

MEASURING THE SOCIAL IMPACTS OF CARBON OFFSETTING: FOREST-  
BASED CARBON CAPTURE AND IMPROVED BIOMASS COOK STOVES IN  
CENTRAL AMERICA

by

EVAN NATHANIEL SHENKIN

A THESIS

Presented to the Department of International Studies  
and the Graduate School of the University of Oregon  
in partial fulfillment of the requirements  
for the degree of  
Master of Arts

December 2009

“Measuring the Social Impacts of Carbon Offsetting; Forest-Based Carbon Capture and Improved Biomass Cook Stoves in Central America,” a thesis prepared by Evan Shenkin in partial fulfillment of the requirement for the Master of Arts degree in the Department of International Studies. This thesis has been approved and accepted by:

---

Dr. Galen Martin, Chair of the Examining Committee

12-01-09

---

Date

Committee in Charge: Dr. Galen Martin, Chair  
Dr. Derrick L. Hindery  
Dr. Kathie Carpenter

Accepted by:

---

Dean of the Graduate School

An Abstract of the Thesis of

Evan Nathaniel Shenkin for the degree of Master of Arts  
in the Department of International Studies to be taken December 2009

Title: MEASURING THE SOCIAL IMPACTS OF CARBON OFFSETTING: FOREST-  
BASED CARBON CAPTURE AND IMPROVED BIOMASS COOK STOVES  
IN CENTRAL AMERICA

Approved: \_\_\_\_\_  
Dr. Galen Martin

International carbon offset projects are framed as a cost effective, market based approach to address global warming through the cap-and-trade model of greenhouse gas emissions trading. Emission reduction projects in the Global South attempt to mitigate or “offset” pollution in the Global North by taking advantage of economic poverty in the developing world. This thesis investigates two development projects in Central America to explore the social impacts of carbon offsetting on communities. The research findings suggest that corporate support for emissions trading disproportionately benefits business interests while remaining largely unaccountable for project outcomes. This thesis argues that cap-and-trade in general and the US voluntary emissions trading market in particular are fundamentally flawed systems incapable of effectively addressing climate change and suggests sustainable alternatives to carbon offsetting.

CURRICULUM VITAE

NAME OF AUTHOR: Evan N. Shenkin

PLACE OF BIRTH: Eugene, Oregon

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

University of Oregon, Eugene  
Lane Community College, Eugene

DEGREES AWARDED:

Master of Arts, International Studies, 2009, University of Oregon  
Graduate Certificate in Nonprofit Management, 2009, University of Oregon  
Bachelor of Arts in Anthropology, 2007, University of Oregon

AREAS OF SPECIAL INTEREST:

International Development  
Latin America  
Climate Change Policy  
Political Economy

PROFESSIONAL EXPERIENCE:

Graduate Teaching Fellow, Department of International Studies, University of  
Oregon, Eugene, 2007-2009  
Internship, Aprovecho Research Center, Cottage Grove, Oregon, 2008

GRANTS, AWARDS AND HONORS:

University of Oregon: Thurber Award for travel expenses, November 2008  
Thurber Award for overseas research, May 2009

## ACKNOWLEDGMENTS

Thanks to my thesis committee for their guidance and encouragement during my graduate studies. Much appreciation goes to Professor Derrick Hindery for inspiring me to ask questions that need to be answered. An equal amount of gratitude goes to Professor Galen Martin, a Renaissance man who thinks globally and acts locally. I would like to express appreciation to the Department of International Studies for financial assistance in making my ideas become reality while staying in the black. I tip my hat to the International Studies graduate students who have listened to me in the graduate lounge and still made it to class on time. Much appreciation to Dan Gorman and Jeannette Longo, office staff with extraordinary dedication and a great sense of humor. Super special thanks go to my family, friends, and Heather.

## TABLE OF CONTENTS

| Chapter   | Page |
|---|------|
| I. INTRODUCTION .....   | 1    |
| Voluntary Carbon Offsetting .....   | 4    |
| Case Study 1: Wood Stove Project Overview.....                                | 9    |
| Case Study 2: Afforestation Project Overview .....                            | 13   |
| Research Design and Parameters .....  | 15   |
| The Cap and Trade Debate .....  | 20   |
| Offsetting Responsibility: Climate Change Policy Maintains Business as Usual  | 23   |
| We Could Have Saved the World but We Were Too Cheap.....                      | 26   |
| Methods .....   | 34   |
| II. THE POLITICAL ECOLOGY OF CARBON OFFSETS.....                              | 36   |
| Theoretical Approach .....  | 38   |
| Discourses on Development.....  | 41   |
| III. PRIVATIZING THE COMMONS .....  | 46   |
| The Tragedy of the Commons .....  | 51   |
| The Accumulation of Land .....  | 56   |
| Privatization of the Atmosphere .....   | 58   |
| Study Limitations .....   | 59   |
| IV. TREE FARMS AND SUSTAINABLE DEVELOPMENT .....                              | 61   |
| Monoculture Tree Farms .....  | 62   |
| Case Study 1: Forest Based Carbon Capture .....                               | 66   |
| A Different Approach to Forestry .....  | 69   |
| Privatizing Profits and Socializing Losses: A Guide to Corporate Funding..... | 71   |
| The Commodification of Nature: Environmental Services for Sale .....          | 73   |
| Case Study 1: Conclusion .....  | 76   |
| V. CASE STUDY II. IMPROVED HOME COOK STOVES .....                             | 78   |
| Introduction .....  | 78   |
| History of the Organization .....   | 79   |
| The Contract: Small NGOs and Big Business .....                               | 82   |
| Additionality Explained .....   | 87   |
| Case Study 2: Conclusion .....  | 89   |

| Chapter  | Page |
|--|------|
| VI. EXPLANATION OF FINDINGS AND SIGNIFICANCE ..... | 92   |
| Recommendations .....                              | 94   |
| Conclusion .....                                   | 95   |
| APPENDICES   |      |
| A. WATER BOILING TEST FOR TRADITIONAL STOVE .....  | 106  |
| B. WATER BOILING TEST FOR PROTOTYPE STOVE.....     | 107  |
| C. GLOSSARY OF TERMS .....                         | 108  |
| REFERENCES.....                                    | 110  |

LIST OF TABLES

| Table                                    | Page |
|--|------|
| 1. Carbon Offset Market.....             | 32   |
| 2. Stakeholder Credibility Ratings ..... | 33   |



## CHAPTER I

### INTRODUCTION

The notion of sustainable development has become central to global warming policy debates. Despite heated international dialogue, there have been only modest changes to curb greenhouse gas emissions on a global scale. This study explores a controversial climate change mitigation model known as “cap and trade” by a first hand investigation of two offset development projects in Central America. The paper calls for greater transparency into emissions trading policies in an effort to show how carbon offsetting has real world impacts on communities in the Global South.

This story examines a particular type of development work in Central America that involve financial contributions from carbon offset providers. Financial contributions from providers are exchanged for “emissions permits” generated by projects when greenhouse gases are reduced or sequestered. These permits or “credits” allow the emission of greenhouse gases (GHG). Each credit is equal to one ton of carbon dioxide or GHG equivalent. This system of emissions trading formally began with the Kyoto Protocol of 1997. However, the emissions trading model has roots as far back as 1990<sup>1</sup>.

The main characters involved in emissions offsetting include governmental organization, the United Nations (UN), multinational corporations, economists,

---

<sup>1</sup> A more thorough history of the Kyoto Protocol and additional explanation may be obtained from: [http://unfccc.int/kyoto\\_protocol/items/2830.php](http://unfccc.int/kyoto_protocol/items/2830.php).

development experts, grass roots organizations, communities and political figures including Al Gore. The objective of the thesis is not to offer a new and striking look at climate change mitigation policies, or to provide a new model of reform, but rather to explore how carbon credits impact people in the Global South while at the same time influencing development narratives in the Global North. Two development projects are analyzed. Both projects take place in Central America. The names and locations of organizations have been changed out of consideration for each group's anonymity. The overarching hope is that the paper will contribute to greater transparency and foster sustainable development solutions that work.

The notion of “sustainability” is a highly contested concept. This thesis will use one of the most commonly used definitions of “sustainable development” drawn from the World Commission on Environment and Development (WCEP). According to WCEP, the term “sustainable development” is defined as “development that meets the needs of the present while not compromising the ability of future generations to meet their own needs” (WCED, 1987;43).

The research topic began as an internship with an organization involved in the voluntary carbon trading market. My fascination with this unique market-based scheme continued despite multiple explanations from those involved in brokering transactions. Questions evolved regarding the nature of pollution regulation and how best to address global warming. An interest in the welfare of people—particularly those in marginalized locations—was of central concern. Questions arose regarding the ways in which international carbon offset development projects financed by carbon offsets affected local

communities in the Global South. To answer these and other questions first hand observation was imperative.

Qualitative research methods are used to better understand development practitioners and their projects designed to curb greenhouse gas emissions. Qualitative methods include participant observation as well as structured and unstructured interviews. Interviews with key participants were focused on illustrating how climate change policies created in North America are affecting those living in the Global South. The paper situates present cap and trade legislation into a historically framed development discourse. To this effect, the overarching goal is to describe some of the concrete effects of carbon dioxide emissions trading while at the same time suggest connections to ongoing social and political trends. Before delving into the details of each case study, a brief description of global warming policy will provide context for the research findings.

The fieldwork drew into question the legitimacy of cap in trade in general, and the voluntary carbon market in particular. The answers to the study's original questions became more complex during research on two types of carbon-offset projects in Latin America. Both related to carbon capture and sequestration under the US voluntary market. My findings suggest that significant modifications to the present emissions trading system are needed to foster greater social and environmental benefits. Through interviews and observation, the paper considers the carbon market's diverse impacts on the social, environmental, and economic conditions of local populations in the Global South.

## Voluntary Carbon Offsetting

The US releases approximately 21% of global greenhouse gas emissions (Bayon, Hawn, & Hamilton, 2009). A cost effective model of reducing greenhouse gases was devised to address global warming. The model is known as the voluntary market<sup>2</sup> and is the primary mechanism in the US' greenhouse gas (GHG) emissions trading scheme. The system, originally modeled on an arguably successful acid rain mitigation program in the US, uses market forces to create incentives for the reduction of sulfur dioxide emissions (Kruger, 2007).

The present voluntary market uses a 'cap and trade' formula to reduce emissions via trading GHG allowances or "credits." The Chicago Climate Exchange (CCX) "operates (as) North America's only cap and trade system for all six greenhouse gases with global affiliates and projects worldwide" (2009). Created in 2003, the Chicago Exchange represents 55% of voluntary trading: with the remaining 44% of carbon offset purchases occurring over the counter to individuals (Stockholm Environmental Institute, 2009). For a variety of reasons, many interests in the US favor using the voluntary carbon offset market to address climate change. Many of the present supporters of the US' voluntary emissions trading model are in fact businesses that may be negatively impacted the most from more rigorous systems of environmental regulation. Those organizations that promote voluntary carbon offsetting include American Electric Power (AEP), one of

---

<sup>2</sup> The term "Voluntary Market" refers to "the non-regulated market for carbon credits, especially Verified Emissions Reductions (VERs) that operates independently from Kyoto and the EU ETS. Also called the Non-Regulated Market" (Kollmuss, A., Zinc, H., & Polycarp, C., 2008;105).

the largest power generators in the nation, and Pacificorp, a large electricity producer headquartered in Portland, Oregon (Greenpeace, 2009).

The popularity of the CCX—and the voluntary market in general—is in the system’s unique approach towards emission reductions which occur without obstructing the economic growth of the market (EPA, 2009). In essence, cap and trade is a capitalist means of purportedly addressing global warming in the most cost effective manner, thus avoiding disruption of development and business interests. Since the voluntary market’s inception, some politicians and US business interests continue to promote the scheme, despite some criticism from the United Nations, the Global South, and environmentalists. On the international stage, different sets of rules and regulations apply to the release of greenhouse gases.

The United Nations created a separate cap and trade model for greenhouse gases that the US has yet to ratify. This almost universally recognized scheme of addressing global warming is known as the Kyoto Protocol. The Protocol sets “binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions amount(ing) to an average of five per cent against 1990 levels over the five-year period 2008-2012” (UNFCCC, 2009;1). Since the US has failed to fully participate in international climate change agreements, the voluntary market functions as a parallel commodities market that lies outside the parameters of the United Nations Framework Convention on Climate Change (UNFCCC), yet purports to provide similar environmental services.

The international development work examined in this paper relates specifically to the US' voluntary cap and trade model. Projects falling within the voluntary market create 'carbon credits' largely through development work in the Global South. Since inception, the entire market has grown rapidly with "trading on the voluntary Chicago Climate Futures Exchange more than doubling in contract volume since the first half of 2008. Trading volumes are also rising quickly on Climate Exchange's London platform" (Kirkland, 2009).

The voluntary market functions by allowing the creation of a series of tradable emissions permits which allow industries and individuals to continue to release harmful emissions if development projects are created to "offset" or otherwise neutralize total global greenhouse gas emissions. The size of the voluntary market is largely unknown because many transactions take place over the counter and go unreported. Nevertheless, the voluntary market has grown by about 200% between 2005 and 2006 with over 150 voluntary carbon offset retailers globally (Lovell, Bulkeley, & Liverman, 2009 in press). Experts believe the size of the voluntary market represented US \$397 million dollars in total emission sales in 2008 (Capoor and Ambrosi, 2009).

Other estimates of the size of the voluntary market place the number as high as US \$700 million dollars in 2008 (Bayon, Hawn, & Hamilton, 2007). By comparison, the UNFCCC regulated market is far larger and has increased "for a total volume of more than one billion (Certified Emission Reductions) CERs transacted for a value of US \$26.3 billion" in 2008 (Capoor and Ambrosi, 2009;37). In both voluntary and compliance markets emission permits are predominantly purchased by developed nations in the

Global North while projects occur largely in the Global South.

Offset projects may take the form of solar, wind, improved wood stoves, afforestation, reforestation, or a host of other sustainable mechanisms for reducing emissions deemed as ‘legitimate’ sources of carbon financing under the Chicago Climate Exchange (CCX). The exchange mimics the UN’s compliance market however does not have the same binding restrictions. The voluntary market may serve to assist, or detract from, real world efforts to address climate change since global policies, particularly those relating to energy, do not take place within a vacuum. On a macro scale, issues of sustainability and the right to pollute the ‘atmospheric commons’ are situated within overarching historical power relationships between the Global North and South.

Western industrialized nations produce the largest share of greenhouse gas emissions. Similarly, political representatives from Northern countries have been disproportionately responsible for creating global development policies aimed at reducing greenhouse gases. If the atmosphere is a common resource shared by all than there is a question of shared responsibility within climate change policy. In other words, there is a need to include a diverse and proportional set of voices from developing nations and from those who hold alternative notions of the meaning of the term sustainable development.

Disparities between rich and poor nations remain the principle factor that allows voluntary offset projects to remain profitable within a globalized, market-based economy. The myriad differences between the two hemispheres provide benefits to carbon offset developers interested in cheaper labor, lax environmental restrictions, regulatory requirements, and technological differences (WWF, 2008). These key differences

outlined by the WWF play prominently into the functionality and profitability of the voluntary cap and trade market as a cost effective means of reducing total global emissions.

The paper explores North-South power dynamics through the lens of NGOs involved in carbon financed development projects. The impetus for this work is to create greater transparency within the voluntary market and shift the discourse of global warming policy from an obscure framework to a more readily understandable development model. Carbon offsetting is portrayed as a means of cutting the cost of emission reductions while “preserv(ing) jobs and US competitiveness” (Climate Care, 2009). However, what is not often available—to consumers and policy makers—is first hand descriptions of emission reduction projects. On the ground investigations of these projects simplify the theoretical nature of carbon offsetting and may illuminate challenges to the system not otherwise available to outside observers.

The paper makes several assertions about the voluntary market. First, the US cap and trade system must become more transparent and equitable for all actors before the American public should consider the model as a legitimate means of protecting the earth’s atmosphere. Additionally, outside researchers and not only climate change experts should be able to qualitatively and quantitatively evaluate emissions trading projects in the developing world to ensure transparency. Proof of the voluntary market’s authenticity and benefits should be evaluated on a social as well as environmental level by engaging local communities in which offset projects occur. Finally, the overarching goal of the voluntary market is to prevent harmful climate change that threatens the continuation of



many life forms on the planet. Therefore, the voluntary market must be evaluated in relation to the more international model of the Kyoto Protocol set to expire in 2012.

The next series of United Nations Climate Change Conference talks will be held in Copenhagen, Denmark beginning on December 7, 2009. The conference promises to be a defining moment in climate change policy history particularly for the United States which until recently had rejected the Kyoto Protocol under the Bush Administration. However, the Obama Administration has since rejoined UN's climate change talks, generating high hopes among some United Nations delegates (UNFCCC, 2009). The US government's role may soon shift dramatically with massive impacts on the voluntary market in the coming months.

### **Case Study 1: Wood Stove Project Overview**

The first development project case study takes place in Central America. The development organization is a locally owned NGO involved in voluntary carbon offsetting via improved efficiency wood burning home cook stoves. Appropriate technology improved stoves reduce greenhouse gases while decreasing fuel use and carbon dioxide emissions by increasing combustion efficiency (Smith, 1999). The project under review quantifies emission savings, translates these savings into carbon credits, and then sells the credits as a commodity on the Chicago Climate Exchange. In addition to emissions savings, stoves have the added benefit of improving indoor air quality, reducing infant mortality, and adult morbidity (Baldwin, 1987). Improved stoves improve

human health and reduce environmental impacts by reducing fuel use (Moberg, 2004; Haines & Kammen, 2000; Biran & Hunt, 2003; Baldwin, 1987; Smith, 1999).

The voluntary carbon market has often leveraged support for improved stove projects by employing the use of narratives that illustrate how stoves improve the lives of those in the Global South. These “narratives” commodify improved stoves and other offset projects with social significance as well as environmental benefits. Carbon dealers may promote a carbon offset project by making use of an uplifting storyline involving reducing emissions while improving quality of life for those in developing nations.

Businesses and individuals who choose to purchase carbon credits may in turn promote their enterprises as socially and environmentally conscious. This allows the use of positive project narratives to travel from one entity to the next, far from the location of the original project. Processes of production, distribution, and consumption sanitize and compartmentalize carbon commodities by maintaining a separation between the methods and means of production from consumer markets. There is therefore a need for greater transparency into the production of carbon offsets as a commodity. Development narratives used in marketing this new product must be unpackaged to determine validity.

Carbon offset brokers use narratives of social and environmental change as essential components “to reassure consumers about what it is they are buying, given the absence of both a tangible product and regulatory standards (Lovell et al., 2009;2 in press). Additionally, the use of these stories reifies carbon credits in an attempt to “negotiate (an) interface between consumers and the ‘social life’ of the commodity, allowing emissions offsets to take on meaning and value (Bryant and Goodman, 2004;

348). In essence, carbon offset commodities are constructed “solutions” based on a market based approach to addressing dangerous climate change (Liverman, 2009). At the root of carbon trading and the constructed notion of carbon offsets lies a specific situated knowledge system based on capitalism and privatization.

The commodification of carbon credits directly relates to what Karl Marx termed “commodity fetishism” and the way in which objects take on new meanings through social interactions and exchange. Marx describes the fetishism of commodities as “products of the labor of private individuals or groups of individuals who carry on their work independently of each other” (Marx, 1990;162). In essence, products take on new meanings through the separation of production and consumption processes. Individual consumers fetishize carbon credits as symbols of environmental protection, humanitarian acts, or markers of progressive social status. Marx’s commodity fetishism is predicated on the notion that product consumers and producers remain separated from one another.

This departmentalization of labor allows work in one area to remain both magical and obscure to those outside. However, when we lift the veil of obscurity from voluntary carbon credits a landscape appears which closely resembles the top down development paradigm of the past 50 years, with a green border. The paper examines two projects at their source to ensure that commodity fetishism does not obscure the realities of carbon financed development. At present, third party verification is an essential component of many offset projects though there has yet to be a universal standard of measuring environmental impact.

The first case study examines several foundational notions within carbon

emissions offsetting to determine if the particular development offset project under review would have occurred without carbon financing. There are often unseen complications that influence both the auditing and financing process. The stove project was reviewed three years after receiving funding from a carbon financier. Individual stove units had been subsidized and sold to consumers at a diminished cost. The carbon subsidization reduced the original stove price by approximately US \$6 dollars or approximately 5% of the total value of the stove<sup>3</sup>.

The contract between the broker and development agency suddenly ended two years before the project' agreed upon completion date. The carbon broker's reasons for severing the contract are unknown. However, a possible cause for the contractual termination could be due to the nature of the voluntary offset market. In recent years carbon offset companies have moved away from sponsoring certain types of high-risk projects including improved wood stoves. In the words of one offset organization manager, "community-based fuel stove projects are more rounded and embedded in culture and trying to explain that to people (customers)...is challenging...people want to know where their money is going" (Lovell, Bulkeley, & Liverman 2009;19 in press). In response to consumer demand, carbon brokers have decided to focus on projects that are easier to sell to potential customers. The factors described above may have influenced the offset company's decision to withdraw support.

Irrespective of the underlying reasons for the stove project's loss of financial backing, the carbon credits generated in the initial phases of the project were sold on the

---

<sup>3</sup> The total value of improved stoves varied slightly based on model. However, the most commonly produced model retailed for approximately US \$130 dollars.

Chicago Climate Exchange and over-the-counter to individual consumers. This project will be addressed in detail in subsequent chapters to illustrate fundamental challenges to the voluntary market, that of accountability.

Carbon offsets are intangible commodities often produced overseas yet sold in the US. Buyers are usually unaware of contractual violations due to the sanitized and compartmentalized nature of the carbon market. The scenario is a theoretically logical environmental approach to addressing climate change with a number of flaws that will be addressed in later chapters. Apart from the fundamental flaws inherent to cap and trade policies, international forestry and stove projects may initially benefit from carbon finance and have beneficial social and environmental impacts.

Development organizations operating projects are exposed to legal and PR backlash if outcomes do not meet theoretical carbon offset expectations<sup>4</sup>. Additionally, development organizations may suffer the consequences of a disillusioned public wary of fraud if project legitimacy is suspect due to substandard carbon accounting practices. This case study illustrates certain vulnerabilities within the current voluntary carbon trading system and presents several possible ways project risks may be reduced.

