

Setting up a social and environmentally sustainable business is hard work. Most entrepreneurs struggle to raise investment capital and make a small profit. Carbon credits can be a welcome source of additional revenue for those businesses and projects that reduce greenhouse gas emissions. But where do you start? Practical information that is easy to apply to your specific situation is hard to find. The information you can find is often either too general, or full of complicated terminology. Hiring an expert is risky without an indication of whether you will be able to earn the money back. As a result many entrepreneurs are discouraged and never properly explore the possibilities of carbon credits, or get stuck somewhere in the process.

This book is a beginner's guide for entrepreneurs who want to assess whether they can generate additional revenue with carbon credits. It provides a concise overview of the basics of carbon credits with a minimum of jargon, and illustrated with practical examples from real cases.

Topics include: What are carbon credits? What are the basic requirements for a business or project to produce carbon credits? Where and how are they sold? What are the current prices and what influences these? Who are the different players in the industry, and what do they do? What are the different steps in the development of a carbon offset project? How do I choose a certification standard? How can I estimate the amount of carbon credits and revenue I can generate?

This book addresses these questions in a way that is relevant to a wide variety of project types. Particular attention is given to the challenges of smaller projects in developing countries as well as forestry, agroforestry and biofuel projects.



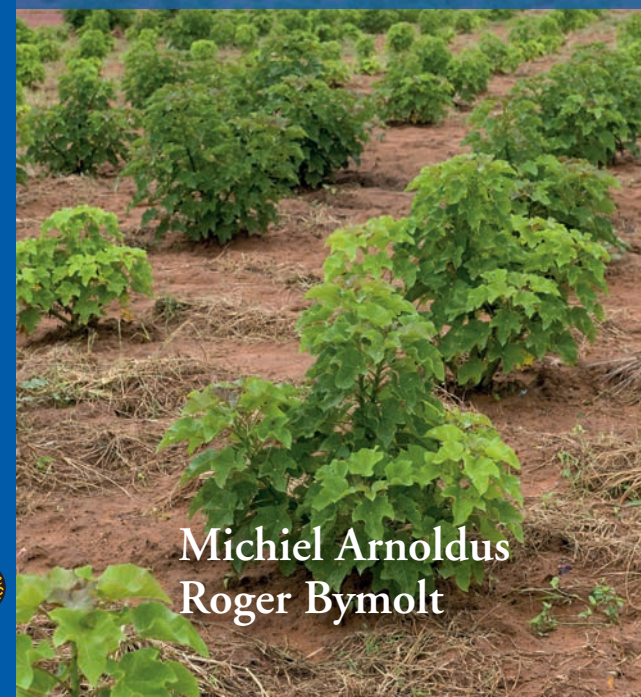
Demystifying Carbon Markets

A Guide to Developing Carbon Credit Projects



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Michiel Arnoldus  
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KIT Publishers



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## Acronyms

AAU	Assigned Amount Units
AFOLU	Afforestation, other land use
AR	Afforestation/reforestation
CCB/CCBS	Climate Community and Biodiversity Standard
CCAR	California Climate Action Registry
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CER	Certified Emissions Reduction
CO <sub>2e</sub>	Carbon Dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
ERPA	Emission Reduction Purchase Agreement
ERU	Emission Reduction Unit
EU ETS	European Union Emissions Trading Scheme
EUA	European Union Allowance
GHG	Greenhouse Gases
GS	Gold Standard
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
lCER	Long-term Certified Emission Reduction
LULUCF	Land use, land use change, forestry
OTC	Over-The-Counter
PDD	Project Design Document
PIN	Project Idea Note
REDD	Reduced emissions from deforestation and degradation
tCER	Temporary Certified Emission Reduction
VCS	Voluntary Carbon Standard
VER	Verified Emissions Reduction



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# 1 Introduction

You might recognise this scenario: You or your company come up with a clever plan that involves social and environmental benefits. The idea might be to produce green energy, or perhaps to protect tropical rainforest from deforestation. Your plan takes into account that all those involved need to make a decent living. At the start you might need subsidies and grants, but you realise that in the long run these will dry up and the project will need to be able to generate its own income stream. Therefore you are likely to structure your project as a business that sells goods or services.

Chances are your biggest challenge will be to get the business model to break even or make a small profit. We all like products that are environmentally friendly, but few consumers are willing to pay substantially more for them. You need an additional source of revenue and you've heard that carbon credits could be a way of making your business viable.

In the beginning you are optimistic, because the general principle of carbon credits seems simple. Your project reduces greenhouse gas emissions and you are issued credits for this, which you can then sell to other polluters. However, after a closer look at the documentation you are left overwhelmed by all the complicated terminology and abstract explanations. Where is all that practical information you need? For example, who buys these credits, and what prices can I expect for my credits? Certification seems important, but which of the many available standards should you choose? Sure, some companies have offered their services to you, but they are very expensive, and do I really need them every step of the way?

If you can relate to this scenario then this is the book for you. In the following pages we aim to provide a complete overview of what carbon credits are, where and how they are sold and certified, prices and what influences them, how to calculate expected revenues and the different players in the industry, all in a language that is understandable. There are also plenty of references to sources for more specific and in-depth information. The book combines general explanations in the main body of text with practical examples illustrated in boxed text.

Because there are so many different types of projects that can generate carbon credits, it is virtually impossible to cover all of those projects in detail. Our focus is on the hurdles one can expect to encounter when setting up a carbon credit generating project in a developing country context. Some extra attention has been paid to forestry, agroforestry and biofuel projects in developing countries, because of the unique challenges they face and the limited experience that is available.

While broad in scope, this book may be of particular interest to those who are involved in the production of biodiesel from *Jatropha*. The genesis of the book was research conducted for Mali Biocarburant (see box 1), a biodiesel producer in West Africa that needed additional income to

finance the planting of more *Jatropha* trees. They asked the Royal Tropical Institute (KIT) for help with certification, sales and distribution of revenues. Quite quickly the complexity of the matter and the lack of easy-to-understand practical information became apparent. A frustrating year followed, in which we searched for the information necessary to make the right decisions. We decided then to share our findings with others who found themselves in a similar position and to try and demystify the carbon markets.

We have, of course, strived to give accurate advice based on our experiences and research. In saying this it is important to remember two things: carbon credit projects can vary tremendously in type, size and circumstance, and so not all of our advice is applicable to all projects; and secondly, carbon markets are still in their infancy. There is no 'usually' in this field - trends, prices and standards are subject to rapid change as the market matures.

We hope that after reading this book you will have gained a solid understanding of the world of carbon credits, and that you will have been able to form an impression of whether or not your project qualifies for carbon credits, and what the expected costs and benefits might be. Finally, we hope that this book will give you an insight into the steps that need to be taken in order to be able to generate, certify and sell carbon credits.

### **Box 1: Case study: Mali Biocarburant. Generating carbon credits from planting *Jatropha* and biodiesel production**

In 2005, Mali Biocarburant (MBSA) began examining the viability of producing biofuel from *Jatropha curcas*. The business concept seemed straight forward enough. *Jatropha* is a shrub that produces nuts with a high oil content, and it thrives in most tropical countries. Thousands of kilometres of hedges had already been planted by smallholders in Mali to protect their crops from goats and cattle and to prevent erosion. MBSA would simply buy the nuts, press them and process the oil into biodiesel for use in any regular diesel engine in Mali. Everyone would benefit: poor farmers would earn additional income, the business would employ more people and clean biodiesel would replace the more expensive imported diesel.



Nursery for *Jatropha* seedlings, Mali (Photo: Mali Biocarburant)

However, as is often the case, the reality was quite different. The older and poorly maintained *Jatropha* shrubs in hedgerows produce very few nuts, and so it quickly became clear that a programme was needed to promote large-scale planting of *Jatropha*. Given the huge investments needed for plantations and the concerns associated with replacing food crops, intercropping by smallholders seemed to be a better approach. It would provide farmers with additional income, improve soil fertility and structure and thus have a positive impact on the surrounding food crops. A system was devised in which nurseries were established to provide local farmers with seedlings, and training was provided by fieldworkers in planting and maintenance techniques. Problem solved, you might think. Unfortunately, research established that it would not be viable to finance the project from the revenues generated by biodiesel production alone. Further research was carried out into whether carbon credits could be a source of finance. This quickly revealed the complexity of the issue.

The idea was simple: MBSA plants trees, calculates the amount of carbon in them, finds someone who can certify this, if possible, and then sells the credits to a willing buyer. MBSA had already found a buyer and began selling uncertified credits. Slowly but surely, additional brokers began to appear offering their financial services. However, these brokers required certification, and they offered much lower prices than expected. Further research was conducted to compare standards and to check whether the prices being offered by brokers were fair.

Our research revealed that at the time there was not one successfully certified *Jatropha* project to be found anywhere in the world. Documentation was found that explained the market and compared certification standards, but not one report gave a complete overview of the issues facing Mali Biocarburant. Furthermore, information was generally incomplete and difficult to understand. A long journey followed, during which many people were interviewed, financial models were built and literature reviewed.



## 2 Climate change and the role of carbon credits: an overview

### Background to the science

The great majority of climate scientists agree that human activities are responsible for the process of climate change (Anderegg, et al 2009). While our planet does release and absorb carbon naturally in a continuous cycle, the burning of fossil fuels, large-scale deforestation and other human activities have all led to the release of more carbon dioxide and other greenhouse gases (GHGs) than can be naturally absorbed and recycled by the world's oceans and forests. As a result of the increasing concentration of GHGs in the atmosphere, average global temperatures are steadily rising.

### The impact of climate change

There are a wide range of expected impacts arising from climate change. An increase in average temperatures will more than likely lead to permanent changes in ecosystems. Glaciers, coral reefs, mangroves, tropical forests, wetlands and prairies are among those most vulnerable to rapid climate change. Sea levels are projected to rise, threatening populations in coastal areas, as well as the flora and fauna that live in them. Furthermore, both the magnitude and frequency of extreme weather events such as tropical cyclones, heat waves and droughts are expected to increase, adversely affecting people's lives and livelihoods<sup>1</sup>.

There is now widespread agreement that the costs of significantly reducing GHG emissions today are lower than the future financial costs that will be incurred as a result of climate change. For example, the Stern Review (2006) on the economics of climate change has estimated that unmanaged climate change would lead to the loss of at least 5% of global gross domestic product (GDP) each year, now and forever. When a wider range of risks and impacts are included, this could increase to 20% of GDP.

### Combating climate change: the role of carbon credits

Perhaps one would expect that the enormous potential cost of climate change would be motivation enough to rapidly reduce GHG emissions. However, the large emission reductions needed to mitigate climate change would require us to drastically reduce our energy consumption, combat deforestation and replace existing fossil fuel-based energy with other sources such as solar, wind and hydro on a massive scale. This, in turn, would require us to change our lifestyles and restructure our economy. For example, we would have to drastically reduce the consumption of goods that require a lot of energy to produce. We will need to use 'greener' transport, and refrain from eating meat every day. Coal, and other 'dirty' sources of energy will need to be phased out. Unfortunately, without strong economic incentives such changes are not likely to happen any time soon.

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<sup>1</sup> For current data on the future impact of climate change see the IPCC Fourth Assessment Report: Climate Change 2007 [http://www.ipcc.ch/publications\\_and\\_data/publications\\_and\\_data\\_reports.shtml](http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml)

## Box 2: Greenhouse Gases (GHG) and their Global Warming Potential (GWP)

Carbon dioxide (CO<sub>2</sub>) is the most well known greenhouse gas (GHG) and is the primary cause of climate change as human activity produces more CO<sub>2</sub> than any other GHG. But there are also several other GHGs. Methane (CH<sub>4</sub>) is a by-product of breeding livestock and decomposing garbage in landfills. Nitrous oxide (N<sub>2</sub>O), HFCs (hydrofluorocarbons), PFCs (perfluorocarbons) and sulphur hexafluoride (SF<sub>6</sub>) are the most common by-products of industrial processes.

The relative impact of each GHG on the global warming is variable. For example, one unit of methane contributes 25 times more to global warming than one unit of CO<sub>2</sub>. In order to set emission reduction targets, a 'common currency' for GHGs needed to be defined. The Intergovernmental Panel for Climate Change (IPCC) has defined this as one ton of carbon dioxide equivalent (1tCO<sub>2</sub>e). It is based on the global warming potential (GWP) of each GHG; one ton of Methane is thus equal to 25tCO<sub>2</sub>e. This is very important for generators of carbon credits. For example, if you reduced methane emissions from a landfill by 100 tonnes you would generate 2500 carbon credits, not 100.

When people in the carbon credits industry talk about CO<sub>2</sub>, they usually mean CO<sub>2</sub>e. The conversion rates for the most common GHGs are as follows:

Carbon dioxide (CO <sub>2</sub> ): 1	Methane (CH <sub>4</sub> ): 25	Nitrous Oxide (N <sub>2</sub> O): 298
HFCs: Various 124-14800	Tetrafluoromethane CH <sub>4</sub> : 7390	Hexafluoroethane (C <sub>2</sub> F <sub>6</sub> ): 12,200
Sulphur hexafluoride (SF <sub>6</sub> ): 22,800		

Source: IPCC Assessment Reports 2007

The core of the issue is that, in most cases, fossil fuel-based energy is still cheaper to produce than renewable energy. Many green technologies are still relatively new and need further research and development to lower the unit cost of energy production. One of the reasons that fossil fuels are relatively cheap is that the costs of polluting GHGs are not reflected in the price of fossil fuels. For example, as a buyer of petrol I do not pay for the loss of farmers' income when an area becomes much dryer and warmer as a result of global warming, even though the production and my use of that petrol contributed to the problem. In economic literature, this problem is often referred to as externalities.

As fossil fuels have been relatively cheap over the past few decades, private sector investment in research and development for renewable energy has been relatively low, particularly when compared to investment in exploring new oil and gas reserves. From a short-term economic perspective, it made little sense to invest in renewable energy development. As a result of decades of cheap fossil fuels and low investment in the development of clean energy sources, our economies are based primarily on fossil fuels. It will take time, significant investment and good policy to wean us off them.

The role that carbon credits could play is to make the use of fossil fuels more expensive and thereby also the production of goods and services that require a lot of energy in their production. It would give companies an economic incentive to reduce the use of fossil fuels by becoming more

energy efficient and replacing them with renewable energy. Simultaneously, carbon credits can also help reduce the consumption of products and services that lead to large GHG emissions, simply because it makes them more expensive. However, whether carbon credits will lead to an actual reduction in emissions largely depends on how the production and sale of carbon credits will be regulated in the future.

### Box 3: Combating climate change with Biofuel: The *Jatropha* gold rush

Every once in while a new 'wonder crop' or tree is 'discovered' and planted on a large-scale around the world. Some, like soy beans and oil palm, live up to their huge commercial potential. Others, however, never meet the high expectations and quickly disappear from the limelight. The Australian Eucalyptus tree, for example, was planted in dry areas around the world because it was thought that it could grow with little water. However, decades later we found out that it survives by drawing on vast amounts of water from a large surrounding area, thereby drying out local water sources. Combined with the chemicals released into the soil from fallen leaves, this kills a lot of the surrounding vegetation.



The nuts from *Jatropha curcas*, from which biodiesel can be made (Photo: Trees for Travel/ Mali Biocarburant)

After an initial spurt of interest in the eighties, *Jatropha curcas* was rediscovered in the early 2000s as a 'wonder crop'. This shrub that originates from Central America can grow in most (sub) tropical regions. It produces nuts with a high oil content (30%-40%) that can be used directly as fuel in slightly adapted diesel engines or generators, or refined into biodiesel for use in any diesel engine. Up to 2008 it was generally assumed that *Jatropha* could grow in dry climates and poor soils, requiring little maintenance, fertiliser or water, reaching maturity in 3 years, and was resistant to animals, drought and pests. It was thought it could be grown in places where food crops cannot be grown and that competition, therefore, for scarce arable land would be limited. With oil prices soaring and fears about climate change growing, *Jatropha* quickly became very popular. Entrepreneurs saw a business opportunity, particularly after a market was created overnight when many countries set ambitious targets for the introduction of a fixed percentage of bio fuels in all diesel sold in their country. Western companies saw an opportunity to comply with their mandatory emission targets, governments saw an opportunity to become less dependent on oil imports, thereby improving their trade balance, and NGOs and other development organisations saw huge potential for extra income and access to affordable energy for poor rural communities.

This increased interest resulted in a veritable gold rush. Early in 2008, a comprehensive survey by GEXI estimated that over 900,000 hectares of *Jatropha* were planted in 242 projects worldwide, and that this would grow to 5 million hectares by 2010. Large-scale mono-crop plantations for export production to the EU with a planned size of 5000 to 100,000 hectares emerged as a popular model. In Tanzania, roughly 235,000 hectares appear to have been allocated to *Jatropha* plantations, and more than 438,000 in Mozambique (Friends of the Earth International). In Ghana, more than 20 mainly foreign companies acquired land (Ghana Business



news 2009), including the Norwegian firm Scanfuel, which, according to Reuters (2008) and ten Hoedt (2010), acquired access to 400,000 hectares. When various sources are combined, the total land allocation in Ghana reached 2.7 million hectares. In the Congo (DRC), 2.8 million hectares were allegedly allocated to China (Amigun et al 2011).

Outgrower models have also proven popular, in which a firm provides seedlings and education to farmers who then sell their crop back to the company. Some organisations promote the establishment of plantations, while others, such as Mali Biocarburant, promote intercropping. The UK firm D1 Oils ran probably the largest private programme. At its peak in 2007 it claimed in its annual report a total of 188.600ha from outgrowers in Indonesia, India, Swaziland, Zambia, Mozambique and Malawi, though some claim that these numbers were never reached. In Asia, many national and local governments drive large-scale models. In 2008, China claimed to have 2 million ha under *Jatropha* cultivation, and India 600,000 ha (GEXI 2008). Finally, many NGOs also advocate this model, as it keeps the land under the control and possession of small-scale farmers. The Dutch NGO Hivos supported small community-based programmes in several countries. A key difference between the two models is that where most private firms aim to export the biodiesel to the EU, NGOs and governments aim to use the diesel locally.

Unfortunately, for many of the investors, the saying “if it sounds too good to be true, then it probably is” seems to apply to *Jatropha* as well. Most projects have been based on overly optimistic assumptions, which even large players like Scanfuel and D1 have admitted simply turned out to be myths. For example, *Jatropha* can grow on marginal land and in semi-arid conditions, but it will result in marginal yields unless fertiliser and irrigation are employed. Without ample water and careful tending during the first years, most plants will actually die. *Jatropha* plants also suffer heavily from pests, just like other crops in large plantations, most notably from termites. Contrary to most business plans, plants may take up to eight years to reach large yields, as opposed to three. Substantial investment in research is needed to develop a range of high-yield varieties suited to a range of different conditions.

As a result of disappointing yields, many *Jatropha* plantations have been abandoned, just like old mining towns. By 2010, only 400hc remained in Zambia from the 25,000ha reported by D1 in 2007, while it also abandoned its ambitious plans in Tanzania and Swaziland, including the 7000ha it claimed to have planted there already. In 2009, BP withdrew from the joint venture it started with D1 in 2007. Starting in 2004, D1 has reported a loss for 7 consecutive years totalling 111 million pounds (D1 Annual reports). The Dutch company Bioshape acquired a lease on 81000 ha of coastal miombo woodlands in Tanzania and clear-felled 285 hectares, on which it then planted *Jatropha*. Early in 2009, the main investor, Dutch energy company Eneco, pulled out, Bioshape went bankrupt, and the plantation was abandoned. The German company Flora EcoPower obtained access to 256,000ha in Ethiopia but abandoned all operations after the share price plummeted and their current plans no longer make any mention of *Jatropha* (FOEI 2010). BioFuel Africa, a Norwegian firm with links to STATOIL, acquired 38,000 hectares in Ghana and cleared at least 2600ha of forest (Spiegel Online 2008). They went bankrupt in 2009, and the abandoned plantation with its wilting *Jatropha* trees and rusty equipment was visited by the author in 2010. Finally, Scanfuel seem to have disappeared from the central region in Kumasi, and only a small pilot plantation remains while they review their business model.

The question is, how did this happen? *Jatropha* is a wild plant that has never been properly domesticated, and there was very little reliable information on yields under a specific range of conditions. Most people simply believed and confirmed each other's stories, and fell for investment prospectuses on the internet. In reality, these stories and business plans were based on myths and overly optimistic assumptions. In the end, *Jatropha* turned out to be just like most other crops: it grows best in good soils, with ample water, inputs and labour for maintenance, and in a range of stable varieties adapted to different conditions. Unfortunately, it will take at least five to ten years of research to develop these varieties and the required farming methods.

It will also take a while to establish which business model is actually most suitable for *Jatropha* cultivation. The plantation model seems to have failed, but the outgrower model also has its drawbacks. The revenues for outgrowers are limited, particularly during the first years, while businesses struggle to find the funding needed to finance tree planting promotion programmes. Additional sources of income are needed; but is this not exactly the kind of situation in which financing through carbon credits can make a difference?



# 3 Introduction to carbon markets

Carbon markets have emerged as one of the mechanisms that have the potential to change this situation. While not a ‘magic bullet’, the development of carbon markets could make the emission of GHGs more expensive so as to better reflect their costs in terms of the environment. More importantly, carbon markets offer an incentive to companies to invest in energy efficiency and to switch to renewable energy. This is done through the trading of carbon credits. Exactly what carbon credits are, their origins, and how they can be generated and traded will be discussed in this section. This is essential knowledge for anyone considering developing a carbon credit project.

## 3.1 The compliance market

Carbon markets trace their origins back to the Kyoto Protocol. In 1997, the United Nations Framework Convention on Climate Change (UNFCCC) adopted the Kyoto Protocol, which set out quantified binding commitments to limit or reduce GHG emissions for 40 industrialised and transition countries<sup>2</sup> in the period from 2008 to 2012. These countries committed to reducing their emissions by an average of 5.2% compared to 1990 emission levels. In order to achieve Kyoto targets, three flexible mechanisms were established. These are emissions trading, the Joint Implementation (JI) mechanism and the Clean Development Mechanism (CDM). These Kyoto mechanisms are associated with what is known as the ‘compliance market’ (also known as the regulated market) because ratifying countries are obliged to participate and comply.

### Emissions trading

Under the Kyoto Protocol, emissions trading (also known as cap-and-trade) can be conducted between countries that have ratified the protocol. In essence, countries that are party to the Protocol are given an emissions allowance based on an emissions reduction target. In order to create scarcity, a limited number of emissions allowances are issued in relation to the global target for a particular period. Under the Kyoto Protocol these emission allowances are called Assigned Amount Units (AAUs) and each AAU is equal to one ton of CO<sub>2</sub>e. These emission allowances (or quotas) are one type of what are better known as ‘carbon credits’.

Countries that are able to reduce their emissions below their target may sell their surplus AAUs to countries that have not been able to meet their emission reduction targets and have exceeded their quota<sup>3</sup>. The rationale behind emissions trading is efficiency. By commoditising GHG emissions into freely tradable AAUs, parties can choose the most cost-effective way of meeting their emission

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<sup>2</sup> These countries are known as Annex 1 countries. See [http://unfccc.int/parties\\_and\\_observers/items/2704.php](http://unfccc.int/parties_and_observers/items/2704.php)

<sup>3</sup> See Article 17 of the Kyoto Protocol

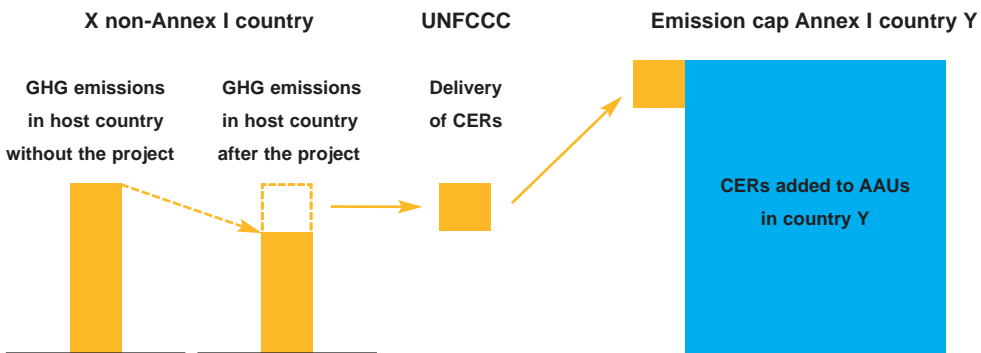
reductions targets: They can either choose to invest in reducing their own emissions or to buy credits from others who have been able to reduce their emissions more efficiently.

### The JI and CDM mechanisms

The two other Kyoto mechanisms are project-based. These mechanisms are known as Joint Implementation (JI) and the Clean Development Mechanism (CDM). In these mechanisms, projects that reduce GHG emissions or sequester CO<sub>2</sub> can register their activities with the UNFCCC. When the emission reductions from their projects are verified, these entities then receive carbon credits, which they may sell to other organisations that need to reduce their emissions in order to achieve their emission reduction targets (Figure 1). The amount of credits that a project is entitled to is the difference between the emissions baseline (what would have happened if the project never got off the ground) and actual emissions. In the literature, emission reduction projects are often called carbon offset projects, because organisations that are unable to meet their emissions quota can offset their emissions by buying CDM-approved carbon credits.

The main difference between the JI and CDM mechanisms is that the JI applies to projects implemented in developed and transition countries<sup>4</sup>, whereas the CDM applies to projects implemented in developing countries. Carbon credits issued under the JI mechanism are known as Emission Reduction Units (ERUs), whereas credits issued under the CDM are known as Certified Emission Reductions (CERs). Countries may choose to purchase ERUs and CERs and add these to their allocated and purchased AAUs to help them to meet their emission reduction targets. As is the case with AAUs, each ERU and CER is equal to one ton of CO<sub>2</sub>e.

