

The present status and prospects of forestry carbon sequestration in China

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Abstract

Climate change is a threat to the Earth's ecological environment, deeply impacting on the politics, economics and societies of all countries. After decades of discussion, some basic consensuses have been reached. Most of countries are committed to tackling climate change. Forestry carbon sequestration offers a solution for many of these countries. China has been richly endowed with land and has huge potential to develop a forestry carbon sequestration industry. This paper provides a review of China's primary policies in regulating forestry carbon projects and its carbon market, the current status of Chinese forestry carbon projects, and China's position in global carbon negotiations. This paper also provides a summary of key issues to establishing forestry carbon projects in China, which include common problems, like forest tenure system and baseline determination. Possible solutions are given, but further research and pilot projects are still necessary. Although forestry carbon sequestration is in its starting stage in China, China has endeavored to improve its mechanisms and has the potential of a brilliant future in this industry.

Key Words: Forestry carbon sequestration, Climate change, China, Present situations, Barriers, Prospects

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List of Abbreviations

CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
CGCF	China Green Carbon Foundation
CO ₂	Carbon Dioxide
DNA	Designated National Authority
FDI	Foreign Direct Investment
GHG	Greenhouse Gas
JI	Joint Implementation
MtCO ₂ e	Megatons of Carbon Dioxide emitted
NDRC	National Development and Reform Commission
NGO	Non-Governmental Organization
REDD+	Reducing Emissions from Deforestation and Forest Degradation Plus
SFA	State Forestry Administration
UNFCCC	United Nations Framework Convention on Climate Change

1.0 Introduction

1.1 Objectives

As negative impacts of climate change become more obvious annually, possible solutions that either reduce greenhouse gas emissions (GHG) or sequester existing GHG have been heatedly discussed for many years. Forestry carbon sequestration refers to the process through which forestry practices remove carbon dioxide from the atmosphere. Forestry carbon sequestration has been considered one of the most useful solutions for reducing and sequestering GHG.

Compared to other potential solutions for mitigating climate change, forestry carbon sequestration has many unique advantages. Firstly, improvements in methodologies reduce investment in forestry carbon projects. These improvements also improve eligibility of forestry carbon projects under current global policies, such as under California's cap and trade program. Secondly, among all types of climate change mitigation methods, forestry-based projects are the only a few that can sequester carbon dioxide. Currently, most projects can only reduce greenhouse gases emissions from the original level. Thirdly, forestry carbon projects are easily introduced to the public, which increases likelihood of the public

participation in carbon offsetting.

Currently China's national forest coverage has reached 195 million ha and total carbon storage in forest has reached 7.8 billion tons (The Information Office of the State Council, 2011). Despite its large forested area, China has more than 40 million hectares of wasteland that can be used for afforestation; hence, China has great potential to help mitigating climate change.

The objectives of this paper are to illustrate the current development of forestry carbon projects and the carbon market in China, analyze the barriers in promoting forestry carbon projects. And finally, the paper provides possible suggestions for future development.

1.2 International policies

Regulatory policies have been promulgated to mitigate climate change effectively and efficiently, among which the Kyoto Protocol is the most authoritative and influential. Under the Kyoto Protocol, 37 countries defined in Annex I excluding United States, are stipulated to reduce their collective GHG emission by 4.2% on average during the period of 2008-2012, when compared to the 1990 level (Olivier, Janssens-Maenhout, Peters, & Wilson, 2011). To decrease the difficulties for Annex I countries

to reach the targets of GHG emission reduction, several flexible mechanisms are allowed by the Protocol, such as Joint Implementation (JI), the Clean Development Mechanism (CDM) and emissions trading (United Nations Framework Convention on Climate Change (UNFCCC), 2011). The Protocol ensures GHG mitigation projects function well and regulates the cooperation between developing countries and developed countries at national and international levels, which leads to the progress of carbon regulatory market.