### **Case Study 2: Afforestation Project Overview**

The second case study documents an afforestation project that plants only native tree species on degraded land in efforts to sequester carbon dioxide. Native dry rainforest

---

<sup>4</sup> Development organizations become burdened by significant legal and ethical responsibilities. The power disparity between carbon brokers from the developed world and NGO from the developing world foster an unequal situation that will be addressed in later chapters of this work.

is protected along the Costa Rican border of Nicaragua while carbon offsets are produced after an annual survey. The small organization focuses on community building by calling on local and non-local experts. The organization also fosters working relationships with landowners and adjacent communities. The development work termed “afforestation” employs the “biological services” of trees to function as “carbon sinks” absorbing greenhouse gases via carbon sequestration<sup>5</sup>. Since carbon dioxide absorption occurs over the lifetime of a tree the project assists carbon financiers in the present to foster long-term sustainability. An analysis of a different type of afforestation work is provided besides examining the previously described project.

The second project sponsored by the World Bank documents carbon offset afforestation via industrial forest monocultures. Both afforestation projects are considered. Questions of local access to resources, the dangers of fortress-style conservation and the political economy of place are also addressed within the context of both case studies. The paper seeks to identify environmentally sustainable forestry practices that consider the equitable distribution of resources. The voluntary carbon trading market is situated within a discussion of local community access to land.

The overarching goal of the paper is to encourage policies that benefit the “atmospheric commons” while ensuring equitable distribution of environmental and economic resources for those living in the Global South. Essentially, the premise of cap and trade reifies the earth’s atmosphere as a commodity with market value. Largely overlooked by the market driven approach to climate change are power disparities

---

<sup>5</sup> Sequestration refers to the capturing of carbon dioxide in a way that does not allow the greenhouse gas from being released into the atmosphere for a specified period of time (Capoor and Ambrosi, 2009).

inherent to Global North-South relations. The paper uses first-hand real-world examples to illustrate how the present system of emissions trading is a fundamentally flawed system requiring replacement by more equitable environmental models.

### **Research Design and Parameters**

This thesis will not address UN-sponsored international global warming initiatives under the regulated emissions trading market and the Kyoto Protocol's Clean Development Mechanisms (CDM). The study focuses on the US voluntary market based on primary data collected from two offset projects located in Central America. Global emissions trading mechanisms are divided into regulated and voluntary markets with unique features. The regulated emissions marketplace occurs under the supervision and control of the United Nations Framework Convention on Climate Change (UNFCCC, 2009). Many businesses and individuals in the USA use the voluntary carbon market due to the US government's reluctance to ratify the UN-sponsored Kyoto Protocol and more recent global climate change mitigation strategies. The United Kingdom and Australia have similar national models though both approaches fit under the umbrella of the Kyoto Protocol's compliance market (UNFCCC, 2009).

There were several reasons that contribute to the project's limited scope. The sheer scale and complexity of emissions regulations surrounding global warming mitigation policies prohibits a thorough analysis. Further, there are limits to the types of information accessible through literary review. It was necessary to conduct first hand

investigation due to the nature of the research question or risk a project that is a mile wide and an inch deep.

The thesis addresses an important gap in research on carbon offsets. Scholarly articles often discuss the negative and positive attributes of carbon credits from a purely theoretical framework. Literature available online and through print may afford an in depth understanding of the rules and regulations of markets and the climate science to prove or disprove the legitimacy of emissions trading. However, there is need for first hand accounts of carbon offset projects based on field research to substantiate existing literature on the subject.

Additionally, the specific relationship between improved cook stoves and voluntary carbon finance has not received significant scholarly attention. This may be due to the challenge of accurately calculating improved stove project carbon savings because variability exists in monitoring and household use patterns (Bumpus and Liverman, 2008;135). Research examined the challenges and opportunities of offset projects within the voluntary market via a number of methods including methane capture, dam construction, and tree planting (Kollmuss, Zink, & Polycarp, 2008; David Suzuki Foundation, 2008; Bayon, Hawn, & Hamilton, 2009).

Improved stoves have received significant scholarly attention as mechanisms in reducing fuel consumption, particulate matter and as a means of mitigating some of the impacts of indoor air pollution on human health (Baldwin, 1987; Smith, 1999; Biran & Hunt, 2003; Barnes, Openshaw, Smith & van der Plas, 1994). Nevertheless, there has



been little scholarly literature on the role of cook stoves in the voluntary cap and trade market.

There are several reasons why improved stove projects may come to occupy a larger role in mitigating greenhouse gases under a cap and trade framework. Even with the significant hurdles to large-scale project adoption, improved stoves may be on the verge of increased notoriety due to a variety of factors. A front-page article in the New York Times on April 15, 2009 asserted that soot or “black carbon” produced from the combustion of wood and biomass may be responsible for approximately 18% of total greenhouse gases released. This claim—that about one fifth of climate change is due to smoke—was made by Dr. Veerabhadan Ramanathan one of the world’s most prominent climate scientists (Rosenthal, 2009). This statistic would mean that black carbon’s impact would rank second only to carbon dioxide (CO<sub>2</sub>) as a leading cause of global warming. CO<sub>2</sub> accounts for approximate 40% of climate change and is the leading cause of global warming.

Improved cook stoves are effective mechanisms in reducing black carbon. However, increased efficiency cook stoves were not considered “Clean Development Mechanisms” (CDM) under the Kyoto Protocol until recently. Development projects that use stoves have therefore been ineligible to receive funding under the UNFCCC’s compliance market. There are several potential reasons that biomass home cook stoves have not been used in the compliance market. These reasons include: project complexity, high levels of risk in conjunction with the significant cost of meeting CDM requirements, and the relatively small scale of stove projects (Household Energy Network, 2007).

Another reason for stove project marginalization within the regulated market is that emissions testing protocols have yet to become institutionally standardized. However, institutional “irregularities” are being addressed, and stove projects are nevertheless currently being utilized by the voluntary market (Harris, 2007). As increasing numbers of countries take steps to address climate change, improved cook stoves may become accepted in the compliance marketplace.

Discussions surrounding climate change policies have become central to the public’s awareness and interests (Ott, 2001). However, agreement has not yet been reached on how best to address the potentially catastrophic challenges of global climate change. The US government’s staunch decision not to ratify the Kyoto Protocol of 1997, calling for reductions in greenhouse gases by 7 percent of 1990 levels in the US, has placed our nation in a unique position. President George W. Bush asserted that the US government “would not continue participating in negotiations on the Kyoto Protocol, and would develop an alternative approach” (Fletcher, 2004;5). The alternative system of addressing climate change became known as the voluntary market. This model functions primarily in the US by funding offset projects in the developing world.

The Bush Administration asserted several arguments against US involvement in international climate change talks. The Kyoto Protocol placed unfair restrictions on US industrial greenhouse gas emissions. The United States would ratify the Protocol only when other powerful industrial nations, including Brazil, China, Russia, and India, were also similarly beholden to mandatory caps on greenhouse gas emissions. The negative economic impact of being legally bound to emissions reductions was too great an

economic burden for the US to bear. In an official press release, President Bush justified the decision not to ratify the Protocol arguing that,

This (climate change) is a challenge that requires a 100 percent effort; ours, and the rest of the world's. The world's second-largest emitter of greenhouse gases is China. Yet, China was entirely exempted from the requirements of the Kyoto Protocol. India and Germany are among the top emitters. Yet, India was also exempt from Kyoto. These and other developing countries that are experiencing rapid growth face challenges in reducing their emissions without harming their economies. We want to work cooperatively with these countries in their efforts to reduce greenhouse emissions and maintain economic growth (White House Press Release, 2001).

This paper primarily addresses the voluntary market created in the wake of the US decision not to participate in the ratification of the Kyoto Protocol. Before delving into detail in the case studies, it is necessary to first understand how global warming became a central issue with far reaching environmental, political, and economic ramifications. To contextualize this qualitative study of the social impacts of climate change mitigation projects the paper investigates how the voluntary cap and trade model works on the ground.

Proponents of the voluntary cap and trade system argue that the planting of trees, among other offsets is a legitimate means of absorbing CO<sub>2</sub> from the atmosphere. Carbon dioxide emissions are calculated by third party verifiers and are intended to ensure accuracy and legitimacy. These outside auditors are intended to provide transparency to projects by proving among other things that projects would not have occurred had offset financing not been present.

Another role of auditors is to ensure that credits will not be sold to multiple buyers. Larry Lohmann of the research and solidarity organization The Corner House

raises a key criticism of third party verifiers. Lohmann states that verifiers “have little incentive to question the effectiveness of the carbon projects they work on, since to do so would be to jeopardize their chances of getting future work. It could also jeopardize their relationships with their other clients (corporations)” (2006;61). There are also challenges that must be addressed on a theoretical level.

### **The Cap and Trade Debate**

Literature on carbon offsetting often oversimplifies the topic by either promoting or refuting the cap and trade model. Critiques from opponents of the voluntary market often frame cap and trade as a ‘band-aid’ solution that fails to address current resource use patterns. According to the David Suzuki Foundation, tree planting projects are problematic for a number of reasons including; lack of permanence, methodological uncertainties surrounding quantifying carbon sequestration in trees, lack of additionality<sup>6</sup>, and the lack of fundamental change to present systems of resource use.

Other challenges to carbon-based forestry offsets include uncertainty surrounding the quantity of carbon dioxide sequestered and inability to argue for trees as permanent offsets due to unexpected fire, disease, logging, or lack of sufficient land to plant enough trees to mitigate impacts. Further, some scientific evidence points to forests as sources of carbon emissions due to the impact of global warming on tree mortality and morbidity (Suzuki, 2009).

---

<sup>6</sup> The term “additionality” is central to the debate over cap and trade. The term is defined according to the Kyoto Protocol, as emission reductions generated by Clean Development Mechanism and Joint Implementation project activities that must be ‘additional’ to those that otherwise would occur. Additionality is established when there is a positive difference between the emissions that occur in the baseline scenario, and the emissions that occur in the proposed project (Capoor and Ambrosi, 2009).

The notion of ‘additionality’ has also been a point of contention for critics who believe it difficult or impossible to prove (Greenpeace, 2009; Lohmann, 2006). To show additionality, the developer must prove that the project would not have occurred had it not been for the financial contributions for carbon offsets. The question used to determine additionality is: would this development project have happened anyway? If the project would not have occurred, then the project is additional (Carbon Finance, 2009). The question of additionality remains challenging for a variety of reasons. Many afforested lands should have been replanted after they were originally cut, but were not (Lohmann, 2006).

There is great difficulty in determining the likelihood that a development project would, or would not, have occurred in the future had there not been financial contributions from carbon offset companies. To establish ‘additionality,’ a hypothetical scenario must be developed with the specific goal of convincing the reader that offset money is essential for project inception. The underlying objectives of carbon offset additionality reports are to demonstrate the need for carbon-financed development (Lohmann, 2006). There may be conflicts of interest because there is an unspoken monetary incentive for companies to create scenarios that earn more money. Further, the Kyoto Protocol has a specific means of calculating additionality. However, the voluntary market has a variety of metrics with varying degrees of standardization. Besides issues of additionality, other factors are often not considered within the voluntary market.

Large-scale forestry monocrops, planted and maintained with fossil fuel inputs, have been tied to biodiversity loss. Importantly, these projects do not fundamentally alter

current modes of economic production responsible for climate change, but rather shift development narratives to function within a carbon emissions trading system. At the time of writing, the World Bank was funding an afforestation project in a region close to the site of the second case study: 600 hectares of teak plantations were planted on degraded land, formerly cattle pastures. The Bank provides funding to Precious Woods Holdings Ltd., a Swiss-based multinational corporation. Armando E. Guzman, a World Bank environmental specialist overseeing the project asserted that “this project is helping to make communities the beneficiaries of the carbon finance market...it is an important pilot program for the Bank, for Nicaragua and for the region” (World Bank, 2008). This project’s effects on local Nicaraguan communities has yet to be determined. Regional employment opportunities—an initial benefit of the project—may be weighed against the long term negative impacts of large-scale monocrops on water resources, worker exposure to dangerous pesticides, and reduced biodiversity.

In essence, the project’s long term effects may have adverse consequences for local communities irrespective of the World Bank’s rhetoric focusing on employment and economic production. Voluntary carbon credits often provide afforestation projects with revenue irrespective of environmental and social impacts. In other words, great variability exists in forestry based carbon capture projects. The Gold Standard (GS) voluntary trading scheme purports to have a ‘triple bottom line’ of social, economic and environmental benefits. However, the Gold Standard is only one of myriad voluntary markets (Gold Standard, 2009). Irrespective of a lack of transparency, the voluntary market continues to encourage existing wealth disparities by offering new forms of

financial and ecological compensation to multinational corporations. Socially and environmentally popular narratives purporting to address climate change may simply greenwash conventional top-down development practices.

### **Offsetting Responsibility: Climate Change Policy Maintains Business as Usual**

Many critics of cap and trade argue that both voluntary and regulated systems of cap and trade are fundamentally flawed. Some criticism centers on the cap and trade model slowing the inevitable shift in resources use patterns towards clean energy technologies. Carbon offsetting allows industries—and conscientious consumers—to continue polluting legally and guilt free (Smith, 2007). This critique would argue that emissions trading schemes simply maintain business as usual at the expense of the environment.

Other concerns challenge carbon emission metrics, verification of “additionally” or encouraging “fortress style conservation” by denying the landless poor access to resources via forest based “carbon sinks.” Other critics claim that the offset market is simply ‘token environmentalism’ or ‘Enron environmentalism’ and is an intellectually dishonest mechanism for greenwashing global warming (Lohmann, 2006).

This thesis asserts that the above-mentioned concerns are valid and substantiates several of these criticisms in first person data collection of offset projects in Central America. Both development projects surveyed were beneficially influencing the environment and adjacent communities. However, the carbon financing that both organizations received was not necessary for these NGOs. Rather, the money from

carbon credits unequally benefited the corporate donors and left the organizations in vulnerable positions.

Despite criticism, many environmental groups continue to promote the voluntary cap and trade system as a pragmatic means of slowing global warming. The World Wide Fund for Nature (WWF), a large Swiss-based environmental group, is a key proponent of carbon trading, and even launched its own voluntary standard, called the 'Gold Standard' in 2003, in conjunction with another NGO (Lovell, Bulkeley, & Liverman, 2009 in press). The organization describes the benefits of offsetting within the voluntary market as:

Allow(ing) for experimentation and innovation because projects can be implemented with fewer transaction costs than CDM or other compliance market projects. Voluntary markets also serve as a niche for micro projects that are too small to warrant the administrative burden of CDM or for projects currently not covered under compliance schemes (WWF, 2008;6).

The statement seems to take a practical approach to environmental protection. The WWF recognizes that Kyoto sponsored Clean Development Mechanism (CDM) projects are often prohibitively expensive and bureaucratic thereby delaying real change. Therefore, immediate action is needed. Despite the risks, the global community must support new and complex methodologies of reducing emissions due to the severity of the climate crisis. This approach to environmentalism is at best pragmatic, at worst intellectually dishonest. The decision for environmental groups to participate in voluntary carbon offset projects is problematic. Significant literature reveals fundamental market failures due to the cap and trade model of emission reductions.

On a theoretical level, the basic components exists for what James Ferguson has



termed the ‘anti-politics machine.’ Ferguson’s 1994 book, *The Anti-Politics Machine: ‘Development,’ Depoliticization, and Bureaucratic Power in Lesotho*, was a foundational text in exploring how issues of power can easily be applied to carbon-financed development. In essence, proponents of carbon offsets claim the threat of global warming is so dire that there is no room for dissent. Further, the ‘carbon financed development model’ of emissions trading dismisses valid criticism from those outside the system. Ferguson commented on the development apparatus and the “experts” that attempted to control development discourse and marginalize local and contradictory opinions through the reification of systems of knowledge. The anti-politics machine can be applied to carbon financed development with its array of experts, auditors, and industry jargon that largely silence public criticism through the metaphysical construction of ‘development narratives.’

At the time of writing, there has been no clear consensus among environmental groups as to the best means of approaching global warming policy. On the contrary, increasing numbers of voluntary carbon “standards” are emerging. For example, the huge multinational investment bank Morgan Stanley designed the Voluntary Offset Standard in 2007 (Morgan Stanley, 2007). Other businesses have created their own carbon standards complete with diverse methodologies and legitimacy criteria.

The Climate Group—a consortium of industry and business interests—launched a voluntary carbon offset model called the “Voluntary Carbon Standard” in November of 2007 (The Climate Group, 2007). The many so-called standards within the voluntary market have created a maze of complex and varying regulations with no overarching

standardization, regulation, or accountability. This system of competing ‘standards’ fosters complexity, lacks governmental regulation, and may detract from overall efforts to reduce greenhouse gas emissions. Further, competing standards significantly reduce the public’s ability to determine legitimacy and provide environmental and social oversight to multinational carbon transactions.

Business operations—in the voluntary emissions trading market—go largely unregulated by US governmental oversight. The voluntary market’s lack of institutional transparency is underplayed by free market enthusiasts who may benefit from the model. Special interest groups—including sunset industries such as coal and oil industries—assert that cap and trade is the most feasible and cost effective model of addressing dangerous climate change. However, numerous compelling arguments by public and private sector agencies, not to mention communities in the developing world, question if emissions trading schemes are sufficiently transparent or environmentally sustainable in the long term. One US government report discussed below addresses issues of regulation and legitimacy within the voluntary market.

### **We Could Have Saved the World but We Were Too Cheap**

The US Government Accountability Office (GAO) published a report in August of 2008 titled, “*Carbon offsets; The voluntary market is growing, but quality assurance poses challenges for market participants.*” The work made several key observations about the state of the US voluntary carbon trading market. Many of the observations were in the form of concerns and included a lack of standardization in quality assurance

mechanisms and a non-central trading platform challenging market transparency. Other concerns included: insufficient information provided to consumers, problems determining additionality, inadequate governmental oversight, and uncertain environmental impact (2008;37). The report seemed critical of many aspects of the voluntary market although no executive action was called for. Instead, congress is directed to consider the creation of a “standardized quality assurance mechanism” (United States Government Accountability Office, GAO 2008).

Other reports also question the viability and long-term vision of emissions trading. The International Energy Agency (IEA) is an intergovernmental organization created after the oil crisis in 1974 to foster sustainable supplies of energy for the world’s needs (IEA, 2009). The IEA recently published an article titled, “The World Energy Outlook 2009.” The document is concerned with issues of energy sustainability and is responsible for promoting growth while at the same time encouraging the reduction of greenhouse gas emissions through alternative fuels. In a letter to the IEA on October 15, 2009, Executive Secretary of the United Nations Framework Convention on Climate Change, Yvo de Boer, praised the IEA in summarizing the article’s findings:

To delay (action on climate change) would only increase costs. Indeed, the report shows that every year of delay adds 500 billion dollars more to the cost of reaching the 450-ppm (parts per million) reference scenario of the report. This is partly due to technology lock-in effects. The power plants that are built today determine the CO<sub>2</sub> emissions for a generation. This makes it all the more important to ensure that low-emissions investments are made now. And once investments do start to pick up again, it is of utmost importance that they will be steered into a low-emissions direction (UNFCCC, 2009).

These statements show that many energy experts recognize the need to make radical changes to the ways in which energy is generated. In addition, key is the

perceived eminent need to change policy out of economic, as well as environmental need. In essence, sustainable sources of energy must be rapidly developed from a pragmatic cost-benefit analysis standpoint. Voluntary carbon offsetting is critiqued throughout the paper because, although carbon accounting strategies theoretically make sense, emissions reductions are not guaranteed. To ensure carbon reductions and to foster more certain sustainability practices, Yvo de Boer goes on to say that:

The report shows that the cost of changing direction would not only be reasonable, but that energy efficiency and other savings could largely offset the total investment required. The report shows that achieving the 450 scenario requires additional investments, but that the costs are manageable (UNFCCC, 2009;2).

This idea that sustainable energy production is both essential for future environmental wellbeing and cost efficient in the long term seems to be a straightforward notion. Yet, barriers exist to shifting energy use patterns. The legislation of the voluntary carbon trading market, although loosely based on Kyoto Protocol's CDM legislation, was constructed by those entities with economic interests in forming weak climate change policy. One organization composed of large corporations is called the Voluntary Carbon Standard (VCS). The VCS supports emissions trading within the voluntary carbon market and attempts to play the role of the UNFCCC in overseeing offset projects. According to the VCS, the organization:

Undertakes a variety of activities, including, but not limited to, the accreditation rules for Validators and Verifiers operating under the VCS, the approval process for recognition of other GHG Programs, supervision of the VCS Project Database, and the conditions for approval of VCS Registries<sup>7</sup>.

---

<sup>7</sup> The VCS quote was copied from the official VCS website at: <http://www.v-c-s.org/faq.html#question1>. Accessed on October 28, 2009.

The VCS organization represents one of the many consolidated business interests attempting to become the 'standard' of measuring projects under the voluntary market system. According to some scholars, "the international standard seen as most likely to become the market leader is the Voluntary Carbon Standard" (Lovell, Bulkeley, & Liverman, 2009 in press). The voluntary market contains powerful interests that have a vested stake in maintaining carbon trading in the US and abroad.

Proponents of the system have made efforts to increase legitimacy in the eyes of the public and private sector. Attempts to "standardize" the market have been funded by such entities including the investment bank Goldman Sachs, DNV a multinational insurance firm, Invista a plastic and polymer manufacturer, Interface the world's largest manufacturer of carpet, and the British Petroleum corporation (BP). If the market continues to function as a de facto model of addressing global warming, this will likely result in justifying pollution emissions and generating profits for those involved in carbon as a commodity.

These corporations listed above have clear interests and specific political projects that underlie efforts to lobby political representatives and support legislation that maintains the voluntary carbon offset market. Leading up to the 2009 post-Kyoto Copenhagen talks global climate change legislation is continues to be constructed. Throughout this crucial period, there is need for other voices including environmental, labor, indigenous, and poor movements to advocate for alternate policies that promote models of climate change that are more populist and benefit those who will experience the most devastating impacts of climate change.

According to the environmental organization, Friends of the Earth, heavy industrial polluters often gain windfall profits from cap and trade legislation. Corporate profits may take the form of the US government giving massive subsidies to heavy industries. There are specific cases of corporate profiteering within the arena of climate change legislation. The Lieberman-Warner bill—also known as America’s Climate Security Act of 2007—was a cap and trade model of addressing climate change.

