Swedish University of Agricultural Sciences
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Carbon Offset Management – Worth considering when investing for reforestation CDM

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Keywords: CDM, forestry, Kyoto, reforestation, afforestation, China, Guangxi, Kyoto protocol

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Foreword

This master thesis was written at the Swedish University of Agricultural Sciences, Department of Forest Products together with Yale University, School of Forestry and Environmental Studies.

My interest for the carbon market arose during a internship for one of the major forest industry companies in Finland, where I carried out a benchmark project partially focusing on environmental issues. When it was time to select a thesis subject, I wanted to carry out a investment case analysis for possible carbon finance project on rainforests in Bahia, Brazil. Besides that, I wanted to make use of my contacts given through my internship. I contacted my previous employer and together worked out the foundation to what later became my final thesis, now with another geographical focus, China. Somewhere on the way I discovered the possibility to do a part of my research at Yale University, which is a leading educational institution in the environmental area in general, and carbon finance in particular.

I would like to give my special thanks to my supervisors – Chad Oliver at the School of Forestry and Environmental Studies, Yale University and Denise McCluskey at the Department of Forest Products, Swedish University of Agricultural Sciences. I thank Denise McCluskey for her advice, comments and support. I am very grateful for being given the opportunity and trust to conduct this study together with Yale University. During my research I got the chance to deepen my knowledge about both the carbon market and Yale University, but also meet many interesting people. I have learned a lot and I hope that my findings have provided a useful insight companies, policy makers and other readers interested in forest carbon finance projects.

I would like to thank Lloyd Irland for providing useful broad information and thoughts about the Carbon Market and the Kyoto flexible mechanisms.

I would like to express my gratitude to all the participants in this study for their time and effort, providing me with useful information and contributing with important opinions. I thank all the involved people at Yale School of Forestry and Environmental Studies for their hospitality and input.

Last, but not least, I would like to show appreciation to my friends and family for their support and encouragement.

Arvid Eriksson
New Haven CT, USA, April 2009

Abstract

The idea for this project was initiated together with one of the leaders in the forest, paper and packaging industry. To get through an A/R CDM process the company is exposed to the risk of failing the process or that the overall costs will exceed the benefits of the project. This would delete the incentives to invest in GHG removals compared to purchasing emission allowances on the carbon market.

The questions that have been raised and needs clarification in the thesis are the following:

- From a company perspective, what are the incentives for implementing Forest Clean Development Mechanism (CDM) projects?
- What is a likely financial outcome of a reforestation CDM project on degraded land in the Guangxi province of the Peoples Republic of China?
- When does an investment like this break even with the cost of buying market based carbon emission allowances?

The objective of this master thesis is to carry out a research about the incentives for forest, paper and packaging companies to invest in reforestation through the clean development mechanism. The study case comprises the UNFCCC afforestation/reforestation methodology and assumes information from previous implemented projects and general data from experts in the forest and carbon industry. Research presented on company incentives is focusing on global forest, paper and packaging companies.

Empirical data was collected using a qualitative research method, involving personal interviews. Secondary data is primarily retrieved from previous registered CDM cases. Particularly one project called *Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin* in Guangxi, China. This project was implemented in 2006 and is suitable for comparison due to the geographical proximity of the hypothetical case of this study.

The results show that the probability for these companies to implement forest CDM is low. This is due to the complex process of CDM, the negative approach in the process and the aim of avoiding profitability for investors. The hypothetical investment case is profitable in itself. However the uncertainty surrounding the circumstances are considered too high compared with other carbon management measures.

Keywords: CDM, forestry, Kyoto, reforestation, afforestation, China, Guangxi, Kyoto protocol

Sammanfattning

Idén till detta projekt inleddes i samarbete med ett av de ledande företagen inom skogs-, pappers-och förpackningsindustrin. För att få igenom en A/R CDM process är företaget utsatt för risken att processen inte går igenom, eller att de totala kostnaderna överstiger nyttan av projektet. Detta skulle ta bort incitamenten för att investera i växthusgas-sänkande projekt jämfört med att köpa utsläppsrätter på marknaden.

De frågor som har tagits upp och behöver förtydligas i avhandlingen är följande:

- Från ett företagsperspektiv, vilka är incitamenten för att genomföra Skogrelaterade Clean Development Mechanism (CDM) projekt?
- Vad är ett troligt ekonomiskt utfall av ett skogsrelaterat CDM-projekt för förstörd mark i Guangxi-provinsen i Kina?
- När går en investering som denna break-even med kostnaden för att köpa marknadsbaserade utsläppsrätter?

Syftet med detta examensarbete är att genomföra en studie om incitament för globala skogs-, pappers- och förpackningsföretag att investera i återbeskogning med hjälp av CDM. Fallstudien utgörs av en metod för återbeskogning och utgår från information från tidigare genomförda projekt och allmänna uppgifter från experter inom industrin. Forskning som presenteras på företagets incitament fokuserar på globala skogs-, papper och förpackningsföretag.

Empiriska data har samlats in med hjälp av en kvalitativ forskningsmetod, genom personliga intervjuer. Deltagarna i studien är globala skogs-, papper och förpackningsföretag. Sekundär data är främst hämtade från tidigare registrerade CDM projekt. Särskilt ett projekt kallat *Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin* i Guangxi, Kina. Detta projekt genomfördes under 2006 och lämpar sig för jämförelser på grund av den geografiska närheten av det hypotetiska fallet med denna studie.

Resultaten visar att sannolikheten för dessa företag att genomföra skogrelaterade CDM-projekt är låg. Detta beror på den komplicerade ansökningsprocessen för CDM, den restriktiva inställning hos UNFCCC och dess strävan att undvika lönsamhet för investerarna. Den hypotetiska fallstudien är lönsam i sig, men osäkerheten kring omständigheterna anses hög jämfört med andra investeringar i kolavsättning.

Nyckelord: CDM, skogsbruk, Kyoto, återbeskogning, Kina, Guangxi, Kyotoprotokollet

Abbreviations

Afforestation	Never grown
A/R	Afforestation / Reforestation
BRIC	Brazil, Russia, India and China
CDM	Clean Development Mechanism
CER	Carbon Emissions Reduction
DJSI	Dow Jones Sustainability Index
DNA	Designated National Authorities
ERU	Emission Reduction Units
EU ETS	European Union Emissions Trading Scheme
GDP	Gross Domestic Product
GHG	Greenhouse Gas
ICAP	International Carbon Action Partnership
IMF	International Monetary Fund
IPCC	The Intergovernmental Panel on Climate Change
ITL	International Transaction Log
IRR	Internal Rate of Return
NGO	Non-governmental organization
NPV	Net Present Value
OECD	Organization for Economic Co-operation and Development
OTC	Over the counter
PESTEL	Political, Economical, Social, Technological, Environmental, Legal
PPP	Purchasing Power Parity
PRC	People's Republic of China
Reforestation	Restocking
R&D	Research and Development
RRR	Required Rate of Return
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar ($)
VER	Verified Emissions Reduction
WB	World Bank
Yale FES	Yale School of Forestry and Environmental Studies

Measures

tCO2e	Tons of CO_2 equivalent
k	thousand
kW	kilowatt
M	million
Mt	million tons
MW	megawatt
t	ton
W	watt
ha	hectare

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1. Introduction

1.1 Background

Sustainability, environmental issues and corporate social responsibility are widely discussed topics among world leaders, global companies, non-governmental organizations (NGOs) and the public today. The debate goes on about what can be adequate measures to stop global warming and prevent the big and small actors of the world to deplete the resources and destroy the vitality of our complex ecosystems.

At the United Nations Conference on Climate Change, held in Rio de Janeiro, Brazil in June 1992, it was determined in the so called Kyoto Protocol that legal bindings to reduce greenhouse gas (GHG) emissions would be enforced for all member parties of the treaty. As of 2008, 183 countries had ratified the protocol that was adopted in December 1997 in Kyoto, Japan and entered into force in February 2005. Under the Kyoto, industrialized countries agreed to reduce their GHG emissions by the next period of 2008-2012 with 5.2 % compared to the year 1990. Kyoto includes defined flexible mechanisms such as emissions trading, joint implementation and the clean development mechanism (CDM) which aims to encourage and make the sustainable development more efficient. The mechanisms allows industrialized countries to meet their GHG emission reductions by purchasing GHG reduction credits from elsewhere through financial transactions from projects that reduce emissions in developing countries, from other industrialized countries or from industrialized countries with excess allowances (www, UNFCCC, No 3, 2009).

1.1.1 Clean Development Mechanism

The CDM enables industrialized countries to more efficiently reach their emissions targets by earning CERs from more cost-efficient projects in developing countries. Each CER I corresponds to a ton carbon dioxide equivalent (tCO2e). The credits can be traded on different exchanges and utilized for industrialized countries to meet their Kyoto reduction targets. The purpose of these measures is to stimulate and encourage sustainable development and emission reductions while providing industrialized countries with flexible options in meeting their emission targets. Proposed projects must go through a rigid process (figure 4) of registration, review and issuance to ensure that all measures are real and that the action would not occur without the project. CDM is supervised by the CDM Executive board who answers to the ratifying countries of the Kyoto protocol. In order to apply for registration at the CDM Executive board the project must be accepted by the Designated National Authority (DNA). Since the start in 2006 more than 1000 projects have been registered which are estimated to produce CERs equivalent to more than 2.7 billion tCO2 in the first commitment period. The CDM is by many seen as a trailblazer. It is the first global environmental trading scheme of its kind, providing a standardized emission offset instrument (www, UNFCCC, No 1, 2009).

1.1.2 Additionality

In order to avoid issuing credits to projects that would have happened without the mechanisms, so called “freeriders”, rules have been set to ensure additionality. This means that the project reduces more emissions than it would in absence of the project. There are two interpretations of the additionality criteria (www, UNFCCC, No 1, 2009):

- *Environmental additionality*: The project is additional if it results in lower emissions than the baseline. In general it looks at what would happen without the project.
- *Project additionality*: The project would not happen without the CDM.

1.1.3 Baseline

The GHG removal by sinks or emission reduction depends on emission occurring without the project minus the emissions of the project. The design and calculation of such a hypothetical scenario is referred to as the project baseline. Baseline scenario may be determined through reference from similar activities and technologies in the same region or if possible to measurable emissions occurring before the project (UNDP, 2003).

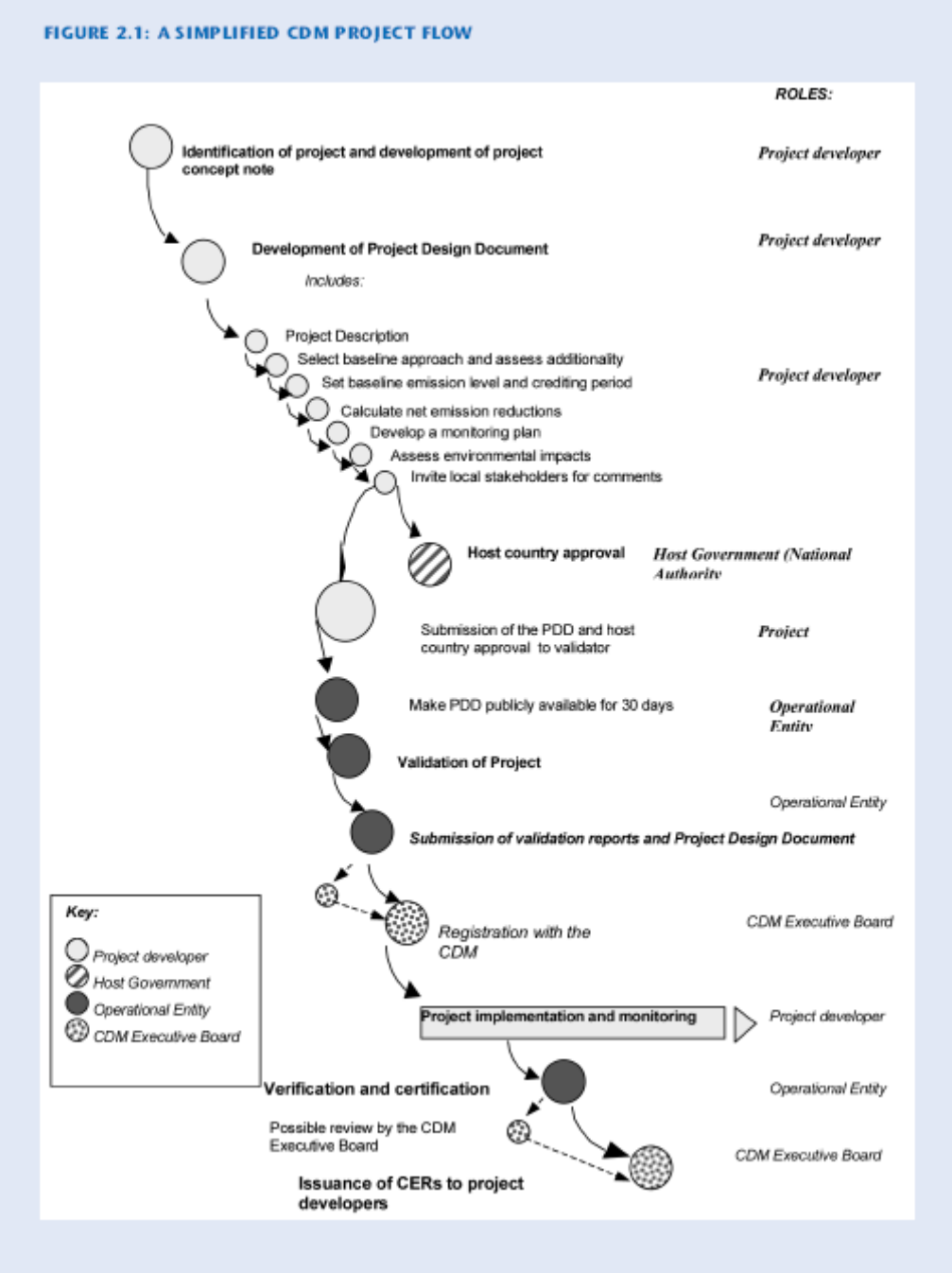


Figure 1. A simplified illustration of the CDM project process (UNDP, 2003).

Within the clean development mechanism (CDM) there are different approved methodologies for what can be undertaken. One of these methodologies describes afforestation/reforestation (A/R). The discussion concerning how to tackle the large impact that deforestation have on the climate has led up to this methodology, but so far excluded the option of adopting avoided

deforestation as a flexible mechanism. At a glance the A/R projects seems to offer many opportunities, especially for stakeholders that have forest management or wood fiber on the agenda.

1.1.4 The case

The idea for this project was initiated together with one of the largest companies in the forest, paper and packaging industry. To get through an A/R CDM process the company is exposed to the risk of failing the process or that the overall costs will exceed the benefits of the project. This would delete the incentives to invest in GHG removals compared to purchasing emission allowances on the carbon market.

1.2 Research questions

The questions that have been raised and need clarification in the thesis are the following:

- From a company perspective, what are the incentives for implementing Forest Clean Development Mechanism (CDM) projects?
- What is a likely financial outcome of a reforestation CDM projects on degraded land in the Guangxi province of the Peoples Republic of China?
- When does an investment like this break even with the cost of buying market based carbon emission allowances?

1.3 Objectives and constraints

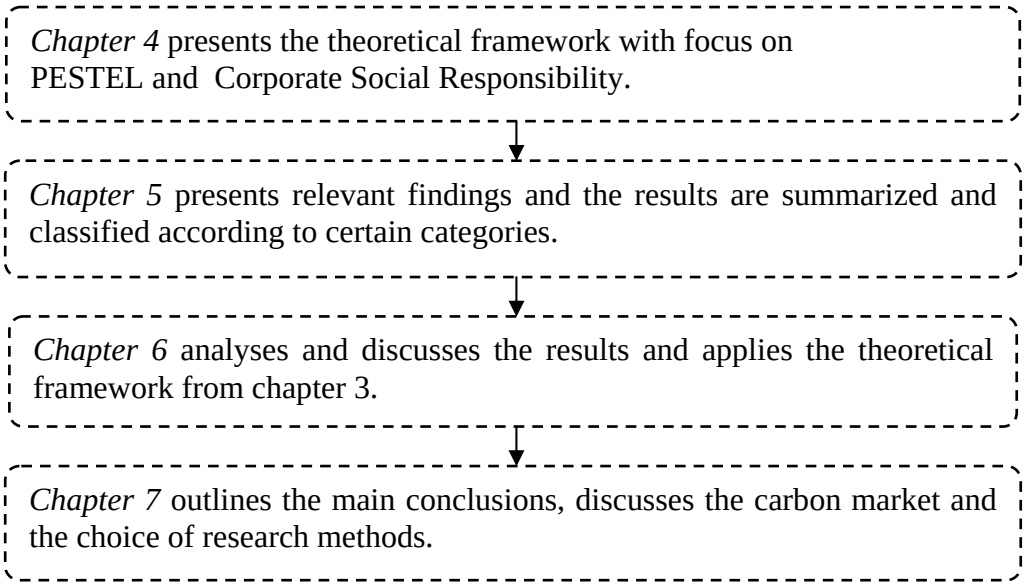
The objective of this master thesis is to carry out a research about the incentives for forest, paper and packaging companies to invest I reforestation through the clean development mechanism. More specifically, the aim of the thesis is to determine carbon finance break-even for a hypothetical reforestation project in the Guangxi province, The Peoples Republic of China. This is complemented with research on how companies perceive these mechanisms and what incentives they have for implementing them.

The study case comprises the afforestation/reforestation methodology and assumes information from previous implemented projects and general data from experts in the forest and carbon industry. Research presented on company incentives is focusing on global forest, paper and packaging companies.

1.4 Thesis disposition

Chapter 2 describes the qualitative method used in the study, the process of collecting primary and secondary data.

Chapter 3 gives the reader a broad overview of the theories behind global warming. The chapter introduces the background and current status on climate change arguments under the Kyoto Protocol in general and the Clean Development Mechanism in particular.


Chapter 4 presents the theoretical framework with focus on PESTEL and Corporate Social Responsibility.
Chapter 5 presents relevant findings and the results are summarized and classified according to certain categories.
Chapter 6 analyses and discusses the results and applies the theoretical framework from chapter 3.
Chapter 7 outlines the main conclusions, discusses the carbon market and the choice of research methods.

2. Methodology

This chapter describes the methods used to collect primary and secondary data. The author presents a theoretical base of the methodology, describing the advantages and drawbacks for each method.

2.1 Choice of methodology

This study has been conducted as a case study where the attention primarily will be on a hypothetical reforestation project in the specific area of the Guangxi province, China. To conduct research as a case study is considered appropriate when a deeper understanding of that particular event is required (Jacobsen, 2002). The model and theories used in this study is in some ways simplified to cope with the complexity of CDM projects. The high level of uncertainty in many factors makes it dubious to attempt the highest level of accuracy. The reality is off course much more complex and in order to maintain a straight forward approach and user friendly presentation some factors has been excluded from the model. A more specified study would either require more recourses or a pure case specific approach.

