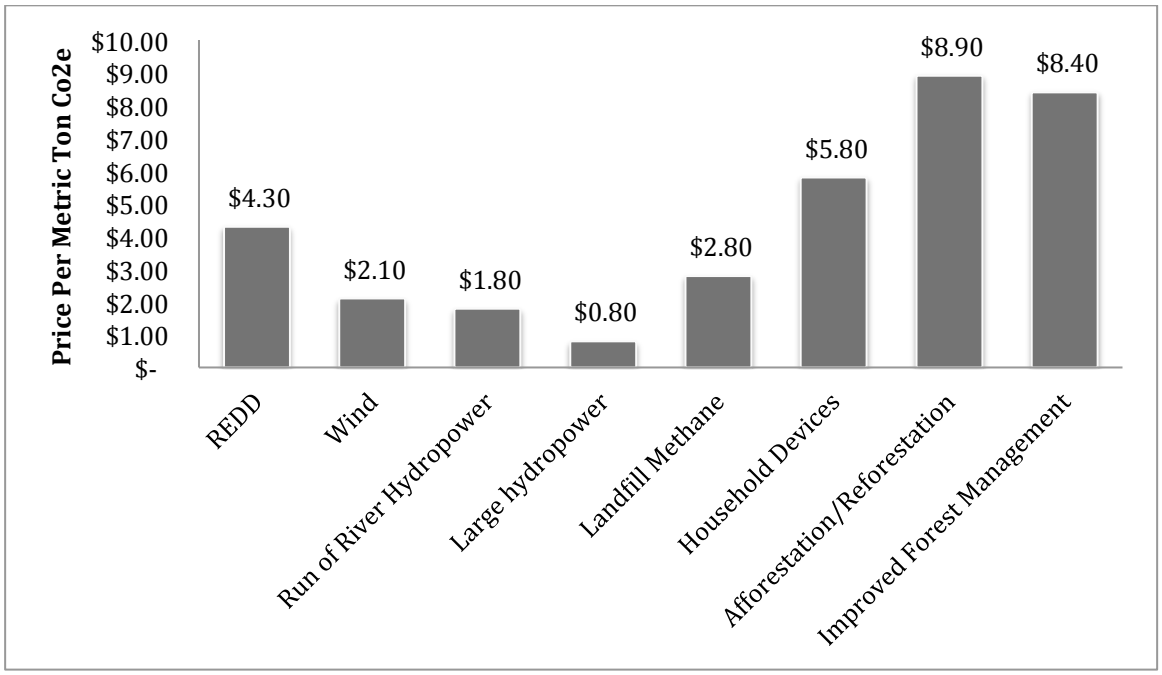

Figure 3: 2014 Average Voluntary Carbon Market Prices by Project Type. Data from Forest Trends' Ecosystem Marketplace State of the Voluntary Carbon Market 2015

In this graph, it is interesting to note that afforestation and reforestation projects as well as improved forest management received the highest price per ton in 2014. This reflects a general interest in forestry projects from the private sector, which could be a result of recent international focus on avoided deforestation and the role of forests

in climate change mitigation through REDD+ schemes. While REDD+ projects are beginning to appear on the voluntary carbon market, these methodologies are newer than afforestation/reforestation and improved forest management (Phelps et al., 2010). As a result these projects may not be as well known, attractive, or trusted.

Typically, projects that succeed in telling a powerful story regarding the community and economic benefits of the carbon credit project are able to achieve a higher price for credits. This is an interesting point that differentiates voluntary offset purchases from regulated offset transactions. Companies, governments, and individuals purchase carbon offsets for a wide variety of reasons (Benessaiah, 2012; Conte & Kotchen, 2010). In many cases offset purchases are "pre-compliance" meaning that companies purchase offsets anticipating that there will be future emissions regulations that impact them (Benessaiah, 2012). However, many offset purchasers are driven by a desire to drive positive social and environmental change, improve the public relations and branding image of a business, or simply alleviate guilt (Conte & Kotchen, 2010). Businesses in particular are facing pressure from customers, business partners, and shareholders to improve the sustainability of their operations, regardless of whether or not this is required by law (Goldstein, 2015a). With these types of voluntary offset purchases, the company or institution that is buying usually advertises the projects that they invest in, and in many cases this may contribute to their own competitive differentiation. Thus, buyers tend to look for more than just carbon sequestration when they purchase offsets. They want a personal story, or

benefits that somehow relate to their own mission. As the market is competitive and in general supply is greater than demand (Hamrick & Goldstein, 2015), carbon offset projects need to stand out in order to attract a buyer and a high price per credit. Projects that are able to clearly communicate the benefits extending beyond emissions reductions and tell a compelling story about how they are creating value are the most successful.

This is not surprising, as in many ways the voluntary carbon market developed to address what was perceived as weaknesses with the CDM market. In particular, CDM has been criticized for not having enough focus on sustainable development (Harris, 2007; Lovell, 2010). Many actors in the voluntary carbon market have positioned themselves as a better solution to climate change than the CDM route; along with carbon sequestration their standards also account heavily for social and economic factors (Hamrick & Goldstein, 2015; Lovell, 2010). The CCB standard is one example of this. Projects that have CCB certification in addition to VCS certification can claim to have a positive impact on biodiversity and community development as well as climate change mitigation (Narasimhan, 2014). These projects sell for a higher price, on average $2.7 more per ton of CO_2 (Hamrick & Goldstein, 2015). In addition, without policy as a direct and major driving force to create demand as is the case with the Kyoto Protocol and compliance markets, the voluntary carbon market has had to generate demand through truly highlighting the value of offsetting.

The voluntary carbon market standards outline the steps required to develop a certifiable carbon offset project. While there is no single definition of what constitutes a carbon offset project on the voluntary market (Corbera et al., 2009), there is general acceptance of a structure similar to that of CDM. Each standard includes methodologies for different types of projects ranging from forestry management to renewable energy implementation. As the voluntary carbon market matures and has coalesced around a few core standards, the process of developing a project has generally become more formal and standardized (Bayon et al., 2009; Hamrick & Goldstein, 2015). Each methodology must be approved by its respective standard; methodology approval itself is a rigorous process that can be time consuming and costly. To issue carbon credits from a particular standard, a project must adhere to a methodology and follow all required project development steps. Depending on the standard, this project development process can range from months to years; in order to be eligible for credits an accredited third party must validate a project. The validation step ensures that the project follows all of the requirements outlined in the methodology. Validation also approves the crediting period, which is the timeframe that the project may be able to issue credits. In order to actually issue these credits once the project is underway, an accredited third party must verify the emissions reduction or sequestration. Finally, the standard organization reviews verification documents and ultimately issues certified carbon credits. The general process for VCS, the largest standard organization, is outlined below.

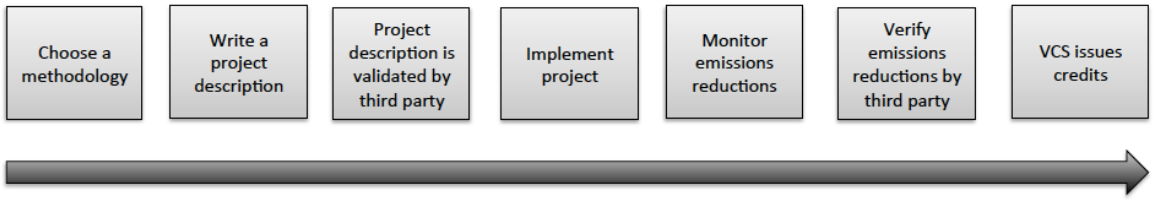

Figure 4: Project Development Process for Verified Carbon Standard.