1.3 Global trends

At the same time, increasing awareness of citizens and companies has resulted in the growth of the voluntary carbon market. When compared to the 98 megatons of carbon dioxide emitted (MtCO₂e) transacted in 2009, the transacted total volume in 2010 grew by 34% in the global voluntary carbon market, which is 131.2 MtCO₂e (Peters-Stanley, Hamilton, Marcello, & Sjardin, 2011). In the transacted carbon credits, forestry-related projects account for around 42% of the total market share, which include REDD+/Avoided Conversion (29%), Afforestation/Reforestation (6%), Improved Forest Management (5%) and General Forestry (2%) (See Figure 1). This helps demonstrate that forestry is regarded as the most accessible method to offset carbon dioxide in the voluntary carbon market.

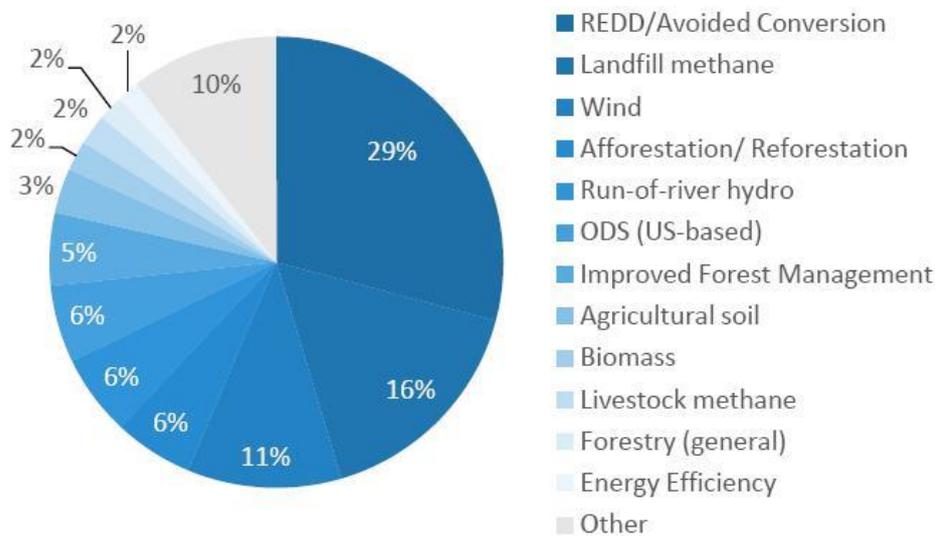


Figure 1. Market Share by Project Type, 2010

(Source: Ecosystem Marketplace, Bloomberg New Energy Finance)

2.0 The development of forestry carbon sequestration in China

2.1 Existing policy instruments

The State Council of the People's Republic of China (PRC) issued *China's National Climate Change Program* in 2007 and *China's Policies and Actions for Addressing Climate Change* in 2008 (Li & Yuan, 2011). In *China's National Climate Change Program*, forestry was included in the six focus areas for mitigating climate change and the four areas of focus to adapt to climate change.

Enhancing the capacity of carbon sinks was emphasized and regarded as an

important aspect for China to achieve its goals in addressing climate change. Several measures were made and further efforts are expected. It was mentioned in the document that, the standard for afforestation subsidy has been increased from RMB 100 to 200 per mu (The Information Office of the State Council, 2011), which is approximately from 234 dollars to 468 dollars per hectare. In the future, China's policies will continue to focus on boosting afforestation all around the country and implementing ecological protection projects, including "...the key shelterbelt construction project in Northwest, Northeast and North China and along the Yangtze River, and projects to return farmland to forest, natural forest conservation project, the program to control sandstorms in the Beijing and Tianjin area, and the comprehensive treatment program of rocky desertification in the karst areas..." (The Information Office of the State Council, 2011). China will endeavor to promote planting in urban areas and accelerate the construction of forest eco-barriers in cities as well. In addition, the National People's Congress declared the next five-year compulsory targets to cope with global warming between 2011 and 2015 to be: decreasing CO₂ emission per-unit gross domestic product (GDP) by 17% by 2015, raising the area of new forests by 12.5 million hectares, increasing the forest coverage rate to 21.66%, raising the forest growing stock by 600 million cubic meters (The Central People's Government of the People's Republic of China, 2011).