2.2 Quantitative and qualitative methodology

The two fundamental existing methods used in research are referred to as quantitative and qualitative research. Quantitative research provides the researcher with objective data that can easily be presented in figures, statistics and percentage. In qualitative methods the respondent give answers to questions either through a specific format or through multiple-choice answers (Holme *et al.*, 1997). Personal interview, mail or telephone is the most common methods for quantitative research. In opposite, the qualitative research is seeking unstructured responses reflecting the respondent's thoughts and feeling. This is referred to as "open-ended" or "in-depth". Qualitative interviews can be describes as short explicit questions that give informative answers (Trost, 2001).

Table 1. Differences between the two most commonly used research methods, quantitative and qualitative research (Hollensen, 2004, modified by Terzieva, E., 2008)

Comparison dimension	Quantitative research	Qualitative research
Objective	Quantify data and generalize results from the sample	Gain an initial and qualitative understanding
Type of research	Description and/or casual	Exploratory
Flexibility in research design	Low (one-way communication)	High (two-way communication)
Sample size	Large	Small
Choice of respondents	Representative sample of the population	Persons with considerable knowledge of the problem
Information per respondent	Low	High
Data analysis	Statistical summary	Subjective, interpretive
Ability to replicate with same result	High	Low
Interview requirements	No special skills required	Special skills required
Time consumption during research	*Design phase:* high *Analysis phase:* low	*Design phase:* low *Analysis phase:* high

2.3 Multiple methods

According to David Silverman (2005) many qualitative case studies combine observation with interviews. The reason might be that there are several research questions or that you want to use different sources or methods to in a form of methodological triangulation. In this study, conducting several personal interviews was considered to cover the largest global forest, paper and packaging industries. After several attempts with planning and financial solutions the sample response was still too low. Therefore personal interviews were conducted to combine secondary data from multiple sources.

2.4 Implementation

The work has been divided into five parts: extended background, theoretical framework, results, analysis and discussion, conclusions and final remarks (Figure 2).

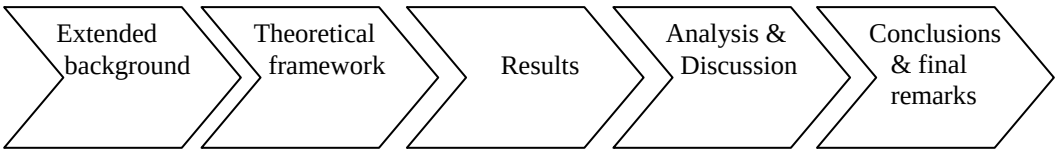


Figure 2. Description of the thesis workflow.

2.5 Primary Data

The primary data in this study was collected through qualitative interviews, both "face-to-face" and video conference. Respondents were interviewed with a set of questions (Appendix 1) as background sent in advance. The questionnaire which gives the respondent an idea of what the interviewer is looking for was sent out it advance to prepare the respondent and save time. Saving time was crucial when all of the respondents are global company executives with limited amount of time to spare. Primary data is as described above data that has been retrieved for the purpose of this particular study (Bengtsson, & Bengtsson, 1995). Framework for questionnaire layout has partially been adopted from the survey *Carbon offsetting trends survey 2008* (EcoSecurities, 2008).

2.5.1 Sampling procedure and criteria

Since it is due to lack of time and funding most often is impossible to survey an entire population the use of sampling techniques is common in research (Saunders *et. al.*, 2007). Sampling and statistics makes it possible reduce the amount of data required for collection by assuming statistics from a smaller sample.

For gaining knowledge on forest industry executives' perception an opinions on forest CDM and CSR the following criteria needed to be fulfilled. All respondents need to be large global forest, paper and packaging industries with explicit CSR and sustainability statements or strategies. Since the amount of actors who would consider this on an international scale are not that big, a smaller sample of the top five players was decided. The respondents were selected from through the PricewaterhouseCoopers (2008) survey of forest, paper and packaging industry based on 2007 turnover (Appendix 8).

Table 2. The top six largest global forest, paper and packaging companies based on 2007 turnover. Extracted from PricewaterhouseCoopers (2008) Global Forest, Paper & Packaging Industry Survey (Modified by Eriksson A. 2009)

Rank '07	Company	Country	Sales '07
1	International Paper	US	$ 21,890
2	Stora Enso	Finland	18,322
3	Kimberly-Clark	US	18,266
4	Svenska Cellulosa	Sweden	15,675
5	Weyerhaeuser	US	13,949
6	UPM	Finland	13,748

Due to unsatisfying response, Weyerhaeuser was excluded, and UPM brought into the sample.

2.6 Secondary data

This study was originally initiated by collecting secondary data. Secondary literature can be found in books, articles, newspapers, corporate and governmental publications (Saunders et. al., 2007). In this study the secondary data is used as reference information assessed on the hypothetical case study.

2.6.1 Reference case

Reference cases are explored in order to obtain suitable secondary data on the amount of variables needed for qualified calculations on CDM projects. Some examples that are required for this study are property value, establishment cost, cost of operations and equipment, cost of risk as well as transaction costs involved in the CDM process. On top the costs you also need to know the possible benefits such as revenue from timber output and CERs from GHG removal by sinks. This data is primarily retrieved from previous registered CDM cases. Particularly one project called *Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin* in Guangxi, China. This project was implemented in 2006 and is suitable for comparison due to the geographical proximity of the hypothetical case of this study.

2.6.2 Transaction costs

Transaction costs are an uncertain variable in CDM projects due to the complex registration process (Marjokorpi A., 2009). These costs comes from completing transactions such as searching for suitable projects, negotiation terms, using consulting an expertise, monitoring operations or opportunity costs, like time loss or recourses (Coase 1937). The transaction cost for this study has been collected from multiple sources using Axel Michaelowa's (2003) *Transaction costs of the Kyoto Mechanisms* as framework for variables. The sources in these costs are often consulting firms who stress the uncertainty and case specific character of these variables. The sample for secondary data on transaction costs was selected from reliable sources such as research reports, articles and manuals from NGOs, governments and accredited consulting bureaus. The sources are stated in Table 8.

2.6.3 Reliability of secondary data

A limiting factor when searching data in foreign countries is the lack of detailed information in many market areas (Cateora et. al., 2000). Information presented under PESTEL analysis in particular is therefore somewhat subjective to the fact that not all sources can be explored in order to get the correct relevant input needed. In this study most of the data for models and calculations are to consider as secondary. It is According to Jacobsen (2002) necessary to be

critical even when using qualitative methods for verifying answers. He also concludes that primary and secondary data can be used to complement each other in order to secure reliability of information. Another problem in this study is the comparability. The reference case and general secondary data collected is collected to be as close to the hypothetical case as possible. However, there are many factors in the case environment that could drastically change the conditions.

3. Extended background

This chapter gives the reader a broad overview of the theories behind global warming. The chapter introduces the background and current status on climate change arguments under the Kyoto Protocol in general and the Clean Development Mechanism in particular.

3.1 Climate change and global warming

The ongoing debate on global warming and climate change has gained substantial foothold and level of concern among people during the past five to ten years. Reports and documentaries such as The Stern Review on the Economics of Climate Change (Stern, L. 2006) and An Inconvenient Truth (Gore, A. 2006) have contributed to increasing the public climate concern. The Intergovernmental Panel on Climate Change (IPCC) has concluded that greenhouse gases from human activities are responsible for most of the temperature increase since the middle of the twentieth century. Climate model projections in the latest IPCC report shows that global surface temperature likely will increase with 1.1 to 6.4 ºC during the twenty-first century (IPCC, 2007).

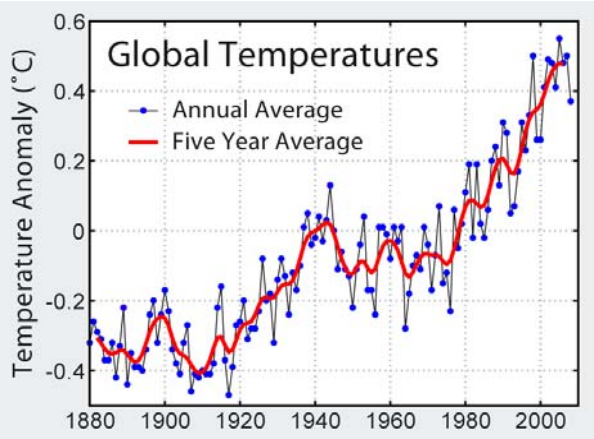


Figure 3. Global mean surface temperature anomaly relative to 1961–1990 (Brohan,J., P et.al. 2006).

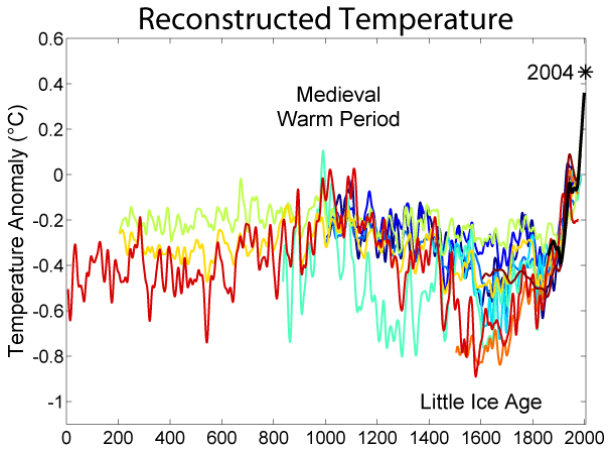


Figure 4. Two millennia of surface temperatures according to different reconstructions, each smoothed on a decadal scale. The unsmoothed, annual value for 2004 is also plotted for reference. (Jones, P.D. et al. 2003)

Increasing temperatures will cause rising sea levels and likely expand areas of subtropical deserts (Lu, J., et. al. 2007). The public and political debate goes on about what would be the appropriate measures to global warming. Most national governments have signed and ratified the Kyoto Protocol from 1997 that aims to reduce greenhouse gas emissions. A new agreement to succeed the first commitment of the Kyoto Protocol is expected to take place at the UNFCCC's[1] COP-15 (Copenhagen, Denmark) talks in December 2009.

The central task of the Kyoto protocol is to force countries to reduce their greenhouse gas emissions. By setting targets the emission reduction is given an economical value. I attempt to

[1] UNFCCC - United Nations Framework Convention on Climate Change

help countries to more effectively reach their targets the Protocol includes market-based mechanisms, Emissions Trading, the Clean Development Mechanism (CDM) and Joint Implementation (JI) (www, UNFCCC, No 1, 2009).

3.2 Carbon market overview

Signatories to the UNFCCC are split into three groups:

- Annex I countries (industrialized countries)
- Annex II countries (developed countries which pay for costs of developing countries)
- Non-annex countries (developing countries)

In 1997 explicit target on green house gas reductions was included in the Kyoto protocol. Every Annex I (industrialized) country that has ratified the Kyoto protocol is obligated to by 2008-2012 reduce their domestic emissions for carbon dioxide equivalents by 5,2 % on average compared to 1990 emission levels. In 1990 Annex I countries emitted about 64 % of global green house gases. Non-Annex (developing) countries does not have binding reduction targets by have to ratify the Protocol in order to host green house has removing projects under the flexible mechanisms. 177 countries plus the European Union has by January 2008 ratified the agreement.

The emission reduction targets can be met by reducing domestic emissions or trading schemes or through the flexible mechanisms of the Kyoto Protocol, Clean Development Mechanism (CDM) or Joint Implementation (JI). The flexible mechanisms yield, if conducted successfully, Certified Emission Reductions (CERs) from CDM, which also trades on the European Union Emission Trading Scheme (EU ETS). Both CERs and Emission Reductions Units (ERUs) from JI can be used for fulfillment of the Kyoto targets of the first commitment period of 2008-2012.

The map (Figure 5) shows various categories of participants to the Kyoto Protocol. We distinguish between EU-15 countries (blur color), European countries with economies in transition, other countries with emission targets, Annex 1-countries that have not ratified the Kyoto Protocol and non-Annex 1 countries:

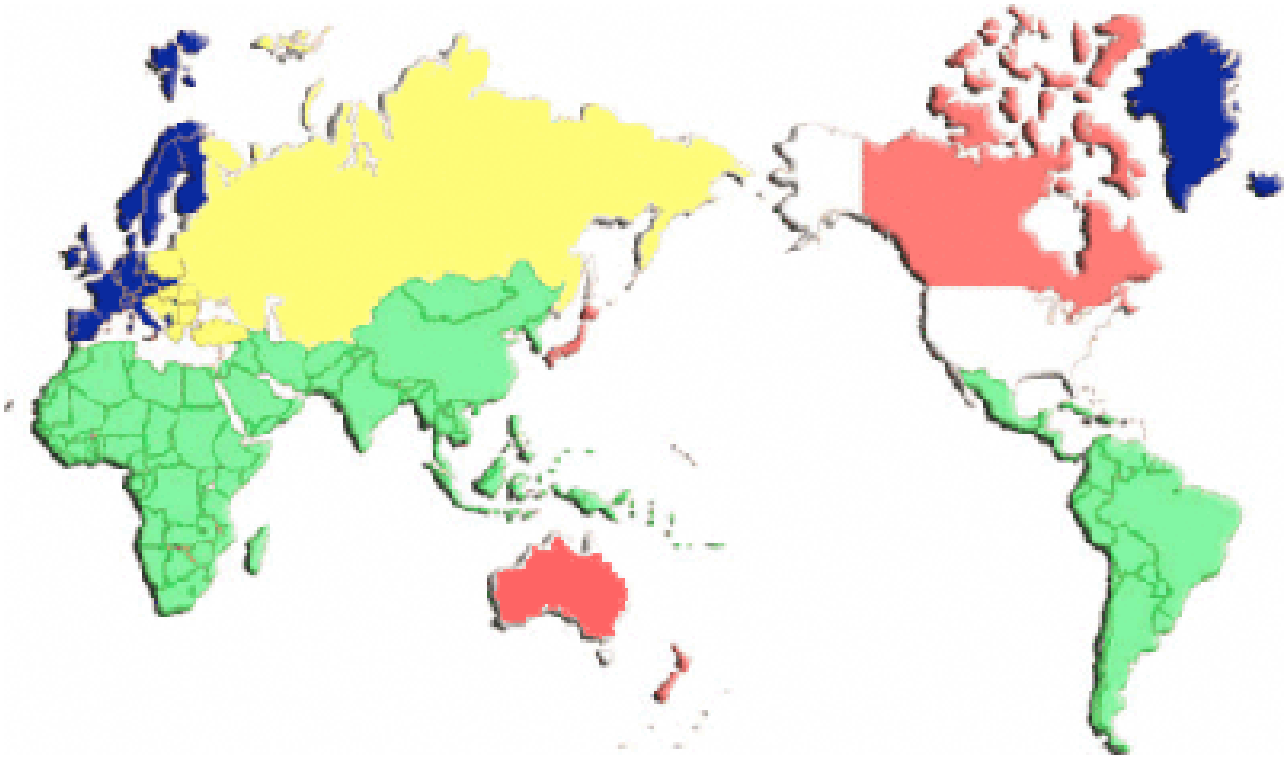


Figure 5. (www, PointCarbon, No 2, 2009).

3.2.1 The European Union

All European (blue color in Figure 5) has taken a common commitment to reduce the average GHG emission by 8 % during the first commitment period, 2008-2012, compared with 1990 levels. In 1990 the EU countries represented 23 % of global GHG emissions. The EU reduction commitment is shared differently between each country. The EU countries are usually net buyers of emissions permits. The countries referred as EU in figure 5 are called EU-15 and are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

3.2.2 Countries undergoing the process of transition to a market economy

Countries marked yellow in Figure 3 represents countries undergoing the process of transition to a market economy. These countries are usually net sellers of emissions permits and are all member of the EU except Russia, Ukraine and Croatia. Therefore they are also part of the EU ETS. These countries emitted around 31 % of global GHG emissions in 1990 and are besides the above mentioned: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Poland, Romania, Slovakia and Slovenia.

3.2.3 Annex II non-EU countries that ratified the Kyoto Protocol

Red countries in Figure 5 are countries that have ratified the Kyoto protocol but are not part of the EU or an economy in transition. These countries stood for about 15 % of global GHG emissions in 1990. Australia was the last one in this category and ratified the protocol in December 2007. Besides Australia these countries are: Canada, Japan, Monaco, Iceland, New Zeeland, Norway, Switzerland and Liechtenstein.

3.2.4 Annex I parties not ratified

Among the countries that signed the Kyoto Protocol 1997 only the USA has not yet ratified it. In 1990 the USA emitted 36 % of global GHG emissions.

3.2.5 Non-Annex I countries having ratified the Kyoto Protocol

Countries marked green in Figure 5 are non-Annex countries without emission caps and are potential hosts of CDM projects. Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Bahamas, Bangladesh, Barbados, Belize, Bhutan, Benin, Bolivia, Botswana, Brazil, Burundi, Cambodia, Cameroon, Chile, China, Colombia, Cook Islands, Costa Rica , Cuba, Cyprus, Djibouti, Dominican Republic, Ecuador, El Salvador , Equatorial Guinea, Fiji, Gambia, Georgia, Ghana, Grenada , Guatemala, Guinea, Guyana, Honduras, India, Israel, Jamaica, Jordan, Kenya, Kiribati, Kyrgyzstan, Lao Democratic People's Republic , Lesotho, Liberia, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritius, Mexico,, Micronesia, Mongolia, Morocco, Myanmar, Namibia , Nauru, Nicaragua, Niger, Niue, Palau Panama, Papua New Guinea, Paraguay, Peru, Philippines, Republic of Korea , Republic of Moldova, Rwanda, Saint Lucia , Saint Vincent and the Grenadines, Samoa, Senegal, Seychelles, Solomon Islands , South Africa, Sri Lanka , Sudan, Thailand, Togo , Trinidad and Tobago , Tunisia, Turkmenistan, Uganda, United Republic of Tanzania, Uruguay, Uzbekistan, Vanuatu, Viet Nam and Yemen (www, PointCarbon, No 2, 2009).

3.4 Carbon market trends

The carbon finance market has grown steadily the past few years. According the World Bank's Carbon Finance Unit, 374 million tons tCO2 where exchanged in 2005 which is a 240 % increase from 2004. The 2004 figure has itself increased with 41 % compared to 2003. In monetary termers the Worlds Bank estimated the total market value to 64 billion USD in 2007 (Capoor K., et. al. 2008).

Table 3. Carbon markets at a glance, volumes and values in 2006-07 (Capoor K., et. al. 2008)

	2006		2007	
	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)
		Allowances		
EU ETS	1,104	24,436	2,061	50,097
New South Wales	20	225	25	224
Chicago Climate Exchange	10	38	23	72
UK ETS	na	na		
Sub total	1,134	24,699	2,109	50,394
		Project-based transactions		
Primary CDM*	537	5,804	551	7,426
Secondary CDM	25	445	240	5,451
JI†	16	141	41	499
Other Compliance & Voluntary Transactions	33	146	42	265
Sub total	611	6,536	874	13,641
TOTAL	1,745	31,235	2,983	64,035

*: Clean Development Mechanism; †: Joint Implementation
M: million.

Figure 6. Point Carbon Secondary CER OTC assessment (www, PointCarbon, No 1, 2009).