Once a project has credits issued, it may retire these credits or sell them to an interested buyer. Private corporations are the largest purchasers of voluntary carbon offsets (Goldstein, 2015a; Hamrick & Goldstein, 2015). Companies purchase offsets as part of carbon management strategies, as a way to mitigate physical climate change risk, as a way to mitigate reputational risk of inaction, in order to meet internal sustainability goals, and as a way to invest in cleaner energy technology (Benessaiah, 2012). While motivations vary and in many cases companies are acting in anticipation of future emissions regulation, private buyers commonly site social corporate responsibility as the primary driver for their offset purchases (Hamrick & Goldstein, 2015). Most private purchasers of carbon offsets are companies in industries that are currently not regulated by climate policies. Sectors that have invested significantly in voluntary carbon offsets include transportation, banks, finance and insurance, services, and technology (Goldstein, 2015a). It should be noted that it is difficult to determine the exact number of offsets purchased voluntary, as companies are not required to report on this. However, through initiatives such as the Carbon Disclosure Project, close to 2,000 companies report on their GHG emissions and climate change policies (Carbon Disclosure Project, 2016). Based on

this reported data, the top corporate purchaser of voluntary offsets is General Motors with 4.6 $MtCO_2e$ purchased in 2012 and 2013 (Goldstein, 2015a). More recently, General Motors finished an initiative to work with universities in the US to develop carbon offset projects and reduce emissions (Chevrolet, 2016; Goldstein, 2015a). Behind General Motors, Barclays is the second largest purchaser of voluntary carbon offsets, followed by PG&E Corporation and Natura Cosmeticos, S.A. (Goldstein, 2015a). The largest volume of voluntary offset purchases came from the US, however in general it is interesting to note that it is more common to purchase voluntary carbon offsets in regions where there are also regulatory carbon markets. For example, the European Union has the largest number of voluntary carbon offset buyers (Goldstein, 2015a). This may be because companies feel more pressured to reduce their emissions in these areas, or it may simple be that they are more familiar with carbon markets and offsetting schemes.

4.3 Market opportunities

The lack of a central regulating body gives the voluntary carbon market considerably more flexibility than CDM and corresponding compliance markets (Bayon et al., 2009; Harris, 2007; Lovell, 2010). In particular, there is often less bureaucracy, lower transaction costs, and faster project development (Benessaiah, 2012). This allows a wide range of stakeholders to participate in the carbon market, in particular those in unregulated industrial sectors or geographical regions that have not ratified the

Kyoto Protocol. In addition, the less rigid requirements make the voluntary carbon market more feasible for small-scale projects wishing to enter the market (Benessaiah, 2012). The voluntary market also allows for companies and individuals to become familiar with carbon accounting and pricing, and for project developers to gain experience with different methodologies without having to adhere to a strict set of rules and regulations. This could facilitate future participation in compliance markets (Kollmuss et al., 2008; Lovell, 2010). For example, prior to the launch of California's cap-and-trade program, many companies and organizations in the state were actively participating in the U.S. voluntary carbon market.

The relative flexibility of the voluntary carbon markets means that there is room for experimentation with different types of methodologies and projects, which may not be included in CDM (Kollmuss et al., 2008). This includes small-scale projects such as some agroforestry methodologies. Interestingly, the voluntary carbon market was originally made up primarily of small-scale forestry projects (Lovell, 2010). In many cases, this market can serve as a testing ground to develop protocols that are eventually adopted by compliance markets. Some even argue that the central role of the voluntary carbon market is to develop the rules and procedures that will eventually be part of future regulatory markets (Kollmuss et al., 2008). Regardless, it is clear that the voluntary carbon market has room for experimentation and unique types of projects. Evidence for this can be seen in the inclusion of micro-projects in the market (Benessaiah, 2012), the development of standards focusing specifically on small-scale projects with sustainable development benefits (Hamrick

& Goldstein, 2015), and the emphasis on creating value above and beyond carbon sequestration. A recent example of this type of innovation came in December 2015, when a Fair Trade certification for carbon offsets was launched (Goldstein, 2015b).

The flexibility and room for innovation in the voluntary carbon market is an opportunity for small-scale coffee producers to experiment with methodologies and project models that could be replicated across the sector. In particular, the opportunity to develop protocols that address concerns beyond simple carbon reduction and sequestration could benefit the coffee industry. Several standards commonly used in the voluntary carbon market already account for co-benefits such as poverty alleviation, biodiversity, economic development, and participatory project design (Corbera et al., 2009; Hamrick & Goldstein, 2015). Sustainable coffee production could potentially contribute to all of these co-benefits along with sequestering carbon. It appears that the voluntary carbon market could be a natural fit for small-scale coffee production, and that these projects could offer the precise type of story that voluntary offset buyers are looking for. In addition, as mentioned previously, companies tend to look for projects that relate to their mission or operations. Carbon offsets developed on coffee farms would be ideal for large coffee buying companies looking to reduce their environmental footprint. Through the voluntary market, these companies could experimentally engage in carbon offsetting and become familiar with the marketplace on their own terms. For industries such as the coffee sector that have thus far not participated on a large scale in carbon

offsetting, the voluntary carbon market can represent an opportunity to develop new methodologies and projects that are suited for sustainable coffee production.

4.4 Market Challenges

The voluntary carbon market has been the subject of much criticism and is not free from challenges. Most critiques revolve around the lack of transparency and poor quality carbon offsets (Gillenwater, Broekhoff, Trexler, Hyman, & Fowler, 2007; Lovell, 2010; Merger & Pistorius, 2011). This was particularly true in the earlier stages of market development. Between 2006 and 2008, the voluntary carbon market experienced dramatic growth (Gillenwater et al., 2007; Hamrick & Goldstein, 2015). Much of this was due to anticipation of regulation, especially in the U.S. (Lovell, 2010). Along with this rapid growth came questions about the validity of carbon credits being traded. As the voluntary carbon market has no governing authority, there is no single agreed-upon standard for monitoring project development methods or verification protocols. This means that there is a multiplicity of standards competing for acceptance; the same flexibility that allows broad participation in the market also makes it difficult to determine which standards and types of projects offer the most integrity. The variety and diversity of standards may lead to confusion among participants in the market, and decrease transparency (Merger & Pistorius, 2011). This is especially worrisome in the case of communities with small-scale producers, indigenous groups, and other more vulnerable populations that may not be as informed about the carbon market (Merger &

Pistorius, 2011). This lack of transparency and market oversight initially led to a great deal of distrust among buyers. In addition, environmental commodity markets can be more susceptible to failures and collapse than traditional markets (Gillenwater et al., 2007). This is because environmental commodity markets, such as carbon markets, transact intangible products that are often public goods. In order to buyers to evaluate the quality of an environmental commodity, there need to be robust transparency and quality assurance mechanisms (Gillenwater et al., 2007).

Another challenge for those participating in the voluntary carbon market is the fluctuation of demand. As mentioned previously, the voluntary carbon market is highly influenced by international policy regarding climate change (Hamrick & Goldstein, 2015). In the U.S. there was a surge in voluntary offset demand in 2008 and 2009 that decreased when it became clear that the government was not going to implement a national climate policy (Hamrick & Goldstein, 2015; World Bank, 2014). Corporations are also very sensitive to perceptions about future market conditions, whether or not they believe their emissions may be regulated in the future, and public expectations about environmentalism (Goldstein, 2015a). This demand uncertainty can make it difficult for offset project developers to make long-term financial projections and determine the feasibility of different projects.

5. Coffee and Carbon Markets

5.1 Coffee Production in Latin America

Coffee production is an important land use and economic activity in Latin America, comprising over 5 million hectares in Central and South America with a production value of over US $5 billion annually (Williams-Guillen, 2014). Over 70% of coffee producers are smallholders, cultivating less than 10 hectares of land (Jha et al., 2011; Mendoza, Preza, Gutierrez, & Fernandez, 2012). In Mexico and Central America, the majority of coffee farmers manage even smaller plots of land, typically 2 hectares or less (Jha et al., 2011). The prevalence of small-scale farms does not necessarily mean that smallholder farmers produce the majority of coffee by volume; in many Latin American countries there are also large-scale plantations with highly intensified production (Jha et al., 2011). However, trends in Latin America show that there are decreasing numbers of large estates and increasing production in small or micro-scale coffee farms (Jha et al., 2011).

The history of coffee in Latin America is broad and complicated with important social, political, ecological, and economic considerations (Jha et al., 2011; Murray, Raynolds, & Taylor, 2006). Within this topic, there are some key aspects of coffee production that are noteworthy as they may be relevant for participation in carbon markets. One aspect is the involvement of coffee producers with Fair Trade, organic, and other certification schemes. Fair Trade began as a movement in the 1960s to connect socially and environmentally conscious coffee consumers with

producers in developing countries (Murray et al., 2006). The idea was to provide a fair living wage to coffee producers who implement socially and environmentally sustainable practices. In 1997 the movement was formalized with the development of the Fairtrade Labeling Organizations International (FLO) (Murray et al., 2006; Raynolds, Murray, & Leigh Taylor, 2004). Coffee soon became the primary product to be Fairtrade certified, with Fairtrade production highly concentrated in Latin America (Raynolds et al., 2004). In order to achieve Fairtrade certification, coffee producers are required to be small family based operations, be members of larger cooperatives or producer associations, and pursue ecological goals along with coffee production (Raynolds et al., 2004).