The bill provided the hydrocarbon industry approximately \$800 billion in emission subsidies with nearly half a trillion dollars allocated directly to the fossil fuel industries and over half of this money going to the coal industry (Friends of the Earth, 2007;3). Under the legislation, nuclear power also received heavy government subsidies. The Lieberman-Warner bill was defeated on June 6, 2008 largely due to criticism from both Republican and Democratic lawmakers (Pooley, 2008). Regardless of the bill’s failure, the legislation essentially tested the waters for future legislation (Cohen, 2007).

Although atomic energy has proven to be a costly and environmentally dangerous endeavor, some continue to support the proliferation of nuclear power as an alternative to greenhouse gas emitting energy production. Key questions regarding the nature of the voluntary market must be posed. Is the privatization of the atmosphere commons—in the name of protecting the world’s climate—leading to greater economic and environmental vulnerability for local communities in developing nations? Conversely, are offset projects providing needed livelihoods for residents and encouraging sustainable resource use practices through forest protection? The answers to these questions are complex and need case-by-case analysis. However, research findings point to cap and trade as an

exceedingly complex model uncondusive to transparency or accountability.

One aim of this thesis is to foster greater transparency within the present system and further the public's role in ensuring feasible solutions to addressing climate change become available. Policies addressing global warming have the potential to distribute wealth and resources in fundamentally different ways depending on which models are accepted into international law. I view my role as a third party observer who seeks to address possible shortcomings or conflicts of interest in the creation of legislation that will affect those in both the Global North and South. Information from the thesis will be made available to those development agencies whose work employs stove projects. The data collected and described in this thesis increases transparency and informs the public of emerging trends in global climate change policies.

The late author Kurt Vonnegut Jr. once reflected that, "we could have saved the world but we were too cheap." The statement may have been a reference to the seemingly universal human propensity to prioritize short-term gain over long term sustainable resource use. Based on the research in this paper, relying on market mechanisms for environmentally sustainable solutions to climate change is at best overoptimistic, at worst apocalyptic. This assertion is supported by unsustainable resource use patterns perpetuated by market mechanisms whose profit margins trump environmental and social considerations.

Numerous national and international development projects use carbon financing. The following graph provides examples of projects that are currently receiving partial funding through greenhouse gas reduction efforts. Some types of projects are considered

legitimate under the Clean Development Mechanism of the Kyoto Protocol while others only qualify under the more lax voluntary market.

**Table 1.** Carbon Offset Market. This table provides an cursory view of several common types of emission reduction or sequestration projects. The table is not intended to be comprehensive only show the reader examples of prices, verifiers, and companies.

| Carbon Offset Provider   | Price/ton | Project Type  | CDM | Voluntary | 3 <sup>rd</sup> Party Verifer(s) |
|--------------------------|-----------|---------------|-----|-----------|----------------------------------|
|                          |           |               |     |           |                                  |
| Verus Carbon Neutral     | 2.75USD   | Varies        | No  | Yes       | CCX <sup>8</sup>                 |
| CarbonFund.org           | 10USD     | Reforestation | Yes | Yes       | CCX, CDM                         |
| LiveNeutral.org          | 12USD     | Efficiency    | No  | Yes       | CCX                              |
| Standard Carbon          | 15USD     | Methane       | No  | Yes       | CCX                              |
| TerraPass                | 14USD     | Renewables    | No  | Yes       | CCX                              |
| Bonneville Envir. Found. | 29USD     | Renewables    | No  | Yes       | Green-e Climate                  |
| Enpalo                   | 19USD     | Varies        | Yes | Yes       | Gold Standard,<br>CDM            |

The great degree of variability within the market price for carbon credits (USD \$2.75 – 19) exemplifies the range of consumer options for emission offset projects. As previously described there is often great variability in the “quality” of emission reductions with some projects having significant differences in additionality, transparency, and standardization variables. Interesting responses were revealed when the US Government Accountability Office (GAO) surveyed project stakeholders. The GAO

<sup>8</sup> Note: “CCX” refers to the voluntary market of the Chicago Climate Exchange. A full definition of the term may be found in the appendix of this work.



asked market participants how they perceived the quality of emission reduction projects. The following chart shows the results of the government’s survey cross-referenced by offset type.

**Table 2.** Stakeholder Credibility Ratings. The table below is an example of the perceived legitimacy of carbon offsets based on project type.

| How credible, if at all, is each type of project? | (0) Not at all credible | (1) Slightly credible | (2) Moderately credible | (3) Very credible | (4) Extremely credible | Varies | Don't know/ unsure | Total responses <sup>a</sup> | Average <sup>b</sup> |
|---|-------------------------|-----------------------|-------------------------|-------------------|------------------------|--------|--------------------|------------------------------|----------------------|
| Agriculture methane                               | 0                       | 1                     | 1                       | 8                 | 12                     | 9      | 0                  | 31                           | 3.41                 |
| Fuel switch                                       | 0                       | 0                     | 3                       | 5                 | 10                     | 12     | 1                  | 31                           | 3.39                 |
| Landfill methane                                  | 0                       | 1                     | 3                       | 8                 | 10                     | 10     | 1                  | 31                           | 3.25                 |
| Coal mine methane                                 | 0                       | 4                     | 2                       | 4                 | 7                      | 10     | 4                  | 31                           | 2.82                 |
| Industrial gas                                    | 1                       | 0                     | 7                       | 2                 | 7                      | 11     | 2                  | 30                           | 2.82                 |
| Non-REC renewable energy                          | 1                       | 2                     | 3                       | 8                 | 4                      | 11     | 1                  | 30                           | 2.67                 |
| Energy efficiency                                 | 2                       | 2                     | 5                       | 6                 | 6                      | 10     | 0                  | 31                           | 2.57                 |
| Afforestation                                     | 2                       | 1                     | 4                       | 5                 | 4                      | 14     | 1                  | 31                           | 2.5                  |
| Reforestation                                     | 2                       | 2                     | 5                       | 3                 | 6                      | 13     | 0                  | 31                           | 2.5                  |
| Avoided deforestation                             | 1                       | 4                     | 5                       | 2                 | 4                      | 14     | 1                  | 31                           | 2.25                 |
| Agriculture soil carbon                           | 0                       | 10                    | 5                       | 5                 | 1                      | 9      | 1                  | 31                           | 1.86                 |
| Rangeland soil carbon                             | 1                       | 8                     | 7                       | 4                 | 1                      | 9      | 1                  | 31                           | 1.81                 |
| Renewable energy certificates (REC)               | 9                       | 3                     | 2                       | 3                 | 2                      | 12     | 0                  | 31                           | 1.26                 |

The graph above was taken from page 51 of the article “CARBON OFFSETS: The U.S. Voluntary Market Is Growing, but Quality Assurance Poses Challenges for Market Participants” by Stephenson, J. (2008). GAO-08-1048 Highlights.

This table indicates that agricultural methane capture was considered the most reliable means of reducing emissions (receiving an average score of 3.41 out of 4 points), compared to rangeland soil carbon sequestration (1.81 out of 4). Afforestation project credibility was slightly better than average at 2.5. Of note is that the GAO received the above information from the voluntary market’s primary trading platform the Chicago Climate Exchange (CCX). Further, the survey of carbon offsets was limited to US based mitigation work and did not include international development projects.

This section discussed some of the challenges we face in addressing climate change in effective ways. An overview of the greenhouse gas trading market provides a sense of the scale to the US based market. The political economy of wealth and power outlined some of the powerful interests with stake in maintaining business as usual. The following section outlines the methods used to gather primary and secondary data for this project.

### **Methods**

The methods used in this thesis were selected to best address the research question: what are the social impacts of carbon offset projects within Central American communities? Additional social impacts on the industrialized world were explored after research was conducted. Two separate approaches were used to obtain specific information relevant to each type of offset project. Volunteer work was used to gain entry into improved wood stove development projects. Interviews were conducted during the course of volunteer work with employees, the organization's board of directors, and project participants. Moreover, I visited 10 households involved in stove projects and conducted interviews with local residents concerning their experience with carbon offsets. I also visited several tree nurseries that were financed by carbon credits. These nurseries were used by logging organizations to reduce environmental pressure on native hardwood tree species through reforestation.

I employed an alternate approach to obtain information on afforestation and forestry conservation projects that use carbon offsetting. Online research was first

conducted on eligible organizations. NGOs best suited to the research question were identified and contacted. A series of inquiries were made via email to determine each organization's level of willingness to work with outside researchers. After positive correspondence and disclosure about my research objectives, I asked to visit several afforestation and forest conservation sites sponsored by carbon credits then arranged to visit forestry sites. I was introduced to key organization employees and forestry workers and lived for one week at two work sites. During this time, I interviewed forestry workers, supervisors, and project directors. The local communities surrounding afforestation sites were surveyed to better understand the ways in which local communities have been impacted by carbon financed development work.

The paper now addresses several theoretical issues related to carbon offsetting. From an historical context, issues of political economy, access to resources, and the privatization of communal lands are considered. This section provides a theoretical framework for subsequent analysis of the emerging paradigm of cap and trade.

## CHAPTER II

### THE POLITICAL ECOLOGY OF CARBON OFFSETS

As previously discussed, North vis-à-vis South power relations play prominently into the underlying framework for the functionality of the voluntary carbon market, the South serving as a 'cost effective' local for the outsourcing of environmental services in the form of greenhouse gas reduction or sequestration. These power dynamics play out in a manner of ways. First person interviews with several local NGO directors revealed that these individuals are at a distinct power disadvantage.

Asymmetrical power relationships are important to carbon-financed development. Power comes in the form of disparities in wealth. NGO directors are often under pressure to obtain funding sources to carry out project goals. These external monetary constraints may motivate developers to accept highly unfavorable contractual agreements with offset companies. Offset agreements are often complex and multifaceted. These legal briefs sometimes require the reader to have a basic working knowledge of legal jargon in conjunction with a college level education. NGOs may be at a distinct disadvantage in fully comprehending these legally binding contracts.

The contracts are largely written by northern offset companies. Interestingly, project responsibility is placed in the hands of development workers in economically

poor regions. The shift in project responsibility from project developer to NGO is important if projects do not progress as originally intended<sup>9</sup>.

This case study examines improved wood stoves. The organization producing the stoves was under full contractual agreement for maintaining greenhouse gas reductions over the entire five-year lifetime of the project. Corporate donors that fund carbon offsets maintain a measure of control over a project. NGOs are then subjected to complex real world situations, which may or may not conform to intended project outcomes. Regardless of these real world results, Northern businesses ‘offset responsibility’ onto the NGOs they work with<sup>10</sup>. In essence, when corporations create contracts of this nature, they are attempting to externalize ethics and legal responsibility onto the NGO. Both entities are separated by geography as well as distributions of wealth. The political ecology of emissions trading plays prominently into the overarching framework of this project and in understanding which actors benefit from the model and which do not.

Within the context of this paper the term ‘political economy’ is used to describe a system of power relations based on Immanuel Wallerstein’s World System Theory (1974). The use of the term political economy is also a reference to Andre Gunder

---

<sup>9</sup> As seen in subsequent chapters, local NGOs are reluctant to inform business sponsors due to the potential for legal backlash. Also, as was apparent during research, organizations and their sponsors maintained a ‘don’t ask, don’t tell’ policy that worked well for both parties.

<sup>10</sup> This invented term is defined as a displacement of the ‘burden of proof’ from the carbon offset initiator (corporation or emission trading organization) to the development organization. This effectively creates a legal barrier between project administrators and developers. Given that project results rest in the hands of those working on the ground, there was found to be pressure and self censorship when the project did not go according to plan.

Frank's notion of Dependency Theory (Biersack and Greenberg, 2006). Although the current usage of 'political ecology' has largely moved beyond the classical Marxist and neo-Marxist frameworks, the thesis continues to use the term in the more traditional sense. Political ecology is used in this manner because the paper is concerned with changes to land and resource access for locals impacted by development for climate change. In the text, *Third World Political Ecology*, authors Bryant and Bailey assert that:

Political ecology is still essential to an appreciation of the environmental crisis besetting the third world. To begin with, upheavals need to be set against a long period of development that is rooted in distant colonial times, yet which even today powerfully conditions the way in which human-environmental interaction takes place in the third world (Bryant and Bailey, 1997:7).

In other words, the environmental policies of today must be situated within an historical context to be comprehensible. The objective is not to use the term in a reductive fashion, but rather to recognize that at the heart of many Latin American struggles lies access to land and the productive capacities of the earth (Eckstein, Garretton-Merino, 2001).

### **Theoretical Approach**

In his seminal text: *The Invention of Development*, professor and post-development theorist Arturo Escobar describes a development model largely begun after WWII, in which western industrialized nations moved toward "solving" issues of poverty and lack of resources in the Global South. Nation-states throughout the developing world became increasingly viewed through the lens of per capita income as a metric for the evaluation of poverty. Escobar explains how—through the mechanism of GDP—

approximately 70% of the global population became “poor” on the day the World Bank decided to define “poverty” as those people who make less than US \$100 dollars per year (Escobar, 1999).

Escobar attacks the World Bank’s approach as overly reductive and dehumanizing to those outside the industrialized world. The World Bank’s move to ‘measure poverty’ is paternalistic if a culturally situated institution from one region of the world designs a universal measurement tool as a “standard” for the evaluation of global “poverty.” Escobar goes on to point out that with the introduction of this global meta-narrative, the rational justification for development work became apparent: the world’s poor must be assisted in raising their standard of living (1999).

The paradigm of development had begun and the poor—as well as their land and resources—became reliant on the assistance of those outside their communities. The resources of the developing world were largely placed in the “capable hands” of rich nations in the Global North. The use of resources and labor from the Global South was justified as a necessary precondition of poverty alleviation by the Global Northern. The West must “teach” those in developing nations how to live “properly.” The Global South underutilized natural resources and human labor energy that fostered a state of economic impoverishment.

Local agency in the third world was reconceptualized under what could be seen as a paternalistic framework of developmentalist discourse. Implicit and explicit to the language of development ideology during the 1950s—with continuing hints today—was the idea that the tide of economic advancement would ‘raise all ships.’ Trickle down

economic theory had begun to take hold not solely as a capitalist model of progress but as a tool through which to leverage the entire world out of “poverty.”

The paradigm of developmentalism—within the context of emissions trading—legitimizes new forms of western influence and control. Top down carbon reducing projects may use a discourse of environmental protectionism as a continuation of western paternalism. This thesis argues that inherent to much cap and trade rhetoric is the notion that development work specifically in the Global South, is a primary solution to dangerous climate change. This notion of encouraging top down development work is problematic for several reasons because outsourcing environmental services may foster a false sense of security without actually addressing basic resource use issues. Paternalistic development patterns may allow the continuation of climate degradation by supporting projects that do not actually reduce emissions as seen in the first case study documenting wood stoves.

This relates to the thesis in that the development paradigm of overseas carbon trading only serves to reinforce systems that initially created the climate crisis. Business models that commodify nature as a “resource” to be exploited, and measure “success” as exponential growth, are incapable of constructing a sustainable system. The theoretically efficient model of emissions trading supported by many gas and coal interests is fundamentally incapable of addressing the foundational causes of climate change policy. The economic system that cap and trade is based on should not be trusted to create environmental solutions. The capitalist market was not built as a long term sustainable model. Evidence of the present market’s environmental and social failures are numerous.



Agroforestry practices have negative impacts on biodiversity (Shiva, 1987), while industrial farming degrades topsoil (Kimbrell, 2002) and water quality (Lanyon, 1994). Further, disproportionate burden of the negative impacts of pollution are often borne by non-white populations throughout the world (Bullard, 1993). The following section will discuss several ideological approaches to development.

### **Discourses on Development**

The polarization of the debate over “good” and “bad” forms of development has served only to complicate real world actions towards creating sensitive and sensible policies with a human face. In the text, *Beyond the Impasse*, David Booth describes a dichotomization of schools of scholars who become trapped in professing the virtues of the market or instead take a Marxist or neo-Marxist approach. Some liberal arguments attack Marxists as economically obsessed, overly reductive theorists with no alternative solutions for development, while some Marxists assert that capitalism on a global scale serves only to deplete resources and oppress the workers of the world (Schurrman, 2004).

Within the context of carbon emissions trading via forestry, some critics claim that the carbon-offset market is a continuation of conventional development discourse (Lohmann, 2006). Within this development paradigm, forests and natural resources are “managed” by northern players intent on extracting “environmental services” from the Global South. The ability to protect and manage the ‘atmospheric commons’ is framed as the responsibility of western nations (Lohmann, 2006). This developmentalist framework is supported by the UNFCCC’ Kyoto Protocol and copied by the US based voluntary

carbon trading market. The guidelines of the United Nations Framework Convention on Climate Change (UNFCCC), state that “developed nations” (Annex I & II) who signed and ratified the Kyoto Protocol are legally limited in their ability to pollute the atmosphere with greenhouse gases during the Protocol’s commitment period (2008 – 2012). However, “developing nations” (Non-Annex countries) are not legally bound to emissions caps (UNFCCC, 2009).

The system allows industrialized nations to conveniently obtain carbon commodities without changing resource use practices. Further, the UN creates justifications for allowing developing nations to go unregulated include: receiving financing from Annex I and II countries for green energy development, and allowing developed nations to meet emissions targets through carbon offsetting. In Article 6, section 1 the Kyoto Protocol states:

For the purpose of meeting its commitments under Article 3, any Party included in Annex I may transfer to, or acquire from, any other such Party’s emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy (UNFCCC, 2009)<sup>11</sup>.

The ability for industrialized nations to meet emission reduction goals by purchasing ‘extra’ carbon permits from poorer nations is undoubtedly more ‘convenient’ and cost effective than meeting emission reductions in the Global North. The west is again relying on the underdeveloped world to meet the demands of a western market

---

<sup>11</sup> For a full review of the protocol including the quoted section, go to:  
[http://unfccc.int/essential\\_background/kyoto\\_protocol/items/1678.php](http://unfccc.int/essential_background/kyoto_protocol/items/1678.php).

commodity other than raw materials and labor. As previously stated, non-Annex nations most notably: Brazil, Russia, India, and China (BRIC) do not have regulated emission limits under the Kyoto framework. This allows developed nations to commodify the ecological and industrial processes of third world nations. In his book, *Open Veins of Latin America*, the Uruguayan writer Eduardo Galeano described the ongoing paradigm of exploitation:

Our (Latin American) region still works as a menial. It continues to exist at the service of others' needs, as a source and reserve of oil and iron, of copper and meat, of fruit and coffee, the raw materials and foods destined for rich countries which profit more from consuming them than Latin America does from producing them (1973;1).

In essence, the Kyoto Protocol and the voluntary carbon trading market are extensions of colonial processes of labor and resource exploitation. Fundamental changes would need to occur in resource use patterns if cheap under-regulated sources of goods, including carbon offsets, were no longer available. China has become a prominent scapegoat in efforts to shift responsibility away from western industrialized nations.

Recent emission calculations show that China has recently surpassed the United States as the world's leading polluter of greenhouse gases (Harrabin, 2008). However, the statistic does not account for per capita emissions, an inherently important factor when assigning responsibility or blame for the drivers of climate change. On a per capita basis, an average US citizen emits about six times more greenhouse gases than a Chinese citizen (Butler, 2007).

Regulated and voluntary climate change mitigation policies are explained from a reductive technological context. The framing of cap and trade as a technical fix overlooks

the social and economic context that gives meaning. In essence, efforts to address climate change via emissions trading are insufficient because historical and political factors are overlooked (Cohen, Demeritt, Robinson, & Rothman, 1998). The tacit assertion is that industrialized nations have the foresight to protect and sustainably manage natural resources. This claim that capitalism contains the seeds of redemption has not been supported by time with present models of production known to deplete and overuse environmental resources (Foster, 1997). However, long term “sustainable development” models are placed within a global commodities market proven unsustainable.

Both development projects reviewed purport to reduce greenhouse gases by privatizing the atmosphere under a market-based paradigm. The atmosphere becomes an environmental ‘bank’ capable of issuing credits (pollution permits) and withdrawals (the right to pollute). The ‘banking system’ of carbon offsetting essentially colonizes the atmospheric frontier. The earth’s environment becomes framed as a monetized entity within a market friendly model. As was the case during the colonial era, the voices of local and indigenous inhabitants are systematically marginalized in this new development discourse.

Voluntary carbon offsetting, as both market-driven industry and ‘environmental’ movement to reduce climate change, is influencing Central American communities in diverse ways. Yet, there is tremendous variability in carbon trading projects. The projects implemented by two small NGOs surveyed differed epistemologically and methodologically from carbon forestry programs financed by the World Bank’s “Carbon Finance Unit” and the “BioCarbon Fund.” Some of these differences in management and

ideology came in the form of tree species planted, while others were reflected in the scale of community involvement. Questions concerning the role of each development organization must be asked. What functions do development organizations play in the North vis-à-vis South context of power relations? More specifically, in what ways are narratives employed to frame development discourse? Are these narratives historically situated into specific country contexts?

In Nicaragua, despite sweeping land reforms made by the Sandinista government's rise to power in 1979, land continues to remain in relatively few private hands. Carlos Fonseca, one of the three founders of the FSLN (Sandinista party) stated, "in Nicaragua, no peasant will be without land, nor land without people to work it" (Burns and Charlip, 2002;277). The Sandinista government's policies to redistribute land were effective in giving many rural peasants access to land tenure. The land given to over 83,000 poor families was however only expatriated "from the Somozas or their closest allies," allowing other rich elite landowners to retain their huge land holding (Burns and Charlip, 2002;277).

From an historical perspective, the next section of the paper describes how certain similarities exist between carbon offset sponsored monoculture tree plantations and the privatization of common lands throughout history. The discussion is also designed to provide a theoretical basis to situate the reader into a discourse over private property rights vs. open access lands. The discussion below is specifically valid to the research on forest-based offsets because the majority of the Nicaraguan people continue to struggle with issues of land tenure and access to resources.

## CHAPTER III

### PRIVATIZING THE COMMONS

This chapter frames the notion of ‘privatizing the commons’ in two different ways. First, emissions offsets often encourage the privatization of land by funding forestry projects that deny access to local communally available lands. Alternately, privatization of the commons also refers to the ‘atmospheric commons’ the political economy of pollution rights vis-à-vis climate policy. This alternate interpretation will be discussed in the subsequent section of this chapter titled “Atmospheric Privatization.”