The price of Carbon emissions has a strong correlation to the oil price. Historic development of emission allowance trading price is shown in Figure 6 (Irland L., 2009). According to a survey conducted by EcoSecurities (2008) is pricing always dependent on project type and the circumstances of the purchase, this also suggests that pricing risk is one of the biggest issues for both emission reduction generators and VER purchasers.

3.4.1 Compliance-driven market

CDM accounted for the greater part, 87 %, of project based transactions in 2007. The CDM created primary transactions worth US$7.4 billion, buyers coming mostly from the EU private sector, but also EU Governments and Japan. The voluntary market which supports GHG reduction activities not yet mandated by policymakers, doubled transaction values from 2006 to 2007.

Table 4. Annual Valumes and Values (2006-2007) for project-based transactions (Capoor K., et. al. 2008)

	2006		2007	
	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)
Compliance	597	6,466	832	13,376
of which				
Primary CDM	537	5,804	551	7,426
Secondary CDM	25	445	240	5,451
JI	16	141	41	499
other	19	76	na	na
Voluntary market	14	70	42	265
TOTAL	**611**	**6,536**	**874**	**13,641**

M: million

3.3.4 CDM delivers clean energy

Carbon contracts from clean energy projects (energy efficiency and renewable energy) accounted for nearly two-thirds of the transacted volume in the project-based market, appropriately reflecting the CDM's mission of supporting emission reductions and sustainable development. These project types typically use sound, road-tested technology, are operated by utilities or experienced operators, and have predictable performance, resulting in CER

issuances that are expected to yield between 70-90% of expected Project Design Document (PDD) volumes, based on current expectations. This explains why they are being targeted by buyers, now that the known industrial gas project types have been more or less contracted (Capoor K., et. al. 2008).

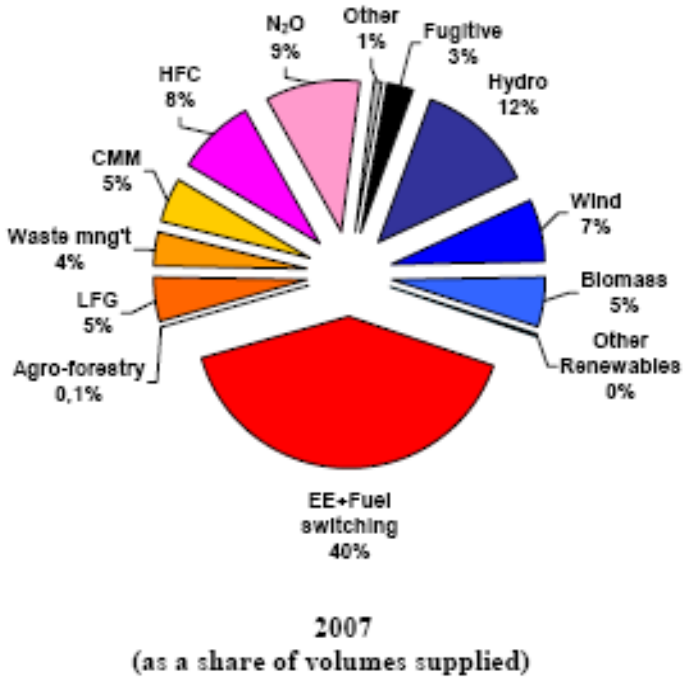


Figure 7. CDM project types as share of volume supplied in 2007 (Capoor K., et. al. 2008).

4. Theoretical framework

The following chapter presents the models, calculations and theories that will be applied to the hypothetical investment case. Focus is laid on PESTEL analysis, corporate social responsibility and a financial decision tool based on net present value of investment cash flows including transaction costs in the case of reforestation. . This theoretical framework has been used to analyses the carbon offset advantages and drawbacks and will be analyzed in the end of chapter 5.

4.1 PESTEL

PESTEL analysis stands for political, economic, social, technological, environmental, and legal analysis and provides a framework for describing the macro-environmental factors when doing market research. Depending on the environment you are exploring different other components can be added to the model such as education, and demographic factors. The PEST can be a useful tool for understanding business position, market growth and direction for operations. The increasing importance of sustainability and environmental factors of the 21st century have give rise the green business and catalyzed the STEER analysis which consider Socio-cultural, Technological, Economic, Ecological, and Regulatory factors (www, Oxford University Press, No. 1., 2009).

The PESTEL model distinguishes between:

- *Political factors.* These factors manly refer to governmental policy. For example you might be looking for what is said about subsiding different branches, what goods the government want to provide, how the business support is prioritized. Political decisions can affect all different levels of the business environment and sometimes entirely disable the opportunities you are looking for.

- *Economic factors.* These factors include economic growth, inflation, interest rates, taxation changes and exchange rates. Higher interest rates may discourage investments due to the cost of borrowing. Depending of the level of exports versus imports the strength of the local currency may be a key factor. Inflation can increase demands on salary and raise costs but income growth can also contribute to boost demand for a firm's product.

- *Social factors.* Changes in social trend can change the demand for a product and the willingness to work for the values different companies represents. An ageing population can for example increase the costs of pension and push the demand for products used mainly by mature consumers.

- *Technological factors.* New technologies create new buyer behaviors, products, demands, markets and opportunities for the companies for companies providing the products. The technological situation can also be barriers for companies, for example can infrastructure and logistics be a limitation factor when production companies enter developing countries.

- *Environmental factors.* Environmental factors refer to climate aspects such as temperature and climate change. Changes in climate and temperature can affect different industries such as farming and tourism. Due to global warming the environmental factors are becoming more significant for companies planning large operations that are climate dependent. The general environmental awareness among consumers is also an important issue when it comes to optimizing transportation and developing green products.

- *Legal factors.* These factor are refers to the legal environment the company operates in. Significant legal changes can affect the behavior of buyers and producers. Regulations involving recycling, minimum wage and discrimination are recent examples of relatively recent laws adopted by many countries (www, Oxford University Press, No. 1., 2009).

Table 5. Typical PESTEL factors to consider (www, Oxford University Press, No. 1., 2009)

Factor	Could include:
Political	e.g. EU enlargement, the euro, international trade, taxation policy
Economic	e.g. interest rates, exchange rates, national income, inflation, unemployment
Social	e.g. ageing population, attitudes to work, income distribution
Technological	e.g. innovation, product development, rate of technological obsolescence[2]
Environmental	e.g. global warming, environmental issues
Legal	e.g. competition law, health and safety, employment law

4.2 Perception of the environment

Factors and information given or retrieved from the environment, like through a PESTEL analysis, can be perceived and utilized with different force, direction and impact. Understanding the firm's environment is a key concept in strategy. However the success of performing the understanding differs between firms. Some firms fails to see signals for change while others anticipate and exploit emerging opportunities. Developing sustainable strategies is somewhat dependent on executives' perception of the environment and their ability to elaborate and utilize meaningful information from it. It is important for managers to not only pay attention to direct financial results but also to capture the full scope of the environmental turbulence. Firms who are poorly equipped for this often recognize their weakness to late to be able to respond efficiently to environmental change (Hugosson M., McCluskey D. 2008). The concept of perception can be mapped out simplified like in Figure 8 below. It shows the borderline between the firm an the environment and how turbulence affects the results through market dynamics which is perceived by management and used as input for strategic alignment.

I this study the environment and market dynamics will be focused on results from PESTEL analysis and CSR findings. It will also put some emphasis on the financial model conducted on the hypothetical investment case.

[2] Obsolescence is the state of being which occurs when a person, object, or service is no longer wanted even though it may still be in good working order. Obsolescence frequently occurs because a replacement has become available that is superior in one or more aspects.

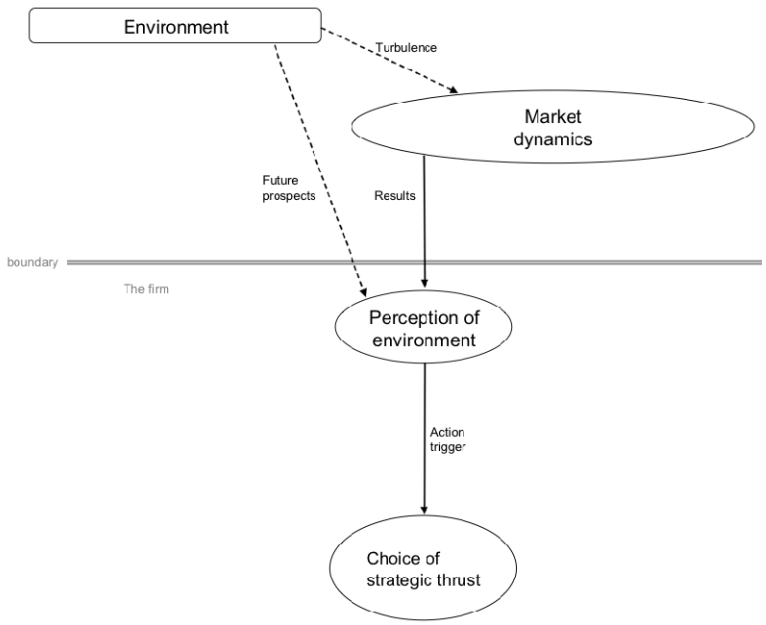


Figure 8. Simplified view of managerial perception (Hugosson M., McCluskey D. 2008).

4.3 Corporate Social Responsibility

4.3.1 CSR background

Corporate Social Responsibility (CSR) has become a way for corporations to communicate their environmental and sustainability commitments to the public and it is therefore essential to have a broad view of the concept. CSR describes an organizations social, environmental and economic impact and commitments on the community and environment where they operate. *4.3.1 CSR background* provides a brief introduction to the subject and will be followed by a more adopted view in chapter 4.3.2 -4.3.4.

The general definition of Corporate Social Responsibility is that it gives a description of the company's economical, environmental as well as social impact on the community (Kytle B., Ruggie J., 2005). These days there are standards for how to develop a CSR report. The Global Reporting Initiative in Amsterdam aims to provide an international standard with 79 indicators possibly supporting companies to use. Today there are two leading indicators for ranking companies work on CSR, Dow Jones Sustainability Index (DJSI) and FTSE4Good Index. It has become increasingly difficult for companies to ignore the concept of CSR. The corporations are under the control and supervision of regulators, governments, investors, non-governmental organizations (NGOs) and consumers in how their operations make impact in the environment and society. As a result CSR emerges as an issue that affects competitiveness and business advantage. One of the most challenging CSR issues that global companies faces today is bringing their CSR strategy to new markets, with their own values and traditions. What is right in the EU and North America is not necessarily right in China or Brazil. In example among the countries Brazil, Russia, India and China (BRIC), Brazil put a lot of energy into CSR while Russia on the other hand does not (Whadcock I., 2008). Today it does not exist any evidence that good corporate behavior and good financial result is linked together but on the contrary there are no evidence that shows that corporate social responsibility are destroying shareholder value as Milton Friedman (1982) fears.

4.3.2 Three domain model of CSR

The development of the pyramid of corporate social responsibility (Carrol A. B 1991) into a three domain model (Schwartz M. S., Carrol A. B. 2003) with overlapping domains is suitable for the assessment of both CSR and PESTEL in this study. The model is based on the three pillars of CSR; Ethical, legal and economical domains (Figure 9).

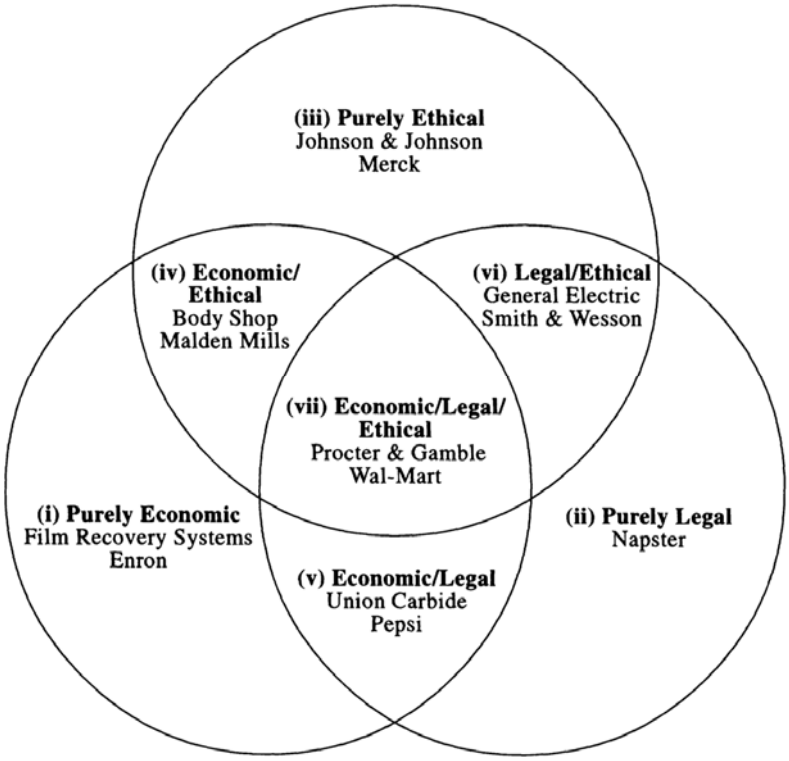


Figure 9. The three domain model of corporate social responsibility with corporate examples (Schwartz M. S., Carrol A. B. 2003).

4.3.2.1 Economic domain

The economical domain captures the actions that are intended to directly or indirectly maximize positive economic impact in the firm in question. This can be maximizing profit or shareholder value. Direct actions can be increasing sales or avoiding costs. Indirect actions can be improving working morale or the company's public image. It is expected that the vast majority of companies have a strong lean towards this domain since it is natural for corporations to be profit maximizing by nature. However this domain only implies if the action maximizes profit (Schwartz M. S., Carrol A. B. 2003).

4.3.2.2 Legal domain

This domain is extensively described in the model but will be kept shorter in this description. The legal category comprises the firm's responsiveness to legal expectations mandated and expected by society. The domain is divided into (1) compliance, (2) avoided civil litigation and (3) anticipation of the law. In broad terms the different categories is self-explained by their category names. The first category comprises the cases of complying the law intentionally or accidently, but also the opportunism used for operating in less stringent legal standards. Avoidance aims at the purpose of avoiding lawsuits and anticipation on possible opportunities with future changes in the law (Schwartz M. S., Carrol A. B. 2003).

4.3.2.3. Ethical domain

The ethical domain refers to the ethical responsibilities of operations as expected by relevant stakeholders and the general population. This includes responsiveness to both domestic and global ethical demands. The domain is divided into three parts; (a) conventional, (b) consequentialist and (c) dentological. Conventional standards are explains as the norms set by the organization, the industry, the profession or society for proper functioning of operations. An action is considered to be ethical according to consequentialism when the action is intended to produce the greatest net benefit to society when compared with all of the other alternatives. Dentological standard is defined as embodying activities reflecting one's obligation or duty. Activities would fall outside the ethical when they are amoral in nature or are only intended to produce a net benefit for the corporation.

4.3.2.4 Overlapping

A major feature with this model is the interception of the different domains. This overlap creates seven different categories illustrated in Figure 11. These categories invites to further analysis and conceptualization. The ideal overlap resides in the center of the model where economic, legal and ethical responsibilities are simultaneously fulfilled. This position is by the author of this study called the "strategic sweet spot".

4.3.3 Risk management

What have driven companies to the extent that they have CSR risk management? On the question "what are the main benefits with a defined CSR for you organization?" 53 % answered "a better brand". A recent example in the U.S. with the toy manufacturer displays this in reality. A study in 2007 had shown that their toys where painted with led color which led to one of the largest media driven scandals in the country (www, NYT, No 1, 2009). Further investigation proved that the accusations were wrong, but for Mattel the damage was already done. Many things are at stake when companies get accused for being unethical and bad for the environment. Accusations and negative media attention may harm branding; create bad publicity and consumer boycotts (Whadcock I., 2008).

The consulting firm McKinsey & Co. recently presented a study where 82 % of the respondents believed that "environmental issues including climate change" is a limited opportunity for them an definitely a risk (McKinsey&Co, 2006). Other studies shows that there I a gap between CSR ambition and actual actions (Figure 10).

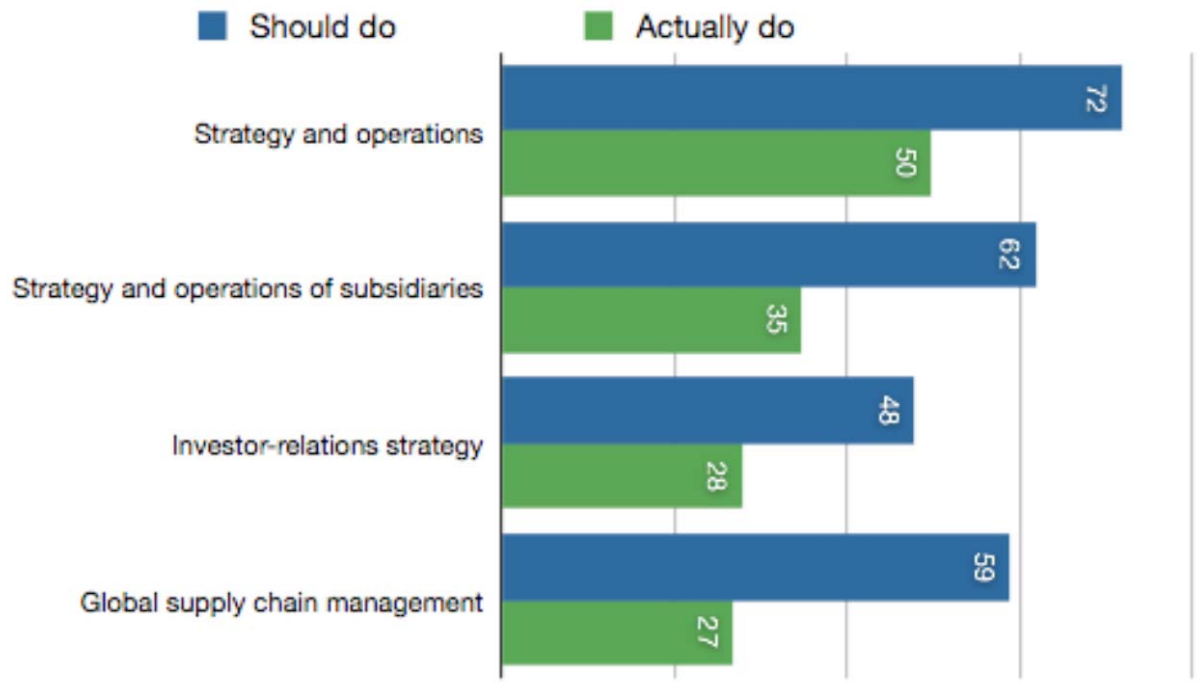


Figure 10. The chart shows the response to the question "What should your company do to address environmental, social and governance issues?" (McKinsey&Co 2008).