Though organic coffee focuses more specifically on production mechanisms, organic farms must go though a certification process similar to Fairtrade (Méndez et al., 2010). Like Fairtrade, organic coffee production has grown rapidly in Latin America (with much overlap between the two certification schemes). Over 2 percent of coffee land in Central America is certified organic (Méndez et al., 2010). In addition to Fairtrade and organic, there are a number of other smaller coffee certifications that have found niche markets in the US and Europe, including a shade coffee standard and Rainforest Alliance's Bird Friendly coffee (Méndez et al., 2010). However, these standards have not reached the same scale as organic and Fairtrade (Méndez et al., 2010).

The prevalence of Fairtrade and organic coffee, as well as other sustainability standards, has greatly impacted the way that coffee is marketed and sold across the

globe (Jha et al., 2011; Raynolds et al., 2004). Fairtrade in particular has increased the ability of smallholder producers to access value-added markets, and has increased the number of smallholder producer cooperatives. Prior to the 1980's, agriculture cooperatives were relatively rare in Latin America. Currently there are over 530 organizations that are members of Fairtrade International, with almost 300 of these being cooperatives of small-scale coffee producers (Mendoza et al., 2012). This means that there are an increasing number of small-scale coffee producers that are members of larger networks. Successfully achieving Fairtrade or organic certification requires that these producer networks have strong internal organization and leadership as well as strong external relationships with corporate buyers, development NGO's, and other international institutions (Raynolds et al., 2004). Cooperatives must learn how to manage both the technological certification process, and market their products worldwide. Essentially, they must be actives participants in the global production network of coffee.

In terms of coffee production methods, there is a range from open sun-grown coffee requiring intense management to heavily shaded coffee plots with little management (Jha et al., 2011). While there has been a trend towards intensifying coffee production and more monoculture type plantations, polyculture agroforestry systems including a variety of shade trees, fruit trees, and timber species along with coffee are still common throughout Latin America (Jha et al., 2011; Williams-Guillen, 2014). This is particularly true among smallholders. As climate change continues to impact

Latin America, these smallholders will be among the most vulnerable (International Trade Centre, 2010). Rising temperature conditions and more frequent extreme precipitation events, including flood and drought, are projected for most coffee growing regions (Intergovernmental Panel on Climate Change, 2015). These conditions directly impact coffee production, as well as create an environment that is more conducive to coffee pests and diseases (International Trade Centre, 2010). As such, it is vital that coffee producers, in particular smallholder, find methods to adapt to changes in climate.

5.2 Coffee and Climate Change Mitigation

It is also important to note that along with adaptation, coffee production can both contribute to and have significant potential to mitigate climate change. According to the Intergovernmental Panel on Climate Change, land use and management practices will be of utmost importance in terms of influencing the organic matter content of soils (International Trade Centre, 2010). Agroforestry systems such as coffee plantations with proper design and management have been shown to be effective carbon sinks (Montagnini & Nair, 2004). In addition, agroforestry systems are valuable in that they provide wood and agriculture products such as timber, coffee, and cacao that generate income for poor rural families and reduce pressure for deforestation (Montagnini & Nair, 2004; Soto-Pinto, Anzueto, Mendoza, Jimenez Ferrer, & de Jong, 2010). The amount of carbon sequestered and stored in agroforestry systems varies widely depending on many factors including the

practices implemented, the climate, and the species of trees planted (Dossa, Fernandes, Reid, & Ezui, 2008; Polzot, 2004). In general, shade grown coffee systems are shown to store more carbon than conventional (grown in the open) coffee farms (Dossa et al., 2008). Some shaded organic coffee farms have been show to store as much soil carbon as nearby forests (Jha et al., 2011; Soto-Pinto et al., 2010). In addition, when compared to other possible land use activities, both organic and non-organic shaded coffee farms were shown to store more carbon (Soto-Pinto et al., 2010). If these carbon stocks and sequestered CO_2 can be quantified, then agroforestry systems such as small-scale coffee farms have significant potential to be included in the carbon market.

Despite the potential of agroforestry to sequester and store carbon, and the growing demand for carbon offsets, coffee producers have not yet participated in the voluntary carbon market on a significant scale. It is clear that smallholder producers face a number of challenges if they wish to access capital from the voluntary offset market. These challenges include requirements to prove that projects are generating emissions reductions beyond a baseline level, high transaction costs, and limited access to technology. However, as more coffee projects begin to appear on the voluntary carbon market, they pave the way for future producers to become involved. As outlined in Section 4, the flexibility of the voluntary carbon market allows for experimentation with new methodologies and project models, which could make this an ideal space for coffee producers to explore their role in climate change mitigation.

5.3 Emerging Coffee-Carbon Collaboration: a review of current projects

While not happening on a large scale globally, there are carbon methodologies that can be applied to coffee farms. In the past five years there have been several instances of coffee carbon projects being developed across Latin America. This appears to demonstrate an increased interest in carbon markets by the coffee industry. However most of these projects are in their early stages. It is difficult to determine the impacts and outcomes of these investments as of yet. This section will briefly review current carbon credit projects under development on coffee farms.

5.3.1. Sustainable Climate-Friendly Coffee (CO_2 Coffee)

The Sustainable Climate-Friendly (CO_2 Coffee) project is a validated project on the VCS Project Database using the CDM approved methodology AR-AMS0007 version 3.1, which allows for small-scale reforestation. Project activities are located in Oaxaca, Mexico and the project is being developed in part by Rainforest Alliance and Pronatura Sur A.C. (a Mexican nonprofit) in collaboration with other Mexican organizations (Figueroa Trejo et al., 2015). The producers participating in this project are members of the *Unidad Ecológica para el Sector Café Oaxaqueño Sociedad Civil* (UNECAFE) cooperative and have obtained Rainforest Alliance certification. Project activities involve reforestation on degraded lands, which includes increasing the shade cover in coffee farms and reforestation of fallow or pasture land. During the first phase of the project, 254 producers are expected to participate (Figueroa Trejo et al., 2015). The project is also supported by *Agroindustrias Unidas de México*

Sociedad Anónima de Capital Variable (AMSA). AMSA is a for-profit Mexico-based buyer and distributor of coffee. In this project AMSA will help finance project activities, purchase and market the "Climate Friendly Coffee" and help arrange the sale of carbon credits (Figueroa Trejo et al., 2015). Over the 30 year lifetime of this project over 100,000 trees will be planted sequestering an anticipated 130,000 tons of CO_2 (Holmes, 2015).

The CO_2 Coffee project is new; the project was only validated and posted to the VCS Project Database in November of 2015 (VCS, 2015b). It remains to be seen how this project will play out and what the market demand for carbon offsets will look like when this project is ready to sell credits. The Rainforest Alliance emphasizes that the project model will ensure significant social and economic benefits to local families as well as environmental benefits. Project developers state that the project will focus on building community resilience and the capacity to cope with climate change (Holmes, 2015; Rainforest Alliance, 2011).

5.3.2. Sustainable Agriculture in Coffee Plantations in Nicaragua (PASCAFEN)

The PASCAFEN project is a pilot initiative being developed with small-scale coffee producers in Nicaragua. The project is being developed by the *Corporación Educativa para el Desarrollo Costarricense* (CEDECO) with support from Hivos, an international development organization based in the Netherlands (Rodriguez & Amador, 2014). The PASCAFEN project is managed locally by the Nicaraguan confederation of cooperatives PRODECOOP, which brings together 38 smaller

agricultural cooperatives (Porras, Amrein, & Borley, 2015; PRODECOOP, 2016). Currently CEDECO is in the process of developing a new carbon methodology, Cam(bio)$_{2,}$ which quantifies GHG emissions reductions through: planting shade trees in coffee farms, producing soil carbon biomass resulting from composting, and avoided emissions from sustainable fertilizer use (Porras et al., 2015; Rodriguez & Amador, 2014). Through a group of pilot farms participating in testing for this methodology, CEDECO calculates that over 17,000 tCO_2 have been generated in offsets and estimates that this number will expand exponentially as the project is brought to scale. However, Cam(bio)$_2$ is not recognized as an approved methodology by any of the leading voluntary carbon market standards. This is a risky approach in that it may be difficult for the PASCAFEN project to gain credibility and in particular to attract buyers for the credits generated. Cam(bio)$_2$ is currently under review by the Gold Standard (Porras et al., 2015) and if approved this would certainly add validity to any Cam(bio)$_2$ credits. The PASCAFEN project has also expressed interest in pursuing the newly launched Fairtrade certification for offsets as well as the Gold Standard (Porras et al., 2015). Considering the long relationship between Fairtrade certification, coffee production and successful coffee marketing schemes, developing Fairtrade carbon credits as a product of coffee farms could be very complementary, particularly if the farms already achieve Fairtrade certification for their coffee.