The consolidation of land ownership in Nicaragua was taking place before the invention of carbon offset sponsored development. However, emissions funding may encourage privatization and have detrimental impacts on local livelihoods. Proponents of large-scale afforestation work often assert that employment opportunities are created because of sustainable development projects (World Bank, 2009). Conversely, natural resources collected from adjacent forestland are available to locals, yet often goes unquantified. Individuals and communities in the Global South may utilize forestry resources including food, medicine, and fuel. However, these resources are often ignored within a developmentalist framework until they cease to be available and must be purchased.

Large-scale afforestation projects, including those funded by the World Bank, assert that providing employment opportunities increases standard of living by increased

access to resources. What should also be considered within the context of these projects is the change in access to natural resources that communities may experience. Access issues should be considered in the context of determining the legitimacy of carbon financed afforestation projects. From an historical perspective, the chapter will begin by describing a way in which to frame the privatization of land.

The seminal work *Das Capital* (Vol. 1) by Karl Marx examines the ways in which land and resources expropriate energy and capital from laborers. Capitalist driven systems of ‘primitive accumulation’ are examined through an historical context. Legal frameworks including the laws termed “Bills for Inclosure of Commons” (sic) were used to expropriate land from the poor in Great Britain (1990;885). Marx used numerous examples to disaggregate the underlying processes of the system and trace elite’s efforts to privatize resources in myriad contexts.

The justification for the privatization of the common resources often arrives with logical reasons for unequal distribution of land across social and geographical spaces. The expropriation of land has been legitimized by excessive taxation to “bankrupt the tenant” and force debt bondage (Du Boise, 2007;101). Privatization has also been presented as a means of protecting and preserving the commons. Garrett Hardin in his influential essay *The Tragedy of the Commons*, asserted “freedom in a commons brings ruin to all” (1968;1244). Hardin argued for either complete state control of land or the preeminence of private property rights to preserve natural resources.

For many the reification of private property remains a foundational institution and within the US Constitution and remains sacrosanct and indisputable (Ely, 2007).

Privatization moves to its natural conclusion when carbon offsets essentially represent ‘atmospheric real estate.’ Private ownership has traditionally contributed to western capitalist notions of land rights. However, these ideas sublimate the underlying conditions that relegate countless laborers to a state of perpetual poverty and state authority (West, 2001;22). What conditions exists beneath the social and economic conditions that foster privatization of land under the various guises of improvement, progress, and now environmental services? Marx described these conditions as ‘exploitation of labor’ and the privatization of the commons. The ultimate underlying project behind privatization is to centralize and stratify power to allow owners to become ‘masters in a world of slaves.’

When the Irish Potato Famine began in 1845, the peasants experienced *both* natural and humanly constructed hardships. Although it is generally agreed that a fungus: *Phylophthora Infestans*, was responsible for a potato blight that devastated the Irish peasantry’s staple food crop, the underlying reasons for the famine and resulting hardship of an entire class may also be found in economic conditions of the land tenure system (West, 2001). The Irish peasantry lacked land tenure. Thomas Malthus, although largely focused on population issues, proposed within the context of the Irish Potato famine that:

There is a fatal deficiency in one of the greatest sources of prosperity, the perfect security of property; and till this defect is remedied, it is not so easy to pronounce upon the degree in which the redundant capital of England would flow into Ireland with the best effect (Malthus, 1951).

In other words, Malthus asserts that a redistribution of land to the peasant class of Ireland would mitigate the potato famine and promote economic prosperity. Under this view, laborers and agriculturalists that lack land tenure are seen to bare the worst impacts



of environmental and social degradation. Unfortunately, disenfranchisement of the poor from property has a well-established historical basis in Great Britain.

Marx described the centralization of property in the hands of a few through his discourse on *enclosures* in chapter 26, *The Secret of Primitive Accumulation*, of *Capital*, Vol. 1. The process of stripping land away from the poor is seen as a transformation of arable peasant land and habitations to “townes pulled down for sheepe-walks” (sic) (1990;879), in other words, the forced depopulation of the small land holdings of the countryside. This change forced the population to move en mass from rural to urban areas and effectively denied peasants access to the land and resources making them destitute and easily manipulated.

Over the centuries, the lives of the working class were further crafted by legislation that created a direct dependency on those who owned land and resources. By 1750 the “rights of modern private property had been established. In addition, capitalists began to employ the new laws as “instrument(s) by which the people’s land is stolen” (Marx, 1990;883-4). The primary instruments and methodology for modern capital accumulation established capitalism as the principle economic and theoretical model of growth. Carbon offsetting is simply a continuation of capitalism’s need to privatize the commons.

Without land, a population is easy to control, thus “capital by its very logic imposes what is in effect a scorched earth strategy” that relegates the worker to a position of forced labor (Foster, 2007). As a result, economic and social conditions in England began to change through sweeping top-down legislation. The overall effect created a

situation in which the poor were unable to fend for themselves and were reliant on assistance from those who created their condition in the first place. Specific reasons drove the expansion of capitalism's ancient scorched earth policy.

Large increases in pastureland in conjunction with a growing disenfranchised labor-base allowed great increases in productivity in industrial sectors. Marx traces privatization in Britain to the enclosure acts instituted at the close of the 15<sup>th</sup> Century (1990;880). According to Marx, the acts were specifically designed by early capitalists to shape labor patterns by denying the poor access to land tenure through excessive taxation or outright violence. The outcome of the enclosure acts and the dismantling of common spaces:

Convert(ed) the land into a merely commercial commodity, extending the area of large scale agricultural production, and increasing the supply of rightless proletarians driven from their land (Marx, 1990;885).

Marx goes on to describe how this "industrial reserve army" of landless disenfranchised workers provided the necessary labor base for the industrial revolution (1990;781). Additionally, despite much contention, the capitalist ideology continues to emphasize centralization of land and the strict regulation of property rights in the interest of production and capital accumulation. This discussion of the privatization of land is important to the thesis in several respects. Privatization of 15<sup>th</sup> Century peasant land has continued and now encompasses privatization of the atmosphere's ability to regulate temperature through cap and trade models. Many elites in both contexts may claim that privatization leads to protection of resources. However, this claim can be rejected as false

when we examine the ways in which privatization has degraded environments and human food security for the last 400 years.

The connection between privatization of land and cap and trade is that both models are legislated from the top down by elites. Cap and trade is the natural outgrowth of privatization of land. Proponents may argue that the system is functional because from their perspective it is a profitable model. Just as wealthy landowners of the 15<sup>th</sup> Century would approve of consolidating the land in the hands of a few. In other words, both elite groups systematically overlook the damages to food security and long term sustainability.

### **The Tragedy of the Commons**

When the article *Tragedy of the Commons* was written in 1968, Garrett Hardin asserted that there was a need to privatize or centralize land ownership to avoid global overexploitation of resources. The seminal essay explores land use patterns by problematizing the negative environmental impacts of allowing an “open” space for use by independent cattle herders.

The essay prioritizes a particular paradigm through promoting the need to protect private property through centralized private or state ownership of land to serve ‘the greater good.’ Hardin bases his opposition to communal property rights by creating a scenario in which pastoralists that, through overgrazing their livestock, inevitably destroy collective property due to shortsighted self-interest (1968). This argument is theoretically predicated on “rational” choice and purposes that “freedom in a commons brings ruin to all” (1968;1244). The essay promotes an idea of resource use that directly contradicts

Adam Smith's notion of the *invisible hand* (Ostrom, Burger, Field, Norgaard, Policansky, 1999).

In Adam Smith's foundational work, *The Wealth of Nations*, the "invisible hand" is conceptualized as the individual work of an entrepreneur, who, while working for private gain, actually furthers the common good, or "the public interest" (1937;423). Individuals, according to Smith, may labor in an industrious fashion with self interest and personal wealth accumulation in mind, yet through the phenomenon of the invisible hand, their selfishness will promote prosperity and bounty for all (Smith, 1937).

Hardin's work contradicted Smith's by claiming that self-interest, within a rational framework, would result in deterioration and degradation of the environment through overuse. Hardin's conclusion, among other social theorists and economists, provided the justification for policy makers, through governmental bodies, to expropriate land and resources under the premise of protecting land for the 'greater good' (Ostrom, et. al. 1999;278).

Of central importance is that Hardin defines "the commons" as "open access" land. Under this specific reductive framing, the conditions that constitute the commons *do* create a scenario in which, "there are no property rights or rules at all and it is widely accepted that under such circumstances 'The Tragedy of the Commons' will indeed arise" (Moberg, 2004). Hardin narrowly defines the term "commons" in a manner that does *not* exist in the majority of non-western societal conditions—one in which there is no management. In other words, resource use practices that deviate from western capitalism are oversimplified to the point of absurdity. Again, an argument for

privatization and capitalist ideology holds up alternative examples outside of their historical and social context to devalue other ways of living. However, there are numerous holes in the logic of capitalism.

The essay, *Revisiting the Commons*, coauthored by Ostrom, Burger, Field, Norgaard, & Policansky (1999) re-examined Hardin's work and found that human oversight of collective land holding is predominantly the rule, rather than the exception. In essence, communities generally self regulate the "rational" individualistic logic that Hardin asserts is built into human resource use patterns. This regulation occurs at the sub-national level outside of the state or private sphere (1999). In other words, privatization does not inherently lead to environmental protection. The authors use a Cambridge-based research study published by David Sneath in 1998 to propose alternates to Hardin's assertions<sup>12</sup>. Sneath's research showed satellite images of the border region between Russia and Mongolia. The land surveyed was controlled by the Union of Soviet Socialist Republics (USSR) until 1991. After the fall of the Soviet Union, political authority was transferred to the Russian state (Sneath, 1998). Satellite images of the border region between Russia and Mongolia showed different land use patterns. Researchers concluded that within the case study, more destructive land use practices occurred on Russian territory despite, or because of, strong state land holdings.

A more comprehensive analysis of data on human environmental interactions may support or refute the assertion that state controlled land leads to greater environmental degradation. However, it is important to note that Hardin's thesis showing a causal

---

<sup>12</sup> The full reference from Norgaard, & Policansky 's 1999 article is: D. Sneath, *Science* 281, 1147 (1998).

relationship between lack of land ownership and environmental degradation may not be accurate. Traditional Mongolian nomadic pastoralists outlined in Sneath's study refute Hardin's argument by maintaining "traditional group-property institutions," allowing seasonal movement and a self-regulating body of individuals who preserve their territory without significant degradation (Ostrom et. al., 1999). The debate between communal lands vis-à-vis privatization was a central theme in Karl Marx' explanation of political economy.

In *The German Ideology*, Marx describes a situation in which capital and land are centralized and accumulated in the hands of a rich, elite class who commands a landless peasantry to work for subsistence (Tucker, 1978). Marx speaks of primary or original accumulation and the ways in which:

The Bourgeois capitalists favoured the operation, with the intention, among other things, of converting the land into a merely commercial commodity, extending the area of large-scale agricultural production, and increasing the supply of free and rightless proletarians driven from the land (Marx, 1990;885).

Marx describes how the material conditions in which humans interact to form the foundation of production. We are led through a chronological process that traces human environmental interaction through various stages of being, beginning as a "natural" tribal state, the familial relationship writ large. Then, as population and wants increase, the complexity of social structures also increase, and lead to expanded exploitation of the lower human echelons within an unnatural social hierarchy of 'communal and State ownership.' Marx's works describing estranged labor, sees the worker's separation from their means of production as inversely related to the accumulation of wealth in the hands

of a few. As capital increases, the worker's life energy is depleted and "the worker becomes poorer the more wealth he produces" (Tucker, 1978;71).

Private property and the privatization of communally shared spaces have specific impacts on the worker. Marx asserts "private property is thus the product, the result, the necessary consequence of alienated labor, of the external relation of the worker to nature and to himself" (Tucker, 1978;79). In other words, private property and wage labor are directly related to one another as commodities, and as things, they may be more easily controlled. Conversely, under a socialist or communitarian system people may be more capable of meeting their basic needs with far less time and energy spent laboring because time and energy can be directly applied to subsistence activities. Elaborate development projects are often created by Northern interests to control and incorporate populations outside the world system of capitalist production (Escobar, 1995).

This discussion of private property and wage labor relates to the thesis in numerous ways. The purported strength of the cap and trade model is "efficiently" and "cost effectively" meeting environmental goals while allowing economic growth to continue. Yet, the notions of 'cost effectiveness' and 'efficiency' are only legitimate in a western capitalist framework. The notion of "cost effectiveness" may be unpackaged to reveal the underlying drivers of 'cheap labor' and 'lax environmental laws.' In essence, emissions trading schemes acknowledge asymmetrical north-south power relations and makes use of southern underdevelopment for northern profit. Cap and trade relies on the anti-politics machine of development discourse to conveniently overlook historical relationships between nations and peoples.

Much impoverishment in Latin America has been due to colonial and neocolonial era' in which labor and raw materials were systematically expropriated from the indigenous inhabitants (Galeano, 1973). Cap and trade is framed in economic terms and relies on ahistorical narratives that continue a neocolonial legacy of exploitation. Yet, if market based approaches are not taken as "givens" other alternatives may be available. Industrialized nations and the overseas markets maintained by western consumption patterns continue to be responsible for the majority of dangerous climate change. The tragedy of the commons has not been a market failure but rather a market success. Western capitalism has indeed been so successful in privatizing and commodifying resources and land that there are fewer markets left. In essence, this new climate crisis has simply been employed to justify the further expansion of a commodities market for questionable quality carbon offsets.

### **The Accumulation of Land**

Albert Einstein's article titled *Why Socialism?* appeared in the Monthly Review magazine's first installment in 1949. The work examined the historical basis for land accumulation. Einstein described that:

Most of the major states of history owed their existence to conquest. The conquering peoples established themselves, legally and economically, as the privileged class of the conquered country. They seized for themselves a monopoly of the land ownership and appointed a priesthood from among their own ranks. The priests, in control of education, made the class division of society into a permanent institution and created a system of values by which the people were thenceforth, to a large extent unconsciously, guided in their social behavior (Einstein, 1949).



In other words, Einstein asserts that the social construction of reality within a capitalist framework is meant to legitimize popular acceptance of privatization rights in the hands of the few. Einstein's discussion of the way in which power is legitimized under a system of predatory capitalism is similar in many respects to critiques of development and development discourse. For Arturo Escobar the present world system continues to rely on antiquated notions of "growth" and "progress." Modernization theory and trickle-down-economics form the rhetorical if not the ideological underpinnings of the development paradigm even though the legitimacy of both theories has been largely called into question (Escobar, 1995).

The privatization of public spaces in Great Britain in the 16<sup>th</sup> Century illustrated the ways in which common land has been expropriated and enveloped in a market based system with negative social and environmental impacts (Tucker, 1978). Similarly, forest based cap and trade policies do not address the underlying causes of social inequity, that of unequal distribution of land and resources but instead may encourage wealth disparities. Garrett Hardin's criticism of the commons must be critiqued as a fundamentally flawed argument based on reductive reasoning that does not take into consideration alternate systems of subsistence. The material conditions that give rise to social inequity and asymmetrical land and resource distribution must be engaged to fully address the environmental issues that we face on a global scale.

### **Privatization of the Atmosphere**

This section heading refers to the ways in which global warming development narratives are framed and addresses issue of scale. Both the UNFCCC compliance and US voluntary markets frame responsibility for atmospheric pollution as a universal problem with a universal imperative for all countries to participate. To this effect, the United Nations directs all governments of the world to participate in climate change mitigation with “common but differentiated responsibilities<sup>13</sup>.” The compliance and US markets support privatization of the atmosphere. The will to quantify then control resources, both tangible and intangible, has an historical basis. Larry Lohmann of the research and advocacy group The Corner House states that:

History has seen attempts to commodify land, food, labor, forests, water, genes and ideas. Carbon trading follows in the footsteps of this history and turns the earth’s carbon-cycling capacity into property to be bought or sold in a global market. Through this process of creating a new commodity – carbon – the Earth’s ability and capacity to support a climate conducive to life and human societies is now passing into the same corporate hands that are destroying the climate (Lohmann, 2006,356).

The two projects described in this work illustrate how carbon finance has effectively commodified the carbon mitigation services of NGOs in the developing world. Privatization of carbon may seem like a cost effective means of quantifying greenhouse gas emissions. However, real flaws were revealed in both case studies showing this system of free market environmentalism has real world impacts on marginalized groups that exacerbate inequities. Development projects purporting to

---

<sup>13</sup> Quoted text taken from [http://unfccc.int/kyoto\\_protocol/items/2830.php](http://unfccc.int/kyoto_protocol/items/2830.php) on November 4, 2009.

function as solutions to climate change must be both scientifically verifiable and work towards redistributing wealth internationally.

### **Study Limitations**

The study's primary focus is on two types of carbon-based offsets, one involving wood burning cooking stoves, and the other concerning afforestation projects. Due to time and resource constraints, the thesis will primarily focus on only certain aspects of the debate surrounding carbon offsets. A brief history of climate change policies is covered, as well as regional factors influencing both projects. However, the bulk of the research examines the ethical implications of the voluntary carbon trading market and the political economy of offsets. Through first-hand observation, the paper seeks to reveal the social and physical impacts of carbon offsetting on people. In addition, several projections for social and environmental impacts are made based on a potential teleology of present events. Potential future outcomes are largely concerned with community access to resources and the efficacy of improved stove projects.

Improved wood stoves increase indoor air quality and improve the health of cooks (Baldwin, 1987). Improper ventilation and incineration of biomass has been shown to affect human health and lead to a variety of ailments including: acute respiratory infections (ARI), chronic obstructive lung disease (COLD), and low birth rates (Smith, 1994;23). Health issues associated with appropriate technology stoves are not addressed in detail within the body of this work because they fall outside the scope of this research project.

Beyond human health impacts, improved stoves are also seen as a means to reduce greenhouse gases through more efficient combustion. Individual stoves have been found to save approximately one ton of carbon dioxide gas (CO<sub>2</sub>) per year, equal to one carbon credit as compared to the traditional unimproved stove known as the “three stone fire” (Still, MacCarty, 2008). To place greenhouse gas emissions in perspective, a simple comparison is needed. One ton of CO<sub>2</sub> has a volume equal to 556.2m<sup>3</sup>. The incineration of one gallon of conventional (regular) gasoline creates 4.867m<sup>3</sup> of CO<sub>2</sub>. Therefore, one ton of CO<sub>2</sub> is equal to the combustion of approximately 114 gallons of conventional gasoline. (International Carbon Bank and Exchange, 2000). This rudimentary association shows that irrespective of international development, resource use patterns in the industrialized world are crucial to reducing emissions worldwide.

Carbon offsets improved the health and financial condition of participants based on interviews with improved stove owners and manufacturers. Small scale forestry projects generated a variety of benefits including employment for locals, potential future tourist infrastructure, and improved environmental condition. Fundamental challenges exist within the voluntary market that will be addressed in detail throughout the paper in the context of each development project.

## CHAPTER IV

### TREE FARMS AND SUSTAINABLE DEVELOPMENT

The world's forests cover an estimated 30% of the earth's surface. During the 1990s, deforestation accounted for approximately 20% of global greenhouse gas emissions (UNFCCC, 2008). Many proponents within the voluntary carbon market promote tree planting as a means of addressing climate change through carbon dioxide sequestration (Capoor and Ambrosi, 2006). The following narrative examines several development projects that utilize carbon funding through afforestation. Information was obtained through literature and web-based sources. Several of the projects described were visited first hand in an effort to better understand how individuals and communities were being impacted.

The term "afforestation," within the context of carbon capture and storage has a specific meaning based on the Kyoto Protocol. Articles 3(3) and 3(4) of the Protocol allow only 'reforestation' and 'afforestation' as Clean Development Mechanisms. According to the United Nations Framework Convention on Climate Change, "afforestation" is defined in 16/CMP.1, Annex, paragraph 1 as "the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources" (CDM Rulebook, 2009;1). In other words, afforestation is the planting of trees

on land that has not been a forest for over 50 years. However, as the subsequent section will illustrate, there are fundamental differences between afforestation projects.

### **Monoculture Tree Farms**

Not all afforestation projects are created equal. Global warming mitigation strategies designed around large-scale monoculture afforestation projects are seen by proponents as an efficient means of delivering environmental services. Some afforestation projects supported by the World Bank's Carbon Finance Unit (CFU) promote the notion that carbon offsetting via tree farms may run parallel to the social goals of alleviating poverty and contributing to sustainable development in the Global South<sup>14</sup>.

However, many afforestation projects supported by large donors including the World Bank have been found to reduce local inhabitant's access to land (Cotula, Dyer, & Vermeulen, 2008). Some critics have also argued that local access to forest resources diminishes because of particular development practices associated with sweeping forestry projects managed by large corporations. Planting eucalyptus and other fast growing non-natives species fundamentally reduces water resources for local communities and degrades ecosystem diversity (Engel, V., Esteban Jobbagy, G., Stieglitz, M., Williams, M., & Jackson, R. 2005). These are hidden costs inherent to some large-scale carbon financed development, which go largely overlooked and uncalculated. Proponents claim

---

<sup>14</sup> The World Bank's Project Goals were accessed from the following website on October 27, 2009; <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTCARBONFINANCE/0,,contentMDK:21841841~menuPK:4125909~pagePK:64168445~piPK:64168309~theSitePK:4125853,00.html>

that large-scale forestry projects are efficient and cost-effective (World Bank, 2009). The large-scale commodification of forestry resources requires infrastructure and services. These features are “external costs” and include the construction of roads, ports, and shipping industries. Guards must be trained to protect private property and a market for wood products must be maintained. These outside aspects often go unquantified yet are essential to maintain international commodity markets. These systems often prioritize economic profit over local livelihoods and healthy ecosystems (Lohmann, 2006).

Empirical evidence supports that extensive monoculture forestry projects may displace small family farms and marginalize local land rights, culture, and ecology (Liverman, 2008). On the other side of the debate are actors who promote industrial forestry practices and have strong arguments for the economies of scale that monocrops are claimed to afford.