4.3.4 Manage risk to reputation

Most of the efforts that are put into CSR might be about doing the right thing and obtaining competitive advantage, but much of the reality is still plain risk management. This means protecting your brand equity and reputation from bad reputation that could cause consumer boycotts. Most of the work with corporate social responsibility may be to do the right and exceed competitors. Much of reality is still basic risk management. This means limit damage to the brand, which may be caused by bad press and consumer boycotts. CSR consultancies try to make companies believe that CSR is the best way to understand the world, and the way to better manage their risks. A survey conducted by the Economist Intelligence Unit asked the question "What are the main business benefits for your organization with a defined corporate responsibility policy", 53 % said, "a better brand reputation" and only 7% said, "Our income is higher than it would be otherwise" (Whadcock I., 2008). One the reasons that many firms fear that their brand is at stake is the fact that Internet has become a new way for NGOs to promote their message. If your bad deal with the supply chain in India ends up on YouTube, the whole world can see it. Companies might continue social responsibility initiatives as a form of insurance in the belief that the reputation for social awareness will lower public criticism in the event of Criticism (Porter E. M., et. al. 2006).

4.3.5 Multi-stakeholder initiative

One of the latest trends I CSR report is multi-stakeholder initiative. Mostly it involves companies running CSR on a strategic level. The benefit that NGOs get from collaborating with global companies is that they might get the opportunity to work with closed markets and reach more consumers with service. The trend was spotted in early 2000 when companies and NGOs realized they were working on the same markets and with similar objectives. Professor Jeb Brugman from Michigan University explains: "If the NGO's once saw State aid and private charity as the only way out of poverty, they now see entrepreneurship also as a

profitable strategy". Burgman has developed a model for NGOs and companies can develop cooperation (Figure 11).

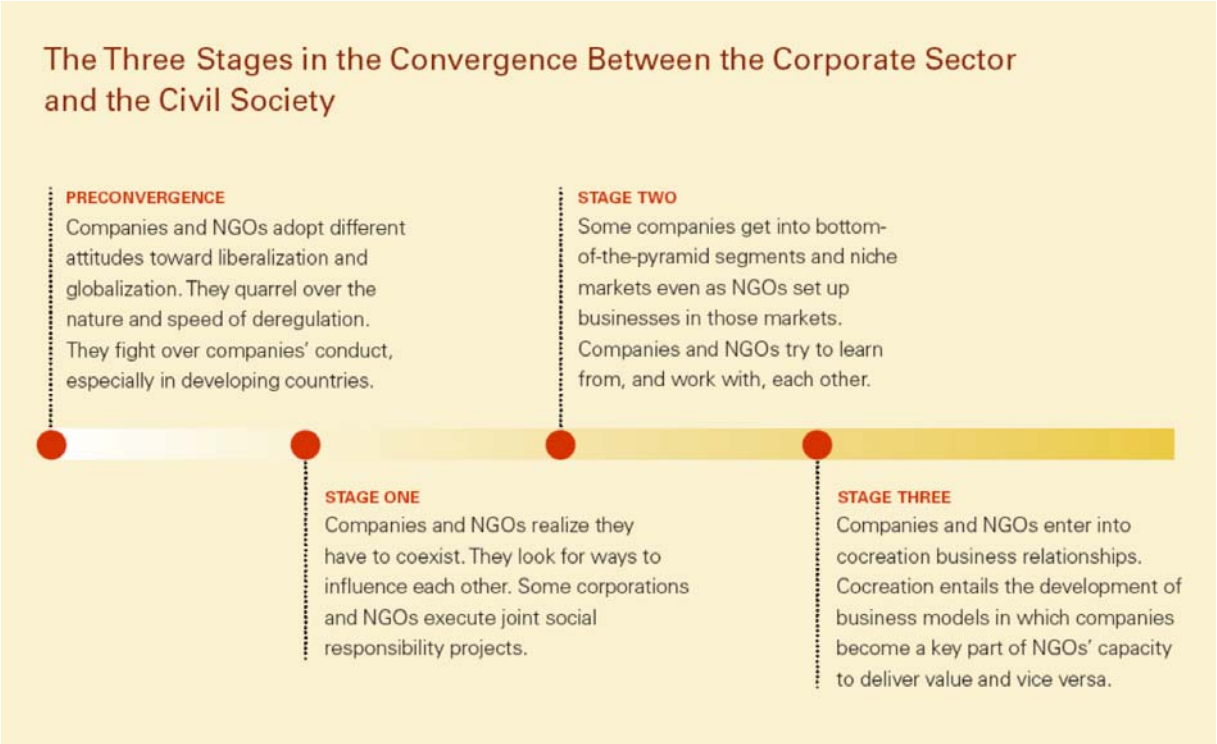


Figure 11. Model on co-operation between firms and NGOs (Burgman J., et. al. 2007).

There are many reasons why companies want the NGOs on their side. NGOs are in general efficient opinion builders and have a large impact on consumer behavior. They also have great opportunities to include corporate services and products into their own marketing. The NGOs on the other hand gets access to more markets and can possibly access marketing though the corporate services. Companies and NGOs are addressing the same audience in this multi-party marketing. Companies are addressing the bottom of the pyramid at the same time as the NGOs aims to help the same audience. Burgman gives three alternatives where companies offer opportunities for NGOs:

- Receive corporate social legitimacy
- Hybrid business models including companies, NGOs and entrepreneurs at the pyramid bottom layer.
- Deliver cost-efficient products to low-income consumers or providing niche products in mature markets

4.4 Financial model

The financial model used for analyzing the investment case of this study mainly uses two commonly recognized financial theories, net present value and internal rate of return that will be presented in part 4.3.1 and 4.3.2.

4.4.1 Net present value

Net present value (NPV) is defined as the total present value of a series of cash flows. It is a method for using the time value of money to appraise long-term projects. Used for capital

budgeting, and broadly throughout economics, it measures the surplus or loss of cash flows, in present value terms, once financing charges are met. Each cash inflow/outflow is discounted back to its present value (PV). Then they are summed. Therefore NPV is

$$\sum_{t=1}^{T} \frac{C_t}{(1+r)t}$$

where t is the time of the cash flow, r is the discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk.) and C_t is the net cash flow (the amount of cash, inflow minus outflow) at time t (Lin, Grier C. I., 2000).

NPV indicates how much value an investment adds to a firm. Appropriately risked projects with a positive NPV can be accepted. This does not mean that it has to be undertaken since NPV may not account for opportunity cost, in example comparing with other available investments. Financial theory states that if there are two mutually exclusive alternatives the one yielding the highest NPV should be selected (Brealey, Richard A., 1996).

There are some common pitfalls you need consider when using NPV as a method for appraising long-term projects.

- If the negative cash flows for a project come late in its life cycle, which means the company owes money, so a high discount rate is not cautious but too optimistic. Some see this as a problem with NPV. A way to avoid this problem is to calculate with provision for losses after the initial investment.
- Another common mistake is to add a premium to the discount rate for risk general risk. This is a subjective way of handling risk and could lead to discounting the impact of losses below its true financial cost. A thorough approach to risk requires identifying and valuing risks explicitly.
- If the NPV is negative the project should not be immediately rejected. Sometimes firms have to execute NPV-negative projects if not executing means more value destruction then executing the project.
- Relying on NPV does not always give the overall view of the gains and losses of a certain project. To see a percentage gain relative to investments usually Internal Rate of Return (IRR) is complemented to the NPV method (Brealey, Richard A., 1996).

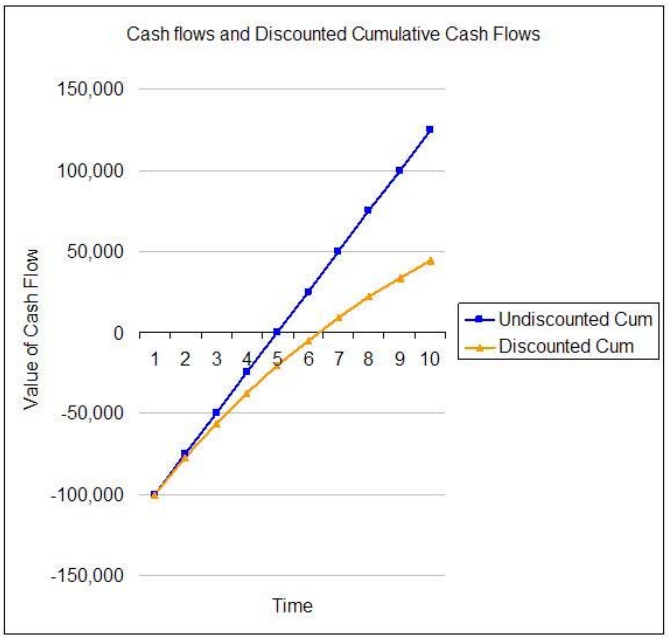


Figure 12. Example of cash flows and discounted cumulative cash flows (Eriksson A., 2009).

4.4.2 Internal Rate of Return

The internal rate of return (IRR) is the rate received for an investment consisting of cash flows that occurs at regular periods. IRR can be used to indicate the efficiency of an investment compared with NPV which indicates the monetary value. A project is to be accepted if the IRR is greater than the return that could be earned for other alternative investments with similar risk. This rate is often called required rate of return (RRR) and can be used as discount rate in NPV models. In general, if the IRR is greater than the cost of capital the project will add value to the firm. Another clarification is that IRR can be determined as the interest rate where the NPV equals to zero.

$$NPV = \sum_{t=0}^{T} \frac{C_t}{(1+r)^t} = 0$$

The calculated IRR should not be used as an investment decision tool to rate mutually exclusive projects, but only to decide if a single project is worth investing in. In cases when on project has a higher initial cost then an second mutually exclusive project, the first project may have a lower IRR but I higher NPV and should be accepted over the second project (Brealey, Richard A., 1996).

The IRR assumes positive cash flows during each project are reinvested at the same calculated IRR. When calculated IRR is higher than the true reinvestment rate the measure will overestimate the annual equivalent return from the project. The model assumes that the company has equally attractive additional projects in which it can invest the positive cash flows (Kelleher J. C. et. al., 2004).

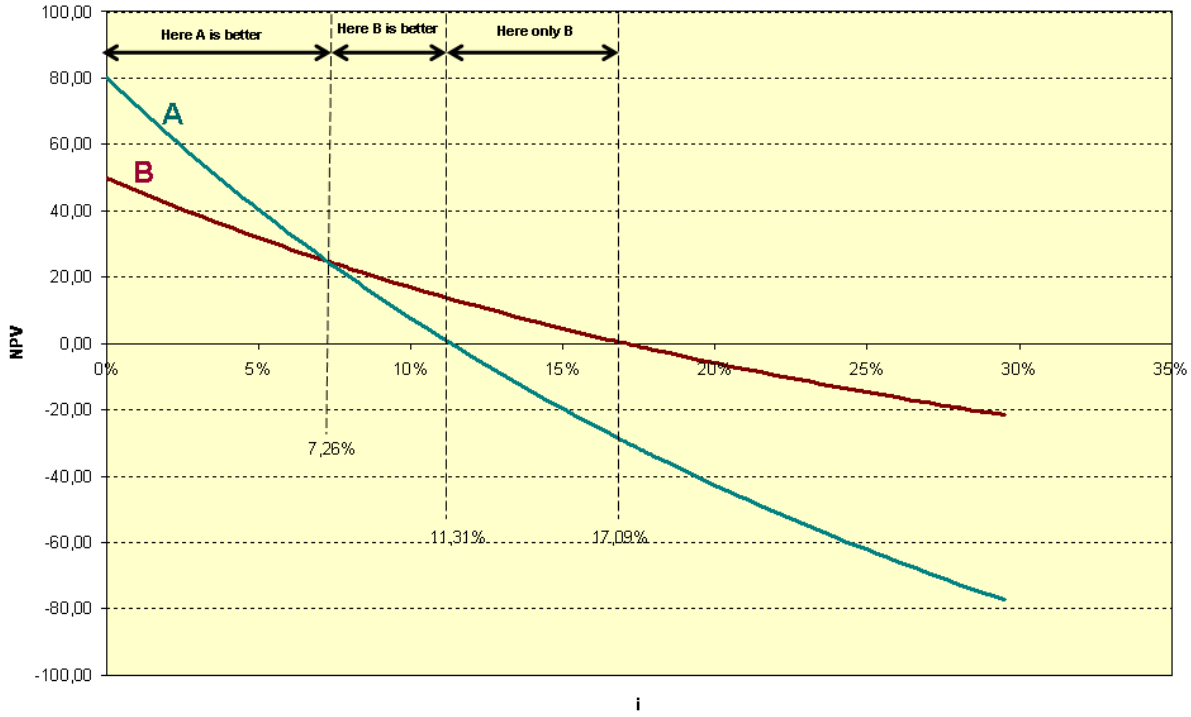


Figure 13. NPV vs discount rate comparison for two mutually exclusive projects. Project 'A' has a higher NPV, even though its IRR is lower than for project 'B' (Brealey, Richard A., 1996).

4.5 Implementation

The idea with the set of theories presented in this chapter is to link them together in an attempt to create a picture of how likely reforestation CDM is to be implemented under the given circumstances. If successful the result and conclusions could provide insight in possible gains, loss, risks and improvements in the process of developing flexible mechanisms and CDM projects.

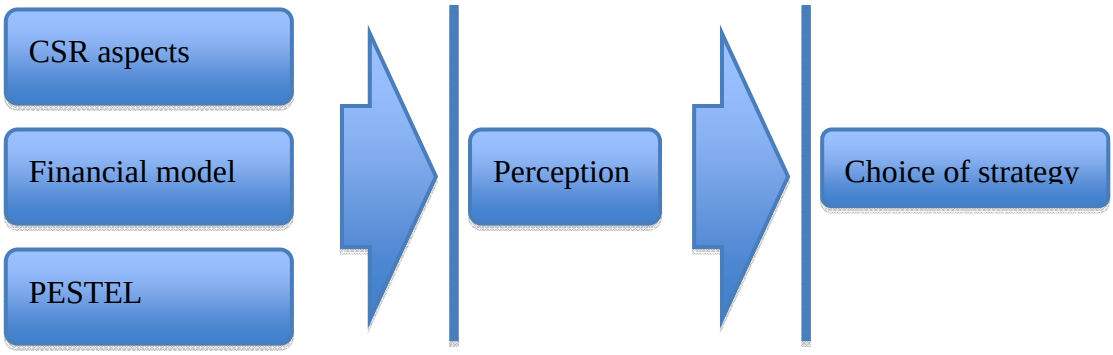


Figure 14. Illustration of theory assessment with three steps; environment, perception and strategy inspired by the concept of perception in 4.2 (Hugosson M., McCluskey D. 2008). Modisfied by Eriksson A. (2009).

5. Results

This chapter presents a summary of the empirical information obtained by qualitative Interviews and collecting of secondary data. The chapter comprises PESTEL analysis, survey results and secondary data findings.

5.1 PESTEL

This part will include macro environmental issues under which a company must operate if entering the Chinese market. Since the business environment of an economy is a broad area, it is impossible to include all features that might affect a firm. Therefore this part will focus on issues that are important for global forest, paper and packaging industries.

The Chinese market was chosen due to different aspects. To be able to implement successful forest CDM projects some factors needs to be fulfilled. First all the environmental factors in terms of climate and temperature are important for vital and productive growth. The hosting country needs to qualify as a developing country under the Kyoto protocol in order to be legitimate for credits. Security and political stability is also crucial to guarantee the implementation and safety of the project. Since CDM requires a lot of bureaucracy and cooperation from many national entities the general attitude to CDM and foreign capital is also important. China has a relatively high score in all the fields required for CDM, which makes the country a logical base fore many CDM projects (figure 15). China is also one of the most important emerging markets that also contribute to the advantage of having operations and production close to your consumers.

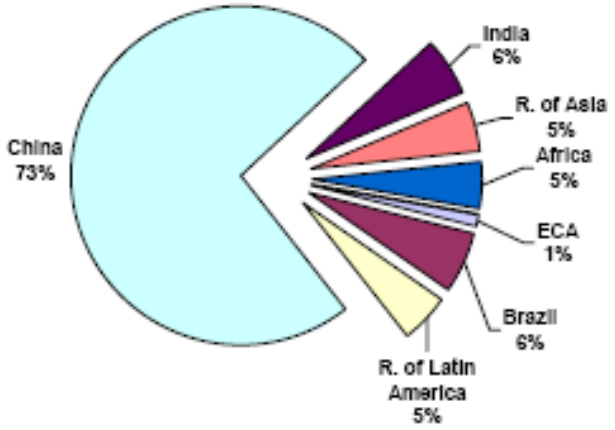


Figure 15. Location of CDM projects in 2007 (Capoor K., et. al. 2008).

5.1.1 Political

China combines market economy and socialistic political regime. In practice the Chinese Communist Party (CCP) holds all political power. Seemingly a one party state could provide a stable political climate, however there are three political factors that potentially could threaten

the political stability of China. Spread between the rich and the poor are increasing tensions and the government must deal with separatists in Tibet and Xinjiang. The Chinese pension system is on the verge of collapse with only 6 of 31 pension funds still functional. International conflicts with Taiwan, Hong Kong and Japan might disturb the stability in the longer run (EI, 2005b).

When it comes to reputation China has a bad reputation. On the Transparency International Corruption Perception Index China scored 3.2 compared Western Europe, which scored 8.2 on average. The average score for Asia I general was 3.95. In terms of bureaucracy China scores well compared to other Asian countries. It involves 12 separate procedures and 41 days to start a business in China compared with 9 procedures and 61 days in East Asia. In terms of closing business the system is rigid since it takes 2.6 years compared to 1.8 years in OECD countries. Setting a contract takes 20 separate procedures and 180 days compared to 18 procedures and 213 days in OECD (BMI, 2006a).

Regulations for foreign investments have improved since the early 1990's. China has displayed an increasing role in the world's economy through participation in international economical organizations. China also became a member of the international monetary fund (IMF) and the World Bank (WB) in the early 1980's. Later that decade China became members of the General Agreement on trade tariffs. China's membership in the World Trade Organization (WTO) in 2001 (www, WTO, No 1, 2009) might be one the most crucial steps to integration with the developed world (BMI, 2006a).

5.1.2 Economic

China's economy throughout the past 30 years has altered from a centrally designed structure that was basically closed to international trade, to a more market-oriented financial system that has a fast rising private sector and is a main player in the global economy. Reforms happening in the late 1970s with the removing of collectivized farming, and stretched to comprise the steady liberalization of prices, financial decentralization, increased independence for state enterprises, the establishment of a diverse banking system, the development of stock markets, the growth of the private sector, and the opening to foreign trade and investment. China has generally implemented reforms in a incremental manner, including the sale of minority shares in four of China's largest state banks to foreign investors. After keeping its currency closely connected to the US dollar for years, China in July 2005 revalued its currency by 2.1% against the US dollar.

The change in the Chinese economy has led to an increase in GDP since 1978 by ten times. On a Purchasing Power Parity basis adjusting for price differences China was the world's second largest economy after the US, however the country still a lower middle income in terms of per capita. Foreign investments were in 2007 totaling close to $84 billion. By the end of that year almost 7000 Chinese companies had a combined $188 billion in direct foreign investments in 173 countries. China faces several different development challenges such as sustaining sufficient job growth, reducing corruption and containing environmental damage and social trouble due to the economy's fast transformation. Worsening in the environment, such as air pollution and soil erosion is other long-term problems.