5.3.3. Organic Coffee and Carbon Credits in Guatemala

Along with Nicaragua, CEDECO developed a pilot carbon project with coffee

producers using the Cam(bio)$_2$ methodology in Guatemala. This project was also developed with the support of Hivos, in collaboration with We Effect, a Swedish Cooperative Center (Amrein, Porras, & Vorley, 2015a). Local participants are members of the Specialty Coffee Trade Federation of Guatemala (FECCEG), which similar to FEDECOOP in Nicaragua is a federation of smaller producer cooperatives. Project activities involve the transition from conventional to organic style coffee production.

The Guatemala organic coffee project stands out from the other pilots in that it reportedly has sold carbon credits. In 2013 CEDECAM used Cam(bio)$_2$ to quantify the carbon stock on land owned by 40 farmers. They calculated that there were 2,897 tons of CO_2e stored, and in 2014 sold 1,159 of these tons to two Spanish companies (Amrein et al., 2015a). The sale was facilitated by CeroCO_2, a Spanish firm dealing in carbon offsets and other environmental services to address climate change. The initial sale was at 7.20 Euros per ton of CO_2 offset (Amrein et al., 2015a). This is a high price compared with averages on the voluntary market. This project is currently listed on the CeroCO_2 database as having offsets available to purchase at a price of 9 Euros per ton (CereCO2, 2015). It should also be noted that these credits were not only quantified by CEDECO; the third party certifier BCS ÖKO-Garantie acted as a verifier for the credits (Amrein et al., 2015a; CereCO2, 2015). After paying for bank and transaction fees, 20 percent of the resulting funds went to FECCEG, with the rest going to the two local producer cooperatives directly participating in the project. In this sale, funds did not flow directly to coffee producers who had implemented the

project on their farms. Rather, carbon finance went towards strengthening the local cooperatives in the form of initiatives such as increasing technical capacity, hiring more employees, and providing greater services to members (Amrein et al., 2015a)

5.3.4. Norandino Cooperative Reforestation Project

In Peru, the producers cooperative Norandino has initiated a reforestation project through the Gold Standard. Norandino receives technical and financial support from numerous organizations, including the Dutch NGO Progreso Foundation via its ProClimate initiative, the Dutch international company ForestSense, and Dutch project developer Just Green BV among others (Amrein, Porras, & Vorley, 2015b; Norandino, 2014). The project was certified in 2011 and has a 25 year crediting period (Pro Climate, 2013). While this project does not include planting coffee trees, the model is intended to finance sustainable coffee production and help coffee producers adapt to climate change. Project activities include reforestation of degraded land in areas upriver from a coffee-producing region; the reforestation and better land management helps regenerate the watershed and limit soil erosion (Amrein et al., 2015b; Pro Climate, 2013). Changes to the watershed and soil quality were negatively impacting downriver coffee producers, both in terms of coffee quality and quantity (Lee, 2012). By developing and incentivizing sustainable forestry systems, this project was intended to reduce pressure for deforestation and improve environmental management. The majority of funds from carbon finance are reinvested into sustainable forest plantation management while a small portion is

invested into climate change adaptation on coffee farms (Pro Climate, 2013).

The resulting carbon credits to date were third party verified by the Rainforest Alliance and thus far the Norandino project anticipates generating over 37,000 tCO_2 offsets (Amrein et al., 2015b). One important feature of this project is Norandino's ability to leverage its international relationships with coffee purchasers to finance carbon credit investment. As a cooperative, Norandino sells to about 12 roasters and importers across the United States and Europe. So far two of these coffee buyers have also purchased the cooperative's carbon credits (Amrein et al., 2015b). Cafedirect has purchased 5,900 tCO_2 and Bewley's has purchased 3,786 tCO_2. Norandino has also sold to one other company not related to their coffee sales (Amrein et al., 2015b). Norandino reportedly has sold credits between $15 and $28 per tCO_2 (Amrein et al., 2015b) which is far above the average price of offsets on the voluntary carbon market. Cafedirect even agreed to purchase some of the offsets upfront in order to help finance initial project activities (Amrein et al., 2015b; Lee, 2012).

The success of Norandino in financing this project and selling carbon credits at a high price likely comes from its long relationship with coffee purchasers. This project is able to make a clear connection between carbon credits and a reliable flow of quality coffee. Norandino could clearly communicate with its coffee purchasers that developing the carbon offset projects upstream would result in better quality coffee produced by the cooperative. In addition, they emphasized that this project would provide funds to be invested into climate change adaptation on coffee farms,

thus mitigating the risks posed by climate change. Coffee purchasers naturally need a consistent supply of quality coffee in order for their business to succeed. Essentially, the interests of coffee purchasers were aligned with the goals of the project.

The following table summarizes the 4 coffee carbon projects described as well as one additional project that will be presented in the following section.

Project	*Location*	*Standard*	*Methodology*	*Start Date*	*Status*	*Project Proponent*	*Project Developer/ Advisors*	*Credit Price*
CO_2 Coffee	Oaxaca, Mexico	VCS	AR-AMS0007 (CDM)	2013	Project Validated	• Pronatura Sur A.C. • UNECAFE	• AMSA • Rainforest Alliance • Negocios Sostenibles ABC Mexico	NA
PASCAFEN Project	Nueva Segovia & Mardiz, Nicaragua	Possibly Gold Standard	$Cam(bio)_2$	2012	Pilot Stage	• PRODECOOP	• CEDECO • Hivos	NA
FECCEG Project	Western Guatemala	Possibly Gold Standard	$Cam(bio)_2$	2012	Pilot Stage (Some credits sold)	• FECCEG	• CEDECO • Hivos • We Effect	7.2-9 EURO per tCO_2
NorAndino Reforestation Project	Sierra Piura Highlands, Peru	Gold Standard	Afforestation/ Reforestation	2011	Active	• NorAndino	• ProClimate • Rainforest Alliance • Progreso Foundation • Forest Sense • Just Green BV	$15-$28 USD per tCO_2
Shade Coffee & Cacao Reforestation	Peru	VCS	AR-ACM0003 (CDM)	2013	Project Validated	• Ecotierra (in collaboration with Centrales and Cooperatives)	• Ecotierra	NA

Table 1: Coffee Carbon Credit Projects in Latin America

5.4. Case Study: Shade Coffee and Cacao Reforestation in Peru

In this section I move from describing coffee and carbon credit projects to a case study of one project. The Shade Coffee and Cacao Reforestation Project is significant in that it is one of the larger projects that is facilitating access to the voluntary carbon market for coffee producers. Analysis of this project can provide insight into some of the challenges faced in the project development process and help determine whether the process could be replicated in other regions of Latin America.

The Shade Coffee and Cacao Reforestation Project is a Peruvian project that is validated on the VCS Project Database. The project is developed by Ecotierra along with multiple cooperatives throughout the country. Ecotierra is a Canadian-Peruvian B-Corporation that implements environmental, carbon, and sustainable development projects (VCS, 2015a). This project is validated using the CDM methodology AR-ACM0003 for large-scale reforestation or aforestation of lands, and has a stated goal of converting degraded land and abandoned plots into plantations producing high-quality coffee and cocoa with a high level of forest cover(ECOTIERRA, 2014a, 2014b; VCS, 2015a)

Project activities involve planting coffee or cacao farms on fallow or degraded agricultural plots (ECOCERT, 2014). The coffee and cacao trees as well as the trees planted for shade cover will sequester and store atmospheric carbon. This reforestation will occur on lands that have been deforested for more than 10 years

and prior to project initiation were used as pasture, fallow, left as wasteland, or covered with annual crops. In some cases farmers had planted perennial trees with low production (ECOTIERRA, 2014c). Because the project's tree planting activities will happen on degraded and deforested lands, the new agroforestry system will improve the potential to sequester and store carbon and can thus be considered to provide additional benefits to the atmosphere over the baseline scenario (ECOTIERRA, 2014c; United Nations Framework Convention on Climate Change, 2012). The AR-ACM0003 methodology used for this project outlines the necessary calculations to quantify the tons of CO_2 sequestered and stored via measurement of the changes in both above and below-ground biomass (United Nations Framework Convention on Climate Change, 2012). In addition, though improving the productivity of existing plots the project reduces pressure to convert new land and forests to agricultural uses. This benefit of potential avoided deforestation is not accounted for as part of this project (ECOTIERRA, 2014c).