The World Bank’s “Precious Woods Project” in Southwestern Nicaragua is one example of carbon offsetting through monoculture afforestation. At the time of writing the Bank was assisting a Swiss-based Corporation known as ‘Precious Woods’ establish teak plantations on 600 hectares of private land on the Costa Rican border. The corporation is not new to the forestry industry and has subsidiaries in Costa Rica, Brazil, Gabon and The Netherlands (Precious Woods, 2009). Proponents within the World Bank assert that:

The project will create a sustainable source of valuable wood for national and international markets, thereby reducing the pressures on natural forests. The project will thus bring about carbon sequestration as well as benefits to ecological, wildlife, and landscape diversity. This will enable sustainable, income-generation options for poor and vulnerable communities (2009).

The bank's claim that the Precious Woods Project will foster environmental diversity and social sustainability has been echoed in the words of some environmental groups including several that were surveyed as part of this research. Some proponents of monoculture afforestation claim that planting fast growing tree species on degraded lands may produce wood otherwise cut from native forests and used for firewood or construction. Monoculture forestry projects are a win-win situation according to proponents because logging "precious woods" like teak results in the production of furniture, flooring, and other products not intended for burning. In other words, commercial hardwood projects may reliably generate carbon offsets because the wood is intended for preservation and not incineration. Yet, there is great difficulty in determining the ultimate uses of these wood products particularly after the useful life of the item is gone. It is difficult to determine if wood that represents sequestered carbon may be deposited in a landfill or burned at some time in the future. A wood product burned—or simply decomposed—returns carbon back into the atmosphere invalidating the offset project at an undetermined time in the future. This unknown variable challenges the assertion that CO<sub>2</sub> will remain trapped in wood products in perpetuity.

According to award winning ecologist Vandana Shiva, monoculture tree farms reduce biodiversity and lead to water and soil degradation. Shiva emphasizes that "the exclusive focus on industrial wood destroys the food, fodder, and water production capacities of the forest...the eucalyptus (tree) has become a symbol of this monoculture" (Shiva, 1997;57). Similarly, Larry Lohmann of the UK-based research organization, The Corner House, argues that large-scale tree plantations in Costa Rica have devastated local



livelihoods as well as ecosystems. Lohmann goes on to outline how development efforts that employ monoculture plantations affect the forest by:

Compet(ing) aggressively for land that might otherwise be given over to secondary regeneration and conservation of native forest. In addition, because CDM forestry projects, for economic reasons, would probably have to cover 1000 hectares and upwards they could well threaten the land tenure of people carrying out other forest projects in Costa Rica. The average landholding in the country is less than 50 hectares, with most parcels belonging to families (2006;249).

Approximately 25% of Costa Rica's total land area is designated as 'national park,' 'protected area,' 'forest reserve,' or other protected biological zone (CCSA, 2005). Monocrops are not part of these protected zones and may simply put pressure on remaining unprotected forests. Similar to Costa Rica, Nicaragua has a comparable breakdown of parklands, with about 21.8% of total land area designated as protected (UNEP, 2009). However, in several respects, Nicaragua is more vulnerable to both deforestation and large-scale afforestation projects than Costa Rica due to a number of factors. Weak government regulation, economic impoverishment, and vertically integrated corruption challenge the preservation of native forests. Already, Nicaraguan forests have been exposed to rampant illegal logging operations and severe environmental degradation (Richards, M., Wells, A., Contreras-Hermosilla A., & Pommier D. (2003). Nicaragua is beginning to follow the Costa Rican model of sweeping tree farm style afforestation via carbon offsetting because the majority of non-protected land is privately owned. Nicaragua may also face even greater challenges to ecological sustainability and land tenure for the poor due to structural and economic hurdles that landless Nicaraguans continues to face.

The following sections provide a brief overview of primary research conducted in Central America. The sections describe two separate case studies integrated into the voluntary emissions trading market to provide a framework for analyzing the ways in which international development is interfacing with climate change policies.

### **Case Study 1: Forest Based Carbon Capture**

The subsequent account is based on primary research consolidated from interviews with several NGOs participating in the voluntary carbon offset market. Three tree nurseries and three afforestation sites were surveyed. Interviews with project participants were conducted. Three NGOs were surveyed first hand. The World Bank/Precious Woods project was investigated via literature and the Internet. Four development projects are analyzed in this chapter. For the purposes of clarity, each project is labeled with a different pseudonym. The first two NGOs described below used a limited variety of tree species. These organizations will be referred to as “Group I and Group II.” The third group focused on planting native trees and employing a community based approach to conservation will be referenced as Group III. The World Bank sponsored forestry program is described as the “The Precious Woods Project.”

Each organization surveyed applied different methodologies to achieve project objectives. These differences were also manifest in individual epistemologies of each organization. Group I and II planted only four types of trees for commercial wood and fuel production. These tree species were *cedro*, a type of true cedar, *pachote*, (*Ceiba aesculifolia*), eucalyptus, and *teca* (teak). Notably, both eucalyptus and teak are not

native to Central America. Group III planted only native trees for non-commercial use and employed a more broad reaching community-based approach to conservation.

The first organizations surveyed (Group I and II) had been working for over a decade to prevent deforestation of primary forest through large-scale tree planting projects. In conjunction with improved stove dissemination, tree nurseries were designed and funded by the organization, in conjunction with local woodcutter cooperatives that provided afforestation services. In exchange for their participation in tree planting, these cooperatives were granted government sanctioned permits to cut between 50-250 trees per year for their livelihood. The tree species selected for nursery cultivation were selected for their rapid growth and desirability for cyclical harvesting.

In both tree nurseries, eucalyptus was the most prevalent tree species grown, representing approximately 68% of total trees planted. Eucalyptus, despite the tree's benefits of rapid growth, is criticized as degrading natural resources for both people and the ecosystems. The non-native tree is known to significantly reduce the size of rivers, streams, and other water sources due to the species' voracious consumption of water, not to mention its damaging effect on soil microorganisms and food systems (Shiva, 1997;55).

Group I decided to plant eucalyptus out of a belief that the species was a useful tool in environmental sustainability and forest protection. Planting the fast growing tree reduced pressure for the clearing of native forest reserves. I was informed that before the project's inception, locals preferred burning native hard woods for cooking and heating. However, after several years of successful eucalyptus afforestation and cutting,

communities began to prefer eucalyptus for home cooking and heating to native wood varieties. The claim seemed substantiated to some degree by observing firewood vendors who sold mixed bundles of eucalyptus and native hardwoods at the same price. If pricing is a determination of local value, then eucalyptus was indeed at least equally valued as a fuel wood. The local people's ability to switch fuel varieties, native species to non-native eucalyptus, was proof that the NGO was having sustainable impact and moving in the right direction.

The assertion that planting eucalyptus takes pressure off local forests and leads to conservation is a primary justification used by proponents of monoculture afforestation work including the World Bank (World Bank, 2009). Some have argued that if conservation strategies prioritize commercial woods over native tree species, biodiverse landscapes will increasingly be replaced by commercial monoculture tree farms shown to lack many characteristics of a healthy forest ecosystem (Hartley, 2002).

I was informed by Group I that one of the central purposes of our visit to tree nurseries was to determine the level of support for further integrating carbon offsets into future forestry practices. The local nursery director was supportive of expanding the role of carbon offsets, which at the time of writing accounted for only a portion of the funding used for trees in the nursery<sup>15</sup>. The types of tree species felled by forestry workers during my visit to Group I's project site were large and more than 15 years old. These log piles did not appear to comprise the four tree species planted in conjunction with the NGO. In

---

<sup>15</sup> Note: The salary of the nursery worker was being paid by the NGO. Further, the nursery director was himself a forestry worker who was benefiting from the help of the NGO and eucalyptus plantations for his livelihood.

other words, the trees that I observed were not those planted during Group I's project lifetime. This might point to a 10 – 15 year 'lag time' between afforestation efforts and trees harvested. There would be great difficulty in determining the amount and quality of native forest preserved because of the afforestation project's efforts.

Group III differed in several key respects from Groups II and I. This unique NGO utilized carbon offset financing to fund the planting of a diverse array of trees for conservation showing that carbon finance may be used for a diversity array of afforestation projects besides being used for strictly commercial purposes. This organization's forestry activities are described in the following section.

### **A Different Approach to Forestry**

Separate in both approach and ideology, the NGO (Group III) promoted a type of integrated community-based afforestation that was different in several respects to the other groups. Local forestry jobs were provided in conjunction with community education programs for youth and adults. While the other groups planted limited tree species for commercial wood harvesting, this organization planted 52 varieties of native trees from seeds collected adjacent to project sites. Eight separate landowners were contacted. These owners were convinced to sign legally binding 40-year contracts allowing for native tree planting and protection. After the contract expires, there is hope to renew again for a longer period. Over two hundred thousand trees were reforested on 409 hectares, an area larger than central park in New York.

Local laborers, including women were employed. In the initial stages, 50 local workers planted and maintained trees. Labor was divided between women who tended the native tree nurseries, and men who planted and protected the saplings. Over the lifetime of the first stage of the carbon financed forest project (40 years), conservative estimates of carbon storage were estimated to amount to be approximately 170 thousand tons of sequestered greenhouse gases. This quantity is equal to removing 30,000 cars from the road for one year. The project's emissions savings and social impacts were verified by the Gold Standard.

The Gold Standard (GS) certification is one of the competing standards used by the voluntary offset market. Gold Standard projects boast 'triple bottom line' benefits, including environmental, societal and economic development aspects that other projects may not have (Gold Standard, 2009). The particular project under review was initiated with assistance from the United States Agency for International Development (USAID) and the US Forest Service. The Gold Standard is a Swiss-based nonprofit emissions verifier that pledges to "contribute to sustainable development and certifies their carbon credits for sale on both compliance and voluntary offset markets" (Gold Standard, 2009).

Since 2003, over 60 NGOs and interest groups have pledged support for emissions trading using the Gold Standard method including: The National Trust for Nature Conservation, The Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety, The Renewable Energy and Energy Efficiency Partnership (REEEP), and Mercy Corps (Gold Standard, 2009). According to many organizations involved in

carbon offsetting, the Gold Standard represents a well-respected source of project verification and contributes to the perceived authenticity of carbon offsets.

### **Privatizing Profits and Socializing Losses: A Guide to Corporate Funding**

The forestry NGO (Group III) described above appears to embody many sustainable development principles providing local jobs, and planting native trees for both environmental preservation and potential ecotourism benefits<sup>16</sup>. Group III's project activities occurred entirely on privately owned forestland. The NGO asserted that, "the government (of Nicaragua) is not powerful enough to protect the forest and so private organization's are more effective."

Primary factors contributing to forest degradation in the region of study include: institutional corruption, a weak state apparatus, land monopolies and undervalued forest goods and services (Contreras-Hermosilla, 2000). Group III employed a long term strategy towards conservation looking into the future for ecotourism potential instead of short-term economic benefits afforded to afforestation of lucrative woods species.

The organization's decision to value species diversity over monocrops was not however the most "efficient" way of gaining revenue under the current carbon offset market. According to the Business for Social Responsibility (BSR), a San Francisco-based think tank that works with corporations to encourage sustainable business practices, the fast growth rates of commercial tree varieties result in greater carbon

---

<sup>16</sup> Ecotourism is believed to be a potential future goal that may provide a sustainable source of financing for forest protection. Tourist dollars are attractive to many land owners. The NGO has promoted ecotourism as a potential benefit to incentivize the signing away of land use rights.

dioxide sequestration and create greater carbon offsets and financial rewards (BSR, 2006). The BSR claims that planting native trees is economically disadvantageous. The organization describes various reasons for not planting native trees. These include natives as “less efficient (at sequestering carbon dioxide) than many mono-crop projects” and “relatively expensive” compared to monocrops, although the organization does recognize that homogenous tree farms can “backfire in PR terms” (BSR, 2006;9). Corporate sponsors including The Ford Foundation and Levi Strauss Foundations fund the organization. US governmental agencies including USAID and the US Department of State also fund the BSR<sup>17</sup>. These funding sources may have objectives that include market expansions and increases in economic growth. The funding institutions listed above may benefit from emissions trading schemes which function in tandem with consumption models of production and western growth models. The BSR may overlook uncommodified local community forest resources use patterns that lie outside market economies which value profit over sustainability. Further, there are contrary arguments that refute the BSR’s assertions.

Nonnative tree species within monoculture tree plantations are not necessarily more efficient at sequestering carbon dioxide than native tree species. In fact, afforestation of nonnative species may lead to increased risk of disease, fire, and have unknown environmental impacts (Alaska Department of Natural Resources, 2004).

---

<sup>17</sup> Information on funding sources was obtained from the official BSR website at: <http://www.bsr.org/research//initiatives/funders.cfm> on November 24, 2009.



### **The Commodification of Nature: Environmental Services for Sale**

From a purely economic standpoint, controlling for the variable of negative PR, monoculture tree farms consisting of predominantly teak and eucalyptus, would be the logical choice for an organization interested in funding a forestry project via the voluntary carbon market. The cost scale employed within carbon offsetting exemplifies how free market environmental can marginalize the health of ecosystems and lead to dynamic negative impacts for adjacent communities.

The voluntary offsetting model meshes with the contemporary “logic” of commercial forestry practices. Market based approaches to environmental resource use have been shown to degrade native forest ecosystems and undermined land tenure for local inhabitants (National Research Council, 2002). For-profit forestry projects may overlook or undervalue availability of food and fuel reserves for local communities (Contreras-Hermosilla, 2000). The argument that greater growth leads to greater prosperity legitimizes monoculture forestry practices under the cap and trade model, but does little to address factors ‘external’ to the equation. These ‘externalities’ to the voluntary market, represent species diversity and life sustaining water resources. Non-commoditized ‘social goods,’ recognized by many ecologists and local communities, often do not fundamentally represent a part of the present voluntary cap and trade system. The environmental services provided by trees must be privatized and quantified in order to be considered part of voluntary climate change mitigation. In one project visited, locals

had been planting native trees for ecological reasons before the carbon offset project's inception. A local landowner explained that he had planted over 500 native trees on his land over the last 15 years in order to improve the environment and water quality. The man's neighbors had also participated in similar tree planting efforts without any payment for carbon offsets. This brings up issues of differential access to resources. Locals who may lack capital and western education may be less likely to access carbon finance markets. Alternately, as will be seen in the next case study, local organizations may enter into carbon credit contracts with western developers who will benefit disproportionately.

According to Group III, carbon offset financing was insufficient to support the true maintenance costs of the project. In other words, only a fraction of the NGO's revenues were carbon credit based and did not provide enough money to sustain the project over its five year lifetime. Corporate carbon financing provided approximately US \$6 dollars per stove unit. The organization was responsible for maintaining the project for a minimum of 5 years. In exchange, the business that provided the money for carbon credits could claim greenhouse gas reductions as soon as the paperwork was signed. This project model leaves NGOs in vulnerable positions. Two of the organizations asserted that carbon financing provides only minimal monetary resources for the total budget of a project. Other sources confirm that offset financing is often insufficient for total development costs. The CEO of a UK-based environmental organization, Trees for Cities, wrote a letter to the newspaper The Daily Telegraph in 2003 stating that:

Future Forests (a carbon offset corporation) had offered them (Trees for Cities) 50 pence (€ 0.75) to plant a tree and maintain it for 99 years. The real cost for this would be at least £5 per tree, meaning that Future Forests was offering us at best 10 per cent of the real cost. It would then sell-on the tree that we plant, paid for largely through charity donations that we have raised, for around £5 to £10 to the likes of Leonardo DiCaprio, Working Title, Avis and O2 to badge and claim as their 'tree'. This clearly is not additional. We rejected Future Forests' offer of 50p per tree because we have no intention of using our charitable donations to subsidize its business (Smith, 2007;21).

The director's assertion that voluntary carbon offsetting only accounts for a fraction of the true value of the forestry project shows a potential problem within the market. Carbon credit prices are prone to fluctuation due to market factors. Even at the times when offset financing is most valuable, the money is insufficient to pay for the real project costs. These costs are shifted onto the shoulders of the project developers, often under funded local NGOs from the Global South.

Global North-South power dynamics may confine NGOs to a vulnerable and sometime desperate position. One option for NGOs in developing nations is simply to agree to the carbon financier's conditions to receive an upfront "donation." The other option available to organizations is to reject carbon financing and compete for scarce and dwindling resources elsewhere. In essence, structural factors, most importantly the need for revenues, may force NGOs to seek unequal and often unfair deals with firms seeking carbon credits. Irrespective of fairness and responsibility sharing, the international carbon trading market continues to allow carbon credit buyers to enjoy the public relations benefits carbon offsetting can provide. These "benefits" are namely the legal ability to

pollute or sell pollution rights combined with a powerful social and environmental narrative. Social and ecological benefits in the developing world may be largely unknown. Unstandardized tools for measuring forestry and stove carbon offsets may complicate matters yet within sheltered western societies, corporations wielding compelling stories of social and ecological success may have a profound impact on perceived legitimacy. In other words, despite questionable scientific methods used to quantify carbon offsets, the public in the industrialized world may be persuaded into believing that emissions trading schemes are a legitimate means of addressing global warming. The following section will outline conclusions regarding the three development projects discussed in this chapter.

### **Case Study 1: Conclusion**

This first case study documented three NGOs (groups I, III, & III) to illustrate some of the diverse project models that function within forestry-based emissions trading schemes. According to the corporate and US government backed Business for Social Responsibility, native trees are less economically feasible from an efficiency standpoint than non-native monocultures because the former is seen to sequester carbon more rapidly than the latter. However, other researchers have concluded that native trees may grow just as rapidly as nonnative varieties while contributing to biodiversity and ensuring water resources remain intact. Further, forestry projects rely largely on theoretically projected carbon sequestration over the entire life of the project. In effect, proponents claim real world pollution occurring in the present will be mitigated by the future carbon

sequestration of the biological processes of trees. Unexpected events including forest fires, disease, illegal logging, and firewood collection may render carbon credits invalid decades after their sale. Irrespective of uncontrollable variables, the forestry projects surveyed were planting thousands of both native and nonnative tree species, while employing and educating locals on conservation topics.

The underlying goal of this thesis is not to devalue the work of the NGOs. Rather, in all cases, there are strong arguments for the environmental and social benefits of each project. Further, those individuals interviewed were working diligently to improve challenging conditions that were in effect far before development work began. The main assertion within the case study is that the voluntary carbon offset model does not provide adequate funding for NGOs to complete project objectives. More importantly, the contract between the Southern organization and the Northern funding agency, often places legal externalizes legal responsibility for project outcomes. In other words, the relationship is an effort—on the part of the Northern offset organization—to privatize profits via carbon credit sales and positive PR, while socializing losses via externalizing project risks, environmental impacts and legal responsibilities. The paper will now turn to a second case study focusing on an entirely different development project also utilizing financing from the voluntary carbon offset market.

## CHAPTER V

### CASE STUDY II. IMPROVED HOME COOK STOVES

Half the world's populations, or 3 billion people, use biomass for heating and cooking (Kaygusuz, 2002; Haines, A., & Kammen, D. 2000; Haines, A., Kovats, R., S., Campbell-Lendrum, D., & Corvalan, C. 2006). Biomass accounts for approximately 10% of all human energy use (Goldemberg, 2004). In the world's most economically poor regions, approximately 80% of the population burns biomass (Biran, A., Hunt, C., 2003). The total impact of biomass combustion on global warming is estimated at as much as 50 percent of total greenhouse gas emissions, with about one-third coming from households (Smith,1999;4).

In the voluntary carbon trading market, improved wood stoves, if used correctly have been shown to reduce fuel use by as much as 50% (Baldwin, 1987). Wood stove efficiencies depend largely on the skills of the cook as well as the quality and moisture content of the fuel available. Outside of controlled institutional settings. The stove project under review calculated that each carbon financed stove reduced approximately one ton of carbon dioxide per year.

#### **Introduction**

An improved wood stove project was examined to further understand the ways in which the voluntary carbon offset industry impacts development and local communities.

In exchange for the organization's cooperation, I worked to improve the efficiency of one of the NGO's current stove models in an attempt to reduce the quantity of wood needed to cook food. After three consecutive weeks of stove testing, a list of suggestions was made. Recommendations suggested that the organization make several small changes to their current stove design.

Through quantitatively testing procedures involving the Water Boiling Test (WBT), stove efficiency recommendations showed that a 14% decrease in wood use could be achieved with minor modifications. Equally important was that the modified stove design was found to increase cooking by a mean time of 30 minutes<sup>18</sup>. The more rapid cook time was important for cleaner combustion and because improved wood stoves must not only save wood, but also cook faster to increase likelihood of local sustainable adoption. Refer to Figure 1 in the appendix section of this work to examine the spreadsheet comparing the relative efficiency of traditional and prototype stove models.

### **History of the Organization**

The NGO had been struggling to stay in business for many years. Because of the economic recession, business was worse than usual. The organization had rented a warehouse space in order to build improved stoves on a contractual basis. There were

---

<sup>18</sup> Please see chart included in the paper's appendix for a detailed breakdown of the mean cooking times and wood use calculations. Findings reflect the results of the Water Boiling Test (WBT) under controlled conditions, using seasoned eucalyptus as a fuel source. All test results recorded are deemed 'significant' based on a 5% margin of error.

frequent breaks between orders and the organization had no office and no air conditioning. That was before the carbon credit contract began.

A large carbon offset corporation decided to broker a deal with the NGO allowing for the sale of carbon credits through the voluntary market. In exchange, the organization would provide improved stoves at a subsidized price to consumers. After the contract was signed, the initial portion of financing was allocated to the organization for present and future project participation, material costs, and additional expenses. The money was promptly used by the NGO to buy a permanent office space, complete with metal shop and warehouse. A company vehicle was purchased and two additional staff members were hired. A more comfortable office was constructed, complete with air conditioning.

The carbon credit financing provided initial capital for the organization to purchase materials to construct a large quantity of stoves in anticipation of future sale. The contract also provided continuous employment for the two metal fabrication workers for a several month period. The customers were primarily small business owners who produced tortillas or tamales from cottage industries and sold to the public from home.

There were also a smaller number of stoves produced simply for family use, however, due to the high cost of materials in relation to carbon credits generated per stove, the commercial models constitute the vast majority of stove types produced. Buyers received subsidies for participating in the carbon offset project. Initially, customers paid US \$6 dollars less than the original price. However, after a second NGO combined a separate voluntary carbon credit program, the subsidy on each stove purchase was increased to approximately US \$30 dollars less than the original price. This



subsidization allowed buyers to purchase stoves at 5 – 23 percent less than the item's original price.