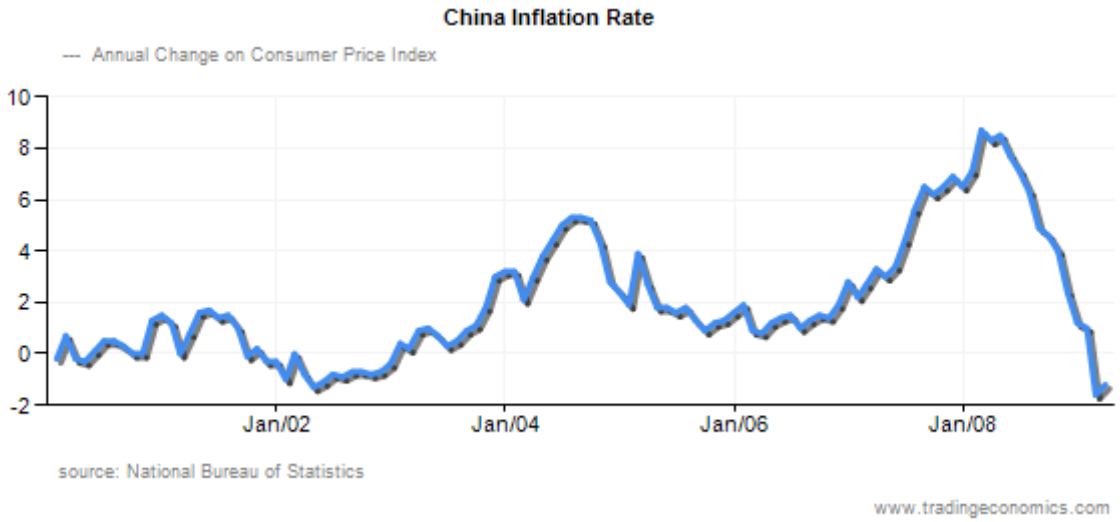


Figure 16. Inflation rate in China 2000-2008 (www, Trading Economics, No 1, 2009).

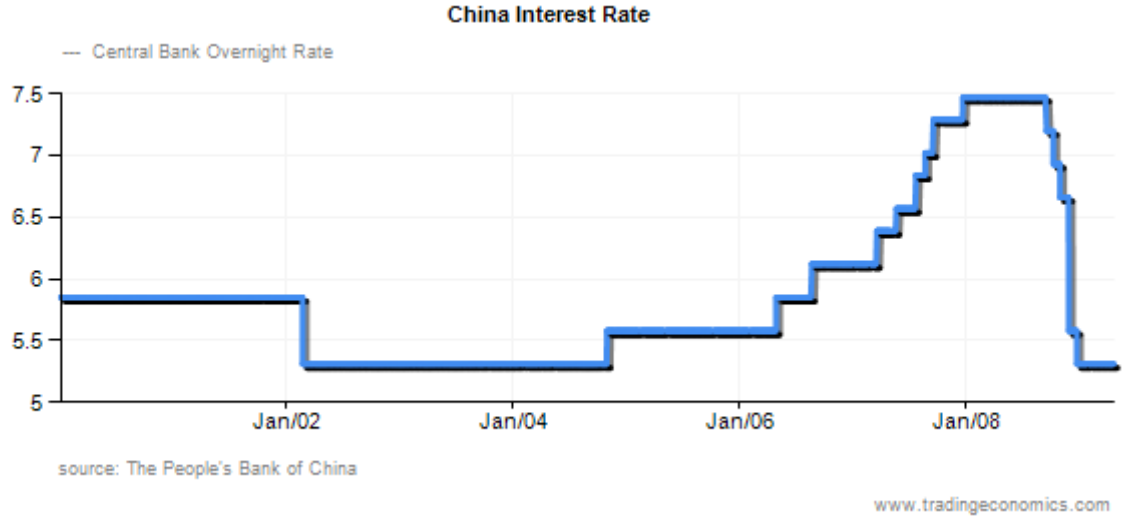


Figure 17. Interest rate in China 2000-2008 (www, Trading Economics, No 1, 2009).

5.1.3 Social

China is a high context culture, which means that speech and individual behavior can change depending on the situation (Johansson, 2003). Communication exists even though words are not spoken and the non-verbal messages are full of intended meanings. In high context cultures, people "read between the lines" when a person speaks and a western person can often miss when a Chinese person "talks around" an issue and not in direct terms (Johansson, 2003).

Agriculture and farming is the main source of income in the case project area. Due to soil erosion the agricultural production has flood and other disasters. Productivity of food in the region is low and the average annual income is about US$ 145, and for some remote villages even below US$ 100. In order to maximize the socio-economical values the reforestation design was formed with a participatory approach. . The local farmers will participate in the reforestation activities such as establishment and forest operations. It is expected that 27 villages will benefit from the project (www, UNFCCC, No 2, 2009).

From the main reference case used in this study (*Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin*), the following social benefits was recognized:

(1) Income generation: local farmers and households will benefit from the project. The mean net annual income per capita will be increased by 23.8% compared to the year 2004. The income generation is especially significant and important for ethnic minorities.

(2) Creating employment: The reference A/R CDM project activity will create temporary employment opportunities from planting, weeding, harvesting and resin collection. It will also create long-term job positions during the crediting period. Most employment opportunities will be taken by the local farmers/communities involved in the proposed A/R CDM project activity and beyond.

(3) Sustainable fuel wood supply: The local communities depend on fuel wood for living to a certain extent. The proposed A/R CDM activity will provide more sustainable fuel sources for local farmers. In addition, local governments are demonstrating and extending bio-gas energy by providing subsidy for local farmers who builds bio-gas system and this will ease the pressure of fuel wood collection on planted forests (www, UNFCCC, No 2, 2009).

5.1.4 Technological

As China is becoming a better-linked player in the World economy, the Chinese government is pushing more resources science and technology. This has improved the financing of research and contributed to a better scientific structure. These factors have led to improvement in several fields such as agriculture, medicine and genetics. Over 60 % of funding to Research and Development (R&D) comes from the private sector while the government contributes the rest. The spending on R&D constitutes close to 2 % of GDP, and the government wants to boost that figure and pass 2 % by 2010 and reach 2.5 % by 2020, which is equivalent to U.S. and Japan (Business Week, 2006).

5.1.5 Environmental

The Chinese government have moved focus to control the country's pollution problem and made it one of their top priorities. The State Environmental Protection Agency (SEPA) was in 1998 upgraded to ministry level, reflecting the increasing importance the government puts on environmental protection. In 2006 China expended further in this area and series of regulations have been enforced. The country have tightened its environmental legislations and made progress in stemming environmental corrosion. During China's 11^{th} 5-year plan (2006-2010) the plan is to reduce emissions by 10 % and bring the energy efficiency up to 20 %. Beijing did a big effort on pollution control as a part of the campaign of being a successful Olympiad host in 2008 (www, NYT, No 2, 2009).

The number of complaints to environmental authorities have increased by 30 % since 2002, and reached a total of 600,000 in 2004 while the amount of mass protests on environmental issues has grown by 29 % (www, China Dialogue, No 1, 2009)

The Xinhua News Agency quoted Wang Jinnan, an environmental official, saying that more than 410,000 Chinese die as a result of pollution each year (www, HRIC, No 1, 2009). A report from the World Bank entitled that Cost of Pollution in China conducted with The State Environmental Protection Agency found that almost 760,000 dies prematurely each year of water and air pollution. High levels of air pollution in big Chinese cities lead to 400,000

premature deaths, it said. Another 300,000 die because of poor indoor air quality and 60,000 from poor water quality (www, BBC, No 1, 2009).

The Chinese government instituted the Green Gross Domestic Product in 2004 in order to determine the real GDP adjusted to compensate negative environmental impact. The result was so much worse than expected that the program had to be cancelled in entirely in 2007. The government has attempted to hold "no-car" days in nearly 100 cities including Beijing where cars would be prohibited on central roads. This was however largely ignored (www, BBC, No 2, 2009).

The climate of the project area belongs to the subtropical monsoon climate. There is a high solar radiation, long and hot summer, and short and warm winter. The mean annual frost-free period is 331 days. Annual mean temperature is 21.2 0C, with the extreme temperature of 39.9 0C and -2.4 0C. The annual mean precipitation is 1,507 mm, mostly between April and August. The annual mean evaporation is 1,513 mm. The annual mean sunshine is 1,779 hours. The annual mean relative humidity is 80 % (www, UNFCCC, No 2, 2009).

5.1.6 Legal

Labor is heavily regulated in China compared with other Asian countries and with OECD average. The regulations are tighter for dismissing than hiring. In spite of governmental efforts the country still has poor protection of intellectual property rights. Since joining the WTO several new laws have been imposed to improve the protection of intellectual property rights, however, enforcements of these laws has not been satisfying and with penalties repeatedly failing to be imposed (BMI, 2006b)

5.2 CSR Survey

This part will present the results from qualitative interviews with environmental and sustainability officials and executives from five of the largest forest, paper and packaging companies. A short introduction to the companies participating is this survey will also be given.

5.2.1 Respondent companies

5.2.1.1 International Paper (IP)

International Paper is a leading global company in the packaging and paper sector and has more than 51,500 employees with a turnover in 2007 of $22 billion. Their main focus is northern America with 105 facilities, with another 46 product facilities abroad. International Paper was ranked as No 1 among forest companies by Fortune magazine in 2007. The headquarters is located in Memphis, Tennessee, USA (www, IP, No 1, 2009).

5.2.1.2 Stora Enso (SE)

Stora Enso is a leading global packaging, paper and forest products company, with focus on newsprint, book paper, consumer board, magazine paper, fine paper, industrial packaging and wood products. SE employs 32,000 people in more than 35 countries. SE turnover in 2008 was €11 billion. The headquarters is located in Helsinki, Finland (www, SE, No 1, 2009).

5.2.1.3 Kimberly-Clark (K-C)

Kimberly-Clark is a leading global consumer products company with focus on health and hygiene and employs about 53,000 people. K-C are located worldwide with operations in 35 countries and have customers in more than 150 countries. The turnover in 2008 was $19.4

billion. Some of their most recognized brands are the diaper, Huggies (dipers) and their tissue, Kleenex. The headquarters is located in Dallas, Texas, USA (www, Kimberly, nr1, 2009).

5.2.1.4 Svenska Cellulosa AB (SCA)

SCA is a leading forest company within tissue, packaging, personal care products, publication papers and solid-wood products and operates in more than 90 countries. SCA's turnover in 2008 was €11.5 billion and employs more than 52,000 people. The main market is Europe and the headquarters is located in Stockholm, Sweden (www, SCA, No 1, 2009).

5.2.1.5 UPM Kymmene (UPM)

UPM is a leading forest company with focus on energy, pulp, engineered materials and paper. They have production facilities in 14 countries and a total of 25,000 employees. UPM's turnover was €9.5 billion in 2008 (www, UPM, No 1, 2009).

5.2.2 Survey findings

5.2.2.1 Familiarity

All interviewed companies are joint-stock companies and therefore have a strong commitment to the shareholders. However, responsibility toward other stakeholders and governments is sometimes equally if not more important. The companies also have in common the general view that CSR is based on social, environmental and economical issues. Not surprisingly all companies of this magnitude has a deep understanding of CSR and a developed CSR strategy.

5.2.2.2 Defining objectives

The most commons structure for defining and coordinating environmental objectives is to have directions set by the senior management, which is then executed by sustainability teams in variable shapes who makes sure the directions is implied through the organizations. These teams are often globally collaborating as in the case with SCA that have one representative in each main market area (Dillon, M. 2009). Kimberly-Clark uses a model with 5-year objectives and is right now working on their third period, the 2015 objectives (Strassner K. 2009). The main targets in these objectives are energy use improvements, recycling, environmental management, carbon reduction and climate change management strategies.

5.2.2.3 Carbon management

International Paper (IP), the largest player on the market with 70 % of its assets in the U.S., are as most global fiber consuming companies monitoring the development of the carbon markets. Douglas Stilwell (2009), manager international affairs IP, has the opinion that the concept of carbon strategy is "more smoke than fire" as far as IP is concerned. Since the U.S. is yet to impose a cap for carbon emissions, IP with heavy asset allocation in the U.S., is not taking the same heat in this matter as its European competitors. Stilwell sees conflicts in how social responsibility is handled in the CDM due to the negative approach UNFCCC have towards having, according to UNFCC, too profitable projects. In the meantime IP waits for a mature global market to emerge and keeps working on how to act in such a scenario. IP have looked into the possibility CDM when i.e. building a biomass boiler in Brazil for efficiency improvements. The baseline in this case is consumption of coal power, which would be replaced by renewable energy. Stilwell admits that this is rather business as usual but believes that projects should be encouraged for CDM even though they are profitable in order to optimize the efficiency of the Kyoto flexible mechanisms.

Both Stora Enso (SE) (Marjokorpi A. 2009) and SCA (Isaksson P. 2009) have experience from implementing CDM projects. SE has done research regarding possibilities of using

rainforest recovery zones as CDM project but these plans are currently on hold due to the lack of CDM methodologies for avoided deforestation. SCA currently runs three projects in India partially as result from having an offset surplus from phase one (2005-2007) in the Kyoto enforcement, that they transferred to phase one in the end of 2007 when the prices were too low to sell without loss.

All the respondents have either had, or have forest plantations in developing countries according to the UNFCCC classification. For I-P and K-C these assets has been sold off. K-C actually sold of all forest assets ten years ago when it fully converted to a consumer-brand enterprise. However, K-C is still a big global buyer of virgin and recycled fiber and still need to be updated on all aspects concerning their main recourses. SE and UPM both holds plantation assets in developing countries while SCA only have local plantations, which do not qualify for CDM.

5.2.2.4 Carbon management strategy

Kimberly-Clark's climate change management strategy comprises solar power, energy efficiency, cap-and-trade preparations and carbon issues in forestry. The latter aspect is brought into account even though the company does not run any forest operations. However, they are a big buyer of fiber (Strassner K. 2009). Stora Enso recently stated their own goals on cutting emission with 20 % by 2020 in line with EU targets (Marjokorpi A. 2009). In overall the companies have a carbon management strategy these days, whether its solitaire or integrated in the general sustainability strategy. The purpose of these strategies is to handle the company carbon balance so that it fulfills the company's environmental goals.

5.2.2.5 Drivers

All public companies are ultimately answering to the annual shareholder meeting who selects the board and votes on large decisions concerning company mission, board members, dividends etc. The meeting and the board represents foremost the shareholders, but is also influenced by other stakeholders like governments, banks, NGOs and the public (Isaksson P. 2009., Stiwell D. 2009). All global successful companies have profit as an overall goal since it's crucial for survival and a mean to obtain sustainable performance. However, the intangible benefits from doing good can often be combined with cost saving and maximizing profitability (Strassner K. 2009). Since the company reputation also can be a strategic and competitive advantage. Cost savings are often a win-win situation for environmental and resource consumption targets. The financial health is still always a key issue for every investment and the general view is that also CSR missions will benefit the most from financial stability in the long run. Therefore break-even or net profit is a requirement, often dependent on case-specific required rate of return (RRR) related to net present value (NPV), which is a common financial decision tool (Marjokorpi A. 2009., Niemi T. 2009).

5.2.2.6 Compare costs of CER with in-house offsets

When it comes to optimizing costs of carbon the companies have different approaches. All the respondents keep track of market price of emission allowances, often done by the corporate energy or business intelligence department (Marjokorpi A. 2009). As mentioned above, executives hope that the world understands that low-cost is the best strategy to effectives global emission reductions. It's a matter of simple math means Ken Strassner (2009) at IP and stresses that more can be done with less cost, regardless of the topic. Since emission caps only have been imposed in the EU so far, costs and trade of allowances directly affect only the part of companies operating in the EU. All respondents still keep track of the development and processes as well as they are learning the system for the day more than EU is having a cap and

trade system. Global companies carbon neutrality depends which markets you count. Overall you could say that companies are polluters even thought K-C for example claims to be an off setter within EU. Regardless of this the companies would be forced to trade emission allowances in case of a global emission cap.

5.2.2.7 Connection between CSR and CDM

The connection between corporate social responsibility and the Kyoto flexible mechanisms might seem like an easy fetch. However the majority of the respondents think that CSR is a general and sometimes abused term and many executives and specialist rather use sustainability. The CSR or sustainability issues that are affected by the CDM are many. The objective of each project is to first remove GHG emissions, but also present improvements in other CRS areas such as labor and quality measures to improve local economy and living standards (Stilwell D. 2009., Niemi T. 2009). Setting requirements for each project is variable and dependent on the host country. Since the host is a developing country they sometimes do not have the same level of knowledge experience as the investing entity. This can sometimes affect the collaborating process when optimizing measures aiming to improve different CSR subjects.

5.2.2.8 Effects from economy crisis

According to all respondents the sustainability actions is affected by the economic climate in the same way companies range of action always is limited by a worsening financial wealth (Isaksson P. 2009., Dillon M. 2009). This also comes back to the fact with dual benefits on cost saving measures. Instead of investing in new GHG reducing projects, companies focus on saving resources and energy in a way to cut costs and cope with reduction targets simultaneously. IP believe that this will put some of the offset suppliers out of business. However, when the market adjusts itself and the U.S. possibly joining a global carbon market, the price of emission allowances should climb (Stilwell D. 2009).

5.2.2.9 General opinion

The common corporate opinion on CDM in general and forest projects in particular is a non-positive one. The main reason that has kept many operators non-believers is the possible strains a cap-and-trade system can put on markets. Stilwell (2009) at IP means that it could actually kill the industry if it is already in bad shape. However, global companies have already explicit sustainability strategies and many are exploring competitive advantages through green profiles and new industries are growing due to the green wave. A more consolidated view from the respondents is the negative attitude and strives towards non-profitability, expensiveness and defensive approach that the UNFCCC and NGOs puts on the Kyoto flexible mechanisms (Marjokorpi A. 2009., Stilwell D. 2009., Strassner K. 2009., Isaksson P. 2009). The mechanisms are not flexible enough to be attractive in the extent to make a substantial impact. Processes are too slow, expansive and much energy are put into making the process expensive and to ensure that nothing is done for profitability reasons. (Marjokorpi A. 2009). A common understanding is also that the most important part of forest related GHG emission comes from deforestation, which is one of the hot potatoes in the upcoming negotiations of the next agreement period starting with the COP15 meeting in Copenhagen, Denmark in December 2009. The problem is to secure avoided deforestation in developing countries with high level of corruption and illegal logging (Irland L. 2009). Some also believe that the incentives for carbon benefits are still to low. This together with a high insecurity of what will happened to this somewhat artificial market after 2020, maybe without US, makes you wonder who wants to bet on it (Stilwell D. 2009).

5.3 Data

This part will present the findings from secondary data collection on costs of reforestation investments, CDM transaction costs as well as possible revenues from carbon credits.

5.3.1 Establishment and forest management

Recent reforestation CDM projects in the Guangxi province have determined suitable management systems for creating suitable and balanced levels of biodiversity, timber output, carbon sequestration, labor, food and fuel wood. The data in this part in mainly extracted from a registered CDM project called *Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin* in Guangxi, China (www, UNFCCC, No 2, 2009). This reference case is chosen since it has similar features as the hypothetical case of this study and many variables can be assumed to be close the same in both cases. Both scenarios are reforestation projects in the southern part of the Guangxi province of China. Both forest management system, costs and benefits of operations as well as GHG removals by sinks is therefore adopted mostly from this project.