The Shade Coffee and Cacao Reforestation Project began in 2013 and has a 40 year crediting period; the entire project is anticipated to provide a long-term average of almost 2 million tCO_2e removed from the atmosphere (ECOTIERRA, 2014c). The project was developed in collaboration with 32 Peruvian cooperatives.(ECOCERT, 2014; ECOTIERRA, 2014b). The 32 cooperatives involved in this project are comprised of small scale producers of coffee and cocoa; in Peru 25% of small coffee and cocoa producers belong to a cooperative (ECOCERT, 2014). Project developers state that over 12,000 hectares of degraded land in Peru will be reclaimed for

sustainable and climate-friendly production and over 16,000 small-scale producers will benefit either directly or indirectly from the project (ECOTIERRA, 2014c). Ecotierra especially emphasizes these social and economic benefits of the project; the stated principal objective is to improve the quality of life of participating cooperative members through the implementation and improvement of agroforestry systems (ECOTIERRA, 2014a).

The primary benefit for the producers involved in this project come from increased levels of agricultural production (ECOTIERRA, 2014b). This financial benefit is an important aspect of the project and critical for its longevity and effectiveness (ECOTIERRA, 2014c). Because the lands included in this project are degraded and often unused, the farmers that work on them are unable to produce high quantity or quality crops. This project will enable producers to implement new agroforestry production systems that are more environmentally sustainable, increase production levels, and generate high quality commodity products (ECOTIERRA, 2014c). Through the cooperatives, producers will receive technical training, resources and support in planting and maintaining their plots. Cooperatives also plan to hire foresters to assist with sustainable production methods (ECOTIERRA, 2014c). Coffee and cacao are not new to the Peruvian Andes, and most of the producers are familiar with the crops and their economic value. When the trees begin to produce, the farmers will be able to sell the products through the cooperatives both nationally and internationally (ECOTIERRA, 2014c). This will greatly increase farm revenue. Future coffee and cocoa market conditions remain to be seen, but Ecotierra

anticipates that the products from these farms can be sold at a higher than average value due to the fact that they are sustainably produced (Private Communication, 2015). In addition, the methodology and project description provide for limited timber extraction and other sustainable forestry uses on project lands (ECOTIERRA, 2014c; United Nations Framework Convention on Climate Change, 2012). This means that in addition to the revenue generated from the sale of their primary products, farmers can supplement their income with small amounts of forest products.

A map depicting areas of Peru involved in the project can be seen here:

Figure 5: Map of Shade Coffee and Cacao Reforestation Project. Source: ECOTIERRA

The Shade Coffee and Cacao Reforestation Project is a prime example of how small scale coffee producers can become involved in the voluntary carbon market through existing structures and methodologies. This project is following a CDM methodology for large-scale afforestation and reforestation, which is accepted by VCS as an accredited methodology (as are all CDM methodologies) (VCS, 2015c). While the

methodology was not developed specifically for coffee or cacao plantations, it has a wide scope and can be applied to essentially any land excluding wetlands (United Nations Framework Convention on Climate Change, 2012). Through cooperatives, small-scale producers are able to group together and implement a large-scale project; individually this would not be economically feasible nor would farmers qualify under this particular methodology. If the project is implemented according to plan the participating farmers stand to benefit significantly. The project has objectives to double the production of coffee or cacao for participating farmers, and to increase crop revenue by 50% for participating families (ECOTIERRA, 2014a). If this does in fact happen, then the coffee and cacao producers involved will truly be accessing the voluntary carbon market and benefitting from doing so. In addition, the revenue from carbon credit sales will strengthen the cooperatives, allowing them to provide better support and technical assistance to producers. However, it should be noted that this project is in an early stage, (the Project Description was only validated in 2014 (VCS, 2015a) and credits will not be issued for at least a few more years). Will the producers truly be able to derive benefit from participating in this project? How will their communities and cooperatives be affected?

5.4.1. Key Project Actors

Applying tools from the GPN framework to this case provides a lens through which it is possible to analyze the different relationships between actors and how the dynamics of money, information, and power may impact the project outcomes. The

figures below can help to conceptualize this particular project. Figure 6 shows the steps and activities necessary in the project, as well as the actors involved in each step. Figure 7 shows a simplified account of some of the main actors involved in the project and their geographical location. While not all components of the network are included here, the point is to illustrate the global nature of the process to create carbon credits and the number of players involved.

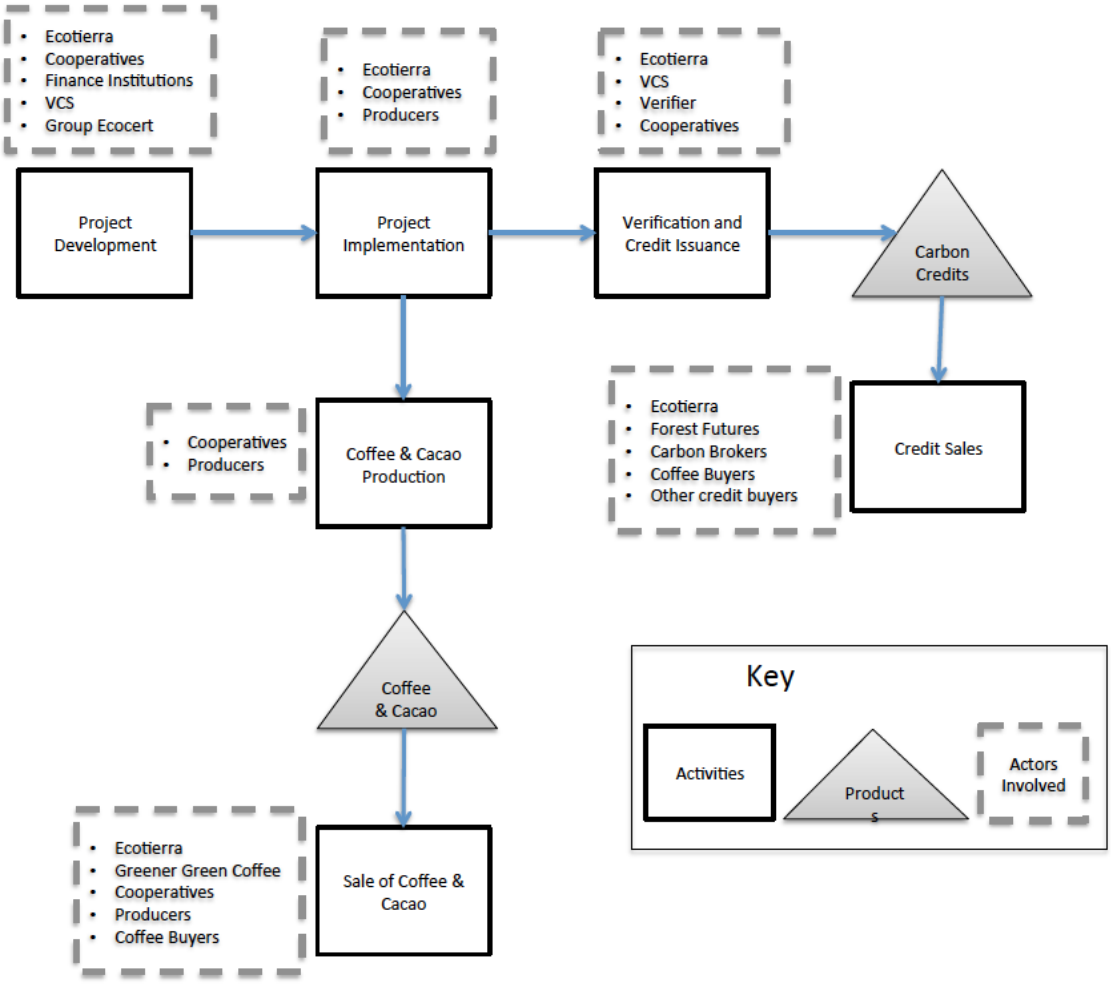

Figure 6: Simplified Process Flow Diagram of the Shade Coffee and Cacao Reforestation Project