In order to receive the subsidized stove price, buyers agree to sign contracts allowing organization employees and third party auditors the ability to visit their residences. These visits were to inspect the condition of stoves and conduct carbon emission tests to verify reductions and their subsequent offsets. My internship allowed me to accompany the directors on several visits to the homes of stove users. The individuals selected for visitation owned their stoves for one to two years. The two sites constituted a portion of the total emissions reducing stoves sold.

During my time with the organization, I visited five residences at each project site, for ten home visits. The information from these visits is not used as evidence of project efficacy as statistically significant sample number was not reached. Only one home had discontinued using their improved stove altogether. This family was in a periurban area outside a city of medium size. Three households were not using the stove properly and had either not cleaned the chimney properly or were not providing a proper seal around the stove body. One household was using two different models of improved stove concurrently to boil corn and make corn mash for tortillas. I was informed that semi-urban or rural stove owners were less likely to continue to use stoves properly, while city dwellers had higher rates of improved stove adoption. The stove users were often unaware of their role in a carbon offset project. A contract had been signed which allowed the buyer to receive a subsidization of the stove's price. Those who purchased the stove agreed to allow NGO-associated visitors to periodically conduct emissions tests

and other stove related tasks. However, these owners had varying degrees of knowledge regarding the role of their stove in a larger emission reduction framework.

### **The Contract: Small NGOs and Big Business**

The carbon offset project was intended to extend for 5 years after the project's inception. Emissions tests were to occur periodically. Stove users were to be subjected to routine carbon credit audits to ensure offset calculations were accurate and representative of the credits originally purchased. In the first phase of the contract, stoves were distributed at a subsidized cost made possible through carbon credit financing.

Both the NGO and the carbon finance agency had signed a three-year contract that was legally binding. After that point, another contract would initiate 'phase two' of the project that would subsidize the sale of more stoves for the remaining two years of the project. However, at the time of writing, one month after the expiration date of the original contract, the organization had received no word from corporate representatives. The NGO was under a great deal of stress, waiting for phase two. After hearing of the situation, I conducted several interviews to clarify the situation.

The directors explained that they had straight forward interactions with the corporation with whom they had originally worked. However, 6 months before the contract was to be renewed, that corporation was purchased by another business. After the company had changed hands, NGO-corporate relations had changed for the worse. The NGO's corporate liaison had been abruptly dismissed and replaced. Then, the company became unwilling to continue the contract until an unspecified later date.

Despite the NGO repeatedly asking for more information there had been no reply from the corporation as to future business agreements. This was causing significant stress for the NGO which had projected an operating budget by anticipating the continuation of the contract. In essence, the wood stove organization was placed in a vulnerable economic position as a result the corporate donor's failure to renew the contract.

The challenge for small organizations working with large multinational corporate funders may constitute a broad concern for the voluntary offset industry in general. Further, there are no universally agreed upon standard regulations in the voluntary market (Guthman, 2007). Carbon credit buyers must essentially trust the carbon broker to deliver a successful development project that will offset the amount of emissions originally calculated. In the case study observed, there was no way of knowing if the carbon offsets in fact reduced greenhouse gas emissions because of an unexpected project termination date.

A concern within this particular development project was one of transparency and accountability. To strengthen the legitimacy of future carbon offsets, carbon credit sale might be limited to after project completion of short-term agreements. There had been concerns during the beginning stages of emissions testing even before the contract's suspension. The third party auditing process had encountered significant hurdles. According to the NGO, a single auditor had been sent to conduct the stove tests. He had completed less than 10% of the total contract and conducted only one emission test of only one of the multiple stove models sold with offset financing. The auditor was thus unwilling or unable to conduct the remaining tests.

Eager to receive offset financing, the local organization had employed a business partner, a friend of the NGO, to encourage the auditor to complete the assignment. After the conversation, the auditor had decided to forgo the remaining tests and agreed to teach the emissions testing protocols to the organization's partner. The training took place and the business partner went on to complete the remaining tests and generate the audit report.

In the end, two individuals completed the emissions audit, one of whom was learning while on the job. A document produced was responsible for calculating expected savings in the quantity of GHG reduced over the project's lifetime. In the future, to avoid possible conflicts of interest there could be greater regulations placed on the auditor's relationship with the development organization to maintain the separation between third party verifier and development organization. According Sterk and Bunse of the German think tank the Wuppertal Institute, "one feature that is indispensable is the auditing of projects by independent third parties: otherwise the compensation cannot be regarded as credible (Taiyab, 2006;12). The third party audit was conducted by a friend of the organization calling into question potential conflicts of interest.

The information contained in the audit provided a theoretically representative sample of all stove emissions, controlling for temperature, fuel moisture content, observer's impact, personal cooking methods, and alterations in the frequency of use. The corporation approved the data in the document and the funds were transferred to the NGO a short time later.

The finances provided to the NGO were a percentage of the total value of the voluntary market's carbon credits. The sale prices for these credits have generally ranged from 6 – 12 USD depending on the condition of the voluntary market. The prices of voluntary offsets are determined through a variety of means. Valuation is initially set lower for the voluntary market than for the compliance markets because of regulatory differences and the “large volume of inexpensive agricultural sequestration offsets being offered, which would not be permitted under the other schemes (Taiyab, 2006;28). However, the price of voluntary carbon credits has since plummeted because of the economic downturn in the latter half of 2008. Also, in the lead up to the Copenhagen Climate Summit which promises to have monumental impacts on emissions trading, the voluntary market price has fallen dramatically to approximately 10 cents per credit (CCX, 2009).

Potential explanations for the contract termination are solely speculative. However, according to several development workers, there had been a shift in the type of preferred projects funded by the voluntary offset market. The majority of carbon finance shifted from wood and biomass stove projects and into reforestation and afforestation. The reasons for this shift are unclear, however, the voluntary market mimics the regulated market in many respects. Improved stove projects are not incorporated into the Kyoto Protocol as a Clean Development Mechanism (CDM). In essence there is not a standard for measuring emissions offsets based on UNFCCC guidelines. Conversely, forestry is included as a CDM and is considered more reliable and transparent.

Irrespective of the politics effecting market interests, the contract between NGO and corporation stated that all responsibility for monitoring and maintenance of the stoves rested on the shoulders of the NGO. The organization was also responsible for replacing broken stove parts, educating users on proper techniques, and accounting for those who stop using the stoves for whatever reason, also known as “leakage<sup>19</sup>.” After the original contract signing, the corporation was free to sell the credits on the open market via the Chicago Climate Exchange. The exchange is “North America’s only cap and trade system for all 6 greenhouse gases” (CCX, 2009).

Originally, the organization was able to contract a person to go door to door on a motorcycle to check on the condition of each stove every month. The NGO was however unable to provide replacement parts if a stove was broken. Instead, the organization could only recommend that the stove user purchase replacement parts at the owner’s expense. The inability to maintain stove user performance during the lifetime of the project were due to budgetary restrictions. The NGO’s inability to provide additional parts was a barrier to sustainable stove use and was a hindrance to project legitimacy.

After some time, the contracted individual responsible for checking on the status of stoves was laid off. At the time of writing, no one had monitored the stoves sold under the offset program. After the initial emissions evaluation, there was insufficient time or financial resources to validate the initial emission audit. Neither the NGO, corporation, nor third party auditor knew how many stoves were being used. The unknown project

---

<sup>19</sup> Leakage refers to a process in which polluters may relocate their activities to another location with more lax restrictions in order to avoid regulation (Capoor and Ambrosi, 2009).

status may serve as a warning to those individuals and businesses interested in purchasing carbon offsets. The project's shortcoming may also serve policy makers interested in building a means of addressing global warming that works. If an unknown quantity of the carbon credit market does not represent valid and known reductions in greenhouse gas emissions than the legitimacy of the system must be reconsidered. Other factors may also be of concern to carbon offset buyers. Among these considerations is the notion of "additionality" which is central to the legitimacy of a carbon offset project.

### **Additionality Explained**

Issues of 'additionality' also serve as unseen barriers to real world atmospheric carbon reductions. As previously mentioned, the question of "additionality" is answered by asking the question 'would this project have happened anyway?' If the answer is 'no' the project is additional to business as usual. Additionality, in the words of World Energy Solutions, a leading online commodity exchange is "the cornerstone of any carbon offset project, since it proves to consumers that their purchases are making a difference" (World Energy Solutions, 2009).

The improved wood stove manufacturing NGO had been selling stoves at unsubsidized prices for almost a decade before the corporation became involved. It would thus be challenging to prove the subsidized stoves were actually being used only because of the carbon subsidization program. In other words, an argument could be made that irrespective of carbon credit financing, people would continue to buy the stoves and use them to save wood and reduce emissions. I was unable to sufficiently address the

problematic issue of additionality during time spent with the wood stove producing organization.

I asked about the problem of transparency and what it might mean for the quality of the carbon credits. I was told by the NGO that whether the credits are legitimate or not, they have been sold by the offset corporation. This leads to questions of legitimacy and transparency in carbon offset development work. Is this individual carbon offset project an isolated example of the challenges of international cap and trade? Further, who should shoulder the responsibility of project outcomes? At present, the contracts often state that the NGO directly participating in development work is fully responsible for outcomes. However, according to both the wood stove manufacturing NGO and forestry organization (Group III) the carbon credit revenues initially received for the initial were insufficient to provide for the quantity of services expected from donors. Essentially, both these NGOs expressed some indignation from working with emission offset financiers. Frustrations from the forestry based NGO (Group III) centered on the insufficient amount of money given for services received. The stove producing organization had relied on carbon financing yet the contract had been unexpectedly terminated leaving the NGO in a difficult position.

Should the price of voluntary carbon credits be increased to provide NGOs with a realistic amount of revenue for the entire project? Should the carbon credit broker and NGO share equally in the responsibility for project outcomes? Would the system of carbon credits be more reliable if offsets were sold only after the completion of the development project? These are challenging questions to answer and it is not within the



scope of this paper to fully address these concerns. There are however, significant outstanding challenges within the voluntary market that are described through first hand experience. The dilemmas described in both case studies attempt to address issues of responsibility, ethics, and the real world impact of development. These concerns have been raised by some scholars, environmentalists and marginalized communities. Despite the challenges, each issue must be addressed if there is to be a functional and egalitarian system of emissions trading.

### **Case Study 2: Conclusion**

Many interesting features about the previous development project illuminate some of the challenges to the current voluntary market. The root causes of these challenges may be framed as structural or economic in nature. Contractual agreements may lose validity if corporate project oversight does not remain constant. In other words, if a corporation that sponsors carbon offsets is bought or sold midway through a development project there is need for continuity in donor support in order to maintain the legitimacy of carbon offsets.

In addition, corporate donors who sponsor offset projects may be under tremendous pressure from shareholders to produce quarterly growth and returns for the corporation. The market driven nature of cap and trade may perpetuate short-term corporate cost saving measures that do not support long-term growth. In this case, a corporation's failure to renew carbon emissions trading contracts may be viewed as a cost saving measure because carbon credits are generated and often sold at the beginning of

the project. Further, there may be little desire on the part of the donor to confirm project legitimacy because, short of a negative PR backlash due to failure, there is no legal obligation for the donor to ensure project success under this type of contract.

Other factors, which are not addressed by the current voluntary market relate to calculating the emissions generated during the production of the improved stove units. Greenhouse gases are released during the process of building stoves. The production of metal and paint is needed in stove construction as well as the fabrication, shipping, and eventual recycling of the stove itself. The emission producing materials just listed go unquantified within the voluntary carbon offset equation. Irrespective of the above mentioned aspects of stove production, the voluntary market does not currently recognize the GHG emissions released in the manufacturing process of improved stoves. A full system analysis of the greenhouse gases released in the process of stove construction is recommended to obtain more accurate emission reduction calculations for this type of development project.

Calculating the GHGs released during the monitoring process would also provide increased accuracy in total emissions. For example emissions generated by development workers and the motorcycle monitor during household stove visits certainly create greenhouse gases. The lack of calculating the entire project's emissions signifies that there lines have been arbitrarily been drawn to provide traction for carbon offset scenarios. In other words, emission offset projects may foster a focus on only the specific activities used to reduce emissions, while systematically excluding the actual emissions generated from all activities associated with development work. Further research may be

directed towards measuring the emissions released in the production of carbon offset projects including windmills and dam construction to provide a more accurate 'carbon footprint.'

As previously stated, the NGO was responsible for the huge task of monitoring the project. This presented significant challenges for the organization. To increase the likelihood of project success, the market may be forced to adjust the price of carbon credits to reflect true long term sustained program costs.

## CHAPTER VI

### EXPLANATION OF FINDINGS AND SIGNIFICANCE

The concrete impacts of improved stove projects remain unknown. According to one NGO employee, the subsidization of the price of cook stoves has often hindered project success. When people in the developing world are given items through full subsidization, the projects often fail. When individuals are asked to pay less for an item, the outcome is often less sustainable. However, this may not be the case for the poorest communities (Barnes, Openshaw, Smith, & Van Der Plas, 1994;24).

The voluntary market, lacking international accreditation under the Kyoto Protocol, may be unable to supply any real tangible environmental services. In the absence of quantified real world impacts, the carbon credit industry relies heavily on development narratives. In the improved wood stove case study, corporate carbon sellers relied on stories of improved indoor air quality and reduced infant mortality to sell carbon credits. Within the context of afforestation projects, pictures showing lush jungles and exotic animals, or social benefits to poor communities are employed. Both the World Bank monoculture afforestation project and the small scale NGO surveyed participated in constructing narratives using these three elements listed above.

The regulated carbon market has significant challenges due to a lengthy review process, significant bureaucracy, and the often-daunting cost of registering offset projects. Having a carbon offset project accepted by the Clean Development Mechanism

Executive Board can cost as much as US \$350 thousand dollars (Bayon, R., Hawn, A., & Hamilton, K. 2009;14). The NGOs surveyed stated that the process of verification through the compliance market was too complex for their organization. The Kyoto mechanisms could be seen as tacitly excluding small organizations from participating in the regulated market.

Some have termed carbon offsetting as “Enron environmentalism,” due to complex accounting practices often used to calculate emission reduction credits (Kronick, 2009). Why does a market exist for intangible carbon offset products? Diana Liverman, a Professor at Oxford University, examines the issue of the commodification of environmental services. Liverman identifies and describes three types of narratives generated by carbon offset dealers to cater to particular situated consumer sensibilities. The three types of narratives employed are the “quick fix for the planet, global-local connections and avoiding the unavoidable.” (Lovell, et. al, 2009;8). Liverman and coauthors go on to articulate how the production and consumption of carbon credits is an essential part of the carbon trading market. Marketing processes reify the intangible commodity that carbon credits represent. Businesses employ the zeitgeist of particular consumer and corporate preferences to sell this new product.

Afforestation projects within the voluntary market prioritize wood fiber production over native species diversity, forest health, and local access to land. The prioritization of the voluntary market comes in the form of the commodification of environmental services that provides economic incentives for more rapid growth, often at the expense of other factors. The trend towards the commodification of the forestry

projects as ‘wood producers’ and ‘carbon sinks’ may fail to incorporate species diversity, water purification and local resource access into project goals. “Impartial” or “objective” development methodologies must be situated into a larger historical processes and places within a political economy that recognizes power disparities between industrialized and developing nations.

### **Recommendations**

The corporation or entity responsible for brokering a carbon credit transaction essentially ‘privatizes’ the emotive power of the development project’s story under the current system of voluntary emissions trading. In other words, the owner of the carbon credit essentially owns a project narrative with social and environmental benefits for those in the developing world. The story may be used by a carbon trader to sell consumers over-the-counter offsets, or to a corporate polluter in the US.

A carbon credit dealer in the voluntary market leverages human emotions with development narratives. The dealer simultaneously ‘socializes’ the risk of project failure on the shoulders of the development organization and the other living creatures on the planet. In essence, privatizing monetary profits and socializing planetary risks and losses is the paradigm. If, for example, a project is found to be illegitimate, the corporate donor may simply claim ignorance and rely on the carbon offset contract to prove which party is accountable. Additionally, the actual carbon offset may have changed hands multiple times further confusing the situation. In short, cap and trade, and the voluntary market in particular, may appear to offer cost effective ways in which to avoid changes in resource

consumption and production in the Global North. In spite of this and from the perspective of environmental sustainability there is a need for greater accountability and a power shift away from carbon brokers to foster a more equitable interaction between actors. I make several recommendations below.

Needed are greater levels of responsibility sharing between carbon financiers and those organizations that carry out projects on the ground. If western nations are to commoditize the environmental commons and make decisions affecting the global climate, there must be responsibility for projects that do not go according to plan. In other words, if monetary profits from carbon trading are privatized, so to should be the losses.

### **Conclusion**

The paper's overarching goal is not to defraud the important development projects under review. In fact, throughout field research I was impressed with both NGO's abilities to foster on the ground sustainable development solutions while utilizing scant resources. The accomplishments and social impacts of integrating carbon finance into these projects are less clear. Measuring emission reductions relating to improved stove projects are at best inexact, leading to questionable quality carbon credits. Further, powerful market mechanisms are influencing the ways in which carbon financed development projects are conducted.

Publicly traded corporations experience external pressure from shareholders to produce quarterly financial growth. Internal management pressure, currency inflation, and competition may also force high mid level management to prioritize decisions based

on capital expansion rather than project quality and legitimacy. This market driven model fosters an accounting framework that conceptualizes environment degradation as “externalities” that traditionally go unrecorded while privatizing profits (Brook, 2001). Broad changes to energy use must occur in the Global North. Extremely complex international emissions trading mechanisms with marginal levels of transparency are less reliable than intra-national level changes that have long term benefits.

Tree plantations use land for ‘environmental services’ for developed nations. Tree farms are often former cattle ranches, agricultural lands, or tropical rainforest. Land that may have been beneficial to local communities for subsistence uses may become less available because of private corporate mono-crops. In addition to privatization of land, we witness the privatization of the ‘atmospheric commons.’ In other words, the ‘ownership of pollution rights’ as a commodity, lies at the heart of the cap and trade debate. The political economy of voluntary carbon trading thus centers on power and access to polluting the atmosphere.

What the paper has demonstrated is that carbon offsetting—in its present form—only increases global wealth and power disparities. Those organizations that support carbon trading also stand to benefit by continued access to pollution rights. Additionally, private businesses also procure potentially lucrative financial commodities with compelling social or ecological narratives (Lovell, Bulkeley, & Liverman, 2009 in press).

Efforts to increase transparency of carbon offsetting may have a beneficial impact on the public’s impression of global efforts to curb greenhouse gas emissions. Climate change legislation and policies influence everyone on the planet, particularly those in the



developing world, less able to adapt to ecological changes. Unfortunately, not all impacted by voluntary and compliance UNFCCC policies will have the opportunity to voice their opinions and interests on the matter.

Global warming mitigation strategies must be legitimate in the eyes of the public in both the global North and South. Those in the developing world where the majority of GHG mitigation projects take place must directly benefit from carbon offsetting schemes if there is to be lasting change. Those who use improved stove technologies should also share in the monetary profits generated by the carbon credits they produce.

Both improved stove and afforestation projects are valuable projects that stand alone irrespective of carbon finance in benefiting human health and environmental preservation. Improved stoves are capable of significantly reducing fuel consumption while improving human health and indoor air quality (Smith, 1999). Afforestation projects also significantly reduce logging pressures on native forest reserves while providing opportunities for future local livelihoods through ecotourism and environmental resource protection (Satyanarayana, 2008).

There is the risk of potentially underrepresenting the importance and social impact of development projects when carbon credits become integrated. This risk occurs when international interest in global warming mitigation programs eclipses other aspects of international development projects. Carbon offsets have been useful from a project-funding standpoint. However, traditional development work may be framed as 'global warming mitigation' by NGO fundraisers looking for ways to sponsor their work.

From an instrumentalist standpoint, NGOs that seek funding by using the ‘hot topic’ of global warming may act as a pragmatic solution. Yet, within a larger political and economic framework organizations from developing nations are allowing carbon financiers to expropriate beneficial environmental and social narratives for pennies on the dollar of the real cost of doing development. Narratives refer to the stories used to promote development to external parties including potential project donors. An example of carbon dealers ‘harvesting narratives’ may be found in advertisements of carbon offset businesses. These narratives stress the real environmental risks of dangerous climate change and support lifestyle adjustments, in conjunction with emission offsetting. One offset company named Native Energy tells consumers “we’ll do the dirty work, NativeEnergy makes it easy for you to do your part to contribute to global warming solutions and help communities in need create sustainable economic benefits” (2009). The subtext to this statement must be unpacked. The underlying assertion is that consumerism is capable of providing easy and convenient solutions to dangerous climate change.

The voluntary carbon offset market has been characterized as ‘environmental greenwash,’ ‘Enron environmentalism,’ or as a wholly fraudulent activity. This thesis has argued that the current models of voluntary carbon offsetting are incompatible with sustainable development. A primary reason for the success of cap and trade is that the model is the most market friendly approach to addressing global warming. However, conventional development narratives are responsible for creating the environmental crisis and are not likely to have generated lasting solutions to dangerous climate change.

This paper has described the key players and competing interests working within the rapidly evolving carbon trading market instead of being for or against carbon offsetting. These interests include NGOs, corporate funders, and third party auditors. Both projects analyzed clearly have beneficial impacts, both environmentally and socially. However, cap and trade supports a developmentalist paradigm that continues a system of power relations between North and South. The model is environmentally unsustainable and perpetuates cultural and ecological degradation through privatization of land, seeds, and pollution rights. Those who desire straightforward social and environmental approaches should oppose the cap and trade model.

Corporations functioning under profit driven systems are ill equipped to shoulder the responsibility of long-term complex development work. In this regard, corporations seem well aware of the capitalist market's failure to address these shortcomings. Contracts between businesses and NGOs have been written to reflect the corporations' reluctance to accept responsibility and liability of unknown project outcomes. The wording of carbon offset contracts essentially fosters a second type of offset: that of 'offsetting responsibility' for failed development work. Development narratives may generate positive PR for project funders resulting in the public's false sense that climate change is indeed being addressed.

Despite these concerns, small organizations do receive carbon financing which allows NGOs to do more development work. However, in return the carbon credits the offset sponsor receives immediate access to a saleable commodity as well as pollution rights. NGOs that are struggling economically may choose to accept long-term

responsibility and become indebted to project funders while shouldering the legally responsibility for project outcomes. NGOs in developing nations once again provide the land and labor base for corporate outsourcing this time providing ‘environmental services’ to heavy industries. In exchange for a token contribution, businesses continue to legally maintain the right to pollute the atmospheric commons. Carbon trading reinforces wealth disparities between rich and poor.