**Figure 1: How the Trade in Emission Quotas and Credits works under the CDM and JI**



Source: MEIE, MEEDDAT & FFEM 2008, p.11

The JI and CDM are regarded as being among the strictest of standards for the rigour with which they ensure that emission reductions are real and permanent. For a project or business to be eligible for issuance of carbon credits under the JI or CDM, a number of requirements must first be met. The concept of 'additionality' is one of the most fundamental issues. Additionality simply means: would the project and its associated emission reductions have happened anyway even if carbon credits were not issued? If the answer to that question is yes, then the project should not qualify

<sup>4</sup> These countries are known as Annex 1 countries. For a list of countries see [http://unfccc.int/parties\\_and\\_observers/items/2704.php](http://unfccc.int/parties_and_observers/items/2704.php)

under the JI or CDM. The way to prove additionality is to show that without the revenues from carbon credits the project or business is economically not feasible, and will therefore never happen. An additionality tool has been developed by the CDM executive board<sup>5</sup>.

Another important issue is that of leakage. Leakage occurs if a project designed to reduce CO<sub>2</sub> emissions leads to the shifting of the emitting activity elsewhere, in which case no real gains are made. For example, if we plant 100 acres of trees in one area but harvest another 100 acres in an unprotected area of land, this results in no real emission reductions. Again, such a project would not, in theory, be eligible for carbon credits. There is also a second type of leakage, which is leakage within the project. Though not often explicitly mentioned, emissions caused by the project, such as tractors ploughing the land and staff transportation, should also be deducted from the emission reductions.

Emission reductions also need to be seen as permanent. This criterion is a problem for forestry in particular, because if the trees should perish after a number of years, then the CO<sub>2</sub> that is sequestered in those trees will eventually be released into the atmosphere again. The issue permanence with regard to forestry and land-use projects is discussed in more detail elsewhere in this book.

Each carbon credit can only be used, or retired, by one party, meaning that carbon credits need to be strictly administered in a database (known as a registry). Registries are intended to prevent 'double counting', which is the use of a carbon credit more than once when claiming emission reductions.

Finally, projects should have no significant adverse environmental or social impacts and must comply with local laws and regulations. One of the primary goals of the CDM (aside from assisting industrialised countries in meeting their emission reduction targets) is to promote sustainable development objectives in developing countries. However, some may argue that the methodology focuses more on mitigation of adverse impacts than on rewarding positive environmental and social benefits, for example contributing to bio-diversity.

Of the three Kyoto mechanisms described above, only the CDM is elaborated upon elsewhere in this book. This is because the CDM directly applies to the development of carbon credit generating projects in developing countries. It is also the largest and most widely accepted project-based standard for offset projects.

### **Other compliance markets**

The European Emissions Trading Scheme (EU ETS) is the largest organised market place for the sale of carbon credits. In fact, 81% of all carbon credits traded worldwide in 2010 were traded within the EU ETS (Table 2). The size of the EU ETS reflects the fact that it presently covers industrial sectors that are collectively responsible for almost half of the EU's emissions of CO<sub>2</sub> and 40% of its total greenhouse gas emissions. No other major emitter, such as the US or Japan, has established a trading scheme on such a scale.

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<sup>5</sup> See <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-01-v5.2.pdf>

The EU ETS is based on the same approach as the Kyoto Protocol and works by setting an emissions cap on the largest industrial facilities. The exact rules of the system are reset for each commitment period. After a trial phase from 2005-2007, the second commitment period covering 2008-2012 is now underway. A third commitment period to run from 2013-2020 is currently being negotiated. The EU ETS works by having governments assign emissions quotas to industrial operators at the beginning of each year. These quotas are called European Emission Allowances (EUAs). Operators can comply either by reducing their emissions to within their quota, by purchasing EUAs from other operators or intermediaries, or by purchasing a limited number of ERUs and CERs generated by projects under the JI or CDM mechanisms of the Kyoto Protocol. A number of other smaller compliance markets for GHG emissions are now emerging that operate at state or national levels. Among these are the New South Wales Greenhouse Gas Abatement Scheme (NSW GGAS), the New Zealand Emission Trading Scheme (NZETS) and the Regional Greenhouse Gas Initiative (RGGI), which covers electrical facilities in some US states. A number of other carbon markets are also emerging in Australia, Canada, Japan and the United States<sup>6</sup>.

#### **Box 4: What is the difference between the Kyoto Protocol and the EU ETS?**

The Kyoto Protocol applies to countries that have ratified the Protocol, particularly to the developed (annex 1) countries that have committed to emission reductions. The emissions trading mechanism in the Kyoto Protocol applies only to these countries.

Several nations and groups of nations have developed their own trading mechanisms to help them meet their Kyoto targets; the biggest of these is the European Emissions Trading Scheme (EU ETS). In the EU ETS, it is certain companies, rather than countries, that receive GHG emission allowances (quotas), which they can trade as needed to meet their reduction targets. However, there is some crossover between the two trading schemes. In what is known as a 'linking directive', the EU ETS also accepts CER credits from most CDM projects. Companies under the EU ETS can purchase and use these credits to help them meet a small percentage of their emission reduction targets.

#### **Further Reading:**

UNFCCC. (2010). The Kyoto Protocol Mechanisms. [http://cdm.unfccc.int/about/cdm\\_kpm.pdf](http://cdm.unfccc.int/about/cdm_kpm.pdf)  
EU. (n.d.) European Union Emissions Trading Scheme. [http://ec.europa.eu/clima/policies/ets/index\\_en.htm](http://ec.europa.eu/clima/policies/ets/index_en.htm)

<sup>6</sup> Presently, these schemes trade very little volume as they are relatively new. The Regional Greenhouse Gas Initiative (RGGI in America) is by far the largest, trading 805 MtCO<sub>2</sub>e in 2009, although this dropped to 45MtCO<sub>2</sub>e in 2010. The RGGI is a regional initiative by states and provinces in the Northeastern United States region aimed at reducing greenhouse gas emissions from power plants. See <http://www.rggi.org/>

### **Box 5: Jatropha biodiesel and carbon credits: where do the opportunities lie?**

With producers of Jatropha biodiesel struggling to make their businesses profitable, carbon credits could mean the difference between success and failure. What makes Jatropha bio-fuel special is that it can produce carbon credits in two ways. Firstly, as the Jatropha shrubs grow, they take CO<sub>2</sub> out of the atmosphere and store it as carbon in their trunks, branches and roots; this process is called carbon sequestration. Secondly, the bio-diesel that does not have any CO<sub>2</sub> emissions replaces the regular diesel, and the decrease in emissions from not burning regular diesel can be claimed as carbon credits.

In order to claim carbon credits, the 'additionality' criteria will need to be met. This means that entrepreneurs will need to show that the business is not profitable without carbon credit income, or not sufficiently profitable to be able to attract investors. For example, a project in Africa or India that only shows 5% profit and takes 5 years to break even is not likely to find an investor, and would thus be unlikely to get off the ground. This means that it meets the requirements of the additionality principle.

One also needs to prove that there are no adverse social and environmental effects. Once again, this is likely to be a problem for many large-scale plantations in Africa, where land rights are often complicated. Land that might appear unused is, in all probability, used by a large number of people, such as herders and gatherers..

In order to claim credits for carbon sequestration, one needs to measure how much carbon is stored in vegetation and soil before the Jatropha was planted (a base line survey), and to calculate how much carbon will be stored after the Jatropha has been planted. If there is more carbon stored after planting, then credits can be claimed based on the difference. It should be noted, however, that projects that clear land of trees and other woody vegetation in order to set up plantations are unlikely to be certified. The main reason for this is that the land clearance would itself produce CO<sub>2</sub> emissions and biodiversity loss. Similarly, if a Jatropha plantation replaces land that is presently being used for agriculture, and the displacement of agricultural activities is likely to lead to the clearance of land elsewhere, then it is unlikely that the carbon project will be certified. (This is known as 'leakage'). Only if Jatropha is planted on severely degraded, empty land, or is used alongside agricultural land is the project likely to be certified. In any case, it is difficult to obtain a useful CDM certification based on carbon sequestration credits, because CDM does not see the emission reduction as permanent and thus only provides temporary credits, for which there is little demand. The voluntary market, on the other hand, is a good option (see chapter 3.2).

To be sure that one is allowed to claim credits for replacing regular diesel, the diesel needs to be sold in developing countries to known customers, preferably in the country where it is produced. If it is exported to countries that are subject to a cap-and-trade system, (such as the EU ETS) then there is a major risk that the final user will also claim the emission reductions in order to comply with his emissions quota. In other words, the producer and emitter cannot both claim the same emission reductions; doing so is known as double counting. In 2010, a CDM methodology (ACM0017: "Production of biodiesel for use as fuel") was approved. This means that others who want to produce such a project can use this methodology, lowering the costs of CDM certification because they do not have to develop the methodology themselves.



Unfortunately for producers of *Jatropha* it will take shrubs 5-7 years to grow enough to be able to produce amounts of biofuel significant enough to generate a large stream of carbon credits.

Despite the clear possibility for carbon credits there are currently very few *Jatropha* projects certified, for which there are several explanations. Firstly the lack of experience with *Jatropha* cultivation and fuel production means that there is a very limited availability of reliable data to calculate emission reductions, making certification difficult and costly. Secondly the majority of *Jatropha* projects developed have been large-scale intensive plantation projects that export the oil or diesel to Europe, clear woodlands and use existing agricultural land for production. These projects cannot qualify because they fail to meet the double counting and leakage criteria. Projects that plant *Jatropha* on deforested marginal land and sell the produced fuel locally or generate electricity can qualify, but many of these have been relatively small projects, making certification often not feasible. The complexity of the carbon credit market and the difficulty in obtaining information have also been major barriers. The low amount of certified projects means there is little experience amongst service providers such as project developers, once again making certification more difficult.

### 3.2 Introduction to the voluntary market

The voluntary market enables companies and individuals to offset their carbon emissions on a purely voluntary basis by purchasing carbon credits generated from projects that either reduce GHG emissions or capture carbon from the atmosphere. In other words, they are not subject to legislation that requires them to reduce or offset their GHG emissions. Voluntary market participants may choose to be part of a voluntary cap-and-trade system in which emission rights are traded, but the majority do not. In the voluntary market, organisations and even individuals typically assess their own 'carbon footprint' themselves, attempt to reduce their emissions by saving energy, and then offset additional emissions either by buying carbon credits from projects that reduce emissions elsewhere, or by directly investing in these projects (MEIE, MEEDDAT & FFEM 2008, p.62). The voluntary carbon market is very small compared to the compliance market (only about one hundredth of their size) but it is developing fast. In 2010, 131 MtCO<sub>2</sub>e were traded on the voluntary market (about 2% of the total) compared to 6692 MtCO<sub>2</sub>e on the compliance market.

While the main motivation for buyers in the compliance market is being able to comply with the law regulating GHGs in the cheapest way possible, voluntary buyers, on the other hand, have a variety of motivations. Among these are personal idealism, corporate social responsibility, and marketing and PR purposes. Some companies also participate in the voluntary market because they see it as a good way of preparing for future entrance into the compliance market, and their actions now may be of benefit later.

For buyers on the voluntary market, the social or environmental story behind the carbon credit is often as important as the GHG emission reduction itself that the carbon credit represents. This is particularly true for those companies using carbon credits for marketing and PR purposes. Carbon credits remain an abstract concept for most consumers; however, an emotive story with associated imagery can be powerful. For example, pictures of methane collection from garbage dumps do not have the same clean image for consumers as, say, wind farms or newly regenerated rainforest.

## Box 6: Carbon offset projects in the voluntary market: typical examples from Trees for Travel

In 1999 Trees for Travel was the first Dutch organisation to start selling carbon credits from tree planting projects managed and owned by others. When the market developed, Trees for Travel realized that there were increasing numbers of producers selling regular (ex-post) carbon credits. However, many still had a problem with finance. Capital is needed most at the start of a project, before emission reductions are made and thus before carbon credits are issued and sold to generate income.

Therefore in 2006 Trees for Travel changed into a project developer that offers advice, assistance and start-up capital to projects. Trees for Travel sells credits to clients at the start of the project based on emission reductions that are to take place in the future. These so called prepaid forward purchase agreements (see chapter 5) provide income early on when needed the most, and a stronger connection between buyer and project is realised. Since 1999 nearly 1 million tons of CO<sub>2</sub>e emissions have been compensated through Trees for Travel, and millions of trees were planted. Trees for Travel operates exclusively on the voluntary market, and the projects it supports provide an interesting sample of what is available in this market:

**Re-forestation and forest protection in Bolivia:** Of 6200 hectares cleared for agriculture on the edge of the amazon 5000 will be reforested with indigenous trees and 1000 hectares developed as agroforestry. A further 1200 hectares will be protected as a nature reserve.

**Re-forestation in Northern Borneo, Malaysia:** 1000 hectares of forest severely degraded by logging will be reforested with the original species.

**Re-forestation in the Phillipines:** most forest on Mount Malindang was logged, leading to soil erosion and floodings in lower areas. A national park was proclaimed in 2004 to protect the remaining forest high on the sloped of the volcano, but only half of the park is actually forest. With carbon credits income 50 hectares can be reforested annually; 80% of this will be protected forest and 20% can be used by the local population.

**Fuel efficient cook stoves in Tanzania:** Like most African countries Tanzania relies almost exclusively on wood and charcoal for cooking, which leads to large scale deforestation. Women are forced to travel larger distances to gather wood. Fuel efficient stoves reduce the consumption of wood by 50%.

**Bio-gas in Cambodia:** 17500 families received access to a bio-gas installation that transforms animal dung in gas and high quality fertilizer. The bio-gas is used for cooking and replaces firewood.

**Micro hydropower in Guatamala:** Small turbines have been installed in local rivers. These turbines can produce 25kW Electricity, sufficient to provide access to Electricity to a school, clinic and several houses. Each 2000 kW/ hour of electricity prevents 1 ton CO<sub>2</sub> emissions.

**Solar panels in Senegal:** Small solar panels provide electricity to households that replaces kerosene lamps candles and other non-renewable energy sources. Each household reduces its emissions with 1,6 ton CO<sub>2</sub> per year.

**Biodiesel for Jatropha in Mali:** Not all projects of Trees for Travel are certified; in many cases the project scale is too small to earn back the cost of certification, and not all clients find certification important; some actually prefer to spend the money needed for certification on i.e. planting more trees. For these projects Trees for Travel helps with the set-up of proper monitoring systems, and carries out the monitoring itself. Large clients are also welcome to join monitoring missions.

The voluntary market operates parallel to the compliance market and is largely based on the Kyoto CDM and JI models. Voluntary market standards have been developed to ensure that the principles of additionality, permanence and leakage are complied with, lending credibility to the market. Most of these standards also require the use of independent auditors to assess a project. As in the compliance market, the voluntary market also quantifies a carbon credit as 1tCO<sub>2e</sub>. Voluntary market credits are known as verified emission reductions (VERs).

Nevertheless, there are important differences between the voluntary and compliance markets. The voluntary market is self-regulatory and projects are not obliged to become certified to a standard. However, the vast majority (93%) of credits sold to voluntary buyers adhered to the third-party standards set down in 2009 (Hamilton 2010, p.57). Most credit producers choose to become certified because they attract considerably higher prices than non-certified credits. Most brokers and buyers also demand certification, because standards help to ensure that emission reductions have actually been made as claimed by the producer, thereby enhancing the credibility of the credit.

Over the past five years or so, about 18 third-party standards have emerged in the voluntary marketplace (Hamilton 2010 vii), each with a different focus and appeal to buyers and producers, as well as different eligibility criteria and certification procedures. In theory, any business, NGO, or other organisation can develop a standard. Most standards are largely based on the Kyoto CDM and JI mechanisms in the compliance market. Standards are discussed in detail in chapter 10.

For credit producers, it is important to note that the certification procedure on the voluntary market tends to be less complicated and less costly than that in the CDM mechanism. In addition, some voluntary standards are not as strict as the CDM. This means that projects that find CDM certification unsuitable may be able to get certified to a standard on the voluntary market. In many cases, carbon credit projects that wish to employ technologies and methodologies not yet accepted by the CDM may find that certification to a voluntary standard is a better option because of lower costs and greater flexibility. For example, agro-forestry and forestry projects cannot fully qualify for the compliance market (see chapter 9).

The lower cost of certification on the voluntary market is particularly attractive for those businesses that generate a relatively small amount of credits. For those generating, say, less than 50,000 tCO<sub>2e</sub> a year, CDM certification may be too costly and too risky. Despite the opportunity of getting good prices for credits, it may prove difficult to earn back the cost of certification. It is also far from certain that registration with the CDM will always be successful. This is a risk that many smaller projects may not be willing to take.

**Further Reading:**

Hamilton et al. (2011). *Back to the Future: State of the Voluntary Carbon Market 2011*. Ecosystem Marketplace, Bloomberg New Energy Finance.  
[www.ecosystemmarketplace.com/reports/SOVCM2011](http://www.ecosystemmarketplace.com/reports/SOVCM2011)





### **Box 7: Assessing an individual case: Can Mali Biocarburant claim carbon credits?**

In Box 5 we discussed the eligibility for carbon credits of Jatropha projects in general and established that projects that plant Jatropha on marginal land and sell fuel locally should be able to obtain certified carbon credits. In this box we will look at the specific case of Mali Biocarburant, in which we need to view the project in terms of the major criteria, such as additionality, leakage and double counting.

#### **Additionality**

Though the production of Bio-diesel is a profitable business, this is only the case at larger production volumes. Due to the limited availability of Jatropha at the start of the business and the fact that it will take six to seven years for the planted shrubs to reach their full production potential, it will take around seven years for production volumes to be sufficient enough to fill the production capacity of the factory and make the business profitable. Until then, substantial capital is needed to fund planting programs. However, seven years is a very long time horizon for most investors to consider investing in a project in Africa. Hence, a combination of grants and carbon credits is required. However, even when sufficient amounts of diesel are being produced, carbon credits may still be needed to make the farming of Jatropha sufficiently interesting to farmers. So, while income from carbon credits may be used to finance planting in the short term, this could lead later on to an increase in the price that MBSA pays to farmers for the nuts.

#### **Net increase in carbon storage**

MBSA promotes intercropping, meaning that a limited amount of Jatropha shrubs are planted on existing agricultural land. Traditionally, this land is farmed for a few years after which it is left fallow, and very small shrubs and high grass will grow until the land is used again. Hence, when Jatropha is planted, no vegetation is removed specifically for Jatropha, and what is removed contains very little carbon anyway. In many areas there are large shea trees in the fields, but those will not be cut down. As a result, the land planted with Jatropha trees will contain considerably more carbon.

#### **Leakage**

Only a limited section of the land will be planted with Jatropha, and that will be trimmed regularly in order to guarantee room for farming. Furthermore, the land was rarely densely planted with agricultural crops in the first place due to limited rainfall and fertility, but the project introduced wells to increase the supply of water, while Jatropha itself improves the structure of the soil. This results in a reduction of the capacity to farm food crops on a specific piece of land, but not to any dramatic extent. Limited areas of new farmland will be needed to replace the space taken by Jatropha, and this land is fallow agricultural land with very sparse vegetation. Leakage is thus minimal, provided that MBSA ensures that competition for soil nutrients and water between food crops and Jatropha is limited. The outgrower programmes contain techniques and initiatives such as composting and wells that address these issues.

**Double counting**

MBSA manufactures and sells the biodiesel to registered customers in Mali who use it locally to replace regular diesel. As Mali is not part of any cap-and-trade system, there is no risk of double counting.

**Adverse effects**

Adverse impacts are negligible; in fact, the project is likely to have a positive impact on the environment and the income of local people, who remain completely in control of their own land and will have an additional source of income. The project has actually given rise to a great background story that will help to sell credits in the voluntary market.

**Carbon sequestration**

MBSA appears to be eligible for carbon credits based on its carbon sequestration. A major challenge for MBSA to measuring this carbon sequestration is that there is a lack of data available from other projects. For example, there is little data regarding the growth of *Jatropha* shrubs under the climatic conditions and soils of Mali or similar countries. The lack of exact data will make certification more difficult. MBSA hopes that the certification body will accept an estimate based on other data, perhaps substantiated with measurements from the first batch of plants from the MBSA programme that will have reached an age of three years.

**Choosing certification: a dilemma**

The most difficult question for MBSA is which certification standard and market to choose. Replacement of regular diesel with biodiesel would fully qualify for CDM, and can be sold in the large compliance market at good prices. Unfortunately, the amount of credits will only be substantial after 5-10 years, and thus cannot finance *Jatropha* planting today. The bulk of the carbon credits will come from carbon sequestration, but this is not regarded as a permanent reduction in carbon credits by the CER standard and only qualifies for temporary CERs, for which there are very few customers. The voluntary market, therefore, seems the better option, but prices there may also be lower. One could explore whether certification can be split into CDM for the bio-diesel and a voluntary standard for carbon sequestration, but this will lead to higher certification costs and there is no certainty as to whether or not this is possible. The final choice depends ultimately on the analysis of costs and revenues, for which more information regarding prices and certification costs is required.





Farmer with young Jatropha trees, Mali (Photo: Trees for Travel/Mali Biocarburant)

## 4 Trends in demand and supply in the carbon markets

Now that we understand the principles of the carbon markets, it is time to look in greater detail at the size of the markets and their recent developments.

### Demand on the compliance market

The compliance market has experienced strong growth in trade volumes since the mid 2000s. This growth continued through 2009 when 7535 MtCO<sub>2</sub>e were traded, but declined in 2010 to 6823 MtCO<sub>2</sub>. Many reports within the industry talk about growing trade volumes, which would appear to be encouraging for carbon credit producers. Trade volumes, however, do not tell the whole story.

**Table 1: Global carbon market, volumes and values**

Markets	Volume (MtCO <sub>2</sub> e)		Value (US\$ million)	
	2009	2010	2009	2010
Voluntary OTC	55	128	354	414
CCX	41	2	50	0.2
Other Exchanges	2	2	12	10
<b>Total Voluntary Markets</b>	<b>98</b>	<b>131</b>	<b>415</b>	<b>424</b>
EU ETS	5,510	5,529	105,746	106,024
Primary CDM	135	94	2,858	1,325
Secondary CDM	889	1,005	15,719	15,904
Kyoto [AAU]	135	19	1,429	265
RGGI	768	45	1,890	436
<b>Total Regulated Markets</b>	<b>7,437</b>	<b>6,692</b>	<b>127,642</b>	<b>123,954</b>
<b>Total Global Markets</b>	<b>7,535</b>	<b>6,823</b>	<b>128,057</b>	<b>124,378</b>

Sources: Hamilton et al. (2010) and Hamilton et al. (2011)

Primary CDM refers to CERs sold for the first time. Secondary CDM refers to CERs that have been subsequently resold by brokers and investors. Primary CDM gives the best indication of the amount of new CERs being brought to the market.

Figures may not add up due to rounding. There are some small discrepancies between the figures in the 2010 and 2011 reports.

The first thing worth noting is that roughly 82% of all credits traded are in fact allowances from emissions trading schemes on the compliance market. The EU ETS makes up the bulk of this trade. Credits produced through carbon credit projects (also known as carbon offsets) account for a much smaller slice of the market. Project based credits include those produced through the CDM. Secondly, trade volumes should not be equated with end-user demand, even for credits associated



with projects, because many credits have been traded more than once. For example, CERs generated through the Kyoto CDM mechanism are differentiated as primary and secondary CERs in the available data. Primary CERs are those credits that are sold for the first time, whereas secondary CERs are those sold any number of times after the first trade. For producers of carbon credits, the data on primary CERs gives the more accurate indication of the size of the market that you are selling into. Data from 2009 shows that trade in secondary CERs was six times greater than trade in primary CERs, suggesting that each CER is traded seven times on average (the first sale as a primary CER and six times thereafter)<sup>7</sup>. Speculative trade is one reason for this. While the trade volumes in secondary CERs grew from 889 MtCO<sub>2</sub>e to 1005 MtCO<sub>2</sub>e between 2009 and 2010, trade in primary CERs actually fell from 135 MtCO<sub>2</sub>e to 94 MtCO<sub>2</sub>e (Table 1). The fall in primary CER volumes is most relevant to producers of CER credits because this is market that they sell into.

So what is really happening on the compliance market? It seems that after the economic recession that followed the global financial crisis in 2008, there was a marked fall in demand for primary CERs. This can be partly attributed to lower economic production levels resulting in fewer emissions and reduced demand for CERs to offset emissions. In addition, uncertainty surrounding the UN climate negotiations in Copenhagen may have also affected demand for investing in primary CERs. While trade in EUAs nearly doubled between 2008 and 2009, with regard to the EU ETS, it is notable that the actual value of trade in EUAs increased only slightly, signifying a large drop in the price of EUA credits. The increase in EUA trade volumes between 2008 and 2009 can be attributed in part to speculation in the bear market. It may also be attributable to increased supply of EUAs to the market as companies attempted to sell off an excess of credits that they no longer needed due to the fall in their economic productivity as a result of the recession. Between 2009 and 2010, the trade volumes and value of EUAs remained more or less unchanged.

### **Supply of CDM credits to the compliance market**

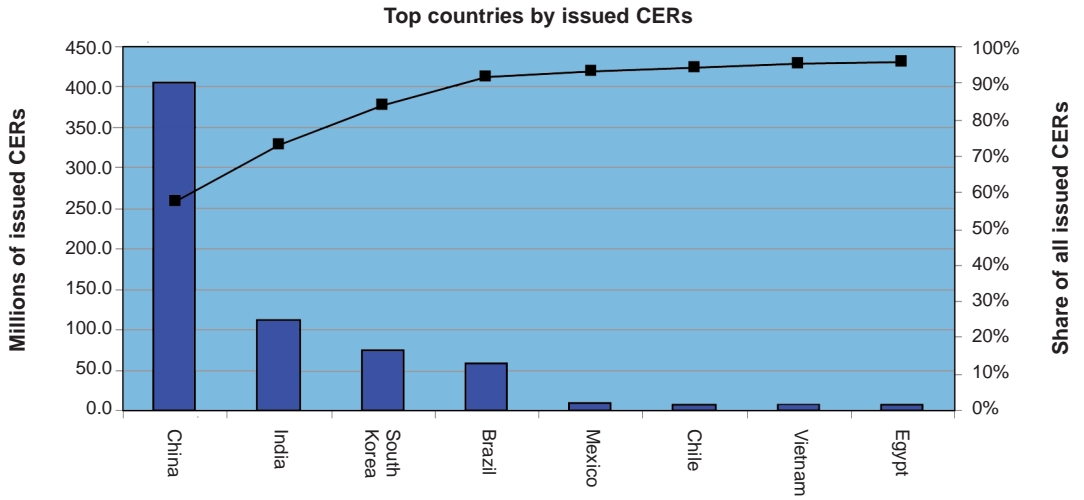
There has been substantial growth in CDM projects since 2005. More than 1100 projects have been validated, registered and issued with CERs<sup>8</sup>. China is currently the main supplier of CERs, accounting for almost three quarters of the global supply (Figure 2). The contribution of CERs from Africa remains at only 7%, although both transaction volumes and the number of projects under development are growing steadily in a number of African countries, such as South Africa, Egypt, Kenya and Morocco (MEIE, MEEDDAT & FFEM 2008, p.23). Between 2005 and 2008, the monthly average of new CDM projects entering the pipeline saw a steady increase, but then fell after 2008 (Figure 3). This can be attributed in part to uncertainty concerning the way in which CDM will be organised after the current period ends in 2012, and in part to restrictions on the eligibility of CDM in the EU ETS post-2012. Other possible reasons are increasing delays in CDM certification and high transaction costs (Kossov & Ambrosi 2010, p.41).