As the most popular official form of cooperation in forestry-based carbon-offsetting projects between developing countries and developed countries, the Clean Development Mechanism (CDM) plays a vital role in assisting developed nations to reach their targets in GHG reduction commitments as well as helping developing countries to realize sustainable development. In order to promote CDM projects and guarantee that projects are carried out successfully, the National Development and Reform Commission of China (NDRC) promulgated *Measures for the Operation and Management of Clean Development Mechanism Projects* to regulate and manage CDM projects in China. In the document, it's required that CDM projects be conducted by Chinese-funded or Chinese-holding enterprises within the territory of China. There are several principle limitations (Long, Wu, & Wang, 2011):

- (1) Enterprises are voluntary to participate in CDM projects,
- (2) CDM projects should be approved by the central government, and
- (3) CDM projects should be able to lead to real, measurable, long-term and additional emission reductions.

In addition, the decree stipulates the responsibilities of National CDM Board, NDRC and Project owners, and official application process.

2.2 Existing organizations

2.2.1 SFA Carbon Sequestration Administration Office

In 2003, with the purpose of enhancing the regulation of afforestation under CDM background and adapting China to international negotiations under the UNFCCC, State Forestry Administration decided to establish Carbon Sequestration Administration Office. The main responsibilities include (State Forestry Administration, 2003):

- (1) Organizing and constituting national rules, methodologies for management, technical standards and relevant policies on forestry carbon-offsetting projects,
- (2) Managing forest-based carbon sequestration projects all around China and instructing project owners how to implement the projects,
- (3) Participating in international technical cooperation to fulfill the commitments under UNFCCC,
- (4) Collecting and analyzing data from nationwide projects, and
- (5) Organizing workshops and conventions

2.2.2 China Green Carbon Foundation (CGCF)

CGCF was approved by the State Council and founded in 2010. It is the first countrywide non-profit public foundation in China to address climate change by increasing the use of forestry carbon sinks. CGCF provides the

public, including enterprises and civilians, opportunities to offset their carbon footprint by forestry measures. The main responsibilities of CGCF are (China Green Carbon Foundation, 2011):

- (1) Raising carbon offset and decreasing GHG emissions by promoting forest-based sequestration projects such as afforestation, sustainable forest management and reducing deforestation,
- (2) Informing the public of relevant knowledge about forestry carbon sequestration and broadening their horizons about climate change, and
- (3) Improving and developing Forest Effect Compensation Mechanism in China.

The sources of fund are:

- (1) Natural people, artificial people or donation by other organizations,
- (2) Income by organizing communal activities of donation,
- (3) Sponsorship by the government, and
- (4) Revenue by investment and increment of interest.

The fund is mainly used for promoting forest-based carbon-offset projects, overhead expenses, fund-raising expenses and investment (Li, Song, & He, The Initiation and Business of China Green Carbon Fund, 2007).

2.2.3 China Carbon Exchanges

By establishing environmental exchanges, China continues to support carbon emission reductions trading and takes advantage of the Kyoto Protocol's flexibility mechanisms. There are mainly three exchanges in China: the China Beijing Environment Exchange, the Tianjin Climate Exchange and the Shanghai Environment Energy Exchange. The mandates of the exchanges relevant to forestry carbon sequestration include providing information and service for CDM projects, trading environment property rights and transacting domestic VERs (Verified Emission Reductions) (Linacre, Kossoy, & Ambrosi, 2011). It has reported that NRDC plans to launch pilot carbon trading markets in Chongqing, Guangdong and Hubei in 2013 (Carbon Market Daily, 2011).

2.3 Present situation

China has great potential to provide the world carbon market with a huge amount of certified emission reductions, however, forest-based carbon-offset projects only account for a tiny portion of all the CDM projects.

According to the latest report by Carbon Finance at the World Bank, private investment in China's clean energy projects grew rapidly and rose by 39% to \$54.4 billion. All of these led to a 33% increase to \$82.8 billion

in CDM projects investment in the Asian region. The worldwide carbon market saw low-carbon finance and investment recover and increased by 30% to \$243 billion following the low severity global financial crisis in 2010. NDRC has approved 2850 CDM projects by the end of 2010, of which more than 1000 have been successfully registered at the CDM Executive Board. 42% of all global registered CDM projects are from China, which are expected to produce 240 MtCO₂e Certified Emission Reductions (CERs) annually or 62% of overall emission reductions from CDM globally (Linacre, Kossoy, & Ambrosi, 2011).