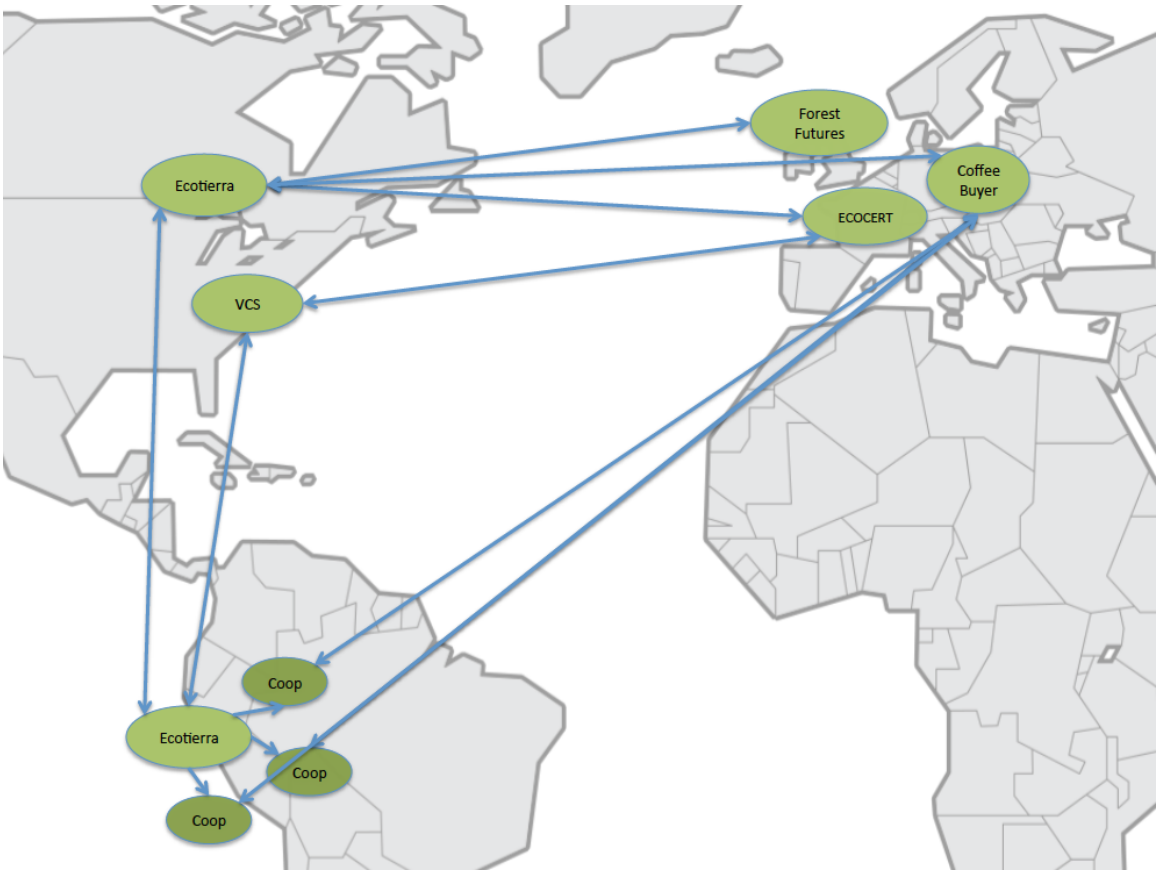

Figure 7: Simplified Global Mapping of Actors Involved in Shade Coffee and Cacao Reforestation Project

These diagrams are simplified and the actors included are those that have been identified thus far as playing a role in the project. In this case, Ecotierra is the official project proponent and project developer with the cooperatives and *centrales* (groups of affiliated cooperatives) as implementing partners (ECOTIERRA, 2014c). The Washington DC based organization VCS is the standard under which the project is developed, and the French company Ecocert is the accredited third party that officially validated this project. Forest Futures is a London based organization that

sells carbon offsets, develops projects, and provides environmental advising services for businesses. Forest Futures is a partner of Ecotierra and lists the Peru project on its website for interested investors (Forest Futures, 2015). Ecotierra also works with other partners, both to finance the reforestation activities upfront and to find buyers for carbon credits. In addition, Ecotierra is working to develop a market for the coffee and cacao that will be produced by project participants. The organization is hoping to attract large European coffee buyers, both to purchase the Peruvian coffee as well as invest in the carbon credits issued (Private Communication, 2015). Part of developing this market for the project's coffee involves development of a coffee brand: Greener Green Coffee. Greener Green Coffee is a creation of Ecotierra and a way to distinguish the product and create market opportunities for the Peruvian cooperatives that participate in the reforestation project. Greener Green Coffee offers organic and Fairtrade certified coffee, as well as what they call Environmentally Friendly coffee; coffee from farms that have not yet achieved certification but are working towards it ("Greener Green Coffee," 2015).

It is also helpful to view the different levels of networks and players involved in and influencing the Shade Coffee and Cacao Reforestation Project. Figure 8 below outlines some of the different forces at play at different levels, from local relationships and regulations regarding land titles to macro-scale climate policy decisions.

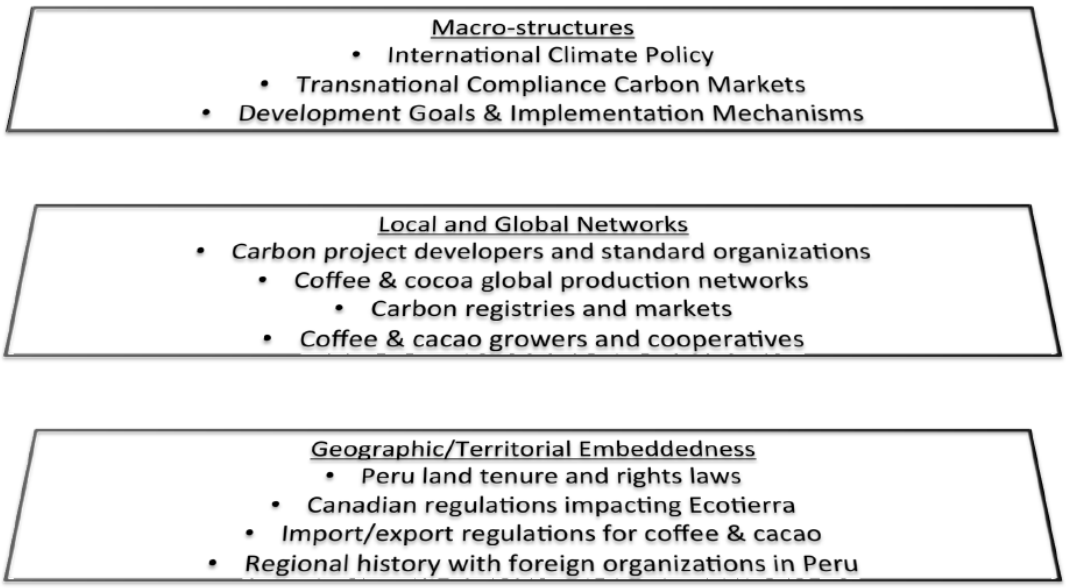

Figure 8: Varying Levels of Actors and Forces Relevant to Shade Coffee and Cacao Reforestation Project

5.4.2. Key Issues

In this section I use the GPN framework categories of value, power, and embeddedness to analyze different levels of this network. This framework helps to identify some of the key challenges that the project faces as well as some of the factors that make it possible.

Land Titles and Carbon Ownership.

On the local and regional level, this project is territorially embedded in the Peruvian Andes. This means that the project must adhere to Peruvian laws, which likely influenced how the project was developed. For example, one particularly important

factor for this project is land ownership and rights of use. In order to receive VCS project validation and issue credits, producers must provide a legal property title (ECOTIERRA, 2014c). The government of Peru has implemented a large-scale land titling program, and approximately half of the land has been titled (US AID, 2010). However there are still a large number of rural producers without formal land titles, and land conflicts in Peru are common, especially regarding the exploitation of minerals and timber (US AID, 2010). Ecotierra has committed to helping producers interested in the reforestation project to obtain formal land rights documents (ECOTIERRA, 2014c). This relationship may not be replicable in other locations. In other words, the ability for coffee producers in other countries to participate in similar projects may depend on the local land tenure situation and the presence of intermediary organizations such as Ecotierra to negotiate on the behalf of landholders. In addition, the system of land tenure may color other aspects of projects developed in the area. For example, this particular carbon project methodology does not seem conducive to alternative forms of land management such as collective ownership. In Peru, many peasant or native communities' lands are held collectively (US AID, 2010). This means that these communities may be excluded from accessing the voluntary carbon market. Women's ownership of land and their participation in decision-making regarding land use is also a factor to consider when these projects are developed. Peru has a favorable legal framework supporting women's rights to land and natural resources, however in reality rural women have less voice in decisions regarding the governance of these resources (US AID, 2010). If

women are not represented in the development of this reforestation project, it may impact whether or not women and families actually benefit from the resulting carbon finance and coffee or cacao production.

In this project, a legal document proving ownership and right of use over land could be an obstacle to accessing the voluntary carbon market. Some producers may be recognized as the rightful owners of land, but unless they can document this to VCS, they may not be able to actually derive benefit from the development of carbon credits. In particular this could exclude producers in areas with difficult access or conflict over land.