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<sup>7</sup> In 2008, secondary sales were still 3.7 times higher than primary sales

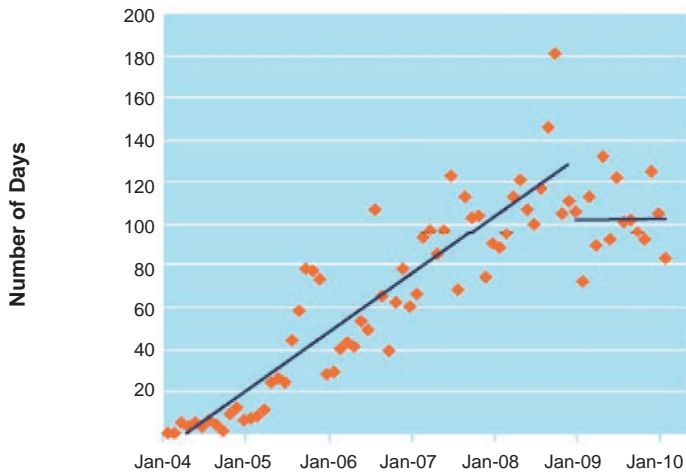
<sup>8</sup> See [www.cdmpipeline.org](http://www.cdmpipeline.org) for up to date statistics and details.

**Figure 2: Primary CDM sellers**



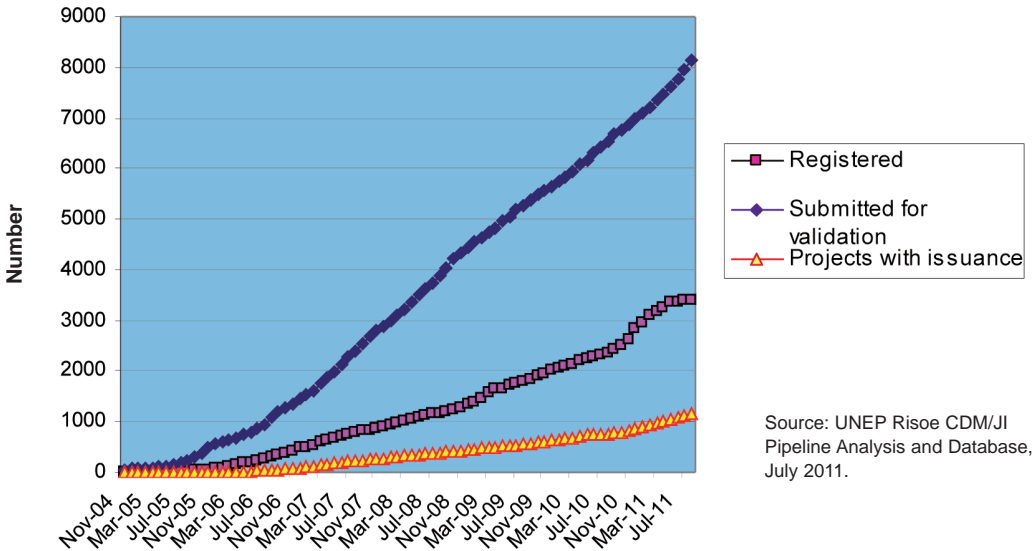
Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, July 2011.

**Figure 3: Number of projects entering the CDM pipeline each month, Jan 2004-Feb 2010**



Source: Kossoy & Ambrosi 2010, p.41

**Figure 4: Accumulated number of projects submitted for validation and registered projects**



**Box 8: Explanation of terms: registered, validated, issued**

**Submitted for validation:** Projects that have requested independent evaluation, checking that all the paperwork and CDM processes have been followed correctly.

**Registered:** Formal acceptance by the CDM executive board that the paper work is in order and that a project has been validated. Registration is the prerequisite for the verification, certification and issuance of credits related to that project activity.

**Projects with Issuance:** Projects that have had their emission reductions audited (verified) by an independent third party are then issued credits.

At the time of writing, there are 7167 projects in the CDM pipeline which have the potential to generate 2.7 billion CERs by 2012 (Table 2), excluding those projects withdrawn by the owners, rejected by the CDM Executive Board, or those projects of which the design was approved but could not validate emission reductions afterwards. However, not all of these 7167 projects will be certified, and if we take into account the percentage of projects that entered the process and were actually certified, as well as delays in the registration and issuance process, then only 960 Million of these 2.7 billion CERs in the pipeline are likely to be issued before the end of the first Kyoto period in 2012<sup>9</sup>.

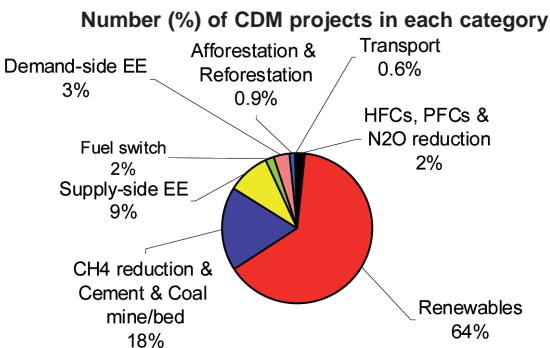
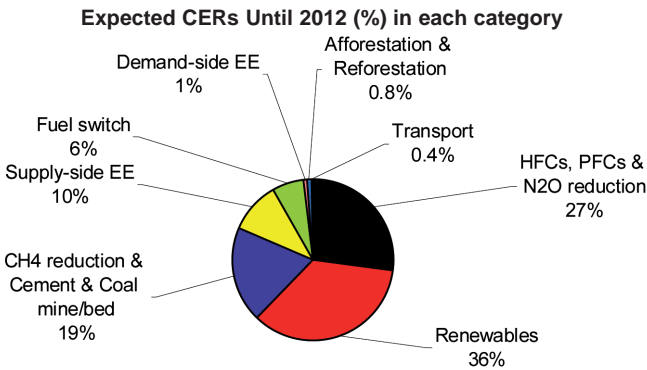
<sup>9</sup> See [www.cdmpipeline.org](http://www.cdmpipeline.org)

**Table 2: Status of CDM projects**

Status of CDM projects	Number
<b>At validation</b>	<b>3186</b>
Request for registration	80
Request for review	60
Correction requested	3
Under review	
Total in the process of registration	143
<b>Withdrawn</b>	<b>53</b>
Rejected by EB	200
Validation negative by DOE	190
Validation terminated by DOE	965
Registered, no issuance of CERs	2240
Registered. CER issued	1155
<b>Total registered</b>	<b>3395</b>
Total number of projects (incl. rejected & withdrawn)	8132

Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, July 2011, <http://www.cdmpipeline.org/>

**Figure 5: Primary CDM sectors**



Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, July 2011, <http://www.cdmpipeline.org/>

## Demand in the voluntary market

The voluntary carbon market is only a fraction of the size of the compliance market. Indeed, with 128 million tonnes of CO<sup>2</sup>e traded in 2009, the trade volume is only about 2 percent of that of the compliance market. The trade volume is calculated from two main sources: over-the-counter (OTC) trade and the Chicago Climate Exchange (CCX). For project-based producers of carbon credits, the OTC trade figures have the most relevance.

OTC trade refers to the direct sale of carbon credits between a producer and buyer. In 2009, 55 million tonnes of CO<sup>2</sup>e were traded OTC, a decrease of 10.5% compared to 2008. However, these numbers refer to trade volumes rather than solely primary sales from producers. We estimate that around 20 million tCO<sup>2</sup> were purchased from producers in 2009. This estimate is based on the assumption that, on average, each carbon credit in the voluntary market is traded 2.5 times. We cite 2.5 times because the majority of voluntary market projects seem to sell their credits through brokers, who in turn sell directly to end customers, meaning each credit is sold twice. A smaller number of buyers will speculatively resell their credits (3+ transactions). Finally, some credits will simply be sold directly to an emitter who then retires the credit (1 transaction). Our estimate fits with that of Hamilton et al. (2010, p.23).

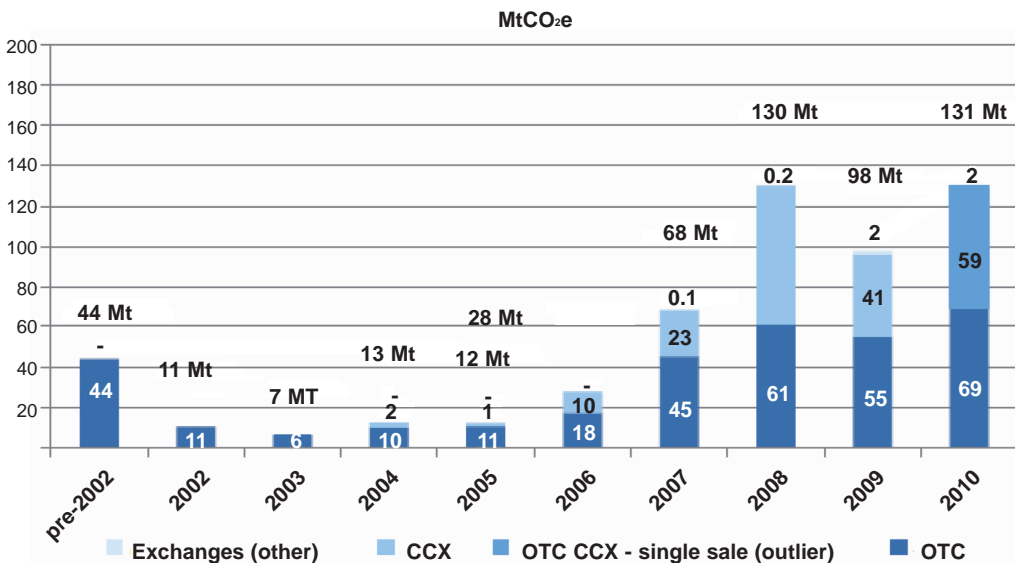
As with the compliance market, the demand for carbon credits in the voluntary market declined in 2009 as a result of the economic crisis, though for different reasons. Economic recessions are always an occasion for companies to cut costs. Corporate social responsibility projects, such as voluntary carbon emissions offsetting, have a tendency to be seen as a luxury that some businesses can no longer afford, and are thus cut. As a result, demand on the voluntary market decreased between 2008 and 2009, and the average OTC price declined by 12 percent from \$7.3/tCO<sup>2</sup>e to \$6.5/tCO<sup>2</sup>e (Hamilton et al. 2010, p.iii). However, in 2010 OTC trade on the voluntary market more than doubled to 128 MtCO<sup>2</sup>e. This shows a strong rebound and growth, which can be put down to businesses spending again on corporate social responsibility and also a growth in the volume of carbon credits coming onto the market. One project type, REDD, has now been accepted into the voluntary market and has instantly captured a large share of the market (see p.58).

Though the Chicago Climate Exchange (CCX) accounted for about 44% of the trade in the voluntary market in 2009, it is of little significance to producers of carbon credits today. In 2010, it only traded 2 MtCO<sup>2</sup>e. The CCX was a voluntary emissions cap-and-trading scheme that traded allowances between 2003 and when it closed in 2010. Most of the credits traded on the CCX were emission allowances, not offsets from emission reduction projects. Furthermore, the prices for credits on CCX were extremely low, averaging only \$1.2/tCO<sup>2</sup>e in 2009. These prices were low because of the markets ongoing concerns about additionality and the integrity of CCX credits, as the fact that it does not take into account any social or environmental co-benefits (Hamilton 2010, p.72). The CCX was set up in anticipation of the United States joining the Kyoto protocol and implementing a cap-and-trade compliance market. Many companies participated in the CCX as preparation for future compliance. The CCX grew rapidly in 2008 after the US Democratic party took control of the Senate and House and a national cap-and-trade system appeared likely. In 2009 legislation for a national cap-and-trade system passed in the US House but was rejected by the US Senate, and as a result many US companies lost interest in the exchange. The CCX subsequently announced that the exchange would be closed at the end of 2010. However, at the

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<sup>10</sup> For updates, see <http://www.chicagoclimatex.com/>

**Figure 6: Transaction volume growth for the voluntary carbon market (Mt)**



Source: Ecosystem Marketplace, Bloomberg New Energy Finance.

Notes: Based on 153 survey respondents. Annual totals may not equal sum of categories due to rounding.

time of writing the CCX was set to announce a new and separate offsets registry programme, which will be initiated for 2011<sup>10</sup>.

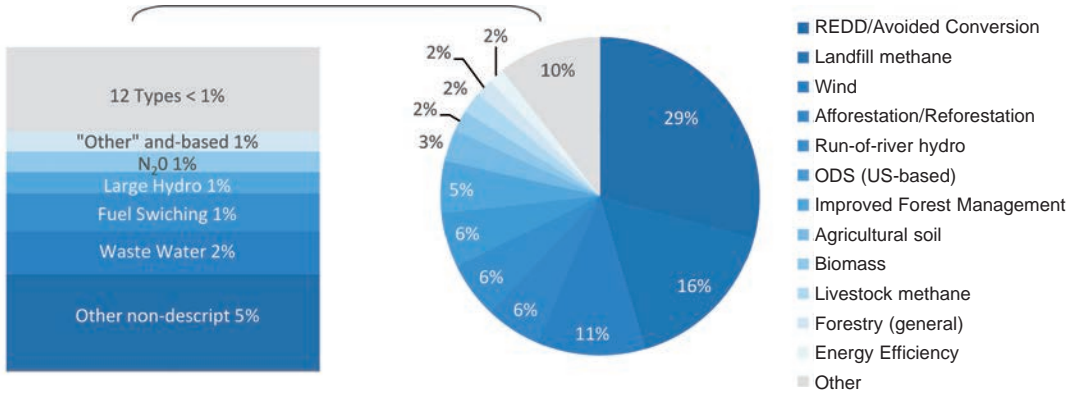
A number of other voluntary schemes and exchanges have also begun to emerge, although at present these account for only a fraction of trade on the voluntary market.

### The supply of carbon credits in the voluntary market

Like the CDM in the compliance market, there has also been substantial growth in the voluntary OTC market. However, due to the number of standards in the voluntary market, as well as the number of uncertified projects, it is nearly impossible to tell how many projects are operating and selling credits in this market. Nevertheless, the growth in transaction volume does suggest a strong growth in the number of projects being developed. This can be confirmed by looking at any one voluntary market standard and viewing the number of projects in their associated registry.

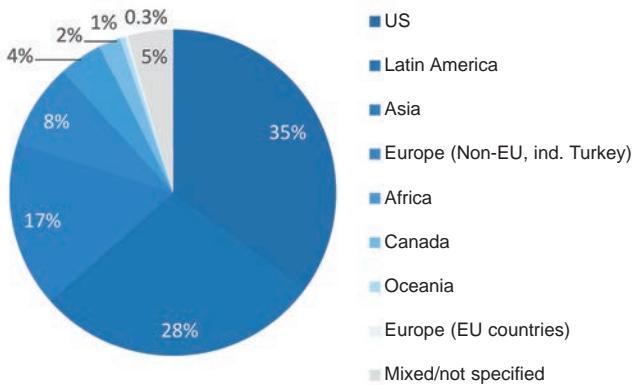
For voluntary market projects, the US is the location with the largest transaction volume. This can be explained by the fact that the US lacks a large compliance market, so companies developing projects there have up to now tended to look to the voluntary market. It can also be attributed to the fact that the US is not a signatory to the Kyoto Protocol, and so US-based projects are not eligible to participate in CDM or JI mechanisms. Latin America has a 28% share and Asia a 17% share of the transaction volume, with Africa accounting for only 4 percent of projects. In 2009, Turkey claimed a relatively significant 5 percent of the market, which can be attributed to the fact that it is ineligible to participate in the CDM, meaning that the voluntary markets remain its main niche. Its market share is also stimulated by the Turkish government's feed-in-tariffs for wind power projects that have attracted many project developers to the region (Hamilton et al. 2010 p.44).

**Figure 7: Transaction volume by project type, OTC 2010**



Source: Ecosystem Marketplace, Bloomberg New Energy Finance.

**Figure 8: Transaction volume by project location, OTC 2010**



Source: Ecosystem Marketplace, Bloomberg

**Further Reading:**

UNEP Risoe CDM/JI Pipeline Analysis and Database, July 2011, <http://www.cdmpipeline.org/>

Hamilton et al. (2011). Back to the Future: State of the Voluntary Carbon Market 2011. Ecosystem Marketplace, Bloomberg New Energy Finance. [www.ecosystemmarketplace.com/reports/SOVCM2011](http://www.ecosystemmarketplace.com/reports/SOVCM2011)

Linacre, N., Kossoy, A., Ambrosi, P. (2011) State and Trends of the Carbon Market 2011. World Bank.

### Box 9: MBSA: Selling credits on the voluntary market

Mali Biocarburant (MBSA) started out by selling uncertified credits on the voluntary market through a Dutch project developer, Trees for Travel. This organisation pre-financed part of the project in exchange for a small percentage of the credits and found a large buyer in KIA Motors Netherlands, the local sales organisation of the Korean car manufacturer. KIA bought these credits to offset the emissions of their customers during the first year after they have purchased a new vehicle. Their motivation was a combination of corporate social responsibility, marketing and PR, and a clear ethical motivation of a few key people within the Dutch organization. The deal between MBSA and KIA was a logical step given that they also offset fuel emissions by planting trees that in turn help produce bio-diesel. KIA also decided to go the extra mile and financed the construction of wells in a number of villages connected to the project.



Refuelling with biodiesel  
(Photo: Trees for Travel/ Mali Biocarburant)

The initial approach was pragmatic: getting started and doing something now was more important than doing it perfectly right, which would cost years. The credits were uncertified, but this was unimportant for KIA. They preferred that MBSA would save the money from certification and spend it on planting more trees. In the first few years KIA employees actually flew to Mali to join Trees for Travel with counting the trees. KIA Netherlands also played a very active role in promoting the project with KIA subsidiaries in other countries. As a result of these efforts KIA Sweden also decided to join in.

Unfortunately, for most producers of carbon credits it is difficult to find companies like KIA and Trees for Travel who are prepared to pre-finance a project and buy uncertified credits. Nearly all brokers told us that they are only able to sell certified credits. Even Trees for Travel has said that it would like to see the project certified in the near future. Certified credits have considerably greater credibility in the eyes of the majority of buyers.





## 5 Selling credits in advance: Ex-ante credits and Forward Emission Reduction Purchase Agreements (ERPAs)

Up to this point, we have only discussed carbon credits as if they are always sold and paid for shortly after they are produced. In reality, however, a large number of the carbon credits in the compliance and voluntary market are sold before the actual emission reduction occurs and the credits are issued. In some instances they are also paid for in advance. For the past three years, credits sold before the actual emission reductions occurred have accounted for a quarter to a third of the credits sold over-the-counter on the voluntary market (Hamilton et al. 2010, p.51). All these different ‘sales constructions’ can be confusing, particularly because different people use different terms to describe the same thing, while it is also common for two different arrangements to have the same name. Therefore, it is important to provide a proper overview and definition that will then be used in the remainder of this book. We will distinguish between the following arrangements:

- 1 **Ex-post credit:** the credit is sold after the credit has been produced and issued by the certification body (sometimes referred to as the ‘standard’).
- 2 **Ex-ante credit:** the credit is issued by the certification body before the emission reduction has actually occurred. First, the project as a whole needs to be certified by an independent auditor, who also verifies the conservative calculation of the credits that will be generated within a future time frame. The certification body then issues ex-ante credits, which can then be entered into a registry and sold. Periodically, an independent auditor needs to verify whether the credits have indeed been produced. The ex-ante credit is quite rare. The CDM does not offer this option, and there are only a few standards on the voluntary market that do (currently only Plan Vivo and CarbonFix). Ex-ante is sometimes also referred to as ‘up-front’.
- 3 **Forward Emission Reduction Purchase Agreement (ERPAs):** This is an agreement in which a producer and buyer agree to the sale of a certain number of credits before they are produced and issued. The actual handover and payment of the credits happens when the emission reductions have been verified and the credits issued. Often this type of agreement spans multiple years, where the buyer agrees to purchase a certain amount of credits each year for a number of years to come. There are different mechanisms for agreeing the price. For example, a fixed price for all credits to be sold in the contract, a flexible price that follows an index of the market price, or a combination of both. Some people refer to this type of sales as an ex-ante credit, though technically it is not.
- 4 **Prepaid forward emission reduction purchase agreement:** This is the same as point 3 above, with the exception that the credit is actually paid for before it is produced and issued. At a later stage, verification of whether the emission reduction has actually occurred is required, and when the credit is issued it is handed over directly to the buyer.

During our research, we found that some people talk about prepaid forward purchase agreements. In order to avoid confusion, we will use the term 'cash up front credits' in the remainder of this book when we talk about both ex-ante and prepaid forward purchase agreements, without having to repeat the whole explanation.

The main reason for selling cash up front credits (ex-ante credits and prepaid forward purchase agreements) is cash flow; both constructions provide cash income at the start of a project. Like any other business starting out, carbon credit producers incur most of their investment costs at the start, while the revenues from carbon credits and the main activity take a while to flow and grow to a level that surpasses the cost. For many projects, the resulting cash flow gap is difficult to bridge, while attracting finance from third parties may also be difficult for any given carbon credit project, because of their innovative character. Therefore, receiving this cash early on in the business may prove critical to its feasibility. This is particularly true for forestry projects where it may take 15 years before the first revenues arrive (from a first thinning) and 25 to 30 years before the main revenue materialises,

While a regular forward purchase agreement will not solve a project's cash flow problems, it may still be preferable to regular ex-post sales because it provides a certain degree of certainty in terms of future income. In principle, the producer of the credits will know the level of income it can expect to achieve over the coming years and can therefore devote more time to other areas of the business instead of having to spend that time trying to find new buyers each year. The increased amount of credits in a multiple-year agreement may also make it more interesting for brokers in terms of selling the credits, and it may reduce transaction costs. Finally, with at least some revenues backed by a contract, it may be easier to find alternative sources of finance.

A major differentiating factor between these four arrangements is the risk for the buyer. An ex-post credit is the safest because it is already verified and issued, so you know that what you are buying actually exists. A forward purchase agreement also has a low risk because the buyer only pays after the credit has been issued. The only risks are that there may be fewer credits than first agreed, in which case they buyer may need to find other suppliers and buy at a higher price on the spot market; or, in the case of a fixed price agreement, that the market price at the moment of purchase has dropped below the agreed price.

An ex-ante credit is a lot riskier because the buyer pays before the credits have been issued; but it is at least backed by a standard, and there may be a risk management system such as a buffer in place. The prepaid forward purchase agreement is, in theory, the riskiest for the buyer, because it depends completely on the arrangements between the buyer and seller for managing the risk of non-performance. The risk assessment in this situation is left entirely to the buyer, instead of a verification agency. The buyer can reduce the risk by choosing to work with projects that have been certified by a proper carbon standard, so that there is at least some degree of certainty as to the solidity of the project itself and the calculation methods used.

A higher risk for the buyer in any market tends to result in lower prices, and as such one would expect prices for prepaid future purchase agreements to be the lowest, followed by ex-ante and forward purchase agreements, with ex-post yielding the highest. Up until a few years ago, this seemed to be the case, but there are now some instances in the voluntary market where ex-ante credits or those sold under pre- paid future purchase agreements are seen to fetch decent prices.

Nevertheless, for any future producer of carbon credits it is probably safer to assume that credits sold in advance will probably fetch lower prices.

What is crucial for both parties is that obligations and liabilities are clearly defined in any purchase agreement. For example, what happens if the project fails to receive certification, or if there is a delay in obtaining authorizations and licenses under national laws. Legal advisors or intermediaries are usually used to draw up the ERPA because of the legal complexity of the contract. However, some standard contracts are now emerging. The CERSPA initiative offers free access to a standard contract that is simple and relatively easy to adapt (see [www.cerspa.org](http://www.cerspa.org)). ERPAs can be found both on the compliance and the voluntary market.

#### **Box 10: Selling credits before they are produced: the case of Native Energy's 'Help Build credits'**

Native Energy is a US-based broker and project developer that specializes in small-scale renewable energy projects, such as wind, hydro, solar and bio-gas (methane capture). These projects typically produce between 2500 and 5000 credits per year. In addition to sales of credits, they also provide assistance with the certification of projects and advice on emission reductions to clients such as Ben & Jerry's ice-cream, Dave Mathews Band and Green Mountain Coffee Roasters.

From the start, Native Energy recognised that ex-ante credits are essential to help finance the development of small renewable energy projects. Many projects struggle to get enough starting capital, and regular (ex-post) carbon credits do not solve this problem because they only provide revenue after the project has started. At the same time, Native Energy wanted all credits in their portfolio to be certified in order to make sales easier and ensure that they are backed by real emission reductions. Unfortunately, the most suitable standard for their projects, VCS, does not offer the option of ex-ante credits. A second challenge is that the amount of credits that can be sold ex-post per year from small-scale renewable energy projects is often too small to make certification and sales attractive. The transaction and certification costs per credit are simply too high.