The world's first CDM forestry project was established in Guangxi province in China, called Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin. This project focuses on reforesting 4000 hectares of remote and severely degraded lands as well as enhancing domestic biodiversity (Gong, Bull, & Baylis, 2010). However, among all CDM projects in China, there were only three registered forestry carbon sequestration projects by the end of 2011, which are estimated to reduce emissions by 116272 tCO₂e (CDM Statistics, 2011).

Project Name	Location	Investors	Estimated annual emission reductions
Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin	Guangxi	Italy, Spain	20 000
Afforestation and Reforestation on Degraded Lands in Northwest Sichuan, Chin	Sichuan	Unilateral Project	26 000
Reforestation on Degraded Lands in Northwest Guangxi	Guangxi	World Bank	70 272
Total			116272

Table 1. Registered Projects (CDM Statistics, 2011)

2.4 China's negotiating positions

2.4.1 Common but differentiated responsibilities

China adheres to the principle of 'common but differentiated responsibilities' in all international climate change negotiations (The Information Office of the State Council, 2011). Since the main cause of climate change is the industrialization of developed countries in past two hundred years, these countries should play leading roles in reducing their GHG emissions. Compared to developed countries, developing countries often lack advanced technologies and adequate funds to support emission-reducing projects. Developing countries must also deal with social, financial and environmental problems. This means that developed

countries should take the lead in carbon emission reduction and actively offer developing countries financial and technological support. With the assistance of developed countries, developing countries should make practical plans to mitigate climate change based on their actual situations. Forestry carbon sequestration projects are always discussed under the UNFCCC background, hence negotiations relevant to these projects should also be in accord with the ‘common but differentiated responsibilities’ principle. Developed countries are encouraged to transfer advanced technologies to developing countries by CDM projects like afforestation and reforestation, as well as provide funds to support policies and incentive mechanisms for reducing deforestation.

2.4.2 Excluding REDD+ from CDM projects

Chinese researchers think that including Reducing Emissions from Deforestation and Degradation Plus (REDD+) into CDM will reduce China’s benefits in CDM projects. To begin with, China cannot gain much profit by implementing REDD+ projects. The main reason is that China doesn’t have severe degradation and deforestation as those countries that own vast tropical forests like Brazil and Indonesia. China is also taking effective legal measures to reduce deforestation and degradation. In addition, including REDD+ into CDM will change the market share in

global CDM projects. REDD+ projects in tropical rainforests have the potential to enlarge its market share in global carbon market, so that developed countries may redistribute their technologies and funds to those countries that have extensive tropical rainforests. This will obviously lead to the loss of technical and financial support in China and other developing countries by reducing the resources needed improve CDM techniques. (Zeng & Chen, 2010)

3.0 Barriers in China

3.1 Institutional factors

3.1.1 Deficiency in Tenure System

The identification of forest tenure is the most important factor that guarantees the trade of forestry carbon credits. Though China has made progress in forest tenure reform, there still exist problems in the management of forest carbon credit tenure.

First of all, the forest carbon credit tenure should be normally consistent with forest ownership; however, due to the complexity of the forest ownership system in China, consistency between forest carbon credit tenure and forest ownership may lead to a series of problems (He, Zhang, & Liu, 2007). In China, there are more than ten forest tenure types, which

can be classified into six broad categories (Xu, Jiang, Sun, & Li, 2008): Individual Household Management, Partnership, Villager Cluster, Outsider Management Contract, Collective Management and Ecological Reserve Forest. Different tenure types are associated with differentiated bundles of rights (transferability, inheritance, harvest rights, freedom of production decision, contract length, etc.) specified in the contracts (Xu & Jiang, 2011). As an invisible asset, the forest carbon credits ownership is different from traditional timber product ownership. Therefore, any ambiguities in the contracts or in the tenure system may have negative impacts on the forest carbon credits tenure of stakeholders.