Existing Cooperative Networks and Infrastructure.

The Ecotierra reforestation project is also embedded in existing networks, which have a history of relationships and in some cases conflict. In particular, this project is developed around an extensive network of cooperatives that already existed in Peru. These agricultural cooperatives have contacts and networks that span regional and international scales. For example, *La Asociación de Promoción y Desarrollo Agrario* [The Association of Agricultural Promotion and Development] (PRO-A) is a group of cooperatives formed in 2002. The Association collaborates with Canadian partners and sells products in the Canadian market (Progreso Agrario, 2016). It is difficult to imagine how an ambitious project such as this Shade Coffee and Cacao Reforestation Project could be implemented without a preexisting network of cooperatives aggregating small producers. In addition, the history of collaboration with Canadians

likely lays a foundation of trust between the actors involved in the reforestation project. At the very least, it means that there were existing experiences of collaboration, transnational relationships and channels of communication. In this case, it appears that participation in some form of scaled organization (such as a producers cooperative) is a requirement for smallholders to access the voluntary carbon market.

At the same time, the cooperatives, which are member owned, determine how carbon funds from the project are spent, and therefore who benefits. The model for this project is that most of the funds from the actual sale of carbon credits goes back to the cooperatives (Private conversation, 2015). The idea is to provide a source of revenue for cooperatives that is not based solely upon production; this helps to stabilize the finances of the cooperatives and allow them to supply better services and technical support to members. Improving the capacity of cooperatives will theoretically translate into better production techniques, more access to technology, and better capacity to adapt to climate change for members. How this actually plays out depends a great deal on the individual cooperatives.

It is also interesting to note that this carbon credit project is being developed in the context of coffee and cacao GPNs. In fact, many of the actors are the same, meaning that existing structures and relationships will impact how the carbon credit project forms. These existing networks may actually be one of the greatest opportunities for carbon credit projects on coffee (or cacao) farms. In order for this project to be successful, Ecotierra needs to market not just the carbon credits but also

the expected increase in coffee and cacao production. As the majority of the "carbon" benefits from this project will come in the form of higher quantity and quality of production, it is essential that markets for increased production are secured. Ecotierra not only works with cooperatives on reforestation activities, it also leverages its contacts within the coffee and cacao GPNs to find international buyers interested in purchasing coffee.

Value Creation and Telling a Compelling Story

As mentioned in Section 4, the price of carbon credits on the voluntary market depends on several factors, including perceived co-benefits of the projects. This is the case in the Shade Coffee and Cacao Reforestation Project. Ecotierra emphasizes that the *social aspects* are what differentiate this project from other carbon credit projects that focus solely on climate benefits (Private communication, 2015). By social aspects I am referring to the money goes back into the communities to address health, educational or other needs and helps mitigate some of the costs and risks of climate change that small producers face. The money can also go towards Fairtrade or organic certification, which can be very valuable for producers. Ecotierra notes that these projects are risky if an investor is only looking to make profit; they are long term, the payoff is unclear, and the voluntary carbon market is uncertain. However, if the objective is to invest in a way that makes a difference and provides social and economic benefits, these projects are attractive. This is the message that Ecotierra hopes to transmit to potential carbon credit purchasers (as well as coffee and cacao

buyers). There are some certifications that can help do this, such as the CCB standard that can be paired with VCS and outlines indicators for climate, community, and biodiversity benefits (Narasimhan, 2014). While CCB certification can help highlight some of the unique co-benefits of this reforestation project, much of the storytelling responsibility is left to those ultimately selling the credits.

Telling a compelling story is also important in securing the market for coffee and cocoa. As part of their project developing activities, Ecotierra is developing a brand of sustainable Peruvian coffee ("Greener Green Coffee," 2015). Here, Ecotierra hopes to obtain a premium for coffee produced as part of the reforestation project, including plots that do not have organic or fair trade certification (Private communication, 2015). This marketing strategy implies that there is a market for products associated with carbon credit projects; participating in a VCS approved reforestation project is valuable to purchasers of coffee. Whether or not this is true on a large scale remains to be seen. In addition, Ecotierra anticipates that large-scale coffee and cacao purchasers will ultimately be interested in purchasing carbon credits. This likely depends on a variety of factors, however if coffee or cocoa companies *are* offsetting their emissions, it would align well with company missions to purchase credits from farms where they source.

The creation of value in the voluntary carbon market is a critical activity for this project. It is interesting to note the role of technology in doing so. As mentioned previously, the final selling price of a carbon credit depends on a myriad of factors

including co-benefits resulting from the project and how project proponents tell their story. The Shade Coffee and Cacao Reforestation Project attempts to take advantage of this. The fact that these carbon credits will hopefully lead to community economic development in poor rural communities, greater production of quality coffee, increased capacity for small-scale producers to adapt to climate change, a slowing of deforestation, and sustainable agricultural production is valuable. These aspects of the project translate into a better price for carbon and more likelihood of finding a buyer. These co-benefits may even be more valuable than the tons of carbon dioxide sequestered. Therefore, in order to access the voluntary carbon market in the full sense of the word, producers involved in this project need to be able to clearly tell the story. Doing so involves technology such as computers, access to Internet, digital cameras, understanding of social media, and in general an ability to develop an international brand. Most importantly it involves a well-defined and unique communications strategy. In this project, the cooperatives clearly have some of the skills and access to communication technology; most of the cooperatives involved in the project have an online presence. However, clearly communicating project co-benefits to interested buyers seems to be a task that falls mostly to Ecotierra and possibly other partner intermediaries. The skills and technology needed to not just develop but also successfully market a carbon credit project would likely be an obstacle for many small producers in other rural areas of Latin America. While there certainly appears to be a market for these projects, evidenced by the fact that afforestation/reforestation projects achieve a higher range of prices than other types

on the voluntary market (Hamrick & Goldstein, 2015), producers' ability to access this market depends on more than simply planting trees.

Power Dynamics

The creation of value is closely intertwined with relationships of power. The original GPN framework addresses power as it is exercised for value enhancement, value capture, and ultimately development (Henderson et al., 2002). In the Shade Coffee and Cacao Reforestation Project, the organization Ecotierra is exercising power in developing this project and marketing products and carbon credits to potential buyers. As a well-known development organization, Ecotierra has the capacity to influence investment where the participating producers and cooperatives on their own may not. It is possible that if this project gains more international recognition and credibility, the cooperatives themselves would be able to exert greater power and autonomy. At the moment it appears that they are very dependent upon third party organizations like Ecotierra. Another powerful institution to consider in this situation is VCS, the standard. By nature of its position in the voluntary carbon market and the price premium that VCS certification can bring to projects, VCS exerts considerable power over all projects that are developed to its standards. VCS methodologies determine how projects are developed, what activities are considered relevant, and what conditions must be met in order to issue certified credits. This means that project developers and project owners have a limited amount of freedom to design and implement projects.

The power of different actors and their ability to influence investors is particularly important for the success of any carbon credit project. As mentioned previously, the value of carbon credits sold on the voluntary carbon market varies with a number of factors. Therefore, in order to truly benefit from the voluntary carbon market coffee producers must have enough influence to convince buyers (of both coffee and carbon) that their project should be invested in and that products are valuable and should be purchased. This also means that purchasers must have a level of trust in project developers, which is likely not the case when project developers are small, unknown cooperatives or individuals that do not actively participate in international networks.

5.5 Commonalities and Implications for Future Projects

In the four projects presented as well as the case study in Peru, there are certain factors and conditions that appear to be necessary in order for coffee producers to fully participate in the voluntary carbon market. In each example, the project is developed through pre-existing producer cooperatives operating in the region. This type of organization appears to be necessary for projects to be cost effective. There are still high transaction costs for project development; costs include payment for validation and verification services, project monitoring, and fees associated with registering a project with a standard. Many of these are fixed costs, which mean that larger or grouped projects may be feasible while individual projects for smallholder coffee producers are likely economically unfeasible. Cooperatives also tend to have

larger networks and relationships, particularly if they have been active for a long time. Many have international contacts, and the skills and credit necessary to attract finance for these types of projects. Depending on the situation, cooperatives or groups of cooperatives may have enough power to attract investment on their own. Alternatively, they may need the assistance of other intermediaries such as Ecotierra or CEDECO.