In her article: *Copenhagen Climate Change Summit not Merely a Seattle Do-over*, Award winning journalist Naomi Klein presents the notion that “offsets and sinks threaten to become a resource grab of colonial proportions” (2009). Klein refers to the privatization of atmospheric resources in the hands of multinational corporations. Commodification of the earth’s ability to regulate human and other forms of life is conceptually transferred into the hands of capitalist market forces that perpetuated the climate crisis. Moving beyond criticism, there are many feasible solutions being presented by cap and trade critics.

One logical answer to the dilemma of seemingly unfair contractual agreements between offset companies and developers would be to create more balanced contracts that share responsibility equally between businesses and project developers. This solution would sound promising if power were indeed shared equally between both parties. The Global North-South dichotomy with wealth and resource disparities does not create a level playing field for equal distribution of power. Northern countries and multinational corporations are largely responsible for causing global warming and are the primary

players in creating carbon offset systems. If industrialized countries construct the rules of the game for Southern players, there is little chance of egalitarian power sharing.

There seem to be few choices available for addressing climate change. Worse, environmental protection has become commodified to the point that efforts to ‘save the planet’ are conducted through commercial markets and through consumerism, rather than through fundamental changes to resource use patterns. In other words, the cap and trade model encourages individuals and corporate entities with available wealth to buy their way out of individual lifestyle changes simply through monetary transactions. In other words, the production and consumption of emission offsets supports conventional corporate behaviors fostering processes of production that are incompatible with environmental sustainability.

The case study documenting the stove project demonstrates that emission reductions, at least within the voluntary market, may have unknown GHG reductions. Emissions trading works on a theoretical level, but in practice significant greenhouse gas reductions may not occur due to factors previously discussed.

For project funders and development organizations seeking or receiving offset funding, there are significant challenges. The decision seems to be either the fickle price fluctuations or irregularities of the US voluntary market, or the bureaucratic and costly UN sponsored CDM. The voluntary and compliance models of emission trading fail to address underlying disparities in wealth and resource use between economies in the North vis-à-vis South. Industrialized nations are responsible for the heavy emphasis on the hydrocarbons sector and continued reliance on fossil fuel inputs. Narratives meant to

address climate change are based on uncertain scientific information about how best to reduce or store greenhouse gases. Development experts participate in myriad competing voluntary 'standards' claiming to be solving the global climate catastrophe. Simultaneously, critics of carbon trading are marginalized as unproductive.

There are also fundamental flaws within the UNFCCC' Kyoto Protocol model. Standardized methodologies do allow greater consistency in calculating emissions metrics. However, the developed and developing world are separated into categories with varying degrees of responsibility. Under UNFCCC guidelines, industrialized nations whose governments have signed and ratified the Kyoto Protocol fall under "Annex I" and "Annex II" categories. Developing nations particularly Brazil, Russia, India, and China (BRIC) are not legally bound to greenhouse gas emissions caps. These three denominations signify each country's role in combating climate change and are "in accordance with the principle of "common but differentiated responsibilities" (UNFCCC, 2009).

One glaring flaw present within the UN framework is that some nations remain outside the framework emission caps. Rapidly growing developing nations, specifically Brazil, Russia, India, and China's (BRIC) economies, produce huge quantities of greenhouse gases that go unregulated and serve as a stockpile of tradable emissions permits. The problem lies in that much of the greenhouse gas emissions produced overseas, particularly those from China, are the result of manufacturing demands made by markets in the Global North. In other words, global warming gases released in developing nations are profoundly connected to foreign markets.

China has become a convenient target for public criticism in the western media. This criticism of Chinese environmental practices may obscure the foundational reasons for climate change. One source asserts that “the carbon dioxide embedded in China's exports to the United States in 2004 alone is estimated at 1.8 billion tons, equivalent to 30 percent of the US total” (Muldavin, 2007). In essence, the greenhouse gasses released in China are fundamentally connected to US consumption and industrial demands. Further, China’s per capita emissions are only one sixth of those in the US. In other words, China may simply be an easy target for ‘strategically ignorant’ industrialized nations unwilling or unable to claim responsibility for a global environmental catastrophe.

The conventional ideology that justifies that developing nations should be provided unregulated pollution rights is founded on the notion that all countries will progress through the same stages of development that industrialized nations passed through. The idea is flawed for several reasons. Developing nations do not have other resource bases to exploit as western nations once used colonies to facilitate their modernization. Further, it is not nations in the South that are asking for the freedom to release emissions, but the institutions of the North who stand to gain from the unequal power relationship (Norberg-Hodge, 2008).

This thesis has aimed to document a growing market based approach to global warming that is rooted in unequal power dynamics between local development agencies in the Global South and corporate donors in the North. Complexity exists within each project surveyed and should not be oversimplified. The discussion of afforestation projects serve to illustrate that limited diversity tree farms funded by the World Bank are

drastically different from the work of local NGOs. These differences exist as compared to afforestation projects that plant native trees and incorporate locals into sustainable development. These differences, including benefits to biodiversity and human subsistence though not often commoditized under the voluntary market, serve as reminders that cap and trade policies may overlook essential components of development.

At present, significant challenges exist that fundamentally threaten the credibility of both the voluntary and regulated carbon offset markets. These concerns relate to the insufficient quantity of revenues provided by corporations to NGOs for ‘environmental services’ provided. Further, the quantities of greenhouse gases reduced through the wood stove project are unknown due to a lack of empirical information. If a carbon offset model is to be legitimate, there is a need for nonpartisan checks at each stage of the project, from inception to completion. Further, those community members who had purchased subsidized home cook stoves were often unaware of their involvement in a greenhouse gas offset project.

Specific development narratives continue to shape the discourse surrounding global warming policy. The paternalistic moral imperative to assist is written into carbon-offset marketing to consumers or used to leverage financial support for questionable development work. The ‘anti-politics machine’ of climate change mitigation policy serves, as Ferguson points out to “depoliticize everything it touches, everywhere whisking political realities out of site, all the while performing, almost unnoticed, its own pre-eminently political operation” (Ferguson, 1985;xv). The ‘political operations’ found in global warming policies are based on privatization of the commons and North-South



wealth disparities. Under a guise of environmental protection, carbon finance has become a multi-billion dollar industry that consolidates capital by privatizing pollution regulations. The system socializes losses onto the atmospheric commons and the 'developing world' most at risk for climate change impacts.

Carbon offsetting is a means of systematically discounting the public's role in shaping environmental policies via the creation of overly complex international trading schemes controlled by experts and largely incomprehensible to the public. There must be broad changes to energy use patterns that should occur on the national, rather than international, level to ensure greater levels of transparency to more effectively address global warming. Industrialized nations must accept greater responsibility for creating dangerous climate change while assisting developing nations in building renewable energy systems and working towards ending the global dependence on hydrocarbons. Alternatives to market based approaches to climate change should seriously be considered.

## APPENDIX A

## WATER BOILING TEST FOR TRADITIONAL STOVE

This chart shows the average fuel wood consumed over the course of nine (9) tests on the existing stove model used by the wood stove nongovernmental organization. The average time to boil a cold pot containing 5 liters of water is 91.7 minutes while the average time to boil water from a “hot start” is 49.9 minutes. To maintain five liters of water at a simmer requires approximately 132 grams of wood. The entire test is known as the “Water Boiling Test.”

| 1. HIGH POWER TEST (COLD START)     | units   | Test 1 | Test 2  | Test 3 | Average | St Dev  |
|-------------------------------------|---------|--------|---------|--------|---------|---------|
| Time to boil Pot # 1                | min     | 87     | 112     | 77     | 91.7    | 18.1    |
| Temp-corrected time to boil Pot # 1 | min     | 94     | 118     | 83     | 98.7    | 18.0    |
| Burning rate                        | g/min   | 26     | 22      | 26     | 24.4    | 2.5     |
| Thermal efficiency                  | %       | 9%     | 15%     | 13%    | 12%     | 3%      |
| Specific fuel consumption           | g/liter | 276    | 346     | 263    | 295.2   | 44.5    |
| Temp-corrected specific consumption | g/liter | 302    | 367     | 285    | 317.7   | 43.2    |
| Firepower                           | watts   | 7,276  | 6,060   | 7,259  | 6865    | 697.0   |
| 2. HIGH POWER TEST (HOT START)      | units   | Test 1 | Test 2  | Test 3 | Average | St Dev  |
| Time to boil Pot # 1                | min     | 53     | 48      | 49     | 49.9    | 3.1     |
| Temp-corrected time to boil Pot # 1 | min     | 60     | 83      | 53     | 65.4    | 15.5    |
| Burning rate                        | g/min   | 26     | 26      | 20     | 23.6    | 3.3     |
| Thermal efficiency                  | %       | 18%    | 17%     | 26%    | 20%     | 5%      |
| Specific fuel consumption           | g/liter | 172    | 175     | 130    | 159.2   | 25.1    |
| Temp-corrected specific consumption | g/liter | 193    | 305     | 143    | 213.6   | 82.8    |
| Firepower                           | watts   | 7,174  | 7,167   | 5,542  | 6628    | 940.0   |
| 3. LOW POWER (SIMMER)               | units   | Test 1 | Test 2  | Test 3 | Average | St Dev  |
| Burning rate                        | g/min   | 17     | (8)     | 21     | 18.7    | 15.8    |
| Thermal efficiency                  | %       | 7%     | 8%      | 8%     | 7%      | 1%      |
| Specific fuel consumption           | g/liter | 112    | 141     | 142    | 131.6   | 17.2    |
| Firepower                           | watts   | 4,738  | (2,383) | 5,762  | 5250    | 4,436.7 |
| Turn down ratio                     | Ratio   | 1.54   | (2.54)  | 1.26   | 1.40    | 2.3     |

The key figures on the chart above are the figures in the column titled “average.” The prototype model was approximately 26 minutes faster to boil in the cold start than the traditional though the wood use was only 22 grams different between stove models. In addition, the prototype model had reduced smoke emanating from the fuel magazine.

## APPENDIX B

## WATER BOILING TEST FOR PROTOTYPE STOVE

Similar to the previous graph in Appendix A, this graph shows a stove prototype that has been modified to have a larger exit chamber for smoke to escape from. The time to boil water from a “cold start” is significantly reduced from an average time of 91.7 minutes (traditional model) to 65.8 minutes (prototype model). The prototype model averaged 44.4 minutes during the “hot start” while the traditional model averaged approximately 49.9 minutes. During the simmer test, the prototype model used about 102 grams of wood compared to 132 grams for the traditional model. In most respects the traditional and prototype, models are similar. The main difference between the two stove models is the time it takes to boil water from a cold start. The prototype model outperformed the traditional model by an about 26 minutes while using approximately the same quantity of wood (295 grams compared to 273 grams respectively). All Water Boiling Tests simmered 5 liters of water for a minimum of 30 minutes.

| 1. HIGH POWER TEST (COLD START)     | units   | Test 1 | Test 2 | Test 3 | Average | St Dev  |
|-------------------------------------|---------|--------|--------|--------|---------|---------|
| Time to boil Pot # 1                | min     | 53     | 63     | 82     | 65.8    | 14.8    |
| Temp-corrected time to boil Pot # 1 | min     | 56     | 66     | 86     | 69.4    | 15.2    |
| Burning rate                        | g/min   | 41     | 27     | 28     | 32.0    | 8.2     |
| Thermal efficiency                  | %       | 9%     | 12%    | 12%    | 11%     | 2%      |
| Specific fuel consumption           | g/liter | 289    | 222    | 308    | 273.0   | 45.2    |
| Temp-corrected specific consumption | g/liter | 309    | 232    | 324    | 288.3   | 49.2    |
| Firepower                           | watts   | 11,856 | 7,497  | 7,859  | 9004    | 2,303.9 |

  

| 2. HIGH POWER TEST (HOT START)      | units   | Test 1 | Test 2 | Test 3 | Average | St Dev |
|-------------------------------------|---------|--------|--------|--------|---------|--------|
| Time to boil Pot # 1                | min     | 50     | 44     | 40     | 44.4    | 4.9    |
| Temp-corrected time to boil Pot # 1 | min     | 53     | 46     | 44     | 47.6    | 4.7    |
| Burning rate                        | g/min   | 29     | 27     | 34     | 29.8    | 3.6    |
| Thermal efficiency                  | %       | 16%    | 18%    | 16%    | 16%     | 1%     |
| Specific fuel consumption           | g/liter | 182    | 156    | 169    | 169.1   | 12.9   |
| Temp-corrected specific consumption | g/liter | 194    | 163    | 187    | 181.5   | 18.2   |
| Firepower                           | watts   | 8,102  | 7,536  | 9,476  | 8372    | 997.6  |

  

| 3. LOW POWER (SIMMER)     | units   | Test 1 | Test 2 | Test 3 | Average | St Dev  |
|---------------------------|---------|--------|--------|--------|---------|---------|
| Burning rate              | g/min   | 13     | 21     | 9      | 14.4    | 6.4     |
| Thermal efficiency        | %       | 6%     | 7%     | 14%    | 9%      | 4%      |
| Specific fuel consumption | g/liter | 87     | 159    | 58     | 101.5   | 51.9    |
| Firepower                 | watts   | 3,695  | 5,987  | 2,469  | 4050    | 1,785.3 |
| Turn down ratio           | ---     | 3.15   | 1.25   | 3.18   | 2.53    | 1.1     |

## APPENDIX C

## GLOSSARY OF TERMS

**Additionality:** According to the Kyoto Protocol, emission reductions generated by Clean Development Mechanism and Joint Implementation project activities must be additional to those that otherwise would occur. Additionality is established when there is a positive difference between the emissions that occur in the baseline scenario, and the emissions that occur in the proposed project (Capoor & Ambrosi, 2009).

**Afforestation:** The process of establishing and growing forests on bare or cultivated land, which has not been forested in recent history (Capoor & Ambrosi, 2009).

**Reforestation:** This process increases the capacity of the land to sequester carbon by replanting forest biomass in areas where forests have been previously harvested (Capoor & Ambrosi, 2009).

**Improved Stove:** A wood or biomass cooking device that reduces emissions from combustion by increasing thermal efficiency, reducing human exposure rates to harmful indoor gases through a chimney or increased incendiary efficiency.

**Leakage:** Process by which emitters relocate activities to avoid regulation (Capoor & Ambrosi, 2009).

**Carbon credits:** Carbon credits are applied to six green house gases (GHG): sulfur hexafluoride, hydro fluorocarbons, perfluorocarbons, nitrous oxide, methane and CO<sub>2</sub>. One carbon credit equates to a decrease of one metric ton of CO<sub>2</sub> (Bayon, R., Hawn, A., & Hamilton, K. 2007).

**Chicago Climate Exchange (CCX):** Members to the Chicago Climate Exchange make a voluntary but legally binding commitment to reduce GHG emissions in 2010 by 6% below a baseline period of 1998-2001.

**Clean Development Mechanism CDM:** “The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO<sub>2</sub>, which can be counted towards meeting Kyoto targets” (UNFCCC, 2008).

**Certified Emissions Reduction Credits (CER):** “The clean development mechanism allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one ton of CO<sub>2</sub>. CERs can be traded and sold, and used by industrialized countries to meet a part of their targets under the Protocol” (UNFCCC, 2008).

**Verified Emission Reduction Credit (VER):** is not mandated by any law or regulation, but originate from an organization’s desire to take active part in climate change mitigation efforts” (DNV, 2008).

## REFERENCES

- Alaska Department of Natural Resources. (June, 2004) Frequently asked questions about reforestation with non-native trees in south-central Alaska. Division of Forestry. Pp 1-3.
- Baldwin, F. S. (1987). Biomass stoves; Engineering design, development, and dissemination. VITA. Princeton University Press.
- Barnes, P. (2008). A Climate solutions; A citizen's guide. Chelsea Green Publishing. White River Junction, Vermont.
- Barnes, D. Openshaw, K., & Smith, K. (1994). What makes people cook with improved biomass stoves; A comparative international review of stoves. World Bank Technical Paper number 242. Energy Series. The International Bank for Reconstruction. Washington D.C.
- Bayon, R., Hawn, A., & Hamilton, K. (2009). Voluntary carbon markets: An international business guide to what they are and how they work. Retrieved December 27, 2008, from <http://books.google.com/books?hl=en&lr=&id=6KL6OXtCGkoC&oi=fnd&pg=PR9&dq=%22voluntary+carbon+market%22&ots=10XLCoNhrx&sig=dhThG7DJU1CkSCNkZfK-mAMAUl4#PPA4,M1>.
- Biersack, A., and Greenberg (2006). Reimagining Political Ecology. Duke University Press. Durham & London. Introduction Pp; 3-15.
- Biran, A., & Hunt, C. (2003). Indoor air pollution, cooking stoves and health. WELL Fact Sheet, Department for International Development of the British Government.
- Broekhoff, D. (2007). Testimony before the House Select Committee on Energy Independence and Global Warming. Voluntary Carbon Offsets: Getting What You Pay For. U.S. House of Representatives, July 18, 2007. World Resources Institute. Available at [http:// pdf.wri.org/20070718\\_broekhoff\\_testimony.pdf](http://pdf.wri.org/20070718_broekhoff_testimony.pdf)
- Bryant, R., & Bailey, S. (1997). Third World political ecology. Routledge. New York, NY. Pp; 1-12.
- Brook, D. (2001). The ongoing tragedy of the commons. The Social Science Journal. Vol. 38. Issue 4. Pp 611-616.

- Bullard, R. (1993). *Confronting environmental racism; Voices from the grassroots*. South End Press. USA.
- Bumpus A.G. and Liverman D.M (2008). Accumulation by decarbonisation and the governance of carbon offsets. *Economic Geography* 84(2): 127-156.
- Business For Social Responsibility (BSR) (2006). *Offsetting Emissions: A Business Brief on the Voluntary Carbon Market*. Accessed on Oct, 23, from [www.pewclimate.org/.../BSR%20Voluntary%20Carbon%20Offsets.pdf](http://www.pewclimate.org/.../BSR%20Voluntary%20Carbon%20Offsets.pdf).
- Butler, R. (2007). China may top U.S. in greenhouse gas emissions in 2007. Retrieved November 22, 2009, from <http://news.mongabay.com/2007/0323-china.html>.
- Capoor, K. & Amrosi, P. (2009). *State and trends of the carbon market 2009*. Washington DC: The World Bank, 2009 - [wbcarbonfinance.org](http://wbcarbonfinance.org).
- Capoor, K. and Ambrosi, P. (2006). *State and trends of the carbon market*. Presentation based on World Bank confidential project database. Accessed on Oct 23, from [http://epa.gov/highwp/electricpower-sf6/documents/conf06\\_capoor.pdf](http://epa.gov/highwp/electricpower-sf6/documents/conf06_capoor.pdf).
- Carbon Finance. (2009). *Carbon Finance at the World Bank: Project Cycle*. Retrieved October 26, 2009, from <http://wbcarbonfinance.org/Router.cfm?Page=ProjCycle&ItemID=24688>.
- Carerram, N., Cotarelo, M. (2003). *Social struggles in present day Argentina*. *Bulletin of Latin American Research*, Blackwell Synergy.
- CCSA (2005). *Costa Rica National Parks - MINAE and SINAC*. Official Website. Retrieved October 22, 2009, from <http://www.costarica-nationalparks.com/>.
- CCX (2009). *Chicago Climate Exchange Overview*. Retrieved October 20, 2009, from <http://www.chicagoclimatex.com/content.jsf?id=821>.
- CDM Rulebook (2009). *CDM Rulebook - Forestry - Eligible Projects - What are forestry projects?* Retrieved October 29, 2009, from <http://cdmrulebook.org/497>.
- Chestney, N. (2009, October 13). *Voluntary CO2 market not netting emissions cuts*. *Green Business*. Reuters. Retrieved October 14, 2009, from <http://uk.reuters.com/article/idUKTRE59C2GV20091013>.

- Climate Care. (December 11, 2009). US companies urge lawmakers to include non-US carbon offsets: About ClimateCare : Helping Reduce Your Carbon Footprint :: Climate Care. Retrieved November 12, 2009, from <http://www.jpmorganclimatecare.com/about/news/businesses-demand-international-offsets/>.
- Climate Group (The). (2007). The Climate Group | News and Events | VCS Launch - A New Quality Assurance for the World's Carbon Market. Retrieved October 30, 2009, from [http://www.theclimategroup.org/news\\_and\\_events/vcs\\_launch\\_a\\_new\\_quality\\_assurance\\_for\\_the\\_worlds\\_carbon\\_market/](http://www.theclimategroup.org/news_and_events/vcs_launch_a_new_quality_assurance_for_the_worlds_carbon_market/).
- Cohen, S. (2007, November 1). Is the latest climate change bill getting warmer? Capitol Report - MarketWatch. Retrieved December 1, 2009, from <http://www.marketwatch.com/story/is-the-latest-climate-change-bill-getting-warmer>.
- Cohen, S., Demeritt, D., Robinson J., & Rothman D. (December, 1998). Climate change and sustainable development: towards dialogue. *Global Environmental Change*. Vol. 8, Issue 4, Pp 341-371.
- Contreras-Hermosilla, A. (June 2000). The underlying causes of forest decline. Center for international forest research. Vol. 30. Pp 1-6. Jakarta, Indonesia.
- Cotula, L., Dyer, N., & Vermeulen, S. (2008). Fuelling exclusion?: the biofuels boom and people's access to land. Google Books. Retrieved November 24, 2009, from [http://books.google.com/books?hl=en&lr=&id=QrYFjxjHO2SkC&oi=fnd&pg=PA1&dq=afforestation+and+access+to+land&ots=X5Yf9vea\\_p&sig=pombo16skh0YDTfFjoWsXJW\\_GR8#v=onepage&q=afforestation%20and%20access%20to%20land&f=false](http://books.google.com/books?hl=en&lr=&id=QrYFjxjHO2SkC&oi=fnd&pg=PA1&dq=afforestation+and+access+to+land&ots=X5Yf9vea_p&sig=pombo16skh0YDTfFjoWsXJW_GR8#v=onepage&q=afforestation%20and%20access%20to%20land&f=false).
- Cryderman, K. (Oct 3, 2009). Carbon offset plan needs safeguards: auditor. (n.d.). Retrieved October 4, 2009, from <http://www.calgaryherald.com/business/energy-resources/Carbon+offset+plan+needs+safeguards+auditor/2061269/story.html>.
- Cycle (The) (2008). Offset. Retrieved December 28, 2008, from [http://unfccc.int/search/search?q=%22voluntary+market%22&btnG=Search&entq=r=0&output=xml\\_no\\_dtd&sort=date%3AD%3AL%3Ad1&ud=1&client=unfccc\\_frontend&oe=UTF-8&ie=UTF-8&proxystylesheet=unfccc\\_frontend&site=default\\_collection](http://unfccc.int/search/search?q=%22voluntary+market%22&btnG=Search&entq=r=0&output=xml_no_dtd&sort=date%3AD%3AL%3Ad1&ud=1&client=unfccc_frontend&oe=UTF-8&ie=UTF-8&proxystylesheet=unfccc_frontend&site=default_collection).
- David Suzuki Foundation: Marine Scene Issue #22. (2009). Retrieved 10/4/2009 from [http://www.davidsuzuki.org/print/Climate\\_Change/What\\_You\\_Can\\_Do/trees3.asp](http://www.davidsuzuki.org/print/Climate_Change/What_You_Can_Do/trees3.asp)



David Suzuki Foundation. (2008) Credit Check; A comparative evaluation of tree planting and fossil fuel emission reduction offsets. Vancouver B.C. Canada.

Det Norske Veritas (DNV). (2008). Voluntary Emission Reductions. DNV.

Eckstein, S., & Merino Garreton M. (2001). Power and popular protest: Latin ... - Google Books. Retrieved October 28, 2009, from [http://books.google.com/books?hl=en&lr=&id=V0o7\\_ILFOMwC&oi=fnd&pg=PR7&dq=latin+america+land+and+power&ots=l3DPGFcPCx&sig=r4qVkMg112R2XrSfItmaogd7--A#v=onepage&q=land%20and%20power&f=false](http://books.google.com/books?hl=en&lr=&id=V0o7_ILFOMwC&oi=fnd&pg=PR7&dq=latin+america+land+and+power&ots=l3DPGFcPCx&sig=r4qVkMg112R2XrSfItmaogd7--A#v=onepage&q=land%20and%20power&f=false).

Einstein, A. (1949, May). Why socialism? Monthly Review, 1. Retrieved 5/29/08, from <http://www.monthlyreview.org/598einst.htm>.

Ely, W. (2007). The Guardian of every other right: A constitutional history of property rights. Retrieved 5/25/08, from [http://books.google.com/books?hl=en&lr=&id=XI7\\_v2f-uiMC&oi=fnd&pg=PP11&dq=%22sanctity+of+private+property%22&ots=y\\_dMV\\_18Sf&sig=IlnCFYEFKm39IF\\_0bBQ-mjWLSkc](http://books.google.com/books?hl=en&lr=&id=XI7_v2f-uiMC&oi=fnd&pg=PP11&dq=%22sanctity+of+private+property%22&ots=y_dMV_18Sf&sig=IlnCFYEFKm39IF_0bBQ-mjWLSkc).

Engel, V., Esteban Jobbagy, G., Stieglitz, M., Williams, M., & Jackson, R. (2005). Hydrological consequences of eucalyptus afforestation in the Argentine pampas. *Water Resources Research*, Vol. 41.

Environmental Protection Agency (EPA). (2009). Cap and Trade | US EPA. Retrieved October 16, 2009, from <http://www.epa.gov/captrade/>.

Escobar, A. (November, 1999). The Invention of Development. From *Current History*. Princeton University Press. pp. 382-386.

Escobar, A. (1995). *Power of development*. Routledge. London, England.

Fletcher, S. (2004). *Global Climate Change; The Kyoto Protocol*. Congressional Research Service Report for Congress. Accessed on Oct 2, 2009 from: [www.fpc.state.gov/documents/organization/34818.pdf](http://www.fpc.state.gov/documents/organization/34818.pdf).

Foster, J. (February, 2007). The ecology of destruction. *Monthly Review*, 58. Retrieved 6/10/2008, from <http://www.monthlyreview.org/0207jbf.htm>.

Foster, J (1997). The Age of Planetary Crisis: The Unsustainable Development of Capitalism. *Review of Radical Political Economics*, Vol. 29, No. 4, 113-142 (1997).

- Friends of the Earth. (October, 2007). Windfalls in Lieberman-Werner global warming bill: Quantifying the fossil fuel industry giveaways.
- Fukuyama, F. (1995). Confucianism and democracy. *Journal of Democracy*, 20-33. Johns Hopkins University Press.
- Ferguson, J. (1994). The anti-politics machine ... - Google Books. Retrieved November 3, 2009, from <http://books.google.com/books?hl=en&lr=&id=vfg8AAAAIAAJ&oi=fnd&pg=PR7&dq=the+anti+politics+machine&ots=YGMsubFsoN&sig=Ik5jzcRAahPRQU-UuRs6-V7qMg4#v=onepage&q=&f=false>.
- Galeano, E. (1973). *Open veins of Latin America; Five centuries of the pillage of a continent*. Monthly Review Press. New York.
- Goldemberg J. (2004). World energy assessment. United Nations Development Program.
- Gold Standard. (2009). About Gold Standard - The Gold Standard. Retrieved October 27, 2009, from <http://www.cdmgoldstandard.org/About-Gold-Standard.62.0.html>.
- Gold Standard Foundation. (2009). Gold Standard. The gold standard: Premium quality carbon credits. Retrieved December 30, 2008, from <http://www.cdmgoldstandard.org/index.php>.
- Guthman, J. (2007). The Polanyian Way? Voluntary food labels as neoliberal governance. *Antipode* 2007: 456-478.
- Haines, A., & Kammen, D. (2000). Sustainable energy and health. *Global Change & Human Health*, 1(1), 78-87. doi: 10.1023/A:1011531916080.
- Haines, A., Kovats, S., Campbell-Lendrum, D., & Corvalan, C. (2006). Climate change and human health: Impacts, vulnerability and public health. . Retrieved December 18, 2008, from [http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B73H6-4JHMS3P-1&\\_user=10&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_sort=d&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=47a2353828dc183fd05c503c78b45aa7](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B73H6-4JHMS3P-1&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=47a2353828dc183fd05c503c78b45aa7).
- Hardin, G. (1968). The tragedy of the commons. *Science*, 162, 1243-1248.

- Harrabin, R. (2008, April 14). BBC NEWS | Asia-Pacific | China 'now top carbon polluter'. Retrieved November 4, 2009, from <http://news.bbc.co.uk/2/hi/asia-pacific/7347638.stm>.
- Harris, E. (2007) The voluntary carbon offsets market; An analysis of market characteristics and opportunities for sustainable development. International Institute for Environment and Development. Earthprint Limited. UK.
- Hartley, M. (2002) Rationale and methods for conserving biodiversity in plantation forests. Elsevier Science.
- Household Energy Network. (2007). Improved Cooking Stoves and the Clean Development Mechanism - Wiki | HEDON Household Energy Network: Retrieved November 3, 2009, from <http://www.hedon.info/ImprovedCookingStovesAndTheCleanDevelopmentMechanism#Contributors>.
- IEA. (2009). About the International Energy Agency (IEA). Retrieved October 19, 2009, from <http://www.iea.org/about/index.asp>.
- International Carbon Bank & Exchange. (2000). Volume calculation of one ton CO<sub>2</sub>. Retrieved November 4, 2009, from <http://www.icbe.com/CarbonDatabase/CO2volumecalculation.asp>.
- Kaygusuz, K. (2002). Environmental impacts of energy utilization and renewable energy policies in Turkey. *Energy Policy*, *Energy Policy*. 30(8), 689-698.
- Kimbrell, A. (2002). *The Fatal harvest reader: The tragedy of industrial agriculture*. Island Press.
- Kirkland, J. (September 25, 2009). Possibility of carbon-trading fraud elbows into senate climate debate. *New York Times*. Accessed on September 29, 2009 from <http://www.nytimes.com/cwire/2009/09/25/25climatewire-the-possibility-of-carbon-trading-fraud-elbo-90802.html?pagewanted=1>.
- Klein, N. (2009, November 13). Naomi Klein: Copenhagen climate change summit not merely a Seattle WTO do-over | Vancouver, Canada | Straight.com. Retrieved November 25, 2009, from <http://www.straight.com/article-270383/vancouver/naomi-klein-copenhagen-climate-change-summit-not-merely-seattle-wto-doover>.
- Kollmuss, A., Zink, H., & Polycarp, C. (2008). *Making Sense of the Voluntary Carbon Market; A Comparison of Carbon Offset Standards*. World Wildlife Fund. Germany.

- Kruger, J. (2007). From Sulfur Dioxide to Greenhouse Gases: Trends and Events Shaping Future Emissions Trading Programs in the United States. National Commission on Energy Policy, USA.
- Kronick, C. (2009). Greenpeace statement on carbon off-setting. Greenpeace UK. (Charlie Kronick, is head of Greenpeace's climate and energy campaign). Retrieved October 9, 2009, from <http://www.greenpeace.org.uk/media/press-releases/greenpeace-statement-on-carbon-off-setting>.
- Lanyon, L. (1994). Dairy Manure and Plant Nutrient Management Issues Affecting Water Quality and the Dairy Industry. *Journal of Dairy Science* Vol. 77 No. 7 1999-2007 1994 by American Dairy Science Association.
- Lasso, M. A. (2004). Is Latin America Really a Carbon Market Pioneer? Retrieved December 24, 2008, from <http://www.tierramerica.net/2004/1120/iarticulo.shtml>.
- Lohmann, L. (September, 2006). Carbon trading; a critical conversation on climate change, privatization, and power. Mediaprint, Uddevalla, Sweden.
- Lovell H., Bulkeley H. and Liverman D. M. (2009 in press). Carbon offsetting: Sustaining Consumption. *Environment and Planning*.
- Malthus, T. (1951). *Principles of political economy*. Second ed. New York: A.M. Kelley. Originally published in 1836.
- Marx, K. (1990). *Capital*. Volume 1. London, England: Penguin Books.
- Moberg, F. (2004). Sustainable development update. 4:4. Retrieved 5/20/08, from <http://www.albaeco.com/sdu/17/htm/main.htm>.
- Metcalf, G., Paltsev, S., Reilly, J., Jacoby, H., & Holak, J. (2008). Analysis of U.S. greenhouse gas tax proposals - Google Search. Retrieved December 19, 2008, from <http://www.google.com/search?client=firefox-a&rls=org.mozilla%3Aen-US%3Aofficial&channel=s&hl=en&q=Analysis+of+U.S.+greenhouse+gas+tax+proposals+&btnG=Google+Search>.
- Montenegro, M. (August 13, 2009). Much Ado About Carbon Offsets SEEDMAGAZINE.COM. Retrieved October 5, 2009, from [http://seedmagazine.com/content/article/much\\_ado\\_about\\_carbon\\_offsets/](http://seedmagazine.com/content/article/much_ado_about_carbon_offsets/).
- Morgan Stanley. (2007, August 14). Morgan Stanley - Press Release. Retrieved December 1, 2009, from <http://www.morganstanley.com/about/press/articles/5371.html>.

- Muldavin, J. (December 19, 2007). China's not alone in environmental crisis - The Boston Globe. Retrieved November 30, 2009, from [http://www.boston.com/bostonglobe/editorial\\_opinion/oped/articles/2007/12/19/chinas\\_not\\_alone\\_in\\_environmental\\_crisis/](http://www.boston.com/bostonglobe/editorial_opinion/oped/articles/2007/12/19/chinas_not_alone_in_environmental_crisis/).
- Murray, L. (Dec 19, 2008). Growing money on trees. Retrieved December 30, 2008, from <http://business.smh.com.au/business/growing-money-on-trees-20081218-71o8.html>
- NativeEnergy. (2009). Global Warming Solutions - You and NativeEnergy Together can Help. Retrieved November 17, 2009, from [http://www.nativeenergy.com/pages/vintage\\_carbon\\_offsets/325.php](http://www.nativeenergy.com/pages/vintage_carbon_offsets/325.php).
- National Research Council. (2002). The drama of the commons - Google Books. Retrieved November 24, 2009, from <http://books.google.com/books?hl=en&lr=&id=q9-lrMRdrM8C&oi=fnd&pg=PA263&dq=capitalism++indigenous+land+tenure+environmental+resources&ots=CTPn2epQJK&sig=YZdv9wGPAKYyTjMch5dCbda79oU#v=onepage&q=indigenous&f=false>.
- NativeEnergy (2008). Additionality of Carbon Offsets and RECs explained by NativeEnergy. Retrieved October 25, 2009, from <http://www.nativeenergy.com/pages/additionality/38.php>.
- New York Times. (2009, April 15). By Degrees - Third-World Stove Soot Is Target in Climate Fight - Series - NYTimes.com. Written by Rosenthal, E. Retrieved November 4, 2009, from <http://www.nytimes.com/2009/04/16/science/earth/16degrees.html>.
- Norberg-Hodge, H. (June 22, 2008) The North-South Divide. *The Ecologist*. London, UK
- Ostrom, E., Burger, J., Field, C., Norgaard, R., & Policansky D. (April, 1999). Revisiting the commons; Local lessons, global challenges. *Science Compass Review*. Vol. 284. Page 1-6.
- Ott, H. E. (Apr., 2001). Climate Change: An important foreign policy issue. *International Affairs (Royal Institute of International Affairs 1944-)*, Vol. 77, No. 2. page 277-296.
- Precious Woods. (2009). Precious Woods - About us. Retrieved October 22, 2009, from [http://www.preciouswoods.com/index.php?option=com\\_content&task=section&id=4&Itemid=30](http://www.preciouswoods.com/index.php?option=com_content&task=section&id=4&Itemid=30).

- Pooley, E. (2008, June 9). Why the Climate Bill Failed - TIME. Retrieved December 1, 2009, from <http://www.time.com/time/nation/article/0,8599,1812836,00.html>.
- Richards, M., Wells, A., Contreras-Hermosilla A., & Pommier D. (2003, September) Impacts of illegality and barriers to legality: a diagnostic analysis of illegal logging in Honduras and Nicaragua. Pp. 282-292 Vol :5. Issue;3.
- Satyanarayana, M. (2008). Proceedings of the workshop on forests for poverty reduction: opportunities with CDM, environmental services and biodiversity. Retrieved November 3, 2009, from <http://www.fao.org/docrep/008/ae537e/ae537e07.htm>.
- Schurrman, F. (2004). Beyond the impasse: new directions in development theory. Google Books. Retrieved October 23, 2009, from [http://books.google.com/books?hl=en&lr=&id=3\\_9cLlBgbI4C&oi=fnd&pg=PP11&dq=shiva,+development+dependency+theory+hidden+consequences&ots=32qs\\_MeXiF&sig=xMzd7ZFa982DpYOn8IAuR1uZjgM#v=snippet&q=dependency%20theory&f=false](http://books.google.com/books?hl=en&lr=&id=3_9cLlBgbI4C&oi=fnd&pg=PP11&dq=shiva,+development+dependency+theory+hidden+consequences&ots=32qs_MeXiF&sig=xMzd7ZFa982DpYOn8IAuR1uZjgM#v=snippet&q=dependency%20theory&f=false). Pp. 51.
- Smith, K. (Feb, 2007). The Carbon Neutral Myth; Offsetting Indulgence for Your Climate Sins. Transnational Institute. The Netherlands.
- Smith, K. (1999). Wood energy, climate and health; Regional wood energy development program in Asia. Vol.14;3.
- Smith, K. (1994). Health, Energy, and Greenhouse-gas Impacts of Biomass Combustion in Household Stoves. International Energy Initiative.
- Shiva, V. (1997). Monocultures of the mind ... - Google Books. Retrieved October 24, 2009, from [http://books.google.com/books?hl=en&lr=&id=QcstWYIcbHkC&oi=fnd&pg=PA5&dq=monoculture+tree+biodiversity+loss&ots=vxK9G4k8rK&sig=EbkZlC\\_YDL\\_JgdGFM46QuShGFNyc#v=onepage&q=monoculture&f=false](http://books.google.com/books?hl=en&lr=&id=QcstWYIcbHkC&oi=fnd&pg=PA5&dq=monoculture+tree+biodiversity+loss&ots=vxK9G4k8rK&sig=EbkZlC_YDL_JgdGFM46QuShGFNyc#v=onepage&q=monoculture&f=false).
- Shiva, V. (1987). Forestry crisis and forestry myths. A critical review of tropical forests: a call for action. Technology and Natural Resource Policy, Research Foundation for Science, Dehra Dun, Uttar Pradesh, India.
- Still, D. and MacCarty N. (2008). An introduction to the carbon credit protocols from; Methodology for improved cook stoves and kitchen regimes. Published by The Gold Standard.
- Stockholm Environmental Institute (2009). CORE: Carbon Research and Education. Market Size & Scope. (2009) Retrieved October 5, 2009, from <http://www.co2offsetresearch.org/policy/Market.html>.

- Taiyab, N. (2006). Exploring the market for voluntary ... - Google Books. Retrieved November 15, 2009, from <http://books.google.com/books?hl=en&lr=&id=PJBDOIB3tNoC&oi=fnd&pg=PP6&dq=carbon+trade+watch+third+party+auditors&ots=WrwduL4Ng8&sig=JRjc4MMYqYXJAIcJCpPHO-Q7lzA#v=onepage&q=third%20party%20&f=false>.
- Tucker, R. (1978). *The Marx-Engels reader*. Second Edition. Norton and Company Inc. New York.
- UNEP (2009). Nicaragua Overview. Convention on Biological Diversity. Retrieved October 22, 2009, from <https://www.cbd.int/countries/?country=ni>.
- UNFCCC. (2009). Kyoto Protocol. Retrieved October 20, 2009, from [http://unfccc.int/kyoto\\_protocol/items/2830.php](http://unfccc.int/kyoto_protocol/items/2830.php).
- UNFCCC. (2008). Clean Development Mechanism (CDM) defined. Retrieved December 18, 2008, from [http://unfccc.int/kyoto\\_protocol/mechanisms/clean\\_development\\_mechanism/items/2718.php](http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php).
- UNFCCC. (2008). Clean development mechanism; In brief. United Nations Framework Convention on Climate Change. Bonn, Germany, 1-12.
- UNFCCC (Oct 15, 2009). Message by Yvo de Boer, Executive Secretary. United Nations Framework Convention on Climate Change to International Energy Agency' Governing Board.
- UNFCCC. (2007). Kyoto protocol; Press fact sheet. Retrieved December 27, 2008, from [http://unfccc.int/search/search?q=United+States+Kyoto+Protocol&btnG=Search&entqr=0&output=xml\\_no\\_dtd&sort=date%3AD%3AL%3Ad1&ud=1&client=unfccc\\_frontend&oe=UTF-8&ie=UTF-8&proxystylesheet=unfccc\\_frontend&site=default\\_collection](http://unfccc.int/search/search?q=United+States+Kyoto+Protocol&btnG=Search&entqr=0&output=xml_no_dtd&sort=date%3AD%3AL%3Ad1&ud=1&client=unfccc_frontend&oe=UTF-8&ie=UTF-8&proxystylesheet=unfccc_frontend&site=default_collection).

United States Government Accountability Office. (August, 2008). GAO-08-1048 Highlights, CARBON OFFSETS: The U.S. Voluntary Market Is Growing, but Quality Assurance Poses Challenges for Market Participants - Powered by Google Docs. Retrieved November 17, 2009, from [http://docs.google.com/gview?a=v&q=cache:76Dk6hXjhykJ:www.gao.gov/highlights/d081048high.pdf+GAO+carbon+www.gao.gov/highlights/d081048high.pdf&hl=en&gl=us&pid=bl&srcid=ADGEEShS219G7Y1C3CXIJZE0ahzTS0Z3xh1406BX\\_NhXwOMf9k2ZFeNH4WnrE\\_n-X1Y\\_JE7fbbaumXH0jB3d9AdpFWGszjm9V0TkVpMIZg1QvOpsJFHD1AwpaHTfF3CUTdPKM8j4SITj&sig=AFQjCNHU6PFkqHKPmnoude6lMq0uOSk1gg](http://docs.google.com/gview?a=v&q=cache:76Dk6hXjhykJ:www.gao.gov/highlights/d081048high.pdf+GAO+carbon+www.gao.gov/highlights/d081048high.pdf&hl=en&gl=us&pid=bl&srcid=ADGEEShS219G7Y1C3CXIJZE0ahzTS0Z3xh1406BX_NhXwOMf9k2ZFeNH4WnrE_n-X1Y_JE7fbbaumXH0jB3d9AdpFWGszjm9V0TkVpMIZg1QvOpsJFHD1AwpaHTfF3CUTdPKM8j4SITj&sig=AFQjCNHU6PFkqHKPmnoude6lMq0uOSk1gg).

Voluntary Carbon Standard (VCS). (Nov 18, 2008). Voluntary Carbon Standard. Retrieved December 28, 2008 from [www.v-c-s.org/docs/Voluntary%20Carbon%20Standard%202007\\_1.pdf](http://www.v-c-s.org/docs/Voluntary%20Carbon%20Standard%202007_1.pdf).

WCED. (1987). *Our Common Future*. London: Oxford University Press.

White House Press Release. (2001). President Bush Discusses Global Climate Change. Retrieved November 3, 2009, from <http://georgewbushwhitehouse.archives.gov/news/releases/2001/06/20010611-2.html>.

World Bank. (2009). *Proyectos - Nicaragua: Precious Woods Project*. Retrieved October 22, 2009, from <http://web.worldbank.org/external/projects/main?menuPK=2805119&pagePK=64312881&piPK=64625384&theSitePK=2748767&Projectid=P094154>.

World Bank. (June 6, 2008). *Nicaragua - In Nicaragua, from Pastures to Precious Woods*. Retrieved October 20, 2009, from <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/LACEXT/NICARAGUAEXTN/0,,contentMDK:21792497~pagePK:1497618~piPK:217854~theSitePK:258689,00.html>.

World Energy Solutions. (2009). *World Energy - About Us*. Retrieved October 29, 2009, from <http://www.worldenergy.com/about/default.cfm>.

Zenha, R. (2005). *The global carbon market perspectives to Brazil*. Retrieved December 26, 2008, from <http://scholar.google.com/scholar?hl=en&lr=&q=%22carbon%20credit%20market%22%20multibillion%20dollar%22&um=1&ie=UTF-8&sa=N&tab=ws>.