Secondly, although the government decentralizes the forest tenure and offers farmers more user rights for the forests, there are still strict limitations (Li, Xie, Li, Wu, Li, & Wen, 2009) and unreasonable compensating systems on non-commercial forests. When farmers' forests are defined as non-commercial forests by the government, even Ecological Reserve Forests, they are deprived of their freedom of managing forests due to strict legislation. In addition, the standard of compensation for ecological non-commercial forests is extremely low. It was estimated that the net revenue of rainforests in Xishuangbanna could reach approximately \$1986 / (hm²·year) by producing rubber (Xia, Wu, Duan, & Da, 2009). In contrast, the compensation for ecological non-commercial forest was only

12.5 dollars / (hm²·year) (Wen, Xu, & Lai, 2010). Forest farmers are given more rights after forest tenure reform, but they may not gain much profit. Due to these factors, private forest owners lack enthusiasm in forestry carbon projects.

3.1.2 Lack of public participation

Currently, China doesn't have a mature system in incorporating citizens and NGOs to participate in carbon related public decision-making process (Guan, 2004). There are more than two thousand environmental non-governmental organizations (ENGOs) in China, most of which are short of financial and institutional support, and cannot find efficient measures to express their points of view to the government (He, Zhang, & Liu, 2007). In addition, Chinese citizens are aware of negative impacts of climate change but few of them have awareness of how to mitigate global warming. For example, a survey called Public Understanding of Climate Change and Consumer Behavior in 2009 had shown that 79% of Chinese youth thought that they should be responsible for mitigating climate change. But, only 25% of them were sure they had knowledge of how to mitigate climate change (GreenSohu, 2009).

3.1.3 Deficiency in mechanisms for international cooperation

Foreign investment is an important source of funds to support the

establishment of forestry carbon projects. An ideal policy is able to bring win-win solutions to both foreign investors and China's government (Chen, Chen, & Wang, 2009). But, existing preferential policies can't effectively distribute benefit gained from forestry carbon projects to both sides. If preferential policies allow foreign investors to obtain excessive profit, this may do harm to the development of the local forestry industry. If foreign investors are unable to acquire the revenue they expected, preferential policies won't be attractive and investors may not be interested in these forestry carbon projects. In addition, although foreign investors are willing to participate in Chinese forestry carbon projects and gain profits, they often hold their advanced technologies and experience back when cooperating with Chinese projects owners (Chen, Chen, & Wang, 2009). Hence, appropriate incentive and restraint mechanisms on foreign investors are needed.

3.2 Market factors

3.2.1 High cost of investment

High costs of investment are obstacles to the establishment of forestry carbon-sequestration projects. The main costs are planting, administration, and transaction costs. Transaction costs have the most impact on the total cost. The main reasons for high transaction costs are:

(1) Low volume of transactions and low price caused by undeveloped

markets

(2) Scattered private forest landowners with different preferences of management patterns. All of these result in a decrease of attraction in forestry carbon projects to investors.

3.2.2 Potential risks of unilateral projects

In current carbon trading market, due to the low carbon prices and sluggish implementation of forestry carbon project, especially for CDM projects, investors prefer to buy carbon credits than invest in projects (Michaelowa, 2007). Unilateral projects, defined as projects being developed, implemented and financed only by the host country (Baumert, 2000), involves no foreign direct investment (FDI), only has the approval of the Designated National Authority (DNA) of the host country and sell its carbon credits after certification or verification directly to an industrialized country (Michaelowa, 2007). As unilateral forestry carbon projects have lower transaction costs and lower risks to carbon credits buyers, they are more attractive than bilateral or multilateral projects. But for projects developers, they will have to face the problems of insufficiency of potential carbon credits buyers and fluctuation of prices. For instance, based on a survey conducted by Eco Securities Group in 2010, 157 of 207

responders stated that they had no interest in buying carbon credits produced by carbon projects in China (Zhao, Liu, & Xue, 2011).

3.2.3 Price fluctuations and long payback periods

Forestry-based projects are a long-term investment. The investors are often paid back with verified carbon credits at defined intervals and unable to make profits by selling carbon credits immediately. Besides, due to the undeveloped market, the price for carbon credits varies significantly depending on many factors such as project types, project locations and standards applied. Furthermore, the price changes rapidly in a short time period, and it's difficult for investors to predict the price in the future. For example, the average price for AR (Afforestation/ Reforestation) projects was 5 dollars per ton in 2009 and grew to 9 dollars per ton in 2010, but for IFM (Improved forest management) projects, the average price decreased from 7 dollars to 6 dollars per ton within one year (Peters-Stanley, Hamilton, Marcello, & Sjardin, 2011). So investors will face the problems of when to sell the earned carbon credits and whether the revenue will be able to cover the costs.