Although carbon credits are physically created on a coffee farm, this sector is unique in that much of the value creation takes place in sites off of the farm and by actors other than the credit owners. For example, a producer may own a plot of land where carbon sequestration is being quantified for credits. However, credits on their own have little to no market value; they need to be certified to a standard and by a third party auditor to hold any real value on the voluntary carbon market. Third party validators and verifiers located in the Global North add value when they certify a project, and carbon brokers or intermediaries, again located primarily in the Global North, communicate and potentially add to this value when they list projects on their database of available offsets. In addition, the current evidence shows that value is created largely through co-benefits associated with a carbon project. This means that value is created through the story telling of a particular project; in most cases this storytelling is done by a project developer with international networks rather than the project owners themselves. Essentially, it appears that without project developers, strong international networks, and access to communication technology, coffee producers would not be able to access the voluntary carbon market. Thus, the

amount of benefit that farmers actually receive from participating in carbon markets largely depends on an external network of actors and organizations: cooperatives, project developers, and carbon brokers. Not all smallholder coffee producers and owners of coffee farms will have full access to the voluntary carbon market. A subset of these producers with access to the technology and relationships necessary will fully be able to benefit from the market; those without the necessary tools and relationships will not.

In each of the carbon credit projects on coffee farms mentioned, the marketing strategy for these cases mentioned adaptation to climate change and resilience. While the explicit benefit of sequestering GHG emissions from the atmosphere is technically the product that is being created, it appears that coping with climate change is the more important narrative. Each case described how the capital from carbon credits would help smallholder farmers adapt to climate change. The mitigating effect of carbon credits is mentioned less frequently. In a competitive and uncertain market, projects must stand out in terms of the value per investment. As the discourse around climate change expands away from just mitigation, the topics of adaptation and resilience in particular seem to gather attention and potentially attract buyers. The role of project co-benefits, particularly climate resilience, in creating value in the voluntary carbon market is interesting, and merits further investigation.

In addition, these projects are all targeting buyers within a very competitive coffee industry. The idea is that as pressures for businesses to improve their

sustainability practices increase, coffee purchasers will be more inclined to purchase carbon offsets. When they do so, they will want to purchase carbon offsets from projects within their sector. As mentioned earlier, private companies are the largest buyers of carbon offsets. This represents a large opportunity for the coffee growers, as many already have long relationships with coffee buyers and others in the industry. The Norandino cooperative for example had success with this strategy and is able to sell carbon credits from reforestation to the same companies that it sells coffee to. In the aftermath of the Paris Climate Convention, it seems likely that the demand for carbon offsets will grow as countries develop strategies to meet their emissions reductions targets. Coffee cooperatives seem well positioned to take advantage of this. However, the ultimate success of coffee carbon projects depends on producers' ability to connect their carbon project to the most current discourse surrounding sustainability and desired co-benefits.

6. Conclusions

There is a significant potential for small-scale coffee producers in Latin America to participate in the emerging voluntary carbon market. In earlier sections I argued that agroforestry systems, including coffee farms, sequester and store carbon dioxide above a baseline. This means that in theory many coffee producers can quantify and sell on the voluntary carbon market any GHG sequestration or emissions reductions that they can prove are beyond what would occur in a "business as usual"

scenario. Several projects in Latin America are currently in the process of developing carbon credits in complement with coffee production; this may mean increasing the shade cover in existing coffee farms, converting degraded land to sustainably managed coffee farms, or converting conventional coffee farms to certified organic. In the cases where these projects have sold credits, they achieved prices far above average prices on the voluntary market. In addition, market trends show that general reforestation and afforestation projects receive higher prices than other project types. Strong prices reflect that there is a market, particularly of coffee producers looking to improve their supply chain, for this type of carbon project. The recent international focus on REDD+ projects, as well as the Paris Climate Convention, which included provisions for carbon markets, also implies that interest in and demand for different types of forestry offsets will continue.

However, there are significant challenges for smallholder coffee producers to truly access and derive benefit from the voluntary carbon market. Based on the group of experiences presented and analyzed here, it is clear that coffee producers cannot currently access the voluntary carbon market on their own. There are several factors that must be present in order for coffee producers to take advantage of the opportunity and truly *access* the voluntary carbon market according to Ribot & Peluso's definition of the word. Each of these elements, which must be in place for a successful project in the current market, influences how the project is developed and determines outcomes.

First of all, smallholder coffee producers must be part of a cooperative or federating organization and have access to larger international networks. This is necessary to overcome a few challenges, including the problem of scale. Currently, transaction costs are too high for small projects to be economically feasible on their own, and the voluntary carbon market lacks any provisions making projects more accessible for small-scale producers. In addition, cooperatives can provide smallholders with the international experience and relationships necessary to participate in the voluntary carbon market. Many smallholder coffee producers are well positioned in this respect due to their experience with Fairtrade and organic cooperatives. Both the coffee industry and the voluntary carbon market can be conceptualized as global production networks. Through the GPN framework, I argued that a large number of small-scale coffee producers already have experience participating in complicated GPNs, managing certification schemes, and maintaining relationships with buyers from their work with cooperatives and international coffee markets. As a GPN, the voluntary carbon market has many of the same participants and overlapping structures as coffee GPNs. The coffee industry already has much of the infrastructure and international networks that are seen in the voluntary carbon market. Thus, smallholder coffee producers who wish to participate in the carbon market may do so through pre-existing cooperatives. The need for cooperatives and international networks in order to access the carbon market is evidenced by the projects presented in this paper. In each case of carbon credit projects developed on coffee farms, producers were members of larger federating organizations with international

contacts. It was only through these organizations that producers were able to access the voluntary carbon market.

Second of all, coffee producers must be able to set a well-defined communication strategy and tell a compelling story regarding their carbon credit projects in order to be successful. Through the GPN framework, I argued that value creation in the voluntary carbon market is unique in that much of it occurs off-farm. In the carbon market GPN, value is created during third party verifying of projects and when projects are described to buyers and financers. As there is no regulation of the voluntary carbon market, there is a certain level of subjectivity as to what is considered a "good" project. I argued that the ultimate value of a project is more related to co-benefits than to carbon sequestration. This can be seen by the fact that all of the examples reviewed emphasized the sustainable development and climate resilience benefits that their projects produced. This was a key part of each marketing and communications strategy. In a competitive market, carbon offset projects need to differentiate themselves to attract investors. The existing coffee carbon projects are doing this, and they have the advantage of being the firsts to enter the sector. Future coffee carbon projects will need to set their own unique communication and differentiation strategy.

In order to successfully tell their story, smallholder coffee producers must have access to communication technology. In addition, they need to spend time and resources in marketing their project. Coffee producers or project developers need to

highlight co-benefits, describe how their credits contribute to climate change resilience, and make the connection between carbon coffee credits and a particular buyer's business model. In order achieve all of this it is necessary to be well connected to the Internet and to be able to communicate with an international network. While it may seem commonplace, this could be challenging for coffee producers in remote areas and without reliable computers or Internet access. In most of the examples presented, external project developers instead of the coffee producers themselves are doing most of the marketing and communicating. The need to not only follow a methodology but also actively promote and advertise carbon credits is an obstacle to benefitting from the carbon market for many small-scale producers without the time, skill, and technology to devote to this.

Overall the voluntary carbon market is a growing opportunity for small-scale coffee producers, but many challenges need to be overcome before producers can take advantage of this opportunity on a large scale. There are a handful of projects that are paving the way for small-scale coffee farmers to become engaged on a larger scale. The shape and future of the voluntary carbon market opportunities for coffee producers will depend greatly on the outcome of these projects, future research, and policy decisions made in coming years. In any case, this is a sector that is quickly evolving and an attractive opportunity for those with the means and resources to take advantage of it.

6.1 Future Work

As this is a rapidly evolving sector, there are significant gaps in the literature understanding of what participating in carbon markets could mean for coffee producers. For example, there is a need for further work in developing small-scale carbon credit methodologies and ways to issue credits at a lower cost. This will help address many of the financial barriers that smallholders face in developing carbon credit projects. I argued that the voluntary carbon market is an ideal place to experiment with more flexible project development schemes.

There are also more opportunities to explore value creation and marketing strategies for carbon credit projects. What co-benefits are the most valuable, and how can they best be communicated? All of the projects reviewed mentioned climate change resilience and adaptation as key benefits and selling points. It appears that much of the international climate change attention is now focusing on adaptation and resilience rather than mitigation. This is an interesting trend that merits further investigation. In addition, it is worth exploring how corporations decide to purchase offsets, and whether or not there are strategies to better align carbon projects with specific industry or company goals. I illustrated how the Ecotierra project is attempting to do this by marketing its credits to coffee purchasers, and it will be interesting to see how this plays out.

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