In order to solve these challenges, Native Energy developed the 'Help Build credit', which is essentially a prepaid forward purchase agreement. Native Energy assists with the design of the project in order to arrive at a reliable estimate of the amount of credits a project is likely to produce over the next ten years. It then assists with the certification (either VCS or CAR) and, once the project itself is certified, it bundles all these expected credits together in a package that is sold off immediately to their clients, who also pay for these credits up front. This all happens before the project has started, or at least before the credits have actually been produced. As the credits are produced, verified and issued by VCS or CAR, they get transferred to the clients who then retire them (register them as used for emission compensation).

According to Native Energy, the 'Help Build' system has many advantages for everyone. Firstly, the producer gets cash at an early stage of the project when investments need to be made. Secondly, the bundling of ten years of future emission reductions into one sale makes a

small project of 5000 credits per annum, that is normally too small to certify and sell into a 50,000 credit project, economically viable. It thus enables small projects to become certified and sell credits, and for many buyers these smaller projects are also more interesting from a marketing perspective. They can now claim that they single-handedly 'help build' a new project each year, instead of just being one of the many buyers for the same project. They much prefer to buy all 50,000 credits from one new project each year than 50,000 credits from the same project for a number of years.

A crucial element in the 'Help Build' construction is risk management. Though the risk of pre-paid forward purchase agreements is potentially very high for buyers, this is tempered somewhat because, though the credits have not yet been verified, at least the project design and thus the calculation methods on which these credits will be based are certified by VCS or CAR. Native Energy also has ample experience in estimating future credit production, which they use to adapt the estimated future production of credits for each individual project. Finally, Native Energy has created its own internal buffer of 20% to ensure that if one project fails to deliver 80% of the estimate, the client can be compensated by credits from another project.

Despite the managed risk, one would expect the sales price of 'help build' credits to be much lower than those of ex-post credits. Initially this was the case, as Native energy set the sales price by calculating the net present value of the sales at the current market price. For example, if one applies a discount factor of 10% to the revenues of the sale of 5000 credits over the next ten years, the price of a package of 50,000 'help-build' credits sold today would be only 61% of the ex-post price. Over time, however, clients began choosing the Help Build credit over vintage credits. For marketing purposes, a story that your company has helped to build a new project is much more valuable than when you buy credits from an existing project. This is particularly true when you can renew that message every year through a new project. Furthermore, clients intuitively understand the principle that the investment is needed before there can be a generation of credits. Currently, 90% of the credits sold by Native Energy are 'Help Build', against 10% ex-post.

Interestingly, although VCS does not have a provision for ex-ante credits, they are aware of the 'Help Build' system and have given it their approval. There is even a registry now that allows the registration of expected credits, which they call 'pending issuance units'. Once the ex-ante credit has been verified, the registry removes one of the pending units and the credit becomes registered as a vintage credit.

Despite the apparent success of the 'Help Build credit', Native Energy appears to be of only a few project developers who offer these credits in North America. One of the reasons may be the difficulty in assessing and managing the risk of non-delivery. This makes it more difficult to find a broker or project developer who is interested in ex-ante credits.

### Box 11: Mali BioCarburant and ex-ante credits

Currently, all of the carbon credits that MBSA sells are sold through a prepaid forward purchase agreement. MBSA asked the research institute IER in Mali to estimate the amount of carbon each tree will absorb during the first ten years of its life, taking into account bio-mass, growth rate and wood density. Each year the total estimated amount of carbon credits is sold to Trees for Travel who sells most of these to the KIA Motors Netherlands and KIA Motors Sweden. Each year, as part of the monitoring Trees for Travel estimates the numbers of trees that are still alive. A random sample is taken from the project administration and the fields are visited to count trees. If a tree dies, the farmer must plant a new tree to replace it. The need for this kind of control became quickly apparent the following year: over 40% of the trees died, and subsequently a large chunk of the trees planted the following year were merely replacing the ones that had died. It was obvious that although *Jatropha* has a reputation as a hardy shrub that can survive without water, this is not the case with newly planted trees. Replanted trees from nurseries also proved to have a much higher survival rate than those originating from cuttings. To increase the survival rate of trees, more emphasis was placed on training of the field staff, education of the farmers, and the construction of wells to make it easier for small-scale farmers to water plants. Furthermore in subsequent years, MBSA sold only 30% of the carbon credits in order to take into account that still 50% of the trees would die in the first year and another 15% in the following years. If fewer trees die, the extra credits are allowed to be sold ex-post.

Unfortunately, selling on a cash up front basis is not that easy. Due to the planned expansion of MBSA, an additional client was needed for the remainder of the credits. Based on the experiences with KIA and Trees for Travel, KIT and MBSA assumed that selling ex-ante was quite common, but while searching for additional clients it soon discovered the opposite. One broker was willing to buy around half the credits as ex-ante, as long as it could buy the other half as ex-post. Furthermore, the credits would be based on the next five years growth instead of ten, VCS certification would be required, and the prices offered were roughly half those offered for ex-post. Other brokers and project developers either had similar requirements or were not interested in buying credits ex-ante, or even through prepaid forward purchase agreements due to the perceived risk.

The conclusion was that if MBSA wanted to expand planting beyond the amount that Trees for Travel was willing to buy, it would have to search hard to find brokers and clients willing to buy ex-ante credits. Furthermore the expected revenues of carbon credits sold as ex-ante or through prepaid forward purchase agreements would probably be much lower than what was currently paid by Trees for Travel. In addition, MBSA would have to sell part of the credits as ex-post and would need to decide on the optimal mix of selling credits as ex-ante and ex-post. Essentially, the decision on how much they should sell ex-ante and how much ex-post is a trade-off between profit maximisation and cash flow management.





# 6 Carbon credit prices and what determines them

## 6.1 Prices of offset credits on the compliance market

For producers of carbon credits, prices of primary CERs (pCERs) are the most relevant as these are the CERs sold directly by producers. In recent years, pCERs have ranged between €7 and €12 (Figure 9). However, there is no single price in the primary CER market, but rather a range of prices depending on the characteristics of the projects and the contract structures. Primary CER pricing is not transparent, as most pCER deals are confidential. In an Emission Reductions Purchase Agreement (ERPA), the prices of pCERs are negotiated between the Seller and Buyer and match the risk appetite of each. The price is typically discounted based on perceived risks such as regulatory risk, implementation risk and performance risk. Furthermore, a project that is at an early stage in its project cycle is likely to have a greater discount price than a project at a more advanced stage because there is a greater perceived risk. There are two main pricing structures offered by a buyer – a fixed price and a floating price, although a combination of these can also be used (see Table 3). Primary CERs with delivery in December 2011 have been trading at around €9.40 tCO<sub>2</sub>e (\$13.62/tonne). The Chinese government has an official floor price for primary CERs of €8.00 tCO<sub>2</sub>e.

**Table 3: pCER pricing structures**

Method	Advantages	Disadvantages
<b>Fixed price:</b> the price per credit is fixed for the entire duration of the contract	Simple and low risk for both parties	Market variations are not taken into account
<b>Indexed price:</b> the unit price is calculated on the basis of a spot rate. A spot rate usually refers to other emission reduction units, such as the price for allowances under the EU ETS	Opportunities and risks for both buyer and vendor, depending on variations in the reference spot rate during the term of contract	In contrast to the method described above, neither the vendors nor their banks will be able to calculate carbon returns, and therefore the value of the contract
<b>A fixed price combined with an indexed price</b>	Guaranteed minimum price and limited impact of spot rate fluctuations	
<b>Indexed price with a floor price and ceiling price:</b> a minimum (floor) price and a maximum (ceiling) price are included in the unit price	Protects both vendor and buyer from major market fluctuations, makes long-term planning easier	

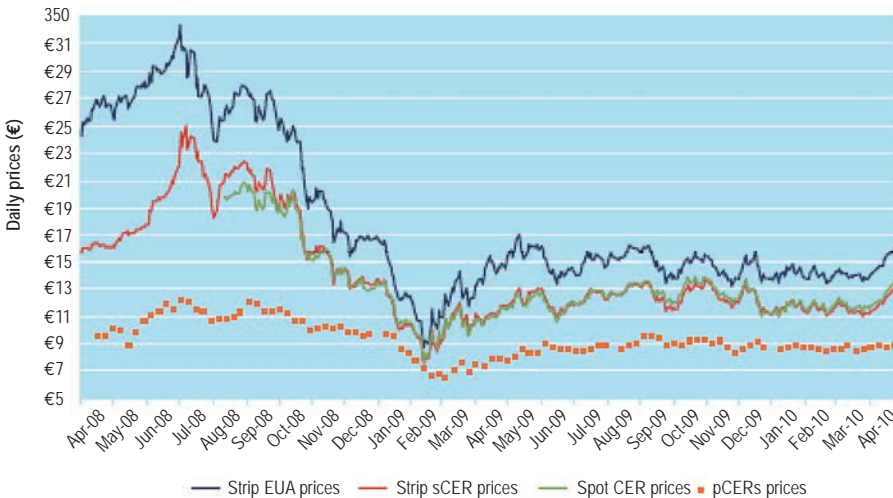
Source: MEIE, MEEDDAT & FFEM 2008

Secondary CERs – those CERs that have been resold by intermediaries such as traders – attract higher prices than primary CERs. The lower price of primary CERs can be attributed to the fact that many projects sell their credits at pre-agreed prices based on long-term contracts, known as ERPAs. When buyers enter into ERPA agreements with generators, they typically share a degree of risk in relation to the project (project risk, credit risk, technology risk, delivery risk, market risk, etc.). This risk, in conjunction with the long-term investment required before delivery of credits,

accounts for the lower prices of primary CERs compared to secondary CERs. Secondary CERs also attract higher prices, which can be attributed in part to the intermediary's economic return in exchange for providing finance, the risk they take, and their efforts in finding buyers.

In addition to prices for primary CERs being lower, they also appear to be more stable than secondary CERs. A likely explanation is that primary CERs tend to be sold as part of long-term contracts, whereas secondary CERs tend to be subject to speculation and a percentage is sold on the spot market where prices tend to be highly volatile. An obvious feature of Figure 9 is the crash in prices to their lowest level in early 2009. The main driver of this crash was the global financial crisis, which affected all kinds of commodity prices around the world.

**Figure 9: Carbon prices 2008-2010**



Source: Kossoy & Ambrosi 2010, p.5

There are several factors that determine the prices of CERs on the compliance market:

### Emission reduction targets

Under the Kyoto Protocol, the greater the number of AAUs issued to Kyoto parties, the easier it is for those parties to meet their emission reduction targets. This lowers the need for CERs in order to further offset emissions, and suppresses their price. Conversely, a more restricted issuance of AAUs may increase the demand for CERs to help offset emissions. The same principles apply with regard to the issuance of EUA credits to companies within the EU ETS. Companies may offset some emissions above their EUA quota by using CERs. This is allowed in the EU ETS under what is known as a 'linking directive' with the UNFCCC. However, the amount of CERs allowed for offsetting in the EU ETS must be less than 50 percent of the emission reductions require<sup>11</sup>. This is meant to encourage internal emission reductions and improve efficiency ahead of outsourcing emission reductions through CDM projects.

<sup>11</sup> [http://ec.europa.eu/clima/faq/ets/index\\_en.htm](http://ec.europa.eu/clima/faq/ets/index_en.htm)

## Economic growth

Economic growth and corresponding production levels also have an effect on the price of carbon credits. As production levels increase, so will GHG emissions. As a result, more companies are likely to seek more CERs (or other credits) to offset their increased emissions, thereby increasing the price of CERs. On the other hand, a drop in production levels - as occurred following the global financial crisis in 2008 - is likely to result in less demand for CERs and lower prices.

## Supply of CERs on the market

The supply of CERs on the market will have an influence on prices simply because of the laws of supply and demand, though the exact effect on prices for final buyers also depends on the amount of speculation generated by middlemen. The availability of CERs depends in turn on changes in the eligibility criteria, the cost and length of the CDM certification procedure, and the development of new technologies. It also depends on current and expected CER prices; low prices may lead to fewer new projects being implemented, and thus a lower supply of CERs in the future, although it should be remembered that CERs yield some of the highest prices for all project-based credits. A greater regulatory certainty would also stimulate supply. This applies to the need to agree on a successor to the Kyoto Protocol before the end of 2012, and to the EU ETS where a clear signal is needed regarding the proposed rules for its next crediting period starting in 2013.

## Costs of emission reduction technologies

The cost of adopting new technologies that produce lower emissions may also affect the prices of CERs in the long term. If adopting new technologies is cheaper than buying additional credits, the demand and the price for CERs may fall.

## Selling credits in advance

Credits sold through forward emission reduction purchase agreements (ERPAs) tend to have a lower price, partly because there is more risk involved for the buyer, and partly because they tend to be sold in large packages through brokers who require a discount for buying a large amount at once. Prepaid forward purchase agreements, in particular, are likely to fetch lower prices. In reality, this is a high-risk financial service that a project developer delivers to the producer and, accordingly, comes at a price (see chapter 5).

### **Box 12: Carbon credit prices and oil prices: a double-edged sword for bio-diesel producers**

MBSA produces bio-diesel and supplements its income through the generation of carbon credits. However, the company is faced with a double-edged sword: Kossoy & Ambrosi (2010) have observed a correlation between the price for energy (coal, oil) and carbon credits. They found that in times of economic growth energy prices rise due to increased demand, as does the price of carbon credits. This is due to an increase in demand for carbon credits to offset increases in energy use. Biofuel businesses are thus at their most profitable in times of economic growth because this is when both the price of biofuel and the price of carbon credits are likely to be high. However, in a recession the price of biofuel falls, as does the price for carbon credits, which impacts them on both fronts. Multi year sales contracts for carbon credits can however decrease the price risk slightly.



**Figure 10: Comparison of carbon, oil and coal prices, Sep 2006-Dec 2009**



Source: Kossoy and Ambrosi (2010), p.11

## 6.2 Prices on the voluntary market

Prices for VERs on the voluntary market vary considerably more than prices on the compliance market. In 2010, VERs were sold for as little as \$0.1/tCO<sub>2</sub>e and as much as \$119.0/tCO<sub>2</sub>e (Hamilton et al. 2011). This can be attributed largely to the fact that carbon credits sold on the voluntary market are less of a uniform commodity than those on the compliance market. Prices depend on a number of related factors, and as such it can be difficult for a carbon credit producer to gain a quick idea of an expected price for their credits.

### Supply and demand

Most obviously, the supply of credits influences the price, just as it does on the compliance market. Where supply struggles to meet demand, prices will be higher, while a glut of supply is likely to depress prices. The recent economic crisis has shown that in times of economic recession the demand for carbon credits falls considerably. This is because companies are then less willing to spend money on 'extras' such as voluntary emissions offsetting.

### Project story

The price for VERs is also influenced by the project's story. This is because participation in the voluntary market is often driven by personal motivation, corporate social responsibility, and public relations. The project story is composed of three elements: the type of project (i.e. solar, forestry, bio-gas) co-benefits as a result of the project design (location, social and environmental co-benefits i.e. are poor people involved and benefiting, bio-diversity protection), and the available communication material (pictures, movies, online maps with the exact location of the projects etc.).

The project type influences the price, simply because some projects are perceived to be more attractive than others for communication purposes. For example, solar energy is synonymous with clean energy and is perceived in a positive light by the public. On the other hand, large-scale hydropower can even attract negative associations such as community and biodiversity loss due to flooding resulting from the project.

Co-benefits are important because simply offsetting emissions is not the only reason why clients buy credits. Emissions offsets can be an abstract and confusing concept for some buyers, and any project that also contributes to human development or the environment is likely to have greater appeal.

Also, a good story needs to be communicated properly to potential buyers, otherwise the story will be of little value. Photos and videos can be an effective way of communicating a story and are valuable marketing materials. Projects that invest time and energy in developing communications materials may find it easier to attract buyers and may also find that their credits attract a premium price. As the old saying goes, a picture tells a thousand words. The value of the 'story premium' really depends on the perceived desirability of the project.

### **Box 13: The story premium of Mali Biocarburant**

We have found Mali Biocarburant's 'story value' to be relatively high. MBSA produces biodiesel from *Jatropha* that replaces regular diesel in the local market in Mali. It benefits smallholder farmers through intercropping and provides them with extra revenue. Carbon credit buyers view this type of project design positively.

Yet, in recent years there has been a lot of debate on the usage of agricultural land for biofuels, with many people claiming that it causes high food prices. This controversy could have a negative impact on the value of credits generated by biofuel projects. MBSA has been able to show that this is not so in their case as *Jatropha* has not been used in monocropping, but instead for hedges around fields and intercropping. Nevertheless, this can be difficult to explain. Another negative aspect is that brokers are aware of the many failed *Jatropha* projects and tend to become quite wary whenever they hear the word *Jatropha*.

Fortunately, the co-benefits of MBSA are highly valued. The project is located in Africa, where it provides additional income to very poor small farmers, and so has a strong appeal to people who care deeply about poverty issues. Another positive aspect for MBSA is that the project has striking pictures at its disposal that clearly illustrate the co-benefits of the project and that can be used in communications strategies. In addition, MBSA works with Google maps that can show the location of fields where *Jatropha* has been planted. This is particularly necessary for sales to consumers who know very little about the project. KIA motors in the Netherlands buys the credits to offset the emissions caused by consumers driving the car in the first year after purchase, but it plans to offer consumers the possibility to buy credits to compensate for their emissions after year one.

The estimated story premium of MBSA credits is subjective, but appears to be in the range of €1,50 to €2,00 for each credit.

## **Certification standards**

Certification standards provide an assurance to the buyer that the credit bought actually represents a reduction of 1tCO<sub>2</sub>e. For companies seeking to enhance their public image of social and environmental responsibility, purchasing credits certified to a standard is likely to be very important. When a company purchases a credit that is certified, it adds credibility to their claim that GHG

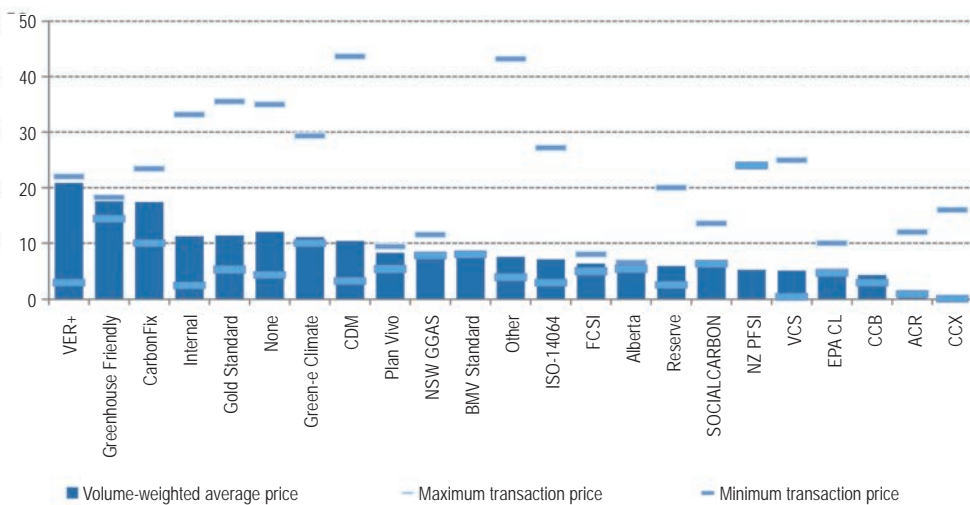


emissions have been offset and that the carbon credit project has had positive social or environmental co-benefits.

Interviews with brokers, project developers, retailers and producers of carbon credits overwhelmingly suggest that certified credits are considerably more desirable than uncertified credits and therefore much easier to sell, though not all customers are interested in certification. In 2009, 93 percent of credits sold to voluntary buyers adhered to active third-party standards (Hamilton et al. 2010 p.57). Furthermore, the interviews also clearly showed that credits certified by certain standards are perceived to be more desirable than those certified by other standards.

The main question is whether certified credits fetch higher prices than uncertified ones, and if this depends on the type of certification. Figure 11 illustrates the price range and average price for the most popular standards on the voluntary market. The different certification standards are discussed in greater detail in chapter 10.

**Figure 11: Average price by Certification Standard (OTC) 2010**



Source: Hamilton et al. (2011), p.36

Interestingly, standards such as CDM and Gold standard seem to fetch higher prices than other standards. However, the range of prices upon which the average is based is enormous, and the 10 projects that sold uncertified credits fetched considerably higher prices on average than those certified with standards such as VCS. One also has to be careful when interpreting prices for standards that are based on a few projects only, such as GHG friendly, CarbonFix and Green-e. Carbon-fix projects, for example, tend to sell their credits directly to end-clients (retail), which raises prices considerably.

So how should we interpret all of this? Based on these numbers and the interviews, our hypothesis (everything else being equal, such as the type of project and the project story) is that certified credits are likely to fetch a higher price than uncertified credits, particularly when certified by standards such as CDM and Gold Standard. Nevertheless, many other factors come into play that may have a larger influence on the sales price than the chosen standard. The biggest impact of

certification may be that far less effort is required in selling the credits. Uncertified credits can be sold at good prices, but this will require a much larger investment in marketing and, perhaps, direct relationships with the end-buyer. This is exactly what Mali Biocarburant has done.

### **Selling credits before or after production**

In chapter 5 we discussed different ways of selling credits before they are actually produced. Generally speaking, credits sold before they are produced tend to fetch a lower price than those already issued. The reason is the increased risk for the buyer, particularly if the payment also takes place before they credits are produced, issued and handed over to the buyer. Furthermore, if the buyer pays before he receives the credits, he is in fact pre-financing the production, and the buyer is likely to demand compensation in the form of a lower price for committing his capital. Assuming all other things being equal, one would expect credits sold under a prepaid forward purchase agreement to fetch the lowest price, followed by ex-ante credits, credits sold under a forward purchase agreement and finally ex-post credits, which fetch the highest price (see chapter 5 for an explanation of these terms).

However, as the examples of Mali Biocarburant and Native Energy (see box 10) show, there are also buyers who see pre-financing of projects through the purchase of ex-ante or pre-paid forward purchase agreements as an opportunity to be instrumental to the success of a project. For these buyers the project story is often more important than the number of credits they buy. Pre-financing means they can claim a bigger role in the success of a project in their communication to their clients. For buyers whose main motivation is pre-compliance rather than voluntary offsetting, recent vintages attract higher prices because they are more likely to be accepted in a future compliance market (Hamilton et al. 2010, p.51).

### **Marketing/sales strategy**

The selling price also depends on how many intermediaries are involved. Selling directly to companies and bypassing brokers may result in higher prices for the producer. However, the work needed to find clients and manage this relationship yourself involves additional costs and time. As a producer you need to ask yourself whether you will be able to find a buyer yourself, and whether the higher price will compensate for the extra cost.

There is also a considerable difference in price depending on whether the credits are sold to larger companies or directly to consumers or small businesses; the latter is often referred to as retail. Many airlines, car-rental agencies, events and concerts offer their customers the possibility of offsetting the emissions caused by using their services. In addition, several shipping companies and producers of consumer goods such as Dell and Toshiba, Backsberg wine estate in South Africa and coffee producers also offer this possibility.<sup>12</sup>

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<sup>12</sup> See, for example, <http://www.carbonoffsetsdaily.com/lists/brands-providing-carbon-offsets>

#### Box 14: An example of carbon credits retailing: Voluntary emission compensation for flights

It is common knowledge that airlines produce more CO<sub>2</sub> emissions than other forms of transport, relative to the distance travelled. Despite this, the airline industry has until now managed to escape inclusion in compliance markets, along with another major source of emissions, sea transport. In an attempt to improve the environmental image of the aviation industry, many airlines now offer consumers the possibility of voluntarily compensation for the emissions caused by their flight. At first glance, this seems to be a very straightforward process. If, for example, I want to fly from Amsterdam to Stockholm to enjoy the Swedish countryside, the Dutch airline KLM ([www.klm.com](http://www.klm.com)) will offer me the possibility of compensating the GHG emissions caused by taking this flight for the modest sum of €2,18. This fee seems particularly modest considering the price of the ticket itself was €250. According to KLM, the fee is based on an estimated emission of 256kg of CO<sub>2</sub>, and the underlying calculation is approved by the auditing firm KPMG. KLM also says that they use the money to buy credits from renewable energy projects approved by the WWF and certified with the Gold Standard. Therefore, for a limited fee I can go and enjoy the Swedish countryside safe in the knowledge that I am not contributing to global warming.

KLM is not the only airline that offers the option of carbon offsetting. SAS and Lufthansa, who operate on the same route, also offer this option, and so does the low-cost flight broker [lastminute.com](http://lastminute.com). You can also go to a number of independent online carbon credit retailers to calculate and offset the emissions that result from this flight. As opposed to the airlines, most online retailers offer the consumer a choice of projects that he or she can support to offset emissions, all with varying prices. The consumer can choose between wind energy, reforestation in the tropics, reforestation in the UK or the US, methane gas recovery from garbage dumps, etc.

A voluntary emission offsetting scheme is certainly a terrific initiative, however there are some criticisms. Firstly, it is questionable whether the consumer has compensated for his or her emissions in full. A quick investigation indicates that the estimated emissions for the same return flight from Amsterdam to Stockholm vary widely; from KLM's 256kg up to 840kg (CO<sub>2</sub>OL). This makes me wonder whether my emissions are being underestimated or overestimated, and whether I am paying too little or too much to offset my emissions. These differences are too large so as to be attributable to different assumptions regarding the type of aircraft used, the route taken, occupancy rates etc. Further investigation shows that there is a major difference between companies in the calculation method. Firstly companies such as KLM, SAS and Lufthansa only take into account CO<sub>2</sub> and not the emissions of other greenhouse gasses, while others base their calculations on CO<sub>2</sub>e. Secondly the airlines do not take radiative forcing into account. Emissions from planes at higher altitudes are said to have a greater effect on global warming because they lead to additional cloud forming. This is called radiative forcing, and according to the UK Government and the IPCC GHG emissions from aircraft need to be multiplied with a factor of 1.9 to take the effect of radiative forcing into account. Organisations such as CO<sub>2</sub>OL, Trees for travel, carbon footprint and carbonfund do use this factor, which accounts for a large part of the difference in cost.

**Table 4: Estimated emissions for a return flight Amsterdam – Stockholm**

Retailer	Broker/ project developer	Estimated Kilometers return	Estimated emissions (kg CO <sub>2</sub> )	Price	Price/ ton
KLM	co2zero	2582	256	€2,18	€ 8,52
SAS	carbon neutral company	2304	267	€2,84	€10,64
Lufthansa	myclimate.org	2304	324	€6,00	€18,52
Lastminute.com	JP Morgan climate care	2304	270	€2,40	€ 8,89
Trees for Travel			750	€6,75	€ 9,00
Forest finance/ CO <sub>2</sub> OL		2506	840		
Carbon planet.com		2302	500	€9,25	€18,50
Carbon Advice Group			420		€ 8,50
Carbon Footprint			680		€ 8,20
Carbonfund.org		2317	700	€5,18	€ 7,40

A second point of criticism is that if the costs of carbon offsetting are less than 1% of the price of a ticket, as in the case of KLM, why then do we even bother to ask consumers to specifically tick a box and pay voluntarily? In a situation where airport taxes and fuel surcharges are often 30% to 50% of the cost of a flight, and the person sitting next to you may have paid twice as much as you for the same ticket, why would anyone worry about an increase in the ticket price of 1%? Surely if they care as much about the environment as some airlines would have us believe, they can just build this into the standard cost of each flight?

Interestingly, from 2012 onwards, European flights will become part of the compliance market under the EU-ETS. Though an important step in the right direction, this will not resolve the issue. Many flights around the world will still not be covered by this scheme, and the EU ETS will not require planes to be carbon neutral. It will simply set a maximum pollution level for European flights (a cap) and allocate EUAs to airlines. If a passenger wants to be sure that his or her European flight is carbon neutral, he will still need to compensate voluntarily himself.

Retail prices for carbon credits tend to be higher than wholesale prices; however, producers of credits need to figure out whether they have the capability to sell the credits themselves. Is, for example, the higher price per ton sufficient to cover the extra cost involved with selling small amounts of credits to thousands of consumers? What becomes clear from the experiences of CO<sub>2</sub>OL (see Box 15) is that, in order to sell carbon credits to consumers, the sale needs to be part of the purchase of a product and service for which the consumer may be willing to compensate for emissions. This means that producers need to actively search for and establish partnerships with other companies.

### Asymmetry of information

It can be difficult for a producer of carbon credits to know the exact market value of their credits. This is because the carbon market is still relatively new and because there are a large number of price determinants. There exists the possibility that brokers and other buyers with a better knowledge of the market may try to take advantage of this asymmetry of information.

### Box 15: Retailing Carbon credits: the experience of CO<sub>2</sub>OL in Germany

CO<sub>2</sub>OL ([www.co2ol.de](http://www.co2ol.de)) is the sales department for carbon credits at Forest Finance. This German company generates carbon credits through reforestation in Panama with tropical species for timber production. Because Forest Finance generates a limited amount of carbon credits, they are difficult to sell to brokers. Forest Finance also believes that selling directly to companies and consumers will allow them to maximise their revenues per carbon credit.

CO<sub>2</sub>OL's marketing strategy is built around five key segments: hotels, events & meetings, exhibitions & businesses and consumers. For each segment, a number of tailor-made services are offered that enable customers to calculate, reduce and compensate emissions. For example, CO<sub>2</sub>OL helps the German rock band Die Ärzte to compensate for emissions caused by their concert tours by calculating emissions and selling the credits. Since 2008 they have compensated 22,803 tonnes of CO<sub>2</sub>e. The cost of this compensation is actually passed on to the consumer by adding a fee of approximately 50 cents to each ticket sold. CO<sub>2</sub>OL also offers a calculator service to booking sites for hotels and event organisers in order to enable consumers to calculate the emissions caused by their visit and to buy compensation when purchasing the product. Examples of events covered include the FSC General Assembly in 2010. Examples of other customers include the German telecom giant Telekom AG, and the train and airplane builder Bombardier. In 2010, a total of 25,000 credits were sold to 150 companies. In addition, CO<sub>2</sub>OL offers consumers the option of calculating and compensating emissions for when using cars, trains and airplanes, and for using electricity and gas in the home. In 2010, direct sales to consumers accounted for about 5% of turnover, or 1250 credits.

One of the most important lessons learned by CO<sub>2</sub>OL is that the option of compensation needs to be integrated into the actual purchase of goods and services. Very few consumers will spontaneously go searching for this compensating option for their emissions and put in the effort required just to pay a few euros to compensate for flight emissions. Few consumers are willing to go through the trouble of providing their credit card information online for such a small transaction. Retailing requires the making of smart deals with organisers of events, airlines and other companies.

#### Further Reading:

Hamilton et al. (2011). Back to the Future: State of the Voluntary Carbon Market 2011. Ecosystem Marketplace, Bloomberg New Energy Finance.  
[www.ecosystemmarketplace.com/reports/SOVCM2011](http://www.ecosystemmarketplace.com/reports/SOVCM2011)

BlueNext Exchange <http://www.blunext.eu/index.php>

Intercontinental Exchange (ICE):

<https://www.theice.com/productguide/ProductGroupHierarchy.shtml?groupDetail=&group.groupId=19>

### Box 16: Expected prices for the carbon credits of Mali Biocarburant

Estimating the selling price for MBSA's carbon credits proved extremely difficult. During the initial research, uncertified credits were being sold to KIA Netherlands through a prepaid forward purchase agreement via the broker Trees for Travel at a price of €5.00 per ton. Another interested broker, US Based Native Energy, offered to buy the remaining credits. However, they only offered \$3.50 per ton (around €2.45 at the time) for the same credits, and under the condition that they were VCS certified. For ex-post credits, around \$5 to \$6 was offered, depending on the market.

Because the price offered by Native Energy was so much lower than anticipated, KIT decided to do more research in order to gather the knowledge needed for price negotiations. It was quickly discovered that credit prices varied considerably, depending on the chosen standard, project type, intermediary and the final client (not to mention a host of other reasons), and that estimating prices would involve a certain amount of gut-feeling and subjectivity. By examining reports such as the State of the Voluntary Carbon Market (Hamilton et al. 2010) KIT found the price range and the average prices of credits certified to the most common standards. By speaking to brokers, project developers, certification standards, consultants and other carbon credit producers, KIT tried to find out which standards MBSA would be eligible for, and where its credits would fall in the price range. The third step was to understand the market trends and to look at trade volumes in order to ensure that the prices quoted were actually based on a significant amount of trade and not just one or two transactions.

KIT soon discovered that prices at that point (2009) had fallen considerably compared to previous years, and that many of the reports from those years had been overly optimistic in their price estimates. Furthermore, the disparity at the high end of the price range was found to be the result of sales to consumers (retail) rather than sale to brokers or companies (wholesale). Though MBSA had a good project story, the debate on food versus biofuels had a negative impact on the price of its credits. Furthermore, the first negative stories of failed Jatropha projects had started to appear, which also influenced its prices. Therefore, a realistic estimate would be that the credits would fall somewhere in the middle of the price ranges provided in the report.

An estimate of the expected wholesale prices for MBSA based on our present level of knowledge can be seen in Table 5

**Table 5: Estimated wholesale prices for MBSA's carbon credits**

		CER	tCER	(PV at 10%)	tCER Gold Standard	VCS + (CCBA)	VCS after 40% buffer	Carbon-Fix	Carbon Fix after 30% buffer
Carbon sequestration	Ex-post	n.a.	€2,600	€6,01	n.a.	€5,50	€3,30	€8	€5,60
	Cash up-front	n.a.				€3,25 - €5,50 *	€1,95 €3,30	€4,80	€3,36 €5,60
Biodiesel	Ex-Post	€7	n.a.	n.a.	€8		n.a.	n.a.	



These prices were obtained by taking the average transaction price from the survey by Hamilton et al. (2010) for Gold Standard, CarbonFix and VCS. For VCS, a story premium of about €2.00 was added because it was believed that MBSA could realize this premium. In the case of other standards, such as Gold Standard and CarbonFix, a good project story is a prerequisite for certification, and thus no premium was added there. Having said that, many VCS projects add an additional CCBA certification to certify the project story. The CDM price is based on the average price of primary CERs over the past number of years, while the tCER is based on the reported average of the range of \$3-\$4 as recently paid by the World Bank BioCarbon Fund, the only large buyer at the moment. Finally, for cash-up-front prices, a range is given that varies from 60% of the ex-post price to the full ex-post price, the reason being that initial research pointed towards a limited market at reduced prices for these credits. Recent experiences, however, at Trees for Travel (Box 6), Native Energy (Box 10) and Forest Finance (Box 22) indicate that in some instances cash-up-front credits can fetch prices equal to ex-post credits. When comparing prices, one needs to take into account the fact that CarbonFix and VCS require a large percentage of the credits to be placed in a buffer account, thus effectively lowering the sales price by the percentage placed in the buffer. On the other hand, tCERs can be sold six times, and thus a column was added with the present value of those 6 sales using a 10% discount factor. In chapter 9, tCERs and buffers will be explained in more detail. Finally, an exchange rate of €1= \$1,35 was applied.

Considering these prices, it seemed that CarbonFix would be the best choice for carbon sequestration credits, and Gold Standard for the biodiesel credits. However, although it is an important exercise to compare prices of different standards, one has to be careful not to attribute price differences to the standard alone. CarbonFix credits may be priced higher not because they are CarbonFix credits, but because they tend to be sold retail instead of wholesale. Finally, expected prices are not the only reason for choosing a particular standard; Chapter 10 will list ten different criteria one should consider when choosing a standard.

# 7 Development of a carbon project: the different stages of the process

The following chapter looks at the project cycle for carbon credit production. One of the problems in the development of carbon credit projects, particularly those aimed at the voluntary market, is that they often do not follow a consistent project cycle. Many projects seem to jump into implementation without a proper feasibility study, and a clear idea which standard will be chosen and how much can be earned with credits. This can lead to a lengthier development process with unforeseen problems. For example, funds may run out and new funding needs to be attracted; it may be set-up in a way it is difficult to certify, monitoring systems may not be consistent with what the certification standard requires, or it turns out the project is simply not feasible and the invested money is wasted.

We would argue that many of these problems can be prevented by following a more rigid order of activities, separated in specific phases. This section will provide a general overview of these stages as well as particular points worthy of attention. While the principle process is similar for most carbon credit standards, there are some exceptions. The reader should therefore refer to the website of each respective certification standard for full details of the process for each standards. Following these different stages should lead to a more efficient development process, both in time and money.

The different stages of the process of developing a carbon credit project we would propose are:

- 1 **Feasibility check:** It is strongly recommended to start with a check on whether your planned project is likely to qualify for carbon credits or not, and if so for which standards. Firstly, one has to hold up the planned project against the key principles of carbon markets mentioned in chapter 3: permanence of emission reductions, additionality, leakage, double counting and adverse social and environmental effects. The next step is to examine the experiences of other similar projects, such as the standards they have chosen, and whether they managed to become certified and have credits issued. One can then assess the extent to which the project design differs, and if these differences stand in the way of certification. Also, one should take a closer look at the different certification standards and see if there is one that stands out for your project type and size.

During this phase it is important to speak to brokers, project developers, experts from independent auditors accredited by the standards, and managers of projects similar to yours. Often, a simple ten-minute conversation, during which you briefly explain your project idea, can result in a lot of relevant information, new contacts and sources of information, and in critical questions you will need to find an answer to. This phase is also important for tracking down the experts you will need later on to help with the development of the project design document and estimation of carbon credit production volumes.

- 2 **Estimate sales and production volumes:** It is important to have an indication early on of the amount of credits you will be able to produce and sell, as this plays an important role in your choice of standard and marketing strategy. Depending on the complexity of your projects, your level of knowledge and the information you can find on comparable projects, you may need to consider hiring outside expertise in the form of a consultant or project developer. Chapter 11 contains a guide on how to estimate volumes.
- 3 **Choice of standard:** With the results of your feasibility check and your estimated volumes in hand, you will now need to decide whether you want to certify and, if so, which standard (or combination of standards) you want to aim for. Chapter 10 contains a list of selection criteria and a comparison of the most common standards.
- 4 **Acquiring Finance:** Once you are sure whether or not it is feasible to produce carbon credits, how many can be produced, and if and how they should be certified, then implementation of the project and certification can begin. This is also when the serious expenses are likely to start cropping up, and thus when finance is needed most. There are several options, including selling ex-ante credits, acquiring bank loans or equity capital, or applying for grants and sub-prima loans in the non-profit sector.
- 5 **Development of a project design document (PDD):** Once a standard has been chosen, a document needs to be written that will contain the design of the project, how it satisfies the criteria set-out in the guidelines of the standard, how the amount of credits produced are calculated and measured, your risk management strategies and how the project is monitored. Unless you are a technical specialist in the exact same area as the project, you will need to hire experts. These can be independent consultants, project developers or organisations that normally act as independent certification and verification agencies. The PDD and a number of accompanying documents will need to be submitted with your formal application for certification.
- 6 **Certification (validation of the project design):** Validation is a third-party audit to assess the conformance of the project design and documentation to the certification body's standards. The validator performs a document review and site visit, and completes a report including an assessment of whether or not the project conforms to the standards. For CDM certification there are actually two separated steps: first the methodology used to calculate and monitor the carbon credits produced needs to be approved by an independent auditor. A different independent auditor will then need to verify whether the project is implemented according to the approved methodology. Only if there is already an approved methodology that can be followed literally, the first step can be skipped. Many voluntary market standards accept CDM methodologies.
- 7 **Monitoring:** Once certified, your project can start producing credits. The project manager must monitor the emission reductions made over the course of time. Some standards allow inclusion of emission reductions that occurred before the project was certified. In this case it is extremely important to have a verified baseline of emissions at the time the project began. Both the CDM (since 2000) and VCS allow this, as long as it can be proven that the generation of carbon credits was considered in the original project design.

- 8 **Verification of emissions:** An independent auditor will need to come by periodically to verify that emission reductions have indeed taken place. For most project types this is done once a year, although for forestry it might only happen once every 5 years or so.
- 9 **Credit issuance:** Carbon credits are then issued into the standard's registry in the account of the project owner. The amount of credits issued is equal to the number of tonnes of CO<sub>2</sub>e that the project has reduced/sequestered.
- 10 **Sales of the first credits:** once credits are issued, you may sell them. After they have been sold, they may be stocked by a broker and re-sold until they are eventually bought by a client who uses them to compensate for emissions. They will then be retired, which means that the registry will note that the credits have been used and cannot be sold again. It is important to note that many projects also sell credits before the actual emission reductions have taken place and the credit has been verified and issued. Chapter 6 explains this in greater detail.
- 11 **Subsequent verifications:** after a certain period of time you will need to verify a batch of credits again using an independent auditor. How often this needs to be done depends on the standard chosen.

You will probably need the help of experts with most of the steps, particularly the project design document (PDD), verification and selling of issued credits.



Biodiesel production, Mali (Photo: Trees for Travel/Mali Biocarburant)

# 8 The players in the carbon industry: who's who, and who do you really need?

The carbon industry is made up of hundreds of organisations that offer a variety of services. As a newcomer it is often difficult to understand exactly what it is they do, and if you need their services. It is even more difficult to find out what the quality of the service offered by different organisations is, and whether they are attractively priced. Neither does it help that many different names are used to refer to essentially the same kind of organisation; for example, a 'third party auditor' is in reality the same as a 'Designated Operational Entity (DOE)' or 'verification agency'. The opposite is also common: organisations that perform different activities often have the same name; project developer, for example, is a very ambivalent term. This section discusses the different actors in the industry, the services they offer, and how you can assess their added value for your project.

## 8.1 Which services do you need from others?

### Services needed at different stages of the project cycle

Before discussing the different kind of actors, it is important to first look at the different services one needs when developing a carbon credit project. Some services are compulsory, such as the use of an independent auditor for certification of the project. Advice and assistance are never compulsory but, depending on the activity, they will probably be required to some degree. Table 6 offers our subjective overview of the necessity of services for each phase of the development of a project. The first column contains the different project development stages, while the second column states which kind of organisations you must hire if you want to certify your project. The second column rates the need to source advice and assistance from experts, such as experienced consultants, brokers and project developers. This will be discussed further later on in this section. The actual actors will be described in the next section.

- 1 Though a quick feasibility check may be the easy option, a knowledgeable advisor will probably do a better job at assessing the feasibility of the project. Hiring an advisor is therefore a good idea. This does not necessarily have to cost you a lot of money; you can run the project by some project developers and ask for their advice. If they are interested in the project, it probably means that it's feasible.
- 2 Estimation of the production and sales potential is also a task for which you need to consider hiring assistance. Even if you have the technical knowledge to calculate the production, you may find it difficult to know and apply the specific rules and precautions contained in the certification standards when making your calculations. For example, in order to avoid selling credits that are not backed by real emissions, calculations tend to be quite conservative, and if certain reliable data or parameters are not available, there are some very conservative assumptions



**Table 6: The need for service providers at project stages**

Project Phase	Compulsory Services assistance from experts	Need to source advice and
1 Feasibility check		Medium
2 Estimate sales and production volumes		Medium
3 Choice of standard		Low
4 Acquiring Finance		High
5 Development of a project design document (PDD)		Very high
6 Certification (validation of the project design)	Independent auditor, certification body	Medium
7 Credit production and monitoring		Low
8 Verification of emissions	Independent auditor, certification body	Low
9 Credit issuance	Certification body, registry	Low
10 Sales of the first credits		High
11 Re-verification	Independent auditor, certification body	Low

you will need to apply. For example, you may be able to calculate the amount of electricity your solar panels will produce at a certain location, but you may still need an expert to find out how much the reduction in carbon emissions will be when you replace ‘dirty’ electricity with ‘green electricity’.

- 3 The choice of certification standard is an important decision, and depends on, among other things, your financial situation, the time you have left in which to certify and the risk you are willing to take. Outside advice may be important in helping you to assess the feasibility of different standards, but ultimately the choice is yours. What makes it even more difficult is that most experts only have in-depth knowledge of a small number of standards and automatically tend to favour those standards. They may also have difficulty assessing other standards. Therefore, you may need to get the advice of several experts in order to arrive at a complete overview of your options. Choosing not to certify is also a legitimate choice.
- 4 Given the fact that it is difficult to obtain the investment capital needed to finance both the implementation of a project and its certification and verification from commercial banks and equity investors, it is important to assess the extent to which the different actors in the carbon market can offer access to finance. For example, project developers may want to provide services on a no cure no pay basis, or pay for certification and do a PDD in exchange for the right to buy credits. Or clients and brokers may be willing to buy ex-ante credits, which acts like another form of pre-finance. However, finance always comes at a price, particularly when the risk involved is high. One therefore needs to find out exactly which finance option is the most affordable.
- 5 Drafting a project design document is arguably the most difficult part of the process and the one where the most technical expertise is needed. The extent to which you need an expert here depends on the time and knowledge you have available and on the complexity of your project,

but you will more than likely need an expert at some stage. Even if you choose not to certify, it may be wise to seek advice on designing your project properly and in coming up with ways of monitoring your projects that will convince buyers that real emission reductions are actually taking place.

- 6 Certification requires you to use an independent auditor, and there are several to choose from. You may also consider the help of an advisor to help you prepare for a visit by an auditor and to help submit all the paperwork. It may also be possible that the independent auditor will pose difficult questions and you may then need an advisor to help you answer them. If your project happens to be turned down, you may need an advisor to help you adapt your project design.
- 7 Credit production and monitoring are the core activities of your business and cannot be outsourced easily. However, you might consider enlisting support in the implementation of your monitoring systems.
- 8 Verification of emissions has to be done by an independent auditor. You may need to use an advisor to prepare documentation for the visit.
- 9 Credits will then be issued by the certification body (standard), and deposited in the registry account associated with that standard.
- 10 You will probably need assistance in selling credits. Though you may be able to find a client yourself, and save money by striking up a close relationship, this is by no means easy. Furthermore, while you are setting up your business you probably won't have the time to visit other businesses in the hope they will buy your carbon credits. In addition, the larger your project is the more clients you will need to find in order to sell your credits. Therefore, if you have a large-scale project (10,000 credits or more), it would probably make more sense to sell your credits via an intermediary with a proper sales organisation and portfolio of clients.
- 11 Re-verification must also be carried out by an independent auditor, and it is probably a good idea to seek assistance in doing a pre-assessment so that you can avoid any nasty surprises when the auditor arrives.

## 8.2 The different actors in the carbon finance value chain

### The producer (carbon credit generator)

It all starts with an activity that leads to emission reduction that, once measured and verified, can be sold as a carbon credit. In this book we refer to the entity responsible for this as the carbon credit producer, but it is also commonly referred to in trade literature as the generator of carbon credits.

### The buyer

The buyer, also commonly referred to as the client, is the person or organisation that buys the credit to compensate for emissions. These can be compensation for his or her own emissions in the case of a consumer, or for emissions caused as a result of the production and sale of goods or services in case of a company or other organisation.

## Project developers

Project developer is probably one of the most ambivalent terms in the industry, and it is difficult to provide a clear definition of what a project developer actually is. There are many organisations with vastly different levels of relevant experience and skills and who offer a wide spectrum of services that call themselves project developers. At one end of the spectrum, a project developer may be an organisation that implements, certifies and finances a carbon offsetting project and manages the sale of credits on behalf of someone else. For example, they may install a windmill on someone's farm, finance it, and certify and sell the credits. But the farmer remains the owner of the windmill. In some cases the project developer may even own the windmill, though in that case he ceases to be a project developer and is more a producer of carbon credits that does everything in-house. On the other hand, there are also project developers that simply offer assistance with the project design and certification and that offer pre-finance for the project.

Arguably, what distinguishes a project developer from a consultant is that a project developer will always take ownership of at least a chunk of the carbon credits. It is common for project developers to be paid in kind with a percentage of carbon credits, 30% to 50% being common for smaller projects. In addition, there is often a forward purchase agreement (ERPAs) for the sales of the other credits for a certain period of time and a specified price. A consultant, on the other hand, will not share in the risk of the project but will demand cash payment.

By taking credits as payment and signing ERPAs, project developers share in the project risk of the credit producer, but this comes at a price. The willingness of project developers to take risks is a great opportunity for those businesses that lack the financial means to finance the development of their carbon credit projects, for example, the cash needed to hire a certification consultant. However, an old economic law states that extra risk needs to be compensated with extra returns, and this is just what project developers need to do. There is a real chance they will end up investing tens of thousands of Euros in advice and certification that may never lead to a carbon credit. As a result, they are entitled to estimate the cost of providing these services and demand credits valued at the ex-ante price (which may be 50% of the regular price) as payment in kind. In order to limit the risks, project developers may also demand a partial cash payment. As a buying price in the ERPAs, they are likely to offer what they think will be the minimum price in the market. Effectively, this means that the project will surrender any potential gain from rising carbon prices in the future. Furthermore, the deal may be structured in such a way that the project developer is not obliged to buy the credits if he does not have a buyer. In that case the risk of a weak market would remain with the credit generator.

There are many knowledgeable project developers out there that offer great services, but there are also many who seem to lack the capacity to deliver on their promises. It is common for intermediaries to claim to be a 'one-stop shop' for certification, project design and sales, while in reality they simply use brokers for the sale and do not have real experience in the certification of the type of project you want to develop. It is therefore important to verify how project developers work, and to ask for concrete examples of their experiences and references. If the project developer has developed and sold credits for many project similar to yours, chances are their experience allows them to offer value for money. If they lack the experience, you are better off going elsewhere, unless you can work out a deal in which you will become a pilot project that allows the developer to gain experience. Though this would reduce cost, certification is likely to take longer.

### **Box 17: The experience of Mali Biocarburant in dealing with project developers**

Because Mali Biocarburant (MBSA) management did not have the human resources to deal with the complex task of marketing all carbon credits, they asked the Royal Tropical Institute, one of the original investors in the business, to act as a project developer on their behalf. KIT would sell the credits on behalf of MBSA and use part of the revenues to cover the *Jatropha* planting cost. The remainder of the revenues were to be invested by KIT in economic and social activities in the farming communities. KIT's added value would be predominantly in making sure that the lion's share of the revenues would end up in the hands of the communities actually planting the trees.

In its search for potential clients and expertise, KIT came into contact with several project developers who claimed they had the experience and expertise necessary to offer a 'one-stop shop solution'. Unfortunately, after critical questions were posed it became clear that these project developers did not actually have their own sales organisation with existing clients but were simply selling to other brokers. Despite their self-proclaimed expertise, few had sufficient experience with design and certification of carbon sequestration and biofuel projects to be able to advise KIT. Some even claimed to have experience with *Jatropha* certification, which is extremely doubtful considering the fact that at the time no other *Jatropha* project in the world had been certified. KIT therefore concluded that the added value of those service providers was limited; it seemed to make more sense to contract a broker and a consultant with the relevant experience directly themselves.

Upon completing its research, KIT concluded that it could not play the role of a so-called 'pro-poor' project developer. Firstly, the potential revenues of the sales of credits were barely sufficient to cover the cost of planting, let alone the cost of KIT. Secondly, there would be insufficient revenues for channelling money back into the communities in a sustainable way. Furthermore, because certification was more expensive, difficult and time-consuming than anticipated, substantial pre-finance was needed, which KIT could not provide. KIT thus decided to pull out after finishing the initial phase of research.

MBSA resolved the situation by setting up two foundations responsible for planting: one in Mali, and one in Burkina Faso. In Burkina Faso, the ICCO fairclimate fund acts as a project developer that pre-finances certification and tree planting. They also actively manage the certification process, using experienced consultants, while they also retain the right to sell all the future credits. In Mali, Trees for travel has also taken on the role of project developer. KIA Motors Netherlands and Sweden are the only large buyer and they do not require certification. Furthermore because sequestration in the earlier years of the shrubs is actually low, the amount of credits produced remain low until 2015. The certification process has therefore been postponed until the results from Burkina Faso are known and the production volumes of credits actually make this economically feasible and interesting for the farmers.

## **Independent consultants**

Independent consultants are typically contracted for specific tasks such as feasibility studies, assistance with the project design and certification process, and setting up a monitoring and evaluation system. The drafting of the project design document, in particular, is often outsourced to consultants. The reason is that for most future credit producers it will be their first time dealing with carbon credits, and they simply lack the necessary knowledge. It is often cheaper, faster and better to hire experts than to try to gather all the knowledge yourself, and then try to find out exactly how to calculate the right amount of credits, etc.

However, given the large number of standards and different type of projects out there, there is no consultant who can possibly know it all. The trick is to find a good consultant with the specific expertise you need for your project. Unfortunately, consultants with highly specialised expertise don't come cheap, and that is why consultancy costs are often the single highest cost factor in any certification process.

## **Universities and knowledge institutes**

In order to limit the cost of hiring project developers or consultants, you could consider outsourcing part of the work to universities or knowledge institutes. For example, a group of students under the guidance of scientists could conduct research to determine the amount of carbon stored in a piece of land before reforestation and gather data on carbon storage in the tree species you are intending to use. Or they could be involved in calculating the annual amount of energy produced using a certain kind of wind turbine in a certain area. For university students, such work is an excellent opportunity to gain practical experience, and for the university itself it may be a great opportunity to develop or pilot new methodologies.

The downside of using universities is that they tend to be slower, and the outcome is never guaranteed. Universities do not tend to do the same thing over and over again, and are thus likely to be doing the work you require for the very first time. This means they'll need more time and cannot really estimate how much time they will need. They might not even be able to get the job done. Therefore, using universities can be an excellent cost cutter, but only if you can afford to wait half a year longer.

In any case, it seems advisable to use an experienced consultant or project developer to check the final results and finalise the certification application. Though the calculations may be accurate, they must meet with the requirements of the standard, and it takes an experienced person to assess this properly. Furthermore, the application needs to be presented in such a way that it makes it easy for the certification body to understand everything and assess it.

## **Brokers**

Brokers can be a great help in the marketing and sale of credits on the open market. Brokers act as intermediaries between suppliers of carbon credits and institutional buyers. Some may also sell credits to consumers (retailing), either on their own website or through the websites of other companies, such as airlines. Obviously, you will need to find a broker who is knowledgeable, has a good sales record, a portfolio of clients interested in your type of credits and who you can trust to offer fair prices.

### **Box 18: Decreasing certification costs through working with Universities**

For the certification of the *Jatropha* shrubs planted by farmers connected to Mali Biocarburant (MBSA), data is required on the carbon sequestration of trees under the specific conditions in the regions of Mali where the company is active. In an attempt to reduce the cost of gathering data, MBSA has become a partner in a consortium led by the University of Leuven. The study, called “*Jatrophability: Impacts of tropical land use conversion to Jatropha on rural livelihoods and ecosystem services in Mali, India and Mexico*” will assess the economic, social and environmental impacts of the production of *Jatropha* in these countries. Most of the fieldwork will be carried out by students under the guidance of scientists. Activities include the digging up of samples of 3-year-old plants to measure the above and under ground biomass, and the amount of CO<sub>2</sub> that has been captured in these plants, which is a requirement for certification. In addition, the study will indicate the most suitable ecoregions for *Jatropha* production, taking into account economies of scale of production and the extent of economic, social and environmental production risks. This cooperation is beneficial for both sides: the university has access to a real case of gathering data and can offer students the opportunity to gain experience in the field. MBSA will get the data it needs and the costs will be limited to the time invested in guiding the students. The only, but significant, downside of MBSA is that it will take more than a year to accumulate the data; the results of the study are expected in May 2012.

MBSA is also a member of a research consortium led by Forest & Landscape Denmark, part of University of Copenhagen and funded by the DANIDA Research Council (Ministry of Foreign Affairs Denmark). The main objective of the project is to find and test improved varieties of *Jatropha curcas* that will provide higher yields in terms of nuts, thus making it a more profitable crop for farmers and bio-diesel producers.

The added value of brokers is their network of buyers, knowledge of market developments and a portfolio of different projects that appeal to a variety of clients. They can advise whether there is demand for a certain kind of project, what the most accepted market standard is, and which prices can be expected. Because this information is difficult to come by, and because sales can be a time consuming affair and many projects are located in developing countries far away from the buyer, the broker therefore performs an essential role in the carbon credit value chain. Brokers tend to be located in the US and Europe where the buyers are.

What makes dealing with brokers difficult is the variation in market prices, which can sometimes be quite extreme due to the number of variables determining price – certification standards, project type, quantity of credits, whether the credits have already been issued, where the project is in the project cycle etc. Brokers may take advantage of the fuzziness of the market and offer buying prices below what, on later reflection, may seem fair. An arrangement where brokers take a margin from the eventual sales price can be a good option for sellers.

It is worth mentioning that many brokers are specialised in terms of the kind of credits they sell, the customer base and the scale they operate on.



### **Box 19: The experience of MBSA in dealing with brokers**

The first client of Mali Biocarburant (MBSA), KIA motors, was found by the broker Trees for Travel, a small broker with a limited portfolio of five projects. The larger brokers such as JP Morgan Climate Care were not interested in credits from MBSA, because they are either not that active in the voluntary market, find the scale of the project too small or have no clients and no expertise in bio-diesel and carbon sequestration projects. Furthermore, in 2009, scepticism surrounding *Jatropha* biodiesel and the food versus energy debate meant that brokers with limited experience in bio diesel credits were less inclined to engage in selling this type of credits.

However, the project story did attract a number of brokers/project developers active on the voluntary market. These brokers all required certified credits, with VCS and Gold Standard being favoured, but could offer little support to the process because of the limited amount of experience with the certification of biodiesel at the time. Unfortunately, few offered the possibility to sell ex-ante, and the ones who did offered a fairly low price for the credits at the time. With certification and finance remaining difficult for brokers, KIT decided to cease discussions with brokers until these issues were resolved.

### **Certification bodies**

Certification bodies are the ones who design and issue certification standards. Organisations such as VCS, Gold Standard and Plan Vivo will be the ones who will eventually assess your application and see whether it complies with their standard. They are financed through the application fees they charge and small margins from every credit issued or sold. Their business is to have as many projects using their standard as possible. Thus, they need to engage in marketing to make their standard known to clients, producers, project developers and consultants in the market.

Certification bodies will encourage you to join their standard, not just because they believe in it, but also because it is their business. They walk a fine line; the standard needs to be strict enough to guarantee the buyer real emission reductions, but not so strict that certification becomes too difficult, costly and time-consuming. Certification bodies also provide toolkits that help you design and certify your project. But they cannot help you with the certification process beyond that, otherwise they would lose their independency. In any case, their advice is never completely objective.

Certification bodies are also a great source of information. They can explain how their standard works and help you find approved methodologies you can use as a basis for your certification. Certification bodies may also be able to bring you in contact with third party auditors, consultants, project developers, brokers and credit producers who have experience relevant to your specific kind of project. Because they deal with a lot of applications and speak to many people, they tend to know who is involved in successful applications. Having said that, they may be reluctant to favour particular service providers if they are afraid of offending others, who may then stop using their standard. As a result, some certification bodies may not provide specific judgements on the quality of individual service providers but simply provide you with a list of all people working with their standard.

## Independent auditors

Virtually all standards require a third party auditor to verify a project's emission reductions prior to credit issuance. This auditor must first be approved by the certification body, who in many cases can suggest one to you. Independent auditors are also called third party auditors, verification agencies or verification agents. Within the CDM lingo of the compliance market they are called DOEs, which stands for "designated operational entities". An analysis of the number of certified CDM projects per entity showed that the most experienced auditors are the German company TÜV Sud and the Norwegian company DNV. These companies and most others on the list are not specialised exclusively in carbon credits, but are independent auditors of a wide number of standards such as ISO.

There are three important criteria you need to remember when choosing an independent auditor: cost, availability and experience. In terms of experience it is important to look at the auditor's experience with the project methodology and the region it operates in, the number of applications they have done and the percentage that were successful. Certain bodies may have more experience in certifying a particular type of project than in others, which may influence how much they will charge for the work, and how quickly they can do it. If, for example, there is only one expert, it may take a while before he or she is available for your project. Costs are typically also influenced by the distance assessors need to travel to your project. Unfortunately, many bodies have a backlog of applications of up to several months and it is important to check the availability of their experts and extent of their backlog before you make your decision.

In order to find and select an independent auditor, one can look at the CDM database to see which methodologies were developed and which project types were certified by which auditors. The project type, country, methodology, number of applications and success rate are all available. You can also ask similar projects to yours which auditor they used and what their experience was. The certification body, project developers and brokers can be other sources of information.

In addition to certification and verification, independent auditors often also offer consultancy for the development of a PDD. If they happen to have a lot of experience in the field, this could be a worthwhile option, though it is not likely to be cheap.

### **Box 20: Selecting independent auditors for MBSA**

In 2009 there was no certified Jatropha project yet, so it was difficult to find an independent auditor, thus KIT turned to the CDM database. The assumption was that auditors with CDM experience would be able to do certification for most voluntary standards as well, since these are mostly based on CDM. Using the CDM database, 26 different auditors were compared using the following criteria: experience with forestry projects, agriculture and energy, experience in Africa, number of projects submitted and success rate. Based on this, a shortlist was made and contact was sought in order to obtain estimates for costs and time.

Unfortunately, some companies in the shortlist had just been suspended because of irregularities in the certification process. This seems to have happened to multiple independent auditors over the past few years, including some very reputable companies. The backlog for Gold Standard certification had also increased dramatically as one of their most experienced auditors had been suspended by the Gold Standard certification body.

## Registries

Issued credits need to be registered in a database and once used by the client they need to be retired, which means they are removed from the registry. There may be multiple registries you can use, depending on the standard. The certification body is usually associated with one particular registry and so this is where your account with credits will be issued, unless you choose to move them.

## Retailers

Retailers are brokers who sell carbon credits directly to consumers. This may be directly, or through the infrastructure of other companies, such as airlines and event organisers that want to offer their clients the option of voluntarily offsetting the emissions they cause by buying that particular product. Most retailers are brokers who also sell to companies. Because the volumes of individual sales are very small, retail prices tend to be higher than those of credits sold to companies. Despite the well-known examples from the aviation market, retailing seems to be still a small part of the market. Nevertheless, it can give your project exposure, which may lead to larger clients or other business partners.

## The non-profit sector: NGOs, development banks and other development organisations

Non governmental organisations active in environmental protection and poverty alleviation have become increasingly active in the carbon markets. The latter are mainly involved because the poor in developing countries are often the most vulnerable to the effects of climate change. Many of these NGOs try to support communities and organisations that are trying to develop a project that will generate carbon credits and deliver additional benefits, such as access to energy. They may hire consultants to certify the project, subsidise equipment, pre-finance projects and sell carbon credits. They also play a role in influencing public opinion on climate change and thereby stimulate demand for credits on the voluntary market. Development organisations such as the World Bank and the French Development Bank tend not to be as involved on the operational level, but rather offer investment capital at attractive rates to carbon credit projects.

### Box 21: The ICCO Fair Climate Fund: Pro-poor carbon credits

The Dutch development NGO ICCO has been active in climate change since 2007, arguing that western countries have a responsibility to compensate developing countries for the fact that they emit less CO<sub>2</sub> while still suffering from global warming. ICCO started the Fair Climate Program, to generate attention for voluntary emissions reductions and help organisations to reduce their own emissions. For this purpose ICCO bought carbon credits from a partner in South Africa that instructed households in how to reduce the use of coal and wood in cooking stoves. It also got involved in other initiatives to reduce emissions and provide people access to renewable energy, such as biogas digesters in India. However, the problem with these activities was that on the one hand they were deemed too commercial for traditional development aid, while on the other they were too small, new and risky to attract the interest of commercial carbon credit project developers. The pre-financing of the set-up and certification of these projects, in particular, were identified as major problem areas.

In 2009 ICCO established the Fair Climate Fund in cooperation with the energy companies Greenchoice and Windtrading. The fund's mission is to enable poor households in developing countries to earn extra income by investing in sustainable energy activities at household level that generate carbon credits, and then trading these carbon credits for a fair price with parties in the North who want to compensate their CO<sub>2</sub> emissions. The fund operates as a full service project developer, offering pre-finance for the start-up of projects and certification, and managing projects, certification and sales of carbon credits. The fund has chosen to focus on selling certified credits, mostly Gold Standard, and works together with experienced consultants in certifying projects. As a well-known Dutch development organization linked to the church, ICCO has the ability to sell carbon credits directly to consumers and small businesses. ICCO is also part of an international network of similar development organizations, which offers access to a number of other European countries. What makes the fund unique is that it does not agree in advance the price at which it will buy the credits from the project organization that produces them, but simply pays the difference between the final sales price and the costs incurred. The objective is to cover 100% of the investment costs for households up-front, and when the emission reductions take place to ensure that as much as possible of the sales revenues after deduction of investment costs ends up with the producers of carbon credits, in order to maximize the income of poor households.

Since 2009, around €35 million has been invested in 15 biogas, energy efficiency and solar energy projects in India, South Africa and Burkina Faso. The fund also acts as a project developer for Mali Biocarburant in Burkina Faso. The efficient cooking projects in South Africa and biogas projects in India are now Gold Standard certified and the carbon credits are sold for respectively €12.50 and €17.50 per ton of CO<sub>2</sub>e. The fund's website contains a calculator that helps people to calculate and compensate their emissions through the ICCO projects.

Initiatives like the fair climate fund are essential if we want to link poor communities in developing countries to the carbon market. Without public money, many innovative small-scale projects would never get started, because the initial investments in developing methodologies and certification are risky and difficult to earn back on this smaller scale. However, the concept is as of yet unproven; ultimately, the efficiency of the fund and its ability to sell credits will determine whether the fair price it can pay for the credits will indeed be of interest. On the other hand, for the communities involved, the carbon credits are only one of the benefits: the biogas projects in India also give people access to energy, and in South Africa people save on wood and coal while their indoor environment becomes more healthy through a reduction in smoke. The main challenge for the fund over the next few years will be to sell all the credits from the projects in the pipeline, which won't be easy. Nevertheless ICCO remains confident, as it claims there is a growing demand for high quality carbon credits but these credits remain in short supply.





Tree nursery for the reforestation of tropical rainforest in the Philippines  
(Photo: Trees for Travel/Aart van den Berg)

## 9 Carbon credits from land use, land use change and forestry: a special case

Globally, a tremendous amount of carbon is stored in trees, plants, roots and soil. Plants require CO<sub>2</sub> to grow, and they store this as carbon in their trunks and branches; this process is called carbon sequestration. If, on the other hand, they are removed, carbon will then be released as they decompose or burn. If you change the way land is used by removing and adding new plants or by changing farming methods, you affect the amount of carbon stored in that land. Land use changes, particularly deforestation, are a large contributor to climate change. In 2000, the IPCC estimated that between 20%-25% of greenhouse gas emissions were caused by deforestation and land degradation, which is more than the transport sector as a whole. More recently, van der Werf et al. (2009) and UNEP (2008) arrived at estimates of 15% and 15 to 20 percent respectively. It seems clear that the achievement of overall climate change goals will not be possible if forests are not included in future climate negotiations. In addition to increasing carbon emissions, deforestation is also contributing to the loss of bio-diversity, loss of water storage and, consequently, floods and droughts, soil erosion and landslides, and the loss of people's livelihoods.

The clearance of tropical forests and woodlands for timber, their conversion to agricultural pasture and the production of charcoal are currently the most pressing issues. Even if the rainforest is replaced by a tree crop such as oil palms, which happens on a massive scale in Indonesia and Malaysia, there is still a huge loss of stored carbon. The trees felled are much larger than those planted, and natural forests have a much higher density of plants, with a large amount of shrubs and tree canopies at different levels. The forest soil itself also contains a large amount of carbon in the form of humus. A lot of this will disappear as the land is cleared.

Despite the large contribution of deforestation to climate change, the role of forestry in the carbon market is limited. Non-Annex 1 countries of the Kyoto Protocol, or countries that have not signed up to the Kyoto Protocol do not need to offset emissions caused by deforestation. The majority of deforestation takes place in countries in the tropics, which are usually non-Annex 1 (developing) countries.

In addition it is surprisingly difficult to certify and sell credits produced from re-forestation. Carbon credits from forestry projects are difficult to certify because of the issue of 'permanence'. If, for example, the trees are cut down or die after the carbon credit has been sold, the carbon will sooner or later be released back into the atmosphere, and no net reduction will have taken place. Therefore, there is no guarantee that the initial reduction in carbon credits will be permanent. In comparison, every litre of diesel that goes unused as a result of an energy-saving project is regarded as a permanent reduction. In the compliance market, forestry projects can only obtain a temporary credit, for which there is very little market because they are not accepted by the EU ETS. In the voluntary market, each standard treats the issue differently; the Gold Standard, for example, does

not accept forestry projects, whereas others require a large percentage of the credits produced to be held in a buffer, thereby substantially lowering the sales revenues.

The biggest challenge facing forestry projects is cash flow. Planting trees is labour intensive and thus requires a significant capital outlay, but incomes from timber, non-timber forest products and fruits from tree crops can take 5 to 50 years to materialise. Traditional (ex-post) carbon credits cannot bridge this gap because it will take equally as long for the trees to store significant amounts of carbon that can be verified and sold. On the other hand, if I erect a windmill this year, I can start producing and selling electricity as well as carbon credits as quickly as within a year of delivery and installation of the windmill. The prospect of having to wait for up to ten years for carbon returns can act as a barrier to financing (Neeff et al. 2010, p.10).

#### **Box 22: Selling carbon credits from sustainable timber production in Panama: the experience of Forest Finance**

Forest Finance is a German company that develops forestry projects, provides consultancy to carbon projects and sells carbon credits from its own projects and those developed by others. They have been developing forests in Panama since 1995. The company buys farms in areas that have been deforested mainly for cattle farming from commercial farmers that no longer wish to continue farming. The remaining patches of primary and secondary rainforest are left standing and protected, while the grasslands are reforested for sustainable commercial timber production. The area is divided into 2-3 ha blocks and each block is planted either with teak or with one of 12 species that occur naturally in the rainforests in Panama. This patchwork of small monoculture plots is a compromise between biodiversity and forestry efficiency. After 10-15 years, the forest is thinned for the first time, while harvesting of the trees can start after 25 years.

The biggest challenge for Forest Finance is being able to finance the planting of the forest up until the moment of the harvest 25 years later. In order to raise capital, it has come up with a number of innovative financial products aimed at private investors. These range from a bond-type construction from as little as 33 euros per month for which 12 trees will be planted each year and managed until the harvest 25 years later, to the legal ownership of 1 ha of forest, including the land it is planted on, for €31000.

Though eventually only 5% of the revenues will come from carbon credits and 95% from timber sales, carbon credits are essential because the income is generated at the start of the project instead of at the end, such as with timber sales. The carbon credits are thus used as a pre-finance mechanism. Each euro of income generated now means that this euro does not need to be obtained from banks or private investors who would require 9% -15% per annum over the 25 years. Without this initial income the investment would probably not be financially attractive enough for investors.

As far back as 1998 Forest Finance was selling its first carbon credits on the voluntary market, then still uncertified. As the years went by, the need for certification increased, but no standard seemed to be applicable to its projects; either because forestry was not accepted (Gold Standard), the market was unclear (CDM tCERs) or because they did not support ex-ante sales (VCS). In



2007, Forest Finance volunteered to be a pilot project for a new standard specifically developed for forestry projects, called CarbonFix. After four years of pioneering, the final site visits were conducted in 2010, and in 2011 the first fully-certified CarbonFix credits will be sold. The carbon credits are also CCB validated, which illustrates the social sustainability of the projects. The Rainforest Alliance is responsible for the certification as an independent auditor. Every five years, a re-certification is required to establish whether the calculations are still valid.

According to Andreas Schnall, the head of the forestry department, the biggest challenge for certification was that of developing a method for estimating the carbon stock of a mix of 8 different tree species at different altitudes, climate and soils. Forest Finance had the advantage of having at least some data for Panama from their own operations over a period of 15 years. Another challenge was the limited knowledge of forestry and carbon standards within the independent certification bodies responsible for the actual certification. Given that the standard has now been developed, and the level of experience at hand, they now estimate that certification of new forestry projects can be done by an organisation with a high level of forestry expertise in roughly 1.5 years, and at a cost of somewhere between €70,000 and €90,000.

The total amount of credits generated annually is 10,000tCO<sub>2</sub> per year, which is quite modest. This makes it hard to sell to brokers, who look for tranches of 10,000 tonnes or more at prices of around \$8. Though Forest Finance does sell to brokers, most credits are sold directly to small and medium sized businesses that want to voluntarily offset their emissions. The current sales price to clients is between €11.80 and €13.80, depending on the project. Examples of clients include companies who pay a monthly fee to offset car and airplane travel, bands who want to offset tour emissions, and Leaseplan Germany who offer their clients the option of making their lease car pool climate neutral. In addition, credits are sold to consumers who visit certain events, such as the Oktoberfest in Munich and the new years ski-jumping event in Garmisch Partenkirchen. Forest Finance also provides a simple calculator that enables people to calculate the emissions from their journey to the event. (<http://mobil.co2ol.de>)

About 99% of Forest Finance buyers are from Germany. Most clients know very little about the different standards. Some clients are not interested in certification at all and just want to see trees being grown, but increasingly, clients want an assurance that an independent auditor has verified that their purchase really does lead to an emissions reduction. This is particularly true for well-known companies and brands; perhaps they want to ensure that when problems with their carbon offsetting do reach the press, they can limit the damage to their reputation by referring to the fact that they bought credits with a respected certification.

The project story is an important part of the sales strategy at Forest Finance, and in order to capitalise on the story a lot of time and effort is invested in its communication. On the website, the exact location of each reforested area is shown in satellite images provided by googlemaps, and with one click a description and a set of photos can be viewed of the different stages of development of each project, and of the people and communities in the area. There is also detailed information on all trees species used and people working in the forests. That makes it easier and clearer for the customers to understand the impact they make by spending money on carbon compensation, according to Julia Daniel (chief of CO<sub>2</sub>OL department).

## 9.1 Different types of forestry projects

There are a number of different types of afforestation, reforestation and land use change projects, and various terminologies are used to describe them. These can sometimes be confusing and difficult to understand; therefore it is important to explain them.

### Afforestation

The term afforestation is generally used for the planting of trees on land that is currently not forested; either agricultural or severely degraded land. This can be anything from a mono-culture forest for timber production to a mix of native tree species, with limited or no intention to harvest trees.

Given the issue of permanence, you may wonder if timber production projects are eligible for carbon credits at all given the fact that eventually most trees will be cut down and sold as timber. The answer is yes, as long as relatively few existing trees and shrubs are removed from the areas planted, and the trees are harvested and replanted in batches in a continuous cycle. The majority of land will then remain under forest cover. For certification purposes, one needs to calculate the average amount of carbon that is sequestered over the project period.

Commercial forest products suffer considerably from cash flow problems, because often the land has been bought, which brings with it substantial management costs, thereby increasing the capital outlay at the start. The first income only arrives with the first thinning after about 15 years, and by far the largest revenues will take between 30 and 100 years to materialise when the first mature trees can be harvested, depending on climate soil and tree species. In developing countries, that tends to be less stable from a political and social economic point of view, and it is a major challenge raising the kind of 'patient capital' needed for 30-year projects. Carbon credits can play an important role in this process because they can generate income long before the first timber sales take place, particularly through ex-ante credits.

Within the context of carbon credits what is generally called agro-forestry also falls under afforestation. This is the introduction of trees to agricultural land that will grow in between crops, or a plantation of tree crops such as cashew nut trees. Obviously, in this case one needs to prove that the tree crops alone are not profitable enough to pay for the planting in order to comply with the additionality principle.

### Reforestation

Reforestation describes the planting of trees on land that was once forest, or is currently a degraded forest as a result of charcoal harvesting or commercial logging. Though the term is different, reforestation is generally treated in the same way as afforestation, which is why they tend to be mentioned together. In the trade literature you will regularly come across references to 'A/R' or 'AR' projects.

### Reducing Emissions from Deforestation and Forest Degradation (REDD)

Reducing Emissions from Deforestation and Forest Degradation (REDD) is a relatively new concept in carbon credits and has only recently gained acceptance in the voluntary markets. REDD differs from other project types - it is a strategy for motivating communities, companies and governments not to cut down forests. In other words, by not cutting down forests, these parties can earn carbon credits. The term 'REDD+' is also sometimes used to describe REDD projects that include the role of conservation, sustainable management of forests or enhancement of forest carbon stocks (<http://www.un-redd.org/AboutREDD/tabid/582/Default.aspx>).

REDD has seen its fair share of controversy. Some people argue that carbon credits should not be issued for doing essentially nothing, i.e. not cutting down trees. Others have argued that not cutting down trees is doing something, i.e. forestry protection and conservation. One key question is how does one prove that the forest would indeed have been cut down without intervention? And another key question is how does one show that leakage will not occur as a result of the intervention, i.e. that conserving one particular forest does not cause another forest to be destroyed, thereby resulting in no net emissions reductions?

As a result of the above, the Kyoto mechanisms do not currently accept REDD offset credits. However, many countries have come to agree that a future successor to the Kyoto protocol must create meaningful incentives to remunerate forest nations for the valuable climate services they provide to the world (Parker, Mitchell, Trivedi, Mardas 2008). The Copenhagen Accord recognizes “the crucial role of reducing emission from deforestation and forest degradation and the need to enhance removals of greenhouse gas emission by forests”, and the need to establish a mechanism to enable the mobilization of financial resources from developed countries to help achieve this (Copenhagen Accord 2009). This gives some cause for optimism that REDD will be included in the compliance market in the future.

Meanwhile the voluntary market, a driver of innovations, has begun to accept REDD projects and has developed methodologies that REDD projects must follow if they are to be certified. One popular standard, VCS, approved various methodologies for REDD projects in 2010. This helped to alleviate buyers’ perceptions of forestry’s reputational and investment risks. The prospect of emerging protocols prompted voluntary buyers to inject investments valued in this survey at \$76 million into REDD projects through forward sales. The number of REDD projects has jumped markedly to 29% of all credits transacted in the voluntary market (Hamilton et al. 2011, p.16).

### Land use change

In theory, one can also claim carbon storage through different use of the terrain, particularly different agricultural practises, though in reality this is fairly difficult. If agricultural practises are changed, for example by leaving more vegetation on the land or changing methods of land preparation, then more carbon will remain stored in the soil. And if less chemical fertilisers and pesticides are used, this can have a huge impact on carbon emissions.. What may be confusing is that the term land use change is used both to specifically address a difference in agricultural practises as well as to address the whole range of activities arising from afforestation, agro-forestry, reforestation, avoided deforestation, right through to a change in agricultural practices.

## 9.2 Forestry and the CDM

Within the CDM mechanism, carbon credits generated from forestry fall under the banner of afforestation/reforestation (A/R)<sup>13</sup>. This includes agro-forestry but excludes avoided deforestation (REDD), which as yet does not qualify under CDM rules. Forestry projects are handled somewhat differently within CDM than other projects, because of concerns regarding the permanence of CO<sub>2</sub> reductions.

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<sup>13</sup> The IPCC defines afforestation/ reforestation as the direct human induced conversion of non-forested land to forested land through planting seeding and/or the human induced promotion of natural seed sources.

Forestry projects help to mitigate climate change as long as they absorb CO<sub>2</sub> and sequester this in the vegetation and soil in the form of carbon. However, a major issue is that forest sinks are potentially reversible. Trees can be cut down, burned, or otherwise perish, which causes the carbon to be released back into the atmosphere and reverses the climate benefit. To address this issue of non-permanence, specific rules have been developed to deal with forestry under the CDM mechanism.

The CDM rules stipulate that permanent CERs cannot be issued to A/R projects. Instead, CERs of a temporary nature can be issued to A/R projects, of which there are two kinds: 'temporary Certified Emission Reductions' (tCERs) and 'long-term Certified Emission Reductions' (ICERs). Each has a different duration of validity, and these credits have to be replaced upon expiry.

The most common type of temporary CERs, tCERs, expire every five years. This means that every five years these emission reductions need to be re-verified against the original baseline. Upon re-verification, new temporary credits are issued for five more years, and these tCERs can then be re-sold. The emitter who purchased the original (and now expired) tCERs also has to re-purchase the tCERs every five years, or replace these with full CERs (from a different project type). This process may be continued as long as the project's crediting period remains valid. The crediting period must be chosen at the start of the project. For forestry this may be either a 20-year crediting period, which is renewable twice, or a single 30-year crediting period (<http://www.cdmrulebook.org/715>). The difference between tCERs and ICERs is that ICERs expire at the end of their crediting period, not every five years (<http://www.cdmrulebook.org/332>)<sup>14</sup>.

Unfortunately, demand appears weak for tCERs, for which there are a number of possible explanations. It is very difficult to find out how tCERs really work and thus to be able to make the kind of calculation shown above. Few people in the industry seem to really understand what tCERs are, and there is a lack of literature that clearly explains the process. Furthermore, there is the issue of the increased financial burden of having to keep track of exactly when credits expire. In addition, most buyers expect carbon prices to rise in the future, which makes postponement through tCER purchases less attractive (UNEP 2008, p.5). Finally, the EU ETS, the world's largest emissions trading scheme, does not accept tCERs and ICERs for the period up to 2012, and at present they remain excluded for the 2013-2020 period. The EU regards the issue of permanence as too large a liability in a company-based trading system<sup>15</sup>. As a result of low demand, trading has been very low in tCERs and ICERs. The one major buyer of note to date has been the World Bank (Box 24).

The supply of tCERs and ICERs is also limited: of the nearly 7000 projects in the CDM pipeline, only 62 were A/R projects<sup>16</sup>. This low number can be partly attributed to the fact that the rules for A/R projects under the CDM are complex and were only finalised in 2006. Furthermore, new methodologies for accounting for emission reductions need to be developed on a regular basis, thereby adding additional cost and delays to an already expensive and time-consuming approval

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<sup>14</sup> By estimating the future price we can take into account that the price of the CER has changed by the time we need to replace the temporary CER. If the price goes up, postponing the purchase will cost more. By assuming the present value of that future expense, we must ensure that over the coming years we do not have a large amount of money locked up in the CER we bought, so that it can be used for other investments where it can create a return.

<sup>15</sup> For discussion, see <http://www.carbonpositive.net/viewarticle.aspx?articleID=1266>

<sup>16</sup> For the latest figures see <http://cdmpipeline.org/cdm-projects-type.htm>

### Box 23: Understanding Temporary Credits: Calculating the Theoretical Price of a tCER

If one purchases a temporary credit, whether a tCER or ICER, one effectively buys the right to postpone the purchase of a permanent credit, a 'real' CER. In order to find out when it makes sense to buy a temporary CER, we need to compare the costs of two scenarios for the buyer:

- 1 Buying a CER today
- 2 Buying a temporary CER today and a CER in the future to replace it

The cost of scenario 1 is the current price of a CER. The cost of scenario 2 is the price of the temporary CER now plus the present value of the expected price of a CER in the future. If we take the case of a tCER that is valid for 5 years, it makes sense to buy a tCER as long as the price of that tCER plus the present value of the expected price of a CER over five years when it expires is lower than the price of a CER today.<sup>1</sup>

If we take  $pCER_t$ ,  $ptCER_t$  and  $EPCER_t$  as the variables for, respectively, the price of a CER, a tCER and the expected price of a CER at time  $t$ , and use  $EPCER_t / (1+i)^n$  to calculate the present value, with the cost of capital as  $i$  and  $n$  as the number of years until the tCER needs to be replaced, it makes sense to buy a tCER as long as:

$PtCER_0 + \frac{EPCER_5}{(1+i)^n} < PCER_0$ ; Re-arranging the formula gives us:

$$PtCER_0 < PCER_0 - \frac{EPCER_5}{(1+i)^n}$$

If we take €10 as the current price of a CER and we expect this to be €11.00 in five years time, and our cost of capital is 10%, then the value of  $PCER_0 - EPCER_5 / (1+i)^n$  is  $10 - 6.83 = 3.17$ . In other words, we would only buy a tCER now if the price is lower than €3.17.

<sup>1</sup> By estimating the future price we can take into account that the price of the CER will have changed by the time we need to replace the temporary CER. If the price goes up, postponing the purchase will cost more. By assuming the present value of that future expense, we must ensure that over the coming years we do not have a large amount of money locked up in the CER we bought, so that it can be used for other investments where it can create a return.

process. Finally, the limited demand for tCERs and ICERs seems to push forestry projects towards the voluntary market, where there is more demand.

It is also important to note that to the best of our knowledge no tCERs have yet been issued through the CDM. tCERs that have been traded to date have been traded through forward purchase agreements. The reason why no tCERs have actually been issued is that producers are waiting as long as possible before the end of the first Kyoto period in 2012 to have their projects verified. This is to allow their trees to grow as much as possible and yield the largest number of carbon credits possible. This is important for producers because tCERs can only be verified once every five years, and only once every commitment period. It is expected that nearly all producers of tCERs will wait to seek verification of their credits until the end of the present Kyoto period.

Low demand and the temporary nature of temporary credits mean that prices are considerably lower than those for full CERs: Various reports have cited the World Bank as paying between US\$3-\$4 per tCER, whereas some brokers have suggested to us a tCER price of between \$0.50 and \$5. This may not look so low compared to prices of between \$7 and \$12 for regular CERs over the past two years, but the biggest issue is that in the absence of real trade prices cannot be stated with any real degree of certainty.

For a generator of carbon credits, these lower prices are not necessarily unattractive. Upon expiry and subsequent re-verification, tCERs can be resold every five years up until the end of the project's crediting period<sup>17</sup>. In other words, you can sell the same emission reduction six times! If, for example, a project produces tCERs and can sell them every 5 years over a 30-year crediting period for \$3, the present value today at a discount rate of 10% is \$7.63. However, the administrative costs associated with verification and reselling will need to be deducted from this. Furthermore, from a cash flow perspective tCERs are less attractive because new businesses and projects are usually in greatest need of revenue in the early stages of a project.

In conclusion, the combination of low demand and supply for expiring ICERs and tCERs makes them too uncertain to base a business model on, in our opinion. Furthermore, the signal from EU ETS that it will not accept tCERs post-2012 and the fact that a successor to the Kyoto Protocol is yet to be agreed, mean that uncertainties remain about what will happen following the expiry of the Kyoto Protocol's first commitment period in 2012. If this situation persists, then there is a risk that no further carbon revenues can be expected through the CDM with regard to forestry (Neef and Henders 2007, p.10), however unlikely this may seem. At the time of writing in 2011, it may well be already too late for new forestry projects to get started, complete the CDM process and have credits issued before the 2012 deadline.

However, as we will discuss in the next chapter, CDM credits may be sold on the voluntary market. Also, many of the voluntary standards are largely based on CDM and accept CDM methodologies. This means that it may be worthwhile preparing for CDM certification if one expects that in the post- 2012 situation the EUETS will accept tCERs and ICERs, knowing that the project can always switch over to a voluntary market standard if needs be.

#### **Box 24: Who is purchasing tCERs? The World Bank BioCarbon fund**

The World Bank, through its BioCarbon fund, is one of the few large-scale buyers of CDM forestry credits at present. Recently, the Bank signed the first significant purchasing agreement for CDM forestry credits from Africa. The Humbo Assisted Natural Regeneration Project in Ethiopia involves the restoration and replanting of indigenous tree species on 2,728 hectares of degraded mountain forest area that has been stripped for fuel wood in south-western Ethiopia. The signed purchasing agreement acts as a forward contract between the parties involved. Typically, a purchasing agreement contains clause that promises to purchase a certain volume

<sup>17</sup> For both types of expiring CERs, there is the choice of crediting periods during which tCERs and ICERs can be certified. One option is a single crediting period with a non-renewable baseline of a maximum of 30 years, the other option is a baseline of a maximum of 20 years, which can then be revised and renewed up to two times.

of offset credits at a certain price, if and when these are issued following a verification event. Under the CDM, forestry credits are issued in the form of temporary CERs (tCERs). The World Bank does not disclose the prices it pays for credits. However, various sources reported the price per credit as being between US\$3-4.

The BioCarbon Fund purchases emission reductions from various project types (including tCERs) on behalf of its Fund Participants on a pro-rata basis according to their percentage participation in the fund. One of the tranches of the BioCarbon Fund is also responsible for purchasing replacement tCERs on behalf of fund participants when they expire.

The BioCarbon fund maintains that there is a demand for tCERs, even though others we interviewed wondered whether the BioCarbon fund actually creates demand by including tCERs in participant's portfolios. To be sure, tCERs have value to fund participants. Sovereign countries may use tCERs to help meet their commitments under the Kyoto Protocol. Japanese private companies will be able to use tCERs for their domestic commitments. Various companies participate in the fund voluntarily, and can sell the credits later in the secondary market. Non-profit organizations that wish to support market-based mechanisms for climate change mitigation in the forestry and land use sector also participate voluntarily, and they may choose to use the credits for their own corporate social responsibility purposes.

Nevertheless, outside of the BioCarbon fund, demand for tCERs appears to be generally weak. One reason for this is that as of mid-2011 there have been no tCERs traded. It is expected that tCERs will begin to be issued following verification events closer to 2012. Waiting until near 2012 gives trees more time to grow, sequester carbon, and produce a large number of credits before the end of the first Kyoto commitment period in 2012.

However, another reason that demand has been weak – as evidenced by the relatively small number of forestry projects in the CDM pipeline – is the expiring nature of tCERs. Many buyers do not understand tCERs that well and would rather purchase a real, permanent offset credit that will not expire. The BioCarbon fund acknowledged to us the general lack of demand for tCERs in the market. However, they did add that it is hard to believe that with the strong co-benefits associated with forestry projects (regarding rural livelihoods, environment, adaptation and mitigation), these projects will continue to experience weak market demand in the future.

We agree that the co-benefits of forestry should stimulate future demand. However, we foresee that demand for tCERs will stay weak in the immediate future due to their expiring nature. They are difficult to understand and require ongoing management as they expire, adding an unknown risk factor to the emitter who must re-purchase these credits every five years. The fact that the EU ETS does not accept tCERs supports and informs our view. Another interview respondent went so far as to say that the “CDM market for forestry credits (tCERs) has failed”, adding that his company only went the CDM road initially because the voluntary market was undeveloped in the early mid-2000s. The buffer system used by a number of standards in the voluntary market is emerging as a credible alternative method for ensuring that forestry offset credits reliably account for risks of (im) permanence.



### 9.3 Carbon sequestration and the voluntary market

Due to the challenges that forestry projects face on the compliance market, many have turned their attention to the voluntary carbon market, which is much more accommodating. The majority of the certification standards on the voluntary market accept forestry projects and provide regular permanent credits that are comparable with those for solar energy, for example. Certification is also made easier because now there are even standards specialised in forestry (CarbonFix and VCS AFOLU). Unfortunately, Gold Standard, the verification standard that seems to fetch the highest average prices, does not allow forestry projects. The certification costs in the voluntary market tend to be lower and the process quicker, which is an important advantage because forestry projects tend to be smaller and have less access to finance. Finally, a good project story, something that most forestry projects tend to have, is worth extra money on the voluntary market.

An important difference, and advantage, between the CDM and the voluntary market regarding forestry is that the voluntary standards can provide permanent credits. This is because standards on the voluntary market use an innovative buffer system to deal with the risk of non-permanence, as opposed to the CDM mechanism that provides temporary credits. In a buffer system, when credits are issued to the producer, a certain percentage is retained by the certification standard in a buffer account. If there is a loss in carbon stocks, through a forest fire for example, credits are taken out of this buffer to compensate for the loss. In the extreme case that there are not enough credits in the projects buffer account, then credits can be used from buffers in other projects (though this has never happened in practice because buffers are quite conservative). In this way, the buyer does not need to worry about the issue of permanence with regard to his or her forestry credits.

The advantage of the buffer system compared to the tCER and ICER systems is that a forestry credit is a full, normal credit that can be sold for the regular price. More importantly, it is simple to understand for buyers, and thus easier to sell. As a result, there is an actual trade in forestry credits in the voluntary market, with multiple buyers and sellers.

The disadvantage of the buffer system is the very high cost of this type of insurance for the producer of carbon credits. For example, with CarbonFix 30% of all credits need to be put in a buffer, effectively reducing the benefits to only 70% of the credits produced. This can be reduced to 20% if the producer organises some sort of project insurance, but the chances of finding an insurer that is willing to insure a forestry project in Africa for that amount are slim, to say the least.

An important advantage of the voluntary market over the compliance market is that it offers more opportunities for selling credits before the actual emission reductions have taken place. There are two standards, Plan Vivo and CarbonFix, that enable ex-ante credits, and prepaid purchase agreements are also common<sup>19</sup>. Both methods are excellent in terms of cash flow for the business as they provide cash income at the start of the project when trees need to be planted.

Unfortunately, there is also a downside: because of higher risk, many buyers are only willing to pay 50% to 60% of the price of a regular (ex-post) carbon credit if they pay cash-up-front for a credit that is yet to be produced. In this case, the producer needs to decide whether it is better to sell 'cash-up front' or ex-post. This decision ultimately depends on the alternatives a business has

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<sup>19</sup> See chapter 10 for an explanation of these terms

### Box 25: The buffer cost with VCS and CarbonFix for Mali Biocarburant

The cost of the buffer system to Mali Biocarburant (MBSA) became clear when we started doing the calculations. MBSA planned to plant 8 million trees in 2010 and assumed that 80% of these trees would survive the first year and each tree would sequester up to 2.5kg of CO<sub>2</sub>. KIT estimated a total production of 16000 carbon credits in 2011. At an estimated price of €5.00 per carbon credit, the maximum potential income was thought to be €80,000 EUR.<sup>18</sup>

If MBSA decides to certify with the CarbonFix standard, it would have to withhold 30% of its credits in a buffer (10% as a project specific buffer and 20% a common buffer shared with other projects). This means that the income would be reduced by 30% to €56,000. In other words, the insurance cost would be €24,000. Effectively, this would reduce the sales price per credit to €3.50 per tonne.

With the Voluntary Carbon Standard (VCS) the calculation is less straightforward. VCS demands a buffer of between 10% and 60%. Based on our short description of the project, VCS estimated the actual buffer requirement to be 40% during the first year. This would mean that only 9600 credits could be sold, generating revenue of €48,000. This buffer requirement can be reduced every five years, hence what is planted in 2015 may only be subject to a 30% buffer requirement. If there are no major losses of trees during the project, then every 5 years 15% of the 6400 credits in this batch that remain in the buffer will be released for sale. Table 7 contains an example of the calculation.

**Table 7: Buffer credits released over time**

Years	0	5	10	15	20	25	30
% of credit in buffer	40,00	34,00	28,90	24,57	20,88	17,75	15,09
Credits free for sale	9600	960	816	694	590	501	426
Credits in buffer	6400	5440	4624	3930	3341	2840	2414
cashflow	€ 48.000	€ 4.800	€ 4.080	€ 3.468	€ 2.948	€ 2.506	€ 2.130
Net present value	€ 54.288						

As one can see in table 7, 960 credits will be released in 2015 from the buffer and can then be sold. In 2020, a further 15% of the buffer that contains 4624 credits at that point will be released. Therefore, it looks like MBSA will get their credits back eventually. But in the meantime, MBSA loses money because part of its assets (the credits) is locked up in a buffer where it does not generate any interest, used to generate profit or pay off bank loans. And these losses are considerable because it will take 65 years before more than 95% of the credits from this batch will have been released. Even if we use we assume all credits can be sold directly at €5.00 and a modest cost of capital of 10%, today's value of these credits in the buffer is only a little more than €6288. Any credits released later than 30 years from now contribute only marginal to this number, and as such seem irrelevant. This means that the economic value of our credits today is only €49.924. The effective sales price is only €3,39 per ton.

Based on this calculation the buffer cost for MBSA seems lower with CarbonFix than with VCS, and thus (all other things being equal) it seems more profitable to certify with CarbonFix. In addition Carbon Fix provides full ex-ante credits.

for financing its tree planting. If there is enough equity in the business, sources of income from other business activities or if one can obtain grants that will cover the cost of planting, then one is better off selling ex-post. If this is not the case, a bank loan or pre-financing via a project developer may be the only alternatives. Each of these finance mechanisms comes at a cost: ex-ante credits fetch a lower sales price, bank loans require interest payments, and project developers often demand a large chunk of the credits produced and may want to sell the remaining credits at a price below the market value. The best way to compare the different options is to calculate their net present value.

Unfortunately, there are not many banks that offer affordable loans for forestry projects in developing countries, as these tend to be regarded as high-risk projects. And finding a project developer that offers value for money is also not easy. Therefore, chances are cash-up-front credits, either through ex-ante credits or a prepaid forward purchase agreement, are the only way to solve the cash flow problem of the business.

Though the voluntary market seems more suitable for forestry projects, certification is not necessarily much easier in these markets. The number of certified projects is still relatively small, while most forestry projects tend to be very different in terms of land ownership, tree species, climate, forest maintenance and governance etc. Therefore, the chance that consultants and certification agencies will have experience with the certification of your type of project, and will have data and calculation models on the shelf to estimate carbon sequestration is fairly small. What does help is that in the case of CarbonFix and VCS AFOLU there are at least 2 standards that were specifically set up with forestry in mind, and thus should be easier to apply. Unfortunately, at the time of writing there were only nine projects certified or at least well under way to certification with CarbonFix, out of which only a few have actually started selling credits. VCS registered its first and, to date, only AFOLU project in 2010<sup>20</sup>. While there are more projects in the pipeline, the market is still maturing and experience with these standards is still in its infancy.

As regards prices, the Forest Carbon Offsetting Report 2010 cites typical prices as being in the \$5-\$10 range. The actual price will depend not only on the certification chosen but also on the project story, the marketing strategy, and the sales moment. One needs to keep in mind though that around 30% to 40% of the credits remain in buffer, thus lowering the effective price to a range of \$3-\$7. Projects certified with CarbonFix tend to fetch higher prices of roughly \$10- \$12, even for ex-ante credits (taking into account a 30% reduction because of the buffer requirement) but this estimate is based on only a few projects with good stories selling a small amount of credits directly to end-clients, which makes it premature to conclude that CarbonFix will offer better prices than other standards.

## 9.4 Conclusion: how and where to sell forestry projects?

Because of the lack of real demand for tCERs and ICERs on the compliance market, the voluntary market seems the best option for forestry credits at the moment. One could still try to sell a tCER on the voluntary market; but because it is so complicated to explain to clients what a tCER really is and how it works, it is doubtful whether this would work. Another compelling argument for the voluntary market is that the sale of cash-up-front credits is much easier on the voluntary market.

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<sup>20</sup> See <https://vcsprojectdatabase1.apx.com/myModule/rpt/myrpt.asp>

### Box 26: Cash up front credits as a finance mechanism for Mali Biocarburant (MBSA)

In order to choose the best finance mechanism for a new carbon credits project, one needs to compare the cost of cash up front sales. This can be done either through a prepaid forward purchase agreement or ex-ante credits, or with alternative sources of finance.

If we assume that MBSA will plant 3,5 million *Jatropha* trees in 2011, with a survival rate of 40% after 10 years, and that each tree will absorb 2.5kg of CO<sub>2</sub> per year, this means that each year a total of 3,500 tonnes of CO<sub>2</sub> will be absorbed. If we further assume that MBSA would go for a VCS AFOLU certification, it then has the choice to sell through a prepaid forward purchase agreement or ex-post. If MBSA decided to sell everything ex-post, it could then sell 3,500 tonnes per year from 2012 until 2016 at a price of €5.50<sup>1</sup>. This means an annual income of €19,250 for five years, or €96,250 in total over those five years.

Alternatively, MBSA may choose to sell ex-ante (through a pre-paid forward purchase contract). It is common for ex-ante credits to be sold in 5 or 10-year packages; in other words, MBSA would sell the credits for the CO<sub>2</sub> absorbed by the trees over the next five years. This would be 17,500 tonnes (5x3500) at a lower price of €3.25 that reflects the discount many buyers require in exchange for the higher risk they incur. This would give it a total income of €56,875 now.

So which option is more attractive? If we sell ex-post, we maximise the revenues, because over a five-year period we would receive €96,250 versus €56,875 for ex-ante. Even if we take the cost of capital into account (which is good practice with investment decisions) i.e. 10% per annum, then selling ex-post still yields higher revenues. The present value of sales over the next five years would be €72,972. In fact, as long as the capital costs are below 20,5% per annum, ex-post selling is more profitable.

Unfortunately, we can only afford to sell ex-post if we do not need the €56,875 we could get today from ex-ante sales, or if we can borrow the money from the bank. Now let's assume we can borrow this amount from the bank at a modest 10% interest per annum, to be paid ahead on the 1st of January, and we use the income of vintage sales every year minus the interest to pay off the loan. As it turns out, the net present value of this option is actually much lower: €50,535. The combination of ex-post sales and a bank loan is only a lucrative option if a loan can be obtained at an interest rate of 5% or less. Unfortunately, the chances of this happening with a commercial bank are very slim, particularly for projects in developing countries. Only with NGOs and development banks are such favourable conditions possible.

Another option would be to find a project developer that is willing to pre-finance the project. In the case of MBSA, project developers typically demanded 30% to 50% of the credits over a number of years as a payment in kind for their services, as well as the right to buy all vintage credits over the next 5-10 years at substantially lower prices than the market rate; in fact they were almost at ex-ante prices. If these project developers would have been able to offer serious support in terms of certification and sales based on real experience and an existing client base, it could have been an option. This was not the case however.

In conclusion, if you are a carbon credit producer that needs large investments up front and it is going to take many years before revenues start flowing, then selling ex-ante may be the only way to finance your business in the early stages. Unless you are one of the rare organisations that has access to a lot of equity capital, grants or low interest loans.

<sup>1</sup> This price estimate comes from box 16

The biggest challenge within the voluntary market is which standard to choose. VCS has a large market share and is widely accepted, while CarbonFix and Plan Vivo are very small, which increases the risk that they will disappear off the scene leaving your project with an obsolete standard. On the other hand, CarbonFix and plan Vivo are set up specifically for forestry projects and as such have more experience in that domain than VCS who only recently came out with a special standard called VCS AFOLU. CarbonFix and Plan Vivo also allow for issuance of ex-ante credits, whereas VCS AFOLU does not and leaves you having to construct a more complicated prepaid forward purchase agreement. Such a construction may be seen as more risky by buyers and thus may result in lower prices. Some experiences also point to the fact that VCS AFOLU is likely to assign a higher buffer of 40% to new projects compared to the standard buffer of 30% applied by CarbonFix and 20% by Plan Vivo, though this obviously depends on the risk assessment by VCS of your particular project. Though few projects sell credits and sales prices may be influenced by retail sales, there are strong evidence that sale prices for CarbonFix credits are higher than those for VCS. Finally, Plan Vivo is likely to have the lowest certification cost, followed by CarbonFix, leaving VCS AFOLU as the most expensive. Unfortunately, Plan Vivo only certifies community-based forestry projects, which excludes many other types of forestry projects.

In the end, the question as to which certification is best for your projects really depends on the specific characteristics of the project itself.

**Further Reading:**

Diaz, D., Hamilton, K., Johnson, E. (2011). State of Forest Carbon Markets 2011, From Canopy to Currency. Ecosystem Marketplace/Forest Trends. [http://www.forest-trends.org/publication\\_details.php?publicationID=2963](http://www.forest-trends.org/publication_details.php?publicationID=2963)

CDM rulebook <http://www.cdmrulebook.org/534>

The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD) in Developing Countries <http://www.un-redd.org/>

### Box 27: Case study Green Resources – Forestry under the VCS

In mid-2009, the Norwegian company Green Resources became the first carbon offset project developer to be registered and verified under the Voluntary Carbon Standard (VCS) according to its agriculture, forestry and land use (AFOLU) guidelines that were finalized in 2007. This was a significant milestone as the project offered an opportunity to test the market's acceptance of forestry credits using a 'buffer' approach to address issues of forestry permanence, in contrast to the 'temporary credits' approach used by the CDM. In the buffer approach, the credits are issued as permanent credits, but a certain percentage is held back in a buffer to be drawn on in the case of unexpected loss of trees.

The project covers two locations in the Southern Highlands of Tanzania (Uchindile and Mapanda). The project actually began prior to 2000 and was thus deemed ineligible for the CDM route, which forced it to turn to the voluntary market. This was because the CDM only accepts projects that started after 2000. At the time, the lack of credible certification standards on the voluntary market hampered Green Resources' efforts to sell their offset credits. As the voluntary market matured and standards developed, Green Resources chose to work with the VCS standard because it was the most widely-used standard in the voluntary market and was widely accepted by buyers and brokers. Another reason was that the VCS is included in the ICROA Code of Best Practice (see <http://www.icroa.org>). ICROA is a not-for-profit alliance of leading carbon reduction and offset providers. Green Resources also attained co-accreditation with the Forest Stewardship Council's (FSC) standard for sustainable forest management and the CCB standard, which ensures that projects also support sustainable development and promote biodiversity.

The VCS carried out a risk assessment of the project and applied a buffer of 40% on the credits issued. In the future, 15% of the buffer credits will be released to the project for sale every 5 years. Green Resources agreed to sell their credits prior to issuance to the Carbon Neutral Company (see <http://www.carbonneutral.com/>) by signing up to an Emissions Reduction Purchasing Agreement (ERPA) that set out the terms of payment upon delivery of credits. The Carbon Neutral company are retailers who sell these credits on to their client base.

In the past Green Services has generally sought certification under the CDM for all projects other than forestry. However, the successful certification of the Uchindile & Mapanda project under the VCS, coupled with uncertainty around a post-Kyoto agreement and the lack of market acceptance for tCERs under the CDM, mean that Green Services may turn again to the voluntary market in the future. At present, Green Services are still looking to certify under the CDM as a first-choice option. Many voluntary market standards, including the VCS, accept projects that have already started out along the CDM track. Green Services therefore have the option of switching a CDM project over to the VCS in the future (so long as credits have not previously been issued under another standard). Green services say they would make such decisions "based on prevailing market conditions", such as demand and expected price.

See project documents:

<https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=142>





Jatropha farmer field school (Photo: Trees for Travel)



# 10 A comparison of certification standards

## 10.1 How to choose a standard: steps to take and decision criteria

All producers of carbon credits are sooner or later confronted with the question of whether to certify and which standard to choose. For the compliance market CDM certification is compulsory, while 93 percent of credits sold in 2009 to voluntary buyers was certified using third-party standards (Hamilton 2010, p.57). The reason is that certified credits tend to attract higher prices and are much easier to sell because they give more certainty to the buyer that they have really led to the reductions claimed by the seller. Producers of carbon credits would be well advised, therefore, to have their project certified.

Over the past five years or so, about 18 third-party standards have emerged in the voluntary marketplace (Hamilton 2010 vii), each with a different focus and appeal to buyers and producers, as well as different eligibility criteria and certification procedures. In theory, any business, NGO, or other such organisation can develop a standard. Most standards are largely based on the Kyoto CDM and JI mechanisms in the compliance market.

The first decision you have to make when choosing a standard is whether one needs to certify at all. If your project is very small, certification may not be an option, because you cannot earn back the costs of the initial application and the regular audits over the course of the following years. It is therefore important to have an estimate of the amount of carbon credits you will be producing before looking into certification. You may also be in the fortunate position of having long-term contracts with clients who do not require certification. However, for most future producers of carbon credits, certification will be essential.

The second step is to analyse whether you can qualify for CDM certification. CDM is the most widely-used standard because it is the only one that provides access to the compliance market, which is by far the largest market. CDM credits can also be sold on the voluntary market. The prices that CERs yield are also among the highest of any project-based carbon credit. On the other hand, CDM is one of the most rigorous standards, and therefore certification is difficult and very costly. Nevertheless, if you can certify through CDM, the efforts are well worth it, provided you produce enough credits. Moreover, when you start the process of CDM certification you always have the option of switching to another voluntary standard later, because they are all based on CDM.

The best way to do a quick assessment is to go to the CDM website and find out if there is an approved methodology for a project similar to yours. If so, your chances of certification are greatly improved and the cost reduced, because you do not have to go and develop a new measurement methodology, as long as you follow the guidelines in the approved methodology. If not, you will

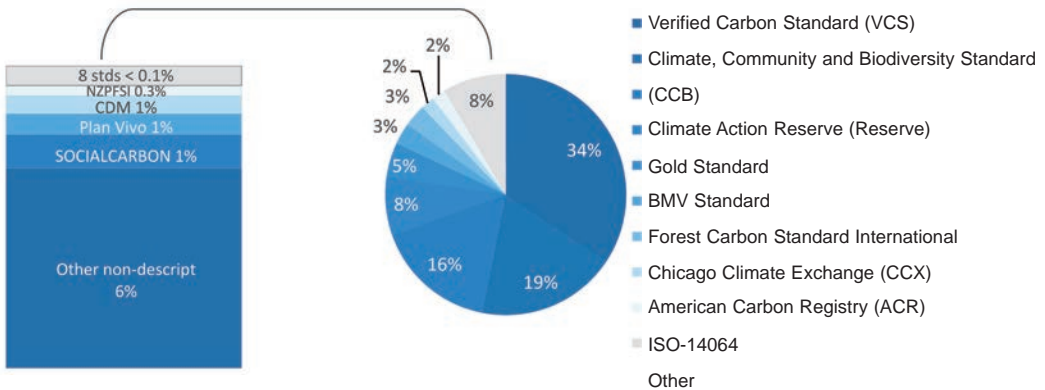
need to have a close look at the guidelines and probably consult with an expert to see what the chances and costs are for CDM certification. But even if there is a methodology that seems similar, it may still be wise to double-check with an expert to ensure that this methodology is in fact applicable to your project.

If you cannot qualify for CDM or if the costs in relation to your sales volumes are too high, then the voluntary market is an option. The question then becomes which of the approximately 18 standards should you choose. We suggest ten criteria that one should take into account:

- 1 **Compatibility with your project:** Many standards exclude certain projects, while others may not exclude them but are not usually used for these kinds of projects. Standards may also be specialised in your type of project.
- 2 **Certification type:** Standards were originally developed for the certification of the emission reduction. However, in the voluntary market, other environmental aspects, such as biodiversity, and social aspects, such as the effects a project has on location communities, are also important for many buyers. Some standards certify both the emission reduction and social and environmental co-benefits, while others focus either on carbon accounting or on the co-benefits. The latter can be used by producers as an add-on to an emission reduction standard for producers active in the voluntary market who want to demonstrate the integrity of their activities. Dual certification can result in a price premium.
- 3 **Chances of a successful application:** When comparing the different standards for your own project, you need to do a quick assessment of the likelihood, per standard, of your project being certified. Furthermore, you need to look at an alternative scenario: what will you do if your application is unsuccessful, and what are the consequences. For example, if a quick assessment by a specialist indicates that there is a fifty-fifty chance your project will qualify for CDM but that VCS is a much more certain option, then you need to decide whether or not to risk spending tens of thousands of euros and twelve months on CDM certification that carries a real risk of failure. If it should fail you would still be able to reuse most of your efforts to obtain VCS certification, but you would probably lose a whole year, as well as the money spent on the first audit for CDM. The crucial question is whether you can afford to lose this money and wait an additional year with the sales of credits? If not, then VCS is probably the better option.
- 4 **Expected sales price:** different standards have different levels of credibility and popularity, which influences the price
- 5 **Certification cost:** Though certification is always expensive, some standards are more expensive than others. Chapter 10.2 will go into greater detail on the cost of certification of a number of standards.
- 6 **Ability to sell ex-ante credits or enter into an ERPA:** the option of selling credits ex-ante can be extremely important in terms of the cash flow, and thus the viability, of a new project. Although few standards issue ex-ante credits, it is usually possible to enter into emission reduction purchasing agreements (ERPAs) with buyers. These forward purchasing agreements sometimes include pre-financing. More commonly, these agreements can be used to raise credit from financial institutions.

- 7 **Eligibility of pre-registration credits:** Many projects are already operational before they become certified, and thus have already produced credits. CDM does not allow those credits to be verified and sold (with the exception of forestry projects), which results in loss of income. However, many voluntary standards do; for example Gold Standard and VCS allow the verification and sales of emission reductions up to two years before the actual certification date of the project. This is often referred to as retro-active crediting. It depends on the specific standard how many years you are allowed to go back in time, but usually you must show that carbon credits were part of your business model from the beginning, to satisfy the ‘additionality’ principle.
- 8 **Time needed for certification:** Time is money, and until one is certified it is difficult to sell credits. Unfortunately, it is difficult to compare the different standards on this criterion, because they mostly depend on the same third-party auditors, and it is often at that level where major waiting times are most prevalent. Sometimes auditors lose their accreditation or a standard becomes more popular and this may lead to a backlog of applications, which may increase the waiting time drastically. Another major influencing factor is whether there are similar projects that have already been certified.
- 9 **Market share:** The percentage of credits sold that uses this particular standard is an important indicator of the level of acceptance of the standards amongst buyers and intermediaries. Market share is also an indication of the likelihood of any given standard being able to survive. Figure 12 shows the market share for standards on the voluntary market.

**Figure 12: Market share of the different standards in the voluntary market**



Source: Hamilton et al. 2011, p.vii

- 10 **Likelihood of survival:** In the new and rapidly changing voluntary carbon market, chances are that not all standards will survive. It is important to choose a standard that will still exist and be recognised in the marketplace in ten to twenty years time. The current market share, as well as the development in the number of certified projects since the start of the standard, provides a rough indication of whether a standard is likely to survive or slowly perish.

### Box 28: Ten criteria for selecting a standard

- 1 Compatibility with your project
- 2 Type of certification (carbon, social and environmental, or both)
- 3 Chances of a successful application
- 4 Expected sales price
- 5 Certification cost
- 6 Ex-ante sales
- 7 Eligibility of pre-registration credits
- 8 Time needed for certification
- 9 Market share of the standard
- 10 Likelihood of the standard surviving

## 10.2 The cost of certification

The cost of certification is an important factor when choosing a standard, so we will take a closer look at the cost of a number of well-known standards. One has to keep in mind that these are rough estimates, based on a variety of interviews and reports that often differ widely in their estimates. The actual cost you will incur will depend largely on how complex your project is, to what extent you can take advantage of work done by similar projects, and how much outside help you need to bring in during the process.

Despite the different cost estimates that different people gave for the same standards, they do seem to agree on which standards are more expensive than others. The general rule of thumb is that the more rigorous the standard, the higher the cost of certification, the longer certification takes, and the higher the price premium for every credit sold. Gold Standard and CDM certification are regarded as the most expensive, followed by other rigorous voluntary standards such as VCS and CarbonFix.

Provided your project potentially qualifies for different standards, choosing one is a trade-off between time, cost and potential revenues. Ultimately, your production volume (the amount of credits you will produce) will determine whether you can earn back the higher certification cost of a more rigorous standard. Another important factor is whether you actually have the financial capital to wait before you can sell your credits; if you need cash quickly, CDM or Gold Standard may not be the best way to go.

When comparing certification costs, we need to look at a number of different costs:

- 1 **Feasibility check:** You will probably need to hire an expert to check how likely it is you will qualify for a certain standard, and how many credits you can produce.
- 2 **Development of a project design document (PDD) and/or methodology:** this is generally the most expensive part, and involves hiring expertise to help write the document that describes your project design and calculate and measure the emission reductions.

- 3 **Certification cost:** You may need to pay a fee for processing your application, and you will need to hire an independent auditing firm that will travel to your project site to carry out all the necessary inspections.
- 4 **Verification cost:** an independent auditor will need to visit your project periodically to verify that the emission reductions have actually taken place.
- 5 **Registration fee:** once the project is certified and emissions are verified, you may need to pay a fee for each credit issued or sold to the organisation that administers the verification standard.
- 6 **Buffer cost:** your project may be confronted with the need to have a buffer, particularly if it is a forestry project. Buffer requirements differ for different standards.

The pre-feasibility check, development of the project design document (PDD) and the certification cost are, in principle, a one-off fixed amount, regardless of the volume of carbon credits you can produce. The verification cost, registration fees and buffer cost are a recurring expense, of which the verification costs are also usually unrelated to production volume, while buffer and registration fees do vary according to the size of your project. It is important to realise that if your project does not get certified during the first attempt, you will probably need to pay an expert to adapt your PDD and pay for certification again.

### The cost for CDM

The CDM process can be a costly affair for producers. In fact, transaction costs associated with developing a project under the CDM are probably the highest of any certification standard. The main reasons are that it is the most rigid standard, requiring a lot of paperwork and specific data to prove that a real emission reduction will take place, and the fact that the entity that does the verification of credits needs to be different from the one doing the certification of the project. This means that a second set of experts has need to familiarise themselves with the dossier and travel out to the project site. In the case of relatively small-scale projects, the time and capital investment in the CDM process may simply not be worth it in terms of the returns on investment.

Arguably the largest influencing factor on the cost of CDM certification is whether there is already an existing approved CDM technology that covers your project. A methodology is in essence a description of the technology and methods you use to reduce, measure and calculate carbon emissions. If there is an existing approved methodology you will not need to develop a new methodology, which may just save you €100,000 or more. Furthermore, the chances of getting certified in one go are greatly improved. The UNFCCC website is an obvious source, but UNEP also has a detailed overview of existing CDM methodologies available on <http://dfcgreenfellows.net/Documents/CDM2010TechnologyMethodologyOverview.pdf>.

**Table 8: Cost and time estimates for CDM phases**

Stage	CDM output	Cost estimate	Time estimate
<b>Preparation phase</b>			
Feasibility study	Formalisation of a Project Idea Note (PIN)	€5000 to €20,000	1 month
Project development	Production of a Project Design Document (PDD). Usually a consultancy company is involved. The costs depend on the complexity and scale of the project, and on the required technologies and expertise.	€20,000 to €70,000	2-3months
New methodology (if required)	Development and approval of a new methodology	Unknown, can easily be €50,000 to €100,000 or more	12-24 months
Project approval	Validation of the project by a DOE	€15,000 to €60,000	3-8 months depending on DOE availability
	Host country approval	Some host countries tax a share of a project's CERs in exchange for issuing a Letter of Approval	A few days to several months depending on the country's procedures and reactivity
Registration	Project registration with the CDM Executive Board	Advance payment of Share of Proceeds Admin for the first year	At least 2 months, and longer if a request for review is made to the CDM executive board.
			Total time: 9 to 18 months (exc. methodology development)
<b>Operational phase</b>			
Verification	External verification of emission reductions	€5,000 to €50,000 per verification	
Administration	Share of proceeds Admin	0.1 US\$ per CER (for the first 15,000 tCO <sub>2</sub> e) 0.2 US\$ per CER (above 15,000 tCO <sub>2</sub> e)	
Contribution to the Adaption Fund for the least Developed Countries	Share of Proceeds Adaption	2% of CER value on each issuance	
		Total: €50,000 to €340,000	

Source: Adapted from MEIE, MEEDDAT & FFEM 2008, p.11



## Small-scale projects - Simplified methodologies and bundling under CDM

The high costs of certification are particularly a problem for smaller projects. Fortunately, the UNFCCC has come to realise that emission reductions from small-scale projects can have a major impact on global emission reductions if widely replicated. Fast-track procedures and simplified methodologies have been developed to reduce the transaction costs associated with CDM preparation, monitoring and registration<sup>21</sup>. Table 9 contains an overview of the kind of projects that qualify for small-scale fast track procedures.

**Table 9: Small-scale projects – Project types, categories and eligibility**

Project types	Project categories	Eligibility
<b>Type (i): Renewable energy projects</b>	A. Electricity generation by the user/household B. Mechanical energy for the user/enterprise C. Thermal energy for the user D. Electricity generation for a system	Maximum output capacity equivalent to up to 15 megawatts (or an appropriate equivalent)
<b>Type (ii): Energy efficiency improvement projects</b>	E. Supply-side energy efficiency improvements - transmission and distribution activities F. Supply-side energy efficiency improvements - generation G. Demand-side energy efficiency programmes for specific technologies H. Energy efficiency and fuel-switching measures for industrial facilities I. Energy efficiency and fuel-switching measures for buildings	Energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, by up to the equivalent of 60 gigawatt hours per year
<b>Type (iii): Other project activities</b>	J. Agriculture K. Switching fossil fuels L. Emission reductions in the transport sector M. Methane recovery	Project activities that both reduce anthropogenic emissions by sources and directly emit less than 60 kilotonnes of carbon dioxide equivalent annually

Source: adapted from <http://www.cdmrulebook.org/152>

One of the most useful strategies for reducing the cost of CDM certification is bundling a number of similar small-scale projects into a single certification procedure. Bundling greatly reduces the certification cost per project, thereby making certification of smaller projects more feasible. Furthermore, when a new project is launched in the future with exactly the same principle and the same project manager, this project can simply be attached to an existing certificate. Box 2 contains an example of bundling under CDM.

<sup>21</sup> For a list of methodologies for small-scale projects see: <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved>

Finally, if there is an existing approved small-scale methodology, certification costs will be reduced. A list of approved small-scale methodologies can be found here:  
<http://cdm.unfccc.int/methodologies/SSCmethodologies/approved>.

### **Box 29: Case study: Mikro-tek small-scale forestry and bundling**

The Canadian company Mikro-Tek started a number of small-scale reforestation projects in 2003 in Chile. The company worked with farmers in possession of land unsuitable for agriculture and suggested that they plant them with pine trees (*Pinus radiata*) to be harvested in rotation. The Nerquihue 'small-scale' project was one of the first to use the simplified CDM methodologies developed for forestry (see <http://cdm.unfccc.int/methodologies/SSCAR/approved>). The project is yet to have a verification event, so hasn't yet been issued credits.

Mikro-Tek chose the CDM as it was then the highest certification standard available and the voluntary market was still undeveloped. This was a little risky on the company's part given that the rules for small-scale CDM projects were still being established at the time. However, even with the simplified baseline and monitoring methodologies, the CDM may still not prove to be cost effective. Mikro-tek found that the CDM processes cost in excess of \$100,000, even when applying the simplified baseline and monitoring methodologies. This meant that the sale of credits might not cover the cost of CDM validation. Mikro-tek's response was to look into the bundling of several similar projects in order to reduce costs. Bundling is the bringing together of several small-scale CDM project activities to form a single CDM project activity, with the aim of lowering transaction costs. The advantage of bundling is that bundled projects can obtain a single validation report and a single certification report for the entire bundle, which streamlines these processes for project participants. Upon its first verification event expected in 2012, Mikro-tek will be issued tCERs. They already have a buyer, a large Carbon Fund, whose name the company chooses not to disclose.

Mikro-tek's Nerquihue project is the first of what will become a bundle of 12 projects. The bundling of these projects mean that they can be certified much more easily, quickly and cheaply. As this is possibly the first attempt to bundle forestry projects in the CDM, Mikro-Tek are unsure as to what the final costs will be.

Project Documents:

<http://cdm.unfccc.int/Projects/Validation/DB/XRC5J6NYTBNBCIUNZIFDL59Q5NZYRV/view.html>

Mikro-tek website: <http://www.mikro-tek.com/>

### **Further reading:**

Guigon, P., Bellassen, V., Ambrosi, P. (2009). Voluntary Carbon Markets: What the Standards Say. Mission Climate Working Paper.

Merger, E. (2008). Forestry Carbon standards 2008 - A Comparison of the Leading Standards in the Voluntary Carbon Market.

## The cost of certification on the voluntary market

Though certification costs on the voluntary market are usually considerably lower than for CDM projects, they are still a substantial investment. Depending on the type of project, standard and amount of assistance that needs to be brought in, the cost can vary between €30,000 for a 'straight forward' vivo certification plan to €50,000 for a mid-range standard such as VCS or CarbonFix, and €75,000 to €100,000 for a complex project with a CDM based Gold Standard certification. These are rough estimates however, based on varied reports and experiences. This means that certification costs can still easily reach two-thirds of the cost on the compliance market.

## Estimating the cost of certification for your project

The first obvious step to take when estimating certification costs is to find out if there is a project similar to yours that is certified. If so, you should contact them and ask them about their experiences. How costly and how difficult was it for them to get certified? Is your project similar and can you use the same methodology?

A second step is to look at the costs for specific standards you are interested in; there are a few studies available that can provide you with some information:

### Further reading:

Guide to small-scale projects: [http://cdm.unfccc.int/Projects/pac/pac\\_ssc.html](http://cdm.unfccc.int/Projects/pac/pac_ssc.html)

Simplified PDD form for small-scale projects:

[http://cdm.unfccc.int/Reference/PDDs\\_Forms/PDDs](http://cdm.unfccc.int/Reference/PDDs_Forms/PDDs)

Guidelines and advice for drawing up a PDD:

[http://cdm.unfccc.int/Reference/Guidclarif/scc/index\\_guid.html](http://cdm.unfccc.int/Reference/Guidclarif/scc/index_guid.html)

List of methodologies for small-scale projects:

<http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>

Rules for Forestry in the CDM: <http://www.cdmrulebook.org/682>

## 10.3 A comparison of standards

Table 10 provides a comparison of the most important standards in the market with regard to their usage. In terms of carbon accounting rigour, the standards listed are generally regarded to be on a par with the Kyoto's CDM and JI mechanisms. The standards are compared in relation to the criteria mentioned in chapter 10. The only criterion that is not used is the chance of success, as this depends too much on the nature of the project to include it in a global comparison that is relevant to different types of projects.

**Table 10: Comparison of standards**

Standard	Price range	Market share	Year established	Likelihood of survival- Project types	Ex-ante/ ex- post	Certification costs	
Clean Development Mechanism (CDM)	Premium \$8 - 16	100% compliance, 0.4 % voluntary	2006	High	All (forestry projects only issued temporary credits, REDD not accepted)	Ex-post	High
<p><b>Pros:</b> A mechanism under the Kyoto Protocol and the first major carbon accounting standard. CDM credits (CERs) can be used to offset emissions on various compliance markets. Designed to create economic efficiency while also delivering development co-benefits for developing countries. CDM is the most widely accepted standard, with its CER credits accepted on various compliance markets, and may also be purchased for voluntary offsets. CDM has a high likelihood of survival and even if a successor to Kyoto is not ratified it will continue for regional/national trading schemes.</p> <p><b>Cons:</b> CDM certification is very strict and expensive, and it can take a long time from registration to issuance of credits. High set-up costs make the CDM most appropriate for large-scale projects, even though 'bundling' and 'simplified methodologies' have recently been set-up for smaller projects (&lt;34000t). CDM only issues temporary credits (tCERS) to forestry projects, which have not been widely accepted by buyers, partly due to their complexity. tCERS are also not accepted in the EU ETS. REDD projects are not yet accepted in the CDM. The project country must be a signatory to the Kyoto Protocol. Credits produced before the date of registration (the date the board approves the project) cannot be validated and sold, apart from forestry projects. Website: <a href="http://cdm.unfccc.int">http://cdm.unfccc.int</a></p>							
Voluntary Carbon Standard (VCS)	Mid-range \$4-8	35%	2006	High	All	Ex-post	Moderate
<p><b>Pros:</b> Currently the most popular standard on the voluntary market. VCS credits (VCUs) are regarded in the market as credible and have a high degree of market acceptance by NGOs, buyers and brokers who would rather deal with a smaller number of widely accepted standards. The certification process is a little easier, faster and cheaper than for CDM and Gold Standard. At the same time, methodological requirements are still strict and similar to the CDM. VCS accepts CDM methodologies, which offers the option for projects going through the CDM process of switching across to VCS, provided credits have not already been sold. The VCS accepts forestry projects, including REDD, for which it has developed the AFOLU standard. It addresses the issue of permanence differently from the CDM by employing a buffer reserve requirement. Based on a risk assessment, some issued credits are held in an "insurance pool" to cover any unforeseen loss of trees. Credits in the buffer are slowly released back to the producer over time.</p> <p><b>Cons:</b> VCS certified credits (VCUs) fetch only medium-range prices, partly because they do not cover wider environmental and social impacts. To address this problem many projects seek co-certification with the CCB standard. Buffer costs for forestry projects are high, because the buffer can easily reach 30% to 40% of credits, and these are released so slowly that most of the credits in buffer should be regarded as lost. VCS also does not issue ex-ante credits. Website: <a href="http://v-c-s.org">http://v-c-s.org</a></p>							

Gold Standard (GS)	Premium \$8-16	7%	2003 for CDM co-accreditation; 2006 as a voluntary standard	High	Renewable energy, energy efficiency. Not forestry, Hydro-power on a case-by-cases basis	Ex-post	Moderate
<p>Standard for the voluntary market, developed by major NGOs following wide consultation. Based on the rigorous principles of CDM, but adds a strong emphasis on environmental and social co-benefits. Can therefore even be used in combination with CDM certification.</p> <p><b>Pros:</b> Because of the emphasis on environmental and social co-benefits, endorsement by major NGOs (in particular the WWF), and the cleverly chosen name, credits tend to fetch high prices.</p> <p><b>Cons:</b> GS does not yet accept forestry and other land-use (LULUCF) projects. Costs of certification are high and certification is likely to take a lot of time.</p> <p>Website: <a href="http://www.cdmgoldstandard.org">http://www.cdmgoldstandard.org</a></p>							
Climate Action Reserve (CAR)	Mid-range \$4-9	31%	2008	High	Forest, U.S. Livestock, U.S. Landfill, Urban Forest, Mexico Livestock, Mexico Landfill, Coal Mine Methane (under revision), Nitric Acid Production, Organic Waste Composting, Organic Waste Digestion and Ozone Depleting Substances.	Ex-post	Ranges dependent on project type
<p>The CAR is a national offset programme focused on the US carbon market, which grew out of the California Climate Action Registry.</p> <p><b>Pros:</b> The CAR's emissions reduction programme has been approved by the VCS, so that credits issued under the CAR can be converted into VCS credits (VCUs). However, VCUs cannot be converted into CAR credits (CRTs).</p> <p><b>Cons:</b> Only provides services to companies and project developers in the US and Mexico. Discussions are underway for further expansion throughout North America.</p> <p>Website: <a href="http://www.climateactionreserve.org">http://www.climateactionreserve.org</a></p>							
ACR	Low \$2-5	4%	Founded in 1996, rebranded as ACR in 2008	High	All	Ex-post	Ranges dependent on project type
<p><b>Pros:</b> ACR methodologies and protocols are all based on International Standards Organization (ISO) 14064. CDM methodologies and tools are accepted. There are no restrictions on project location.</p> <p><b>Cons:</b> Co-benefits are not required, but are desirable. Additional certifications such as CCB Standards can be used with ACR standards.</p> <p>