3.3 Technical factors

3.3.1 Carbon Stocks Inventory

As a standard system of carbon inventory hasn't been established, China is

currently behind in technologies of carbon stock measurement and monitoring, holding the development of carbon market back. The main methods to measure forest carbon stocks are:

- (1) To measure carbon accumulative stocks by monitoring biomass,
- (2) To measure forest CO₂ flux by applying micrometeorology and to convert CO₂ flux into carbon stocks.

The first method is easy to operate but lacks precision. The second method has great precision, but has limitations on fund investment and operability. Hence, methods for carbon inventory that are precise and practical are necessary for the development of forestry carbon sequestration in China.

In addition, many factors such as tree species, tree age and the ability of soil to sequester carbon, add to the complexity of estimating carbon stocks. China lacks databases like FIA (Forest Inventory and Analysis) to collect information about growth models of various tree species and decrease the difficulties in carbon inventory (Fahey, Woodbury, & Battles, 2010). Also, different methods will largely result in discrepancy among the estimates on forest biomass carbon (Guo, Fang, Pan, & Birdsey, 2010).

3.3.2 Carbon Leakage

Carbon leakage is an indirect result of carbon projects. Leakage refers to the indirect increase in GHG emissions or reduction of carbon sinks occurring outside the project boundary (ERA's Carbon Glossary, 2011). For instance, a forestry carbon sequestration project results in the cancellation of original afforestation projects in adjacent areas. The actual transferable emissions reductions equal to the difference between the emissions reductions within project boundary and carbon leakage. Hence, identifying whether carbon leakage is caused by designated forestry projects and measuring the impact of the carbon leakage should be significant.

3.3.3 The determination of maturity age

The optimum period for carbon sink trade is when planted forests can store the most carbon, or when the carbon sink is greatest. This is also known as the maturity age of forest carbon stocks. Postponing harvesting to the age of biological maturity may result in the formation of a large carbon sink (Alexandrov, 2007). However, there is no consensus on the standard of how to decide when the maturity age of forest carbon stocks occurs for each tree species (Chen, Chen, & Wang, 2009).

3.3.4 Disunity of standards and registry programs

Due to the lack of consensus on international and centralized regulation on the global voluntary carbon market, various standards (e.g. VCS, CCBS, Gold Standard) and registry programs have been established, which focus on the methodologies of deciding the baseline, the eligibility of forestry activities, the availability of carbon pools, the process of monitoring and the payment modes. Different standards and registry programs have been found to lead to variation of transaction costs (Pearson, Brown, & Andrasko, 2008). Standards with higher precision will have high transaction costs. Hence, strict standards are not quite suitable for those individual private landowners. Nonetheless, applying less strict standards and registry programs results in the lack of authority in certification of carbon credits. This may result in buyers' doubt on whether carbon credits produced by these private forestry projects are worth to buy. Hence, deciding which standards and registry programs to apply will be a controversial issue.

4.0 Discussion of Future Prospects

4.1 Improving legal systems and carbon trading market

Consistent with the requirements established on the Making Active Responses to Climate Change, China will research and constitute specific

policies to improve the environment for forestry carbon sequestration. Also, China should combine the actual conditions with legal system, revising relevant legislations, rules and standards. Relevant departments should organize experts to write the National Plan to Promote Forestry Carbon Sequestration to guide the work in next years.

China should improve its legal system on regulating forest tenure and the ownership of forest resources. By coordinating the relationship between forest tenure and property right of forest carbon, contractual provisions can be clarified, reducing legal disputes. Carbon credits can hence be traded successfully and rapidly under legal protection, accelerating the flow of carbon credits and fund. In the result, carbon trading market in China will grow and thrive in the future.

Apart from original financial channels, like funds from developed countries, Chinese government can also set stumpage. In Canada, stumpage is the royalty charged by the government when Crown land is logged. This will be a measure to both increase the fund to support forestry carbon projects and reduce deforestation.