In the reference project mentioned above trees will be planted in mixed stands in order to minimize risk of fires, pest, insects and disease as well as maximize environmental and social benefits. *Pinus Massoniana* (Masson's pine) and *Cunninghamia Lanceolata* (China fir) that are less flammable will be planted on inaccessible areas like upper parts of slopes. More fire resistant broad leaf species will be planted in lower slopes and more accessible areas. Broad leaf will also be used on hill ridges as firebreaks. The plantations will not be thinned. Resin will be collected as a by-product of the *P. massoniana* from the age 16-20 years to raise the local income. *P. massoniana* and *C. lanceolata* will not be harvested during the crediting period. *Liquidimbar Formosana* (Formosan sweetgum and *Schima Superba* will be harvested around the age of 17, eucalyptus around age 10 and oak around age 7. The forest management plan is shown in appendix 4. After harvesting, eucalyptus and oak will be regenerated naturally through re-sprouting, and other stands will be directly re-planted. Re-sprouted stands grow faster and have many more stems per hectare compared to planted stands (www, UNFCCC, No 2, 2009).

5.3.2 Transaction costs

Transaction costs are the costs resulting from completing transactions, like finding partners and projects, negotiating deals, consulting and experts, monitoring agreements as well as opportunity costs like lost time and resources (Coase, 1937). Even though the costs are simply effects of transferring property rights they exist in every market economy. The most obvious impact of transaction costs is that they raise the costs for the participants of the transaction and thereby lower the trading volume or even discourage some transactions from occurring. Taking transactions costs into account might change the optimal choice when comparing different alternatives, domestically and internationally. In order to seize low cost abatement options abroad, countries have to make use of one of the Kyoto Mechanisms and thus to bear the additional costs caused by the institutional framework of the Kyoto Protocol (Michaelowa A., et. al. 2003).

Michaelowa (2003) defines in the report Transaction costs of the Kyoto Mechanisms the different variables (Table 6) to consider in Kyoto flexible mechanism assessments.

Table 6. Definition of transactions cost components (Michaelowa A., et. al. 2003). Modified by Eriksson A,. 2009

Transaction cost components	Description
Project based: Pre-implementation	
Search cost	Costs incurred by investors and hosts as they seek out partners for mutually advantageous projects
Negotiation costs	Includes those costs incurred in the preparation of the project design document that also documents assignment and scheduling of benefits over the project time period. It also includes public consultation with key stakeholders
Baseline determination costs	Development of a baseline (consultancy)
Approval costs	Costs of authorization from host country
Validation cost	Review and revision of project design document by operational entity
Registration costs	Registration by UNFCCC Executive Board
Project based: Implementation	
Monitoring costs	Costs to collect data
Verification costs	Cost to hire an operational entity and to report to the UNFCCC Executive Board
Review costs	Costs of reviewing a verification
Certification costs	Issuance of Certified Emission Reductions by UNFCCC Executive Board
Validation of baseline	Re-assessment and control of the baseline scenario
Trading	
Transfer costs	Brokerage costs
Registration costs	Costs to hold an account in national registry

Secondary data gave after calculating averages, the transaction costs presented in table 7. Full set of data is found in Appendix 2.

Table 7. Transactions cost findings in US dollar

Transaction cost components	Amount is US $
Project based: Pre-implementation	
Search cost	$ 13 000 [1,2,3,4]
Negotiation	$ 116 667 [1,2,3,4,6]
Baseline determination costs	$ 34 167 [3,4,6]
Approval costs	$ 27 167 [1,4,6]
Validation cost	$ 19 250 [1,2,3,4,6]
Registration costs	$ 49 375 [2,3,4,5]
Project based: Implementation	
Monitoring costs	$ 9,2 per hectare every 5th year [1]
Verification costs	$ 17 000 upfront and $ 8 500 every 5th year [1]
Review costs	$ 27 500 [4]
Certification costs	2 % of CER value [3,4]
Validation of baseline	$ 30 000 every 5th year [1,3]

Trading	
Transfer costs	5 % of CER value [1,2,6]
Registration costs	0,03 % of CER value [1,2,6]
Source:	[1] Gutierrez V. H., et. al. (2006) [2] Michaelowa A., et. al. (2005) [3] EcoSecurities (2007) [4] Pin K. P., (2005) [5] Pembina Institute (2003) [6] Michaelowa A., et. al. (2003)

The upfront transactions costs ads up to $334,953.29, calculated on CER value presented in part 5.3.4. Future negative cash flow from transaction costs ads to $75,300 every 5th year.

5.3.3 Greenhouse gas removal by sinks

The estimated GHG removals by sinks in the reference case include direct N2O emission caused by N input, decrease in carbon stock due to removal on existing non-tree vegetation as well as the carbon stock change in above-ground and below-ground biomass in living trees. To estimate the biomass stock change achieved by the proposed A/R CDM project activity, local growth curves was used. These growth curves were results from Chinese forestry data inventories carried out every 5th year since the 1970's. The nitrogen fertilizer is applied to eucalyptus plantation at the first, second and third year of the establishment or regeneration of the plantation. The actual net GHG removals by sinks is that the carbon stock change in above- and below-ground biomass minus the increase in N2O emission of nitrogen application stands (www, UNFCCC, No 2, 2009).

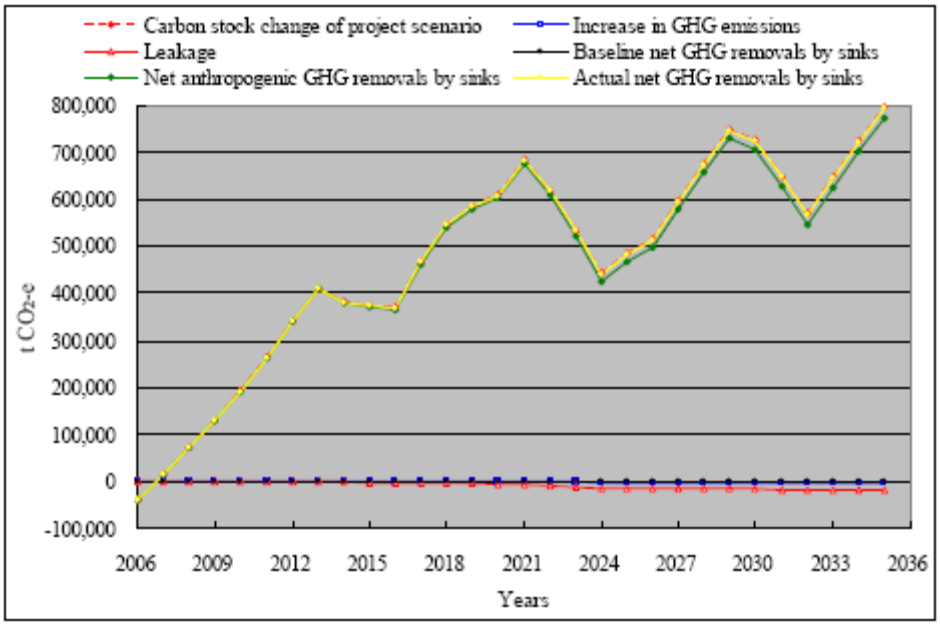


Figure 18. Reference case GHG removal by sinks and leakage over the project life cycle (www, UNFCCC, No 2, 2009).

The total GHG removal by sinks accumulates to 773,842 tones CO_2 during the proposed project period (www, UNFCCC, No 2, 2009).

5.3.4 Constructing the Investment model

The model used for analyzing the costs and benefits of this CDM investment case is based on calculating net present value (NPV) on different cash flows. Internal rate of return (IRR) is mainly used to compare the financial efficiency of the project with the required rate of return (RRR). All calculations obtaining NPV and IRR on the investment case are made through linear programming on spreadsheet in Microsoft Excel 2008.

5.3.4.1 General input

The basic case for the investment uses initial cost year 0 of property on US$400/ha (Storck G, 2009) and a CER price on US$17 which is the approximate market price this April 24th 2009 (www, PointCarbon, No 2, 2009). The required rate of return (RRR) used in the model is 12 %, which is a standard issued by the Chinese Ministry of Agriculture (CMOA, 1996).

5.3.4.2 Establishment costs

The planting procedure is divided on the two first year of the project period. To calculate the percentage of planting done in year zero and year one the area planted in year 2006 and 2007 in Appendix 2 are summed up and divided on the total area. The result is that 36 % is planted in year zero and 64 % is planted in year one. To simplify the model the mean value on establishment costs in appendix 2 is multiplied with the percentages for year zero and year one and then individually multiplied with the total area of 4000 hectare. The mean establishment cost per hectare comes to $509.26 per hectare. This gives the total establishment cost in year zero is $731,034 and $1,305,974 in year one (www, UNFCCC, No 2, 2009).

5.3.4.3 Costs of equipment

Cost of equipment is extracted from Appendix 2 as a mean value and the multiplied with the total area of 4000 hectares. This is an upfront cost and occurs only in year zero (www, UNFCCC, No 2, 2009). The mean value for equipment is $54.63 per hectare and the total upfront cost is $218,528.

5.3.4.4 Other costs

Other costs are calculated in the same way as equipment. The mean value of other costs is extracted from Appendix 2 and comes up to $61.26 per hectare. This variable comes to a total upfront cost of $183,786 (www, UNFCCC, No 2, 2009).

5.3.4.5 Unpredictable costs

The unpredictable costs are evenly distributed over the project period as a form of insurance. Due to the appreciation of time in the NPV formula this decreases the unpredicted cost over time just as the risk decreases the shorter time period that's left of the project. The mean value of unpredictable costs extracted from Appendix 2 is $59.92 per hectare. This gives a total cost of $7,989.07 per year when multiplied with 4000 hectare and divided by 30 years (www, UNFCCC, No 2, 2009).

5.3.4.6 Operating income

The operating income is the monetary result from logging the different species planted in the reforestation project. This income is extracted by species and for oak also into different rotations according to Appendix 3. Timber output is multiplied with the total planted area per species, which gives 117,280 m^3 for eucalyptus, 14,697 m^3 for oak first rotation, 58,336 m^3 for oak after first rotation, 39,168 m^3 for *S. superba* and 97,920 m^3 for *L. formosana*. *P. massoniana* is left out of the operating income calculation since it is not harvested during the project period. From these variables harvesting cost, transportation cost and timber revenue is

calculated for each species as above. The gross income per species is given by subtracting costs of harvesting and transport from timber revenue. The net profit is then calculated through subtracting 10 % tax from the gross income. This gives a net income per species of $3,261,566.80 for eucalyptus, $245,23.14 for oak first rotation, $973,394.50 for oak after first rotation, $774,899.64 for *S. superba* and $919,664.64 for *L. formosana*. These operating incomes are given each time the species is harvested during the project period.

The findings given on operating income is presented in Table 8 below. The data is extracted and calculated from attached in Appendix 2, 3 and 4. The project time is 30 years and based on a plantation area of 4000 hectares.

Table 8. Costs and benefits of forest operations based on data from Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin (www, UNFCCC, No 2, 2009)

REVENUE harvest	**Eucalyptus**	**Quercus 1st rotation**	**Quercus after 1st rotation**	**S. superba**	**L. formosana**	**P. massoniana**
Timber output (m3/ha)	117.28	16.33	72.92	65.28	65.28	78.67
Harvest cost ($/m3)	8.03	8.03	8.03	8.65	9.27	9.27
Transportation ($/m3)	4.33	4.33	4.33	6.18	6.8	6.8
Price ($/m3)	43.26	30.9	30.9	39.56	27.81	42.65
Tax (gross if income)	10%	10%	10%	20%	20%	20%
Volume total (m3)	117280	14697	58336	39168	97920	165207
Revenue total	$ 5,073,532.80	$ 454,137.30	$ 1,802,582.40	$ 1,549,486.08	$ 2,723,155.20	$ 7,046,078.55
Cost total	$ 1,449,580.80	$ 181,654.92	$ 721,032.96	$ 580,861.44	$ 1,573,574.40	$ 2,654,876.49
Occurs year	9, 16, 26	7	13, 19, 25	17	17	none
Net Profit	$ 3,261,556.80	$ 245,234.14	$ 973,394.50	$ 774,899.71	$ 919,664.64	$ 3,512,961.65

5.3.4.7 CDM transaction costs

Upfront transaction cost for implementing the process of CDM is presented in part *5.3.2 Transaction costs* and is given through adding the different variables that only occurs as upfront costs. The upfront transaction costs ads up to $334,953.29. Transaction costs for CDM that occurs every 5th year is also given in part 5.3.2 and ads to $75,300.

5.3.4.8 Carbon benefits (CERs)

The total amount of GHG removal by sinks is given in *5.3.3 Greenhouse gas removal by sinks* and totals to 773,842 tones CO_2. To obtain the CER value per year this figure is multiplied with $17 (www, PointCarbon, No 2, 2009) and then divided by 30 years. This gives an annual CER income of $438,510.47.

5.3.4.9 Net cash flow, NPV and IRR

The different variables presented above are added together in each year they belong in the model to create the net cash flow for each one of the 30 years of the project. The cash flows are then discounted each year with the RRR of 12 % given in part *5.3.4.1 General input.* After

that NPV and IRR are given through the formulas presented in *4.4.1 Net present value and 4.4.2 Internal rate of return.*

6. Analysis

This chapter analyses the empirical findings using the theoretical framework described in chapter 4. The chapter is divided into the following areas: PESTEL, Corporate Social Responsibility and Investment model.

6.1 PESTEL

6.1.1 Political

As Figure 11 shows, 73 % of CDM projects in 2007 where located in China (Capoor K., et. al. 2008). This is partially due to that regulations for foreign investments have improved since the early 1990's. China has displayed an increasing role in the world's economy through participation in international economical organizations.

6.1.2 Economical

The economical aspects are closely related to political due to Chinas change from a closed to a more open international economy. According IP is China by far the most foreign capital friendly company among potential CDM investment areas (Stilwell D. 2009). China is largely affected by the current economical decline due to the heavy investment the country has made in financially suffering US. The earlier high and increasing inflation rate has plunged and it is hard to say how this development will evolve in the close future. The investment case RRR is partially depending on the inflation rate. However, risk might be the larger part of the discount rate in this case. The declining inflation rate and interest rate is worth noticing.

6.1.3 Social

According to the findings in 5.1.3 the local social benefits are many. Agriculture and farming is the main source of income in the case project area. This states speaks for an accessible and motivated workforce that will put motivation and emphasis into the operations and maintenance of the project. It is expected that 27 villages will benefit from the project. The main socio-economic benefits of the project include income generation creating employment and creating a sustainable fuel wood supply (www, UNFCCC, No 2, 2009).

6.1.4 Technological

The scientific improvement in agriculture and genetics has potential to help the development of reforestation projects in the country. China is pushing a high level of development I all fields they consider important for China. This make agriculture a key research area due to the high level of income contribution the vast amount of farmers make. When the Chinese government put all that plan economy bureaucracy behind something the decisions are made fast and the impact is large (Business Week, 2006). Overall the technological development among farmers is not high in international standards. However bringing foreign technology into the site should not be a problem since national and local leader in China welcome new technology.

6.1.5 Environmental

The Chinese government instituted the Green Gross Domestic Product in 2004 in order to determine the real GDP adjusted to compensate negative environmental impact (www, BBC,

No 2, 2009). The fact that Chinese officials are trying to manage the countries pollution problems impose that forest carbon offsetting should be welcomed (www, NYT, No 2, 2009).

Companies issues with bringing their CSR values and strategies to new markets might be a problem since the number of complaints to environmental authorities have increased by 30 % since 2002, and reached a total of 600,000 in 2004. At the same time the amount of mass protests on environmental issues has grown by 29 % (www, China Dialogue, No 1, 2009). According to Whadcock I. (2008) one of the most challenging CSR issues that global companies faces today is bringing their CSR strategy to new markets, with their own values and traditions. What is right in the EU and North America is not necessarily right in China or Brazil.

The climate of the case site is to be considered as appropriate since similar projects have been successfully conducted in the same area (www, UNFCCC, No 2, 2009). The proposed forest management system is to be adapted to the local climate features.

6.1.6 Legal

Labor is heavily regulated in China compared with other Asian countries and with OECD average. This should not be a problem for companies from industrial western countries who are used to high social security. In spite of governmental efforts the country still has poor protection of intellectual property rights. Forest plantation does not involve many big secrets and protection of intellectual rights is not a key issue (BMI, 2006b).

6.2 Corporate Social Responsibility

6.2.1 Understanding and benchmark

Not surprisingly the companies represented in part 5.2 has a high level of knowledge on CSR and sustainability due to the industry's obvious impact on the environment. Cutting down trees and forest management has a history of being a hot topic in environmental contexts. In the 90's the slogan was "the lungs of the world" which is not far from the concrete threats of global warming today (Marjokorpi A. 2009). According to a survey conducted by EcoSecurities (2008), 43 % of organizations have a carbon management strategy (figure 19).

Figure 19. Percentage of companies having a carbon management strategy (EcoSecurities, 2008).

Compared with Figure 19 the forest industry has a higher level of strategic awareness when it comes to carbon than the general enterprise. Due to the historically pressure on logging the companies in this study is used to managing stakeholders, which leads us to the next part.

6.2.2 Stakeholders

On the question what establishes the CSR objectives, the vast majority of the respondents claim that most of such objectives originally comes from different stakeholders, ultimately representing a mean opinion of the public. Common stakeholders mentioned are governments, banks, costumers, shareholders and NGOs. Different companies and different areas receive different pressure from NGOs dependent on the structure of NGOs. One example is Stora Enso who has received many complaints on the management of ancient forests in northern Finland. The focus on Finland and Stora Enso (SE) is due to that Finland is one of Greenpeace's focus areas on forest protection. This has led to that SE has taken a lot of heat in Finland, but also globally as an affect of the NGO paying more attention to the company. A recent effect of that are protests against the firm's operations in Brazil. Stora Enso also recognizes that one of their sub-contractors in China were involved in the collision that led to one dead. A total of 20 people alleged to have been in place for the clash, reports the Finnish news agency STT. The dispute concerned four trees in one of the villages in the area in southern China (www, papernet, No 1, 2009). This is a typical example of an occurrence that might or might not be at any responsibility to the company, but still make a large impact on their public credibility and CSR performance.

In correlation to Figure 11 in part 4.2 firms and NGOs integrates over time and take mutual benefits from each other (Burgman J., et. al. 2007). The results in this study taps that the integration is rater developed and that the two parties "know each other". Since the survey only covers the firms, no definite conclusions are drawn on where in this process of integration they are located.

Another finding which seems right on target with presented CSR theory is IP's drive on stressing effectiveness and profitability in environmental issues (Stilwell D. 2009). This complies with the believes of Burgman (2007): "If the NGO's once saw state aid and private charity as the only way out of poverty, they now see entrepreneurship also as a profitable strategy".

6.2.3 Risk management

Risk management and especially reputation as a driver is commonly recognized in the survey findings. In a survey conducted by the Economist Intelligence Unit asked the question "What are the main business benefits for your organization with a defined corporate responsibility policy", 53% said, "a better brand reputation" and only 7% said, "Our income is higher than it would be otherwise" (Whadcock I., 2008). It seems that companies successfully mediate the locally correlation between cost-saving measures and environmental targets. By exploring competitive advantage through CSR goals they strive toward reaching dual targets while promoting sustainability commitment in front of profitability as insurance to cope with possible deductibles in case of accusations. Just as Porter (2006) says: companies might continue social responsibility initiatives as a form of insurance in the belief that the reputation for social awareness will lower public criticism in the event of Criticism (Porter E. M., et. al. 2006). Since 82 % according to a McKinsey (2008) survey see CSR as a risk, the case of insurance makes even more sense when you look at the recent case with SE in China and Brazil.

6.2.3 The strategic sweet spot

That profit is a central goal for corporations is not news. For all companies influenced by competition profitability is a mean for survival and creating competitiveness on the market. Therefore companies see few reasons or incentives to disregard financial goals when setting strategies combined with CSR. However, CSR can as mentioned earlier largely affect reputation and costumer reaction if the firm does not act as expected by its stakeholders. Most companies cannot afford to loose trust by the public and through that have decrease in sales. Therefore CSR is seen rather as an opportunity to maximize profit with a new angel rather than setting profit aside for doing good. The forest sector seems to be more affected and influenced by CSR that the general corporations due to its obvious impact on the environment, which also costumer and consumer perception more important. One example is Korsnäs AB whish have 60 % of its sales at Tetra Pak, a CSR aware and demanding costumer. Korsnäs simply does not afford to the risk of not performing CSR good enough (Brunberg B., 2009).

To assess the concept of the three domains of CSR explained in 4.3.2 a modified version of Figure 11 is shown below (Figure 20). The model shows the importance of profit and performance compared to the other factors. This means that the financial performance of the firm is important for the majority of stakeholders in the society where the business of a firm have impact. For forest companies in particular it is important to take in account all three domains to maximize sustainable profit and competitiveness and this way stay in the "strategic sweet spot" (Figure 20).

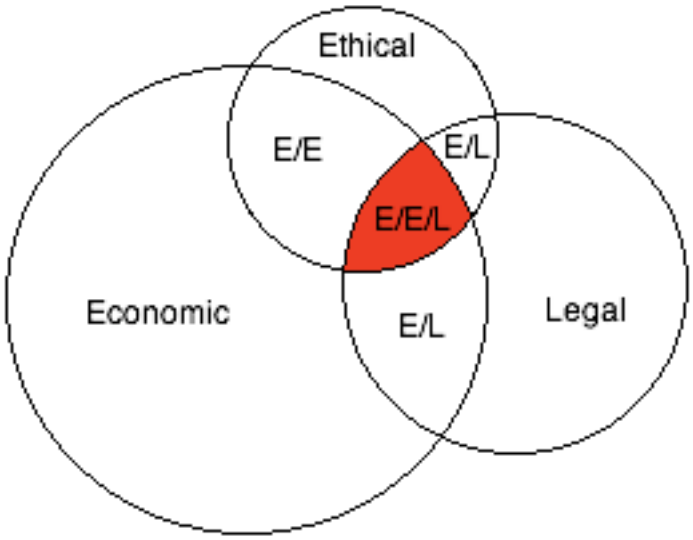


Figure 20. The figure shows the "strategic sweet spot" (colored area) and different importance of the three domains of CSR in forest industry examples (Schwartz M. S., Carrol A. B. 2003. Modified by Eriksson A. 2009).

6.3 Investment model

From the data provided in part 5.3, a spreadsheet model was created for further analysis. The model uses all data provided on establishment, operations, transaction costs and CER revenues to calculate NPV, IRR and CER break-even over a 30-year project period. The required rate of return (RRR) used in the model is 12 %, which is a standard issued by the Chinese Ministry of Agriculture (CMOA, 1996). An example of the model in year 0-3 with certain settings is presented in Appendix 7. Table 9 presents further calculated values on possible CERs and Transaction costs for the case.

Table 9. Calculated values on possible CERs and CDM transaction costs

GHG removal by sinks and possible CERs	
Total GHG removal by sinks (tCO2e)	773,842
GHG removal by sinks, tCO2e per hectare and year	6.45
Total possible CER value based on $17 price	$ 13,155,314
Total possible CER value per year	$ 438,510
Transaction costs	
CDM transaction cost, upfront	$ 334,953
CDM transaction cost, upfront per hectare and year	$ 2.79
CDM transaction cost, every 5th year	$ 75,300
CDM transaction cost, every 5th year per hectare and year	$ 0.63

6.3.1 Output

The basic case for the investment uses initial cost year 0 of property on US$400/ha (Storck G, 2009) and a CER price on US$17 which is the approximate market price this April 24th 2009 (www, PointCarbon, No 2, 2009). The basic scenario gives the results shown in table 10 below.

Table 10. Findings in basic scenario

Basic scenario	
IRR	18.9 %
IRR no CER	8.3 %
IRR no CDM	8.5 %
NPV with CDM and CER	$ 2,489,443
NPV no CDM	$ -1,374,729
NPV no CER	$ -1,466,712
Cost per credit, no Harvest	$ 5.29 (CER)
Cost per credit, with Harvest	$ 1.89 (CER)

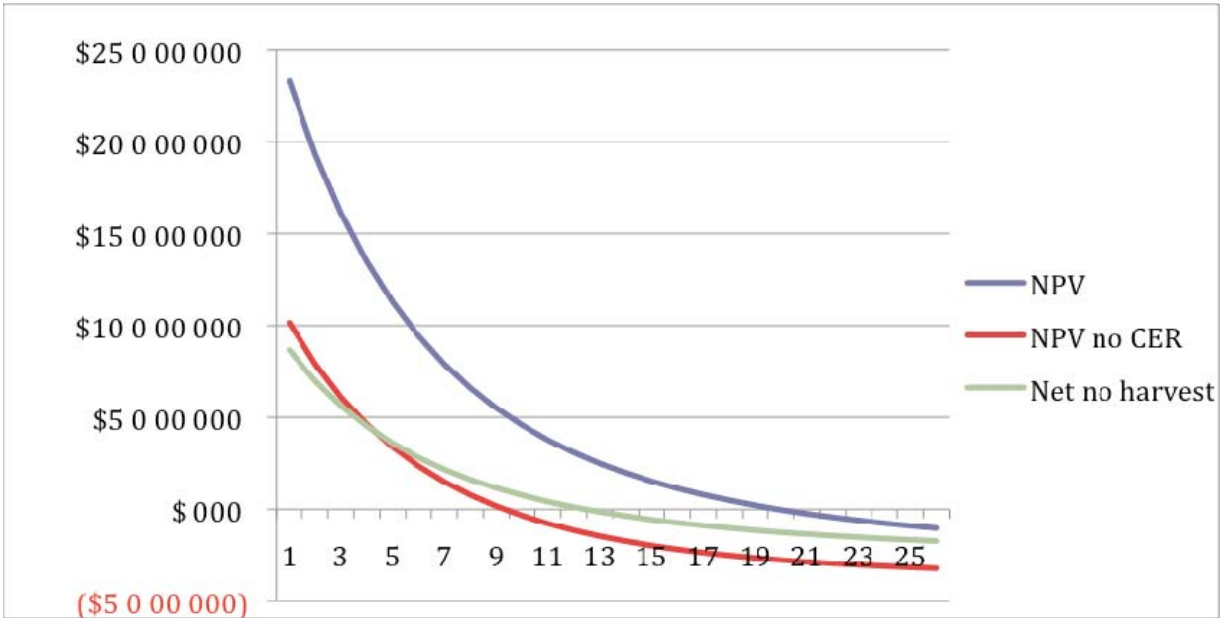


Figure 21. NPV with and without carbon finance and harvest revenue at different dicount rates.

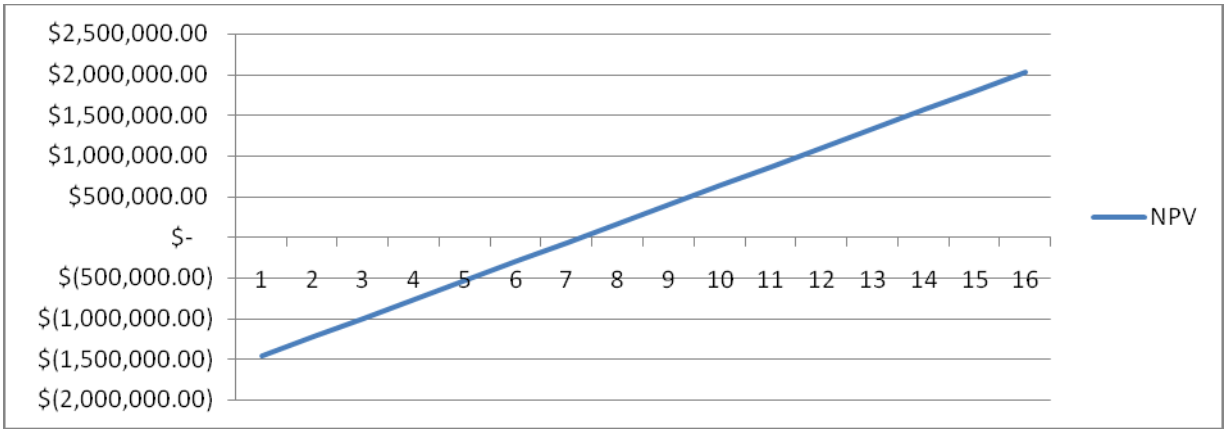


Figure 22. NPV at different CER prices.

Figure 22 shows a break-even just above seven US$ while Table 10 uses different break-even through cost per credit. This is due to the fact that the cost per credit calculation does not include CER revenue. The reason why CER revenue is included in Figure 22 is to show how NPV changes at different CER prices.

6.3.2 Elasticity

Table 11. Elasticity measured on IRR and NPV when increasing different variables with 10 %

Variable	Sensitivity coefficient IRR	Sensitivity coefficient NPV
Timber output	2.65 %	10.57 %
Timber price	4.23 %	15.95 %
Operations costs	1.59 %	5.38 %
Transaction costs	0.53 %	0.37 %
CER price	6.35 %	15.87 %

Table 11 shows the elasticity and sensitivity coefficients of variables with impact on NPV and IRR. The table also shows that the two most important variables to keep track of is timber price and price of CER since they have the highest sensitivity.

7. Conclusions and final remarks

The aims of this final chapter are to provide the reader with a discussion about the thesis work, reflect upon the analysis and give some final thoughts. The author assesses the study method and the reliability and validity of the thesis.

7.1 Main conclusions

7.1.1 PESTEL

The PESTEL analysis shows an overall positive picture of China and the Guangxi area for the investment model. Companies need to be aware of the joint venture mandatory when staring companies in China. This should not be a problem since the country probably supports the project if it manages to be admitted by the UNFCCC executive board. Compared with other countries, China seems to the best and easiest one to commence CDM in.

7.1.2 Corporate Social Responsibility

Most of the surveyed companies have a negative view of forest CDM. Road tested technology I says Stilwell D. (2009). Too much focus on the negatives and to make the process expensive concludes Stora Enso (Marjokorpi A. 2009) and Kimberly-Clark (Strassner K. 2009). Establishing additionallity in the CDM process is another complex part, which seems to drag down the pace of forest CDM. Also the exculpation of avoided deforestation, which stands for most of the GHG emission, takes credibility from the mechanism. It also seems a bit unclear in what extent profitability is allowed be achieved which repels companies from even thinking of CDM. Profitability equals efficiency and mutual benefits are the consensus among the respondents. In the CDM project family forest CDM has among the lowest desirability (Figure 23)

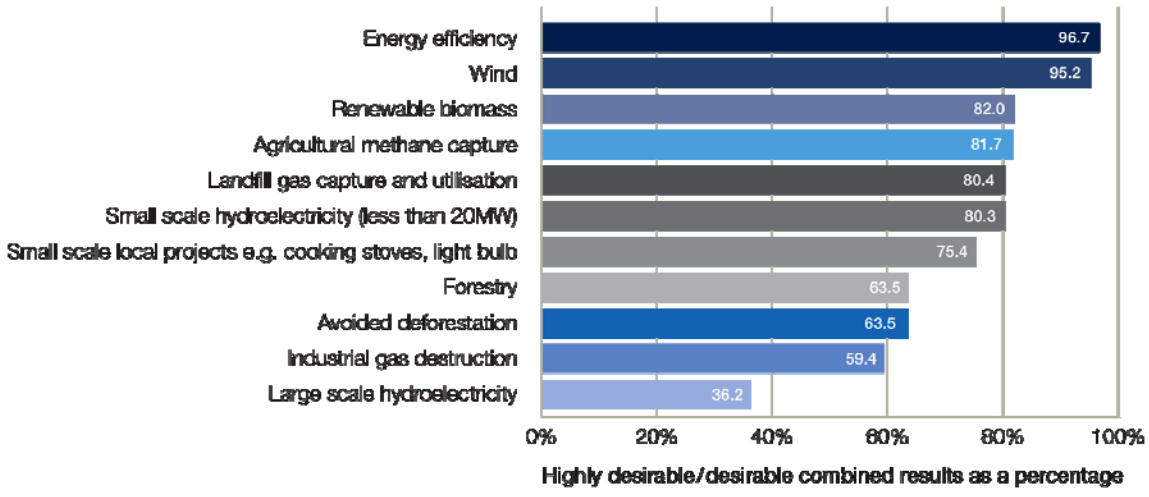


Figure 23. Level of desirability of different projects from a global carbon offset survey (EcoSecurities, 2008).

7.1.3 Investment model

Since the NPV is negative without carbon finance and on the limit without timber output, with an RRR of 12 % both harvest and carbon benefits are required for project success. This exposes the project to risk since it does not break-even without full success on these key

items. However in the basic case the model is profitable with NPV on almost 2.5 million US$ and should therefore be undertaken.

Timber price and CER price have the highest impact on financial outcome explored in the elasticity analysis in 6.3.2. Timber could be suspected to be more solid with less fluctuation in price then CER but this needs more research to be determined. CER price have a relatively short history due to the youth of carbon markets and have fluctuated quite a lot during ots lifetime.

In this case NPV and IRR gives approximately the same decisions. However when determining the highest impact of elasticity the case is split on the top two. IRR tells CER is more important while NPV states Timber output. This is due to the fact that IRR favors early positive cash flows and does not take cost of time into account (Brealey, Richard A., 1996).

7.1.4 Perception and implementation roundup

A lot of the managerial perception regarding the concept of forest CDM has been shown in the CSR survey results in this study. Those results show a negative attitude towards the UNFCCC's view of the goals of CDM. Managers believe that more could be reached if financial performance was not set a side in the process. The factors that influence the executive perception of this hypothetical investment case are CSR and CDM aspects (survey), financial opportunities (financial model) and the business environment (PESTEL). At a glance the investment seems like a win-win situation from a strategic and financial point of view. However, the main goal of business, profitability, seems to be the one thing not accepted in the CDM process. This could be called a contradiction in terms if you want to get CSR out of CDM. If the UN in the climate debate takes this into account is not a part of this thesis. CSR theory tells us that economical factors of CSR is crucial and should therefore not be seen as greed on expense of other CSR values (Schwartz M. S., Carrol A. B. 2003).

The conclusion from this study is that most of the prerequisites for successful reforestation is on the table, especially in China. The problem is the nature of the complex CDM process, the uncertainty in transactions costs and project success and the negative attitude towards projects been commercially profitable.

7.2 Choice of method

The choice of method in this thesis is considered to be appropriate in order to gain a broad view of the carbon market and the hypothetical investment case. The qualitative research has allowed the researcher to be flexible during the interviews and gain a deeper understanding of each company.

Before travelling to USA, it would have been relevant to test the interview questions on a company as a pilot study This would have provided the researcher with opinions and suggestions about the questionnaire, making it possible to revise and improve certain questions. The interview questions are designed with respect to the theoretical framework. However, main attention was laid on the connection between CSR and CDM. Therefore, the CSR theory solely and theories about PESTEL have not been applicable to the same extent.

To give the thesis work a more in-depth insight into the carbon market and flexible Kyoto mechanisms it would have been necessary to gain practical experience by visiting a carbon offset supplier or a approach a real investment case.

7.3 Further research

It would be interesting to investigate how companies could combine carbon offset with avoided deforestation an still be able to guarantee satisfying project lifetime. More specific case studies on real up-started forest CDM project would be highly interesting to make visible for potential investors

7.4 Final comments

- Do not invest in forest CDM if CER price is below or run the risk to get below 5.29 US$ for a project similar to this.
- Have thorough investigation made on the project before commencing any CDM project.
- Forest CDM needs improvements to be useful efficient in desirable extent.
- The probability of global forest, paper and packaging companies to implement forest CDM is low.
- Forest CDM can be profitable under the right conditions but the overall uncertainty and risk is high.

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Appendix

Appendix 1. Questionnaire: Company CSR and CDM survey

Questionnaire

This survey is a part of our master thesis
"Carbon Offset Management"
At
Yale School of Forest and Environmental Studies

1. What do you see as your firm's corporate responsibilities?
   what responsibilities do you take? what are the responsibilities of other actors?

2. Are you familiar with corporate social responsibility (CSR)?

   No
   Little
   Much

3. Does your company have a CSR strategy?

   Yes
   No
   N/A

4. Who is involved in defining your company's environmental objectives?

   Board
   Senior management
   Marketing
   HR
   CSR
   Strategy
   Operations
   Sustainability/Environment team
   All

5. Has your firm discussed either carbon management/clean development mechanism? If so, what is the status? - any special projects?

6. Are you familiar with the clean development mechanism (CDM)?

   No
   Little
   Much

7. Do you thinks these initiatives will be directly profitable? Or would you do these for other reasons?

8. Does your organization have a carbon management strategy?

   Yes
   Under development
   No

9. Does your company own plantations in a developing country? If so, which?

Yes Countries:
No

10. Does your organization recognize connections between CSR and CDM?

    Yes
    No

11. Which are the most important drivers for Carbon management / CDM?

    Revenue
    Reputation
    Carbon offsetting
    CSR goals
    Costumers
    Shareholder
    Stakeholders

12. Does your organization have experiences of implementing CDM?

    Yes
    Under development
    No

13. Timing - in what time frame are you considering the possibility of any such investments?

14. How big risk is your company willing to take financially if using CDM?

    Net loss 10 %
    Break-even
    Net profit 10 %

15. Does your organization analyze the ratio between price of carbon emissions and costs of in-house carbon offsetting?

    Yes
    No

16. What would be a probable required rate of return for a forest CDM project?

    0-5 %
    5-10 %
    10-15 %
    15-20 %
    20-25%

17. How does your organization’s carbon footprint look like?

    Polluter
    Neutral
    Off setter

18. Where would your organization most likely invest in CSR measures?

    Locally
    Most cost efficient
    Developing country
    Other

19. How are the CSR and CDM strategies affected by the current economical climate?

    Not
    Cut down
    On hold
    Terminated

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Appendix 2. Establishment costs

	Eucalyptus sp.	*P.massoniana* + *Q. sp.*	*P.massoniana* + *S. superba*	*L. formosana* + *P.massoniana*	*L. formosana* + *C.lanceolata*
Planting in 2006 (ha)	850	100	220	490	
Planting in 2007 (ha)	150	800	380	560	450
1 Establishment	**815.89**	**447.71**	**403.71**	**429.30**	**449.70**
1.1 site preparation	160.69	139.06	132.88	122.37	139.06
1.2 seedlings	49.82	82.45	48.33	88.13	88.13
1.3 planting	27.81	40.79	37.08	33.38	37.08
1.4 fertilization (3 years)	346.10	0.00	0.00	0.00	0.00
1.5 fire and disease control (3 years)	16.68	18.54	18.54	18.54	18.54
1.6 weeding (3 years)	213.23	166.87	166.87	166.87	166.87
2 Equipment and infrastructure	**50.68**	**55.62**	**55.62**	**55.62**	**55.62**
2.1 road and protection	35.22	37.08	37.08	37.08	37.08
2.2 tools	14.84	18.54	18.54	18.54	18.54
3 Other costs (designing, training, technical demonstration and consultation, administration, supervision and monitoring, etc)	**70.64**	**58.90**	**58.90**	**58.90**	**58.97**
4 Unpredictable costs (10% of above cost)	**90.95**	**53.67**	**49.27**	**51.83**	**53.87**
5 Total	**1026.00**	**615.92**	**567.51**	**595.65**	**618.09**

(www, UNFCCC, No 2, 2009)

Appendix 3. Costs and benefits from operations

Items	Eucalyptus	Q. griffithii	S. superba	L. formosana	P. massoniana
	timber	timber	timber	Timber	Timber
Standing volume at harvest (m^3/ha)	156.37	27.22/121.53[14]	93.25	93.25	112.38
Timber output ratio (%)	75	60	70	70	70
Timber output at harvest (m^3/ha)	117.28	16.33/72.92	65.28	65.28	78.67
Resin production (t/ha/yr, 16-20 year)					
Labor cost for timber harvesting (US$/$m^3$)	8.03	8.03	8.65	9.27	9.27
Labor cost for resin collection (US$/t)					
Transportation (timber, US$/$m^3$)	4.33	4.33	6.18	6.80	6.80
Transportation (resin, US$/t)					
Selling price (timber, US$/$m^3$)	43.26	30.90	39.56	27.81	42.65
Selling price (resin, US$/t)					
Tax (% of gross income)	10	10	20	20	20

[14] 1st rotation/after 1st rotation

(www, UNFCCC, No 2, 2009)

Appendix 4. Forest management plan

Year No	Year	Monitoring	Verification	Harvesting			
				P. massoniana and C. lanceolata	*L. formosana* and *S. superba*	eucalyptus	Oak
1	2006						
2	2007						
3	2008						
4	2009	X					
5	2010						
6	2011						
7	2012	X	X				X
8	2013						X
9	2014					X	X
10	2015					X	
11	2016					X	
12	2017	X	X				
13	2018						X
14	2019						X
15	2020						X
16	2021						
17	2022	X	X		X	X	
18	2023				X	X	
19	2024				X	X	X
20	2025						X
21	2026						X
22	2027	X	X				
23	2028						
24	2029						
25	2030						X
26	2031					X	X
27	2032	X	X			X	X
28	2033					X	
29	2034						
30	2035						
31	2036						
32	2037	X					

(www, UNFCCC, No 2, 2009).

Appendix 5. GHG removal by sinks 1

Years	Estimation of baseline net GHG removals by sinks (tones of CO_2 e yr^{-1})	Estimation of actual net GHG removals by sinks (tones of CO_2 e yr^{-1})	Estimation of leakage (tonnes of CO_2 e yr^{-1})	Estimation of net anthropogenic GHG removals by sinks (tones of CO_2 e yr^{-1})
A	B	C	D	E=C+D-B
2006	7.8	-40,647	-140	-40,795
2007	8.7	54,430	-27	54,394
2008	9.5	57,858	-38	57,811
2009	10.2	57,530	-6	57,514
2010	11.0	61,799	0	61,788
2011	11.7	72,281	0	72,269
2012	12.5	77,275	-21	77,242
2013	13.2	70,345	-83	70,250
2014	13.9	-29,904	-1,376	-31,294
2015	14.5	-7,746	-1,304	-9,065
2016	15.2	-4,978	-1,317	-6,310
2017	15.9	98,249	-23	98,210
2018	16.5	78,310	-105	78,189
2019	17.1	39,802	-367	39,417
2020	17.7	23,577	-367	23,192
2021	18.4	74,345	-46	74,280
2022	19.0	-65,080	-2,903	-68,002
2023	19.6	-84,133	-2,903	-87,056
2024	20.2	-92,639	-3,009	-95,668
2025	20.7	42,991	-547	42,423
2026	21.3	29,828	-491	29,316
2027	21.9	81,962	0	81,940
2028	22.4	78,605	0	78,583
2029	23.0	71,922	0	71,899
2030	23.6	-22,291	-1,386	-23,701
2031	24.1	-76,207	-1,671	-77,903
2032	24.6	-80,961	-1,685	-82,670
2033	25.2	78,947	-23	78,899
2034	25.7	77,357	-13	77,319
2035	26.2	71,398	0	71,371
Total (tones of CO_2 e)	531.2	794,225	-19,852	773,842

(www, UNFCCC, No 2, 2009)

Appendix 6. GHG removal by sinks 2

		removals by sinks (t CO_2-e yr^{-1})	removals by sinks (t CO_2-e)
1	2006	-40,795	-40,795
2	2007	54,394	13,599
3	2008	57,811	71,410
4	2009	57,514	128,924
5	2010	61,788	190,711
6	2011	72,269	262,981
7	2012	77,242	340,223
8	2013	70,250	410,472
9	2014	-31,294	379,178
10	2015	-9,065	370,113
11	2016	-6,310	363,803
12	2017	98,210	462,013
13	2018	78,189	540,202
14	2019	39,417	579,619
15	2020	23,192	602,811
16	2021	74,280	677,091
17	2022	-68,002	609,089
18	2023	-87,056	522,033
19	2024	-95,668	426,366
20	2025	42,423	468,789
21	2026	29,316	498,105
22	2027	81,940	580,045
23	2028	78,583	658,628
24	2029	71,899	730,527
25	2030	-23,701	706,826
26	2031	-77,903	628,924
27	2032	-82,670	546,254
28	2033	78,899	625,152
29	2034	77,319	702,471
30	2035	71,371	773,842

(www, UNFCCC, No 2, 2009)

Appendix 7. Example of model, year 0-3

Example of model spreadsheet of year 0-3 out of 30 (CER price: US$17, land value: US$400/ha, RRR: 12%)

Analysis

Time (yr)	0	1	2	3
Land value	$(1 600 000,00)	$-	$-	$-
Establishment	$(730 697,78)	$(1 305 302,22)	$-	$-
Equipment	$(218 528,00)	$-	$-	$-
Other costs	$(183 786,00)	$-	$-	$-
Unpredictable	$(7 989,07)	$(7 989,07)	$(7 989,07)	$(7 989,07)
Harvest profit	$-	$-	$-	$-
CDM Transaction costs	$(72 000,26)	$-	$-	$-
CER revenue	$438 510,47	$438 510,47	$438 510,47	$438 510,47
Area (ha)	4000			
All Costs	$(2 813 001,10)	$(1 313 291,29)	$(7 989,07)	$(7 989,07)
Net cashflow	$(2 374 490,63)	$(874 780,82)	$430 521,40	$430 521,40
Net no CER	$(2 813 001,10)	$(1 313 291,29)	$(7 989,07)	$(7 989,07)
Net no CDM	$(2 741 000,84)	$(1 313 291,29)	$(7 989,07)	$(7 989,07)

Time (yr)	0	1	2	3
Net cashflow	$(2 374 490,63)	$(874 780,82)	$430 521,40	$430 521,40
Discount rate	12%	12%	12%	12%
NPV	$(2 374 490,63)	$(781 054,31)	$343 209,02	$306 436,63
IRR no CDM	**8,5%**			
IRR no CER	**8,3%**			
			Breakeven no Harvest	**$(5,29)**
IRR	**18,9%**			
			Breakeven with Harvest	**$(1,90)**
Total NPV	**$2 489 443**			

Appendix 8. PricewaterhouseCoopers (PWC) (2008). Global Forest, Paper & Packaging Industry Survey. 2008 Edition – Survey of 2007 Results

PwC Top 100

Table 3: Top 100 Global Forest, Paper & Packaging Industry Companies
(US $ millions)

Rank '07	Rank '06	Company Name [1]	Country [10]	Sales		Net Income		ROCE [2]	
				2007	2006	2007	2006	2007	2006
1	1	International Paper	US	$21,880	$21,985	$1,168	$1,050	5.7%	5.3%
2	3	Stora Enso [3]	Finland	18,322	16,274	(291)	734	3.5%	7.0%
3	4	Kimberly-Clark	US	18,266	16,746	1,622	1,500	16.2%	12.1%
4	5	Svenska Cellulosa	Sweden	15,675	13,796	1,056	739	5.7%	6.0%
5	2	Weyerhaeuser [3,4]	US	13,949	15,336	462	142	2.5%	1.9%
6	6	UPM	Finland	13,748	12,588	111	427	3.5%	3.8%
7	9	Oji Paper	Japan	10,758	10,439	146	181	2.3%	3.2%
8	8	Metsaliitto [5]	Finland	10,507	10,382	(12)	(31)	1.4%	0.7%
9	10	Nippon Unipac	Japan	9,990	9,908	195	148	2.1%	1.7%
10	11	Smurfit Kappa	Ireland	9,963	8,833	202	(213)	6.0%	4.0%
11	12	Mondi Group [10]	UK/South Africa	8,589	7,223	319	98	5.6%	3.2%
12	13	Smurfit-Stone	US	7,420	7,157	(103)	(59)	2.0%	2.1%
13	14	MeadWestvaco	US	6,908	6,530	285	93	4.6%	3.7%
14	16	PaperlinX	Australia	6,551	5,574	67	49	5.0%	3.8%
15	26	Domtar [3]	Canada	5,947	3,306	70	(609)	4.5%	3.5%
16	19	Sequana Capital	France	5,926	4,998	195	1,203	4.3%	0.9%
17	15	Boise Cascade	US	5,413	5,780	128	72	6.2%	6.3%
18	20	Sappi	South Africa	5,304	4,941	202	(4)	6.1%	2.9%
19	21	Norske Skog	Norway	4,837	4,495	(106)	(438)	7.1%	2.1%
20	29	Sumitomo Forestry [5]	Japan	4,257	3,403	45	19	2.2%	1.2%
21	24	Sonoco	US	4,040	3,657	214	182	10.5%	9.8%
22	17	Temple-Inland [5,6]	US	3,926	4,185	1,305	466	0.7%	1.5%
23	23	AbitibiBowater	Canada	3,876	3,530	(490)	(139)	-4.0%	1.9%
24	32	Cascades	Canada	3,674	3,001	89	3	4.6%	3.5%
25	36	Arauco	Chile	3,576	2,850	697	622	11.9%	11.3%
26	31	DS Smith	UK	3,534	3,046	121	8	6.8%	10.2%
27	27	Daio Paper	Japan	3,520	3,460	90	80	3.2%	3.2%
28	28	Rengo	Japan	3,500	3,459	80	112	2.5%	3.6%
29	33	Cartiere Burgo	Italy	3,263	2,991	18	27	0.5%	2.1%
30	41	CMPC	Chile	3,227	2,260	502	205	8.3%	4.3%
31	35	West Fraser Timber	Canada	3,100	2,933	(32)	351	-0.4%	4.3%
32	30	Canfor	Canada	3,063	3,389	(337)	416	-3.0%	-0.1%
33	38	Holmen	Sweden	2,836	2,529	223	198	9.9%	6.4%
34	47	Sonae Industria	Portugal	2,830	2,134	108	40	6.6%	1.9%
35	44	Sodra	Sweden	2,834	2,161	202	172	9.8%	10.5%
36	34	Tembec [3]	Canada	2,571	2,880	(46)	(258)	-0.1%	-2.7%
37	40	Unicharm	Japan	2,566	2,325	128	131	8.8%	10.5%
38	37	Universal Forest Products	US	2,513	2,665	21	70	4.9%	11.2%
39	55	Pfleiderer	Germany	2,467	1,778	79	105	8.2%	7.8%
40	39	Graphic Packaging [3]	US	2,421	2,321	(75)	(101)	3.1%	1.1%
41	49	Ahlstrom	Finland	2,413	2,009	1	72	1.3%	5.1%
42	52	Mayr-Melnhof Karton	Austria	2,380	1,900	160	133	8.6%	9.2%
43	43	Packaging Corp of America	US	2,317	2,187	170	126	10.4%	8.5%
44	46	Rock-Tenn	US	2,316	2,138	82	29	7.8%	4.8%
45	48	NewPage Corporation	US	2,168	2,038	(22)	(32)	3.1%	4.8%
46	54	The Lecta Group	UK	2,082	1,810	(42)	22	0.8%	3.2%
47	50	Mitsubishi Paper	Japan	2,076	1,965	62	62	1.8%	3.8%
48	64	Shandong Chenming	China	2,001	1,477	128	75	6.3%	6.5%
49	51	Myllykoski	Finland	1,980	1,925	1	(48)	1.8%	4.8%
50	53	Kimberly-Clark Mexico	Mexico	1,976	1,848	343	325	20.3%	17.7%

Notes

1. All companies have December 31, 2007 year ends except those listed below:
   March 31, 2007: All Japanese Companies
   April 30, 2007: DS Smith
   June 30, 2007: Buckeye Technologies, PaperlinX, Nine Dragons Paper, Ballarpur Industries
   September 30,2007: Rock-Tenn, Sappi, Tembec
2. Return on Capital Employed is calculated as net income before unusual items, minority interest, and interest expense, on an after tax basis, divided by average total assets less average non-interest bearing current liabilities.
3. 2006 sales have been restated by the companies.
4. Weyerhaeuser and Plum Creek results exclude the Real Estate Divisions.
5. Results are reported for identifiable forest segment only. Estimates have been made to allocate company-wide expenses as required.
6. Temple Inland results includes $2.01 billion from sales of timberland.
7. New addition this year.
8. Weyerhaeuser results include income from discontinued operations.
9. Votorantim Cellulose results include $998 million gains on exchange of assets.
10. Country's head office is used for grouping (Le Mondi has dual listings and head offices in the UK and South Africa, and Sino Forest's head office is in Canada, while all its operations are based in China).

Rank '07	Rank '06	Company Name [1]	Country [10]	Sales		Net Income		ROCE [2]	
				2007	2006	2007	2006	2007	2006
51	58	Aracruz	Brazil	1,884	1,681	422	455	9.5%	15.8%
52	56	Hansol-Paper	Korea	1,762	1,706	(4)	(119)	1.6%	-3.4%
53	66	Suzano	Brazil	1,760	1,429	278	205	8.0%	5.8%
54	42	Louisiana-Pacific	US	1,705	2,187	(180)	124	-2.9%	5.1%
55	62	Potlatch [3]	US	1,654	1,598	56	139	7.8%	9.8%
56	-	Verso [7]	US	1,629	1,611	(81)	11	0.4%	3.6%
57	59	Catalyst	Canada	1,604	1,660	(30)	(14)	2.5%	0.0%
58	67	Portucel	Portugal	1,572	1,357	211	157	10.2%	7.4%
59	72	Klabin	Brazil	1,443	1,251	321	218	9.2%	13.4%
60	65	Daiken	Japan	1,431	1,430	(37)	21	-0.5%	4.1%
61	76	Siam Pulp & Paper	Thailand	1,404	1,109	75	93	8.0%	11.5%
62	74	Yuen Foong Yu Paper	Taiwan	1,352	1,219	34	35	-0.1%	2.9%
63	69	Hokuetsu Paper	Japan	1,351	1,322	38	28	2.8%	2.0%
64	68	Votorantim Celulose [9]	Brazil	1,333	1,317	1,221	372	10.9%	11.9%
65	82	Nine Dragons Paper	China	1,298	986	264	172	13.0%	14.2%
66	61	Plum Creek Timber [3,4]	US	1,273	1,319	62	161	3.8%	8.7%
67	70	Tomoku	Japan	1,263	1,271	6	20	2.2%	2.6%
68	75	Wausau-Mosinee Paper	US	1,240	1,186	(2)	18	1.4%	3.7%
69	73	Rayonier	US	1,225	1,230	174	193	11.4%	12.5%
70	80	P H Glatfelter	US	1,157	997	63	(12)	2.6%	-0.8%
71	79	Billerud	Sweden	1,148	999	60	42	5.5%	5.7%
72	88	Kinnevik (Korsnas)	Sweden	1,136	858	94	78	1.6%	2.1%
73	78	Nampak	South Africa	1,117	1,047	39	47	5.4%	8.1%
74	71	Norbord (Nexfor)	Canada	1,104	1,252	(45)	87	-1.4%	11.4%
75	90	Svenskog	Sweden	1,075	820	210	291	3.3%	4.6%
76	85	Cheng Loong	Taiwan	1,028	901	19	24	3.6%	3.2%
77	87	Masisa SA	Chile	966	887	41	30	2.5%	2.4%
78	92	Mercer International	Canada	964	784	30	60	5.7%	5.4%
79	77	Appleton Papers [8]	US	963	974	(8)	11	3.4%	6.6%
80	83	Chuetsu Pulp & Paper	Japan	960	955	(15)	3	0.1%	0.6%
81	86	Grupo Industrial Durango [2]	Mexico	911	861	(28)	(6)	0.5%	2.4%
82	-	Setra Group [7]	Sweden	897	794	78	30	25.2%	12.3%
83	91	ENCE	Spain	888	812	80	63	6.5%	5.4%
84	93	Groupe Gascogne	France	867	758	17	13	4.8%	3.6%
85	81	Caraustar Industries [5]	US	854	933	(25)	47	0.2%	1.7%
86	92	Western Forest Products	Canada	832	780	(52)	30	-6.1%	-2.1%
87	-	Shandong Huatai Paper [7]	China	798	530	66	53	8.4%	9.1%
88	95	Buckeye Technologies	US	769	728	30	2	6.5%	-4.9%
89	-	Heinzel Holding [7]	Austria	760	579	48	(9)	9.2%	4.7%
90	99	Schweitzer-Mauduit	US	715	655	3	(1)	5.5%	3.4%
91	97	Fraser Papers [3]	Canada	714	796	(44)	(114)	-11.8%	-6.8%
92	-	Sino Forest Corporation [7,1C]	China/Canada	713	555	152	113	12.8%	12.4%
93	98	The Pack	Japan	710	695	26	24	11.0%	10.4%
94	100	Shan Dong Sun Paper [3]	China	671	676	50	45	9.2%	10.6%
95	-	Lee & Man [7]	China	660	484	129	77	15.0%	12.6%
96	-	Corticeira Amorim [7]	Portugal	621	555	32	25	5.4%	7.7%
97	-	Otor [7]	France	604	510	36	(29)	7.2%	-4.5%
98	96	Interfor	Canada	571	727	(12)	64	-2.4%	6.7%
99	-	Ballarpur Industries [7]	India	556	423	61	47	8.3%	6.1%
100	94	Ainsworth	Canada	509	730	(202)	(85)	-5.1%	-2.5%
		Total		$343,285	$317,254	$13,483	$11,935	4.8%	4.8%

Source: PricewaterhouseCoopers LLP

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