China will create a national carbon credit trading market, and reform the legal system to regulate the growing market. Also, China will learn from

the international carbon credit trading market and combine international experience with actual conditions in China. The government should develop carbon credit price system and avoid huge price fluctuation. Moreover, innovations in carbon trading market mechanisms also include the construction of financing channels, establishment of transaction rules, and determination of profit distribution.

4.2 Reducing risks and increasing economic benefits

China should enhance its mechanisms to resisting various risks for forestry carbon projects, reducing operational cost and maximizing net revenue. Classification of risks, analysis of the causes, solutions to risks should be taken into consideration before establishment of projects. Methods that are widely applied by other countries include:

- (1) Constructing institutions researching on risks
- (2) Strengthening technical training on managing forests
- (3) Applying forest insurance on projects
- (4) Combining different business patterns
- (5) Controlling natural disturbances.

For disturbance control, enhancing management of combustibles in forests and creating early warning systems can effectively decrease the frequency and scale of natural disturbances, preventing the loss of carbon sink.

For private forest landowners, there are several possible strategies to reduce transaction costs (Cacho, Marshall, & Milne, 2005). Some institutions and financial intermediaries have provided alternatives to bundle projects in a portfolio, which means potential project owners will have more approaches to gain funds for investment and more project choices than bilateral programs (Wexler et al., 1994). Engaging groups of private forest landowners in projects instead of individuals is effective in reducing transaction costs as well, which shares the fixed transaction costs of planning and conducting projects among hosts.

4.3 Optimizing carbon inventory methods and species selection

It's necessary for Chinese foresters and forestry departments to draw on and introduce foreign carbon inventory methodologies. Pilot projects focus on metering and monitoring carbon stocks in the process of afforestation and tree growth. Pilot projects will be beneficial to finding the availability of metering and monitoring methods and realizing the localization of foreign methods, creating a technical system in line with the "measurable, reportable and verifiable" mechanisms.

Most forests in China are planted and secondary forests, which have low

biomass density. It's estimated that present carbon stocks in forest resources only reached 44.3% of its total potential carbon stocks (Wang & Feng, 2000). By optimizing tree species selection and stand structure, trees in projected areas are able to gain a huge increase in growth and hence raise the total carbon stocks.

4.4 Promoting public participation and professional training

China should also provide the public with more opportunities to participate in forestry carbon activities. Firstly, China should educate citizens with knowledge relevant to forestry carbon sequestration and hold more social activities like tree planting. Secondly, the media should give more publicity to forestry carbon sequestration in all-directional methods. Thirdly, the government should enhance the cooperation with NGOs, considering their opinions and give them incentives to participate in the process of decision-making.

Besides, human resources management plays a significant role in developing forestry carbon sink in China. Currently, there is a deficiency in professional people who have good knowledge in both forestry carbon and international carbon market in China. The government should take measures to proactively train native foresters, introduce foreign experts, and conduct academic exchange with foreign state and academic

institutions.

4.5 Strengthening international cooperation

International situations deeply affect the implementation of forestry carbon projects and the development of the carbon market. For instance, the consequences of international negotiations may have an impact on the execution of bilateral projects. International policies also affect carbon credit price. China should improve its ability to cope with various turbulent situations in global market, making sure that growing forestry carbon industry keeps flourishing.

China should strengthen communication and cooperation with developed countries, and introduce their advanced mechanisms to address possible changes in global market. China's government will be more responsible in coordinating international negotiations and mitigating conflicts among different countries, so as to increase its status in global forestry carbon industry.

5.0 Conclusion

Forestry carbon sequestration is a new concept to most Chinese. Forestry carbon sequestration was first introduced to citizens during coverage of

international conventions and negotiations addressing climate change. Though China hasn't signed any contracts committing to reducing greenhouse gases emissions, China is the second largest producer of GHG; hence, China has great potential to play a critical role in mitigating climate change.

China is faced with opportunities and challenges. China has a stable social and economic environment compared to most developing countries, which provides greater certainty that forestry carbon projects can be successfully implemented. At the same time, forestry carbon sequestration in China is still in its starting stage, which means China has to make efforts to improve undeveloped systems and mechanisms.

Since China is a member of the World Trade Organization (WTO), it has great impacts on international affairs. By participating in global activities addressing climate change, China is converting its growth into a more sustainable pattern. Forestry carbon sequestration will be one of most useful tools to realize this target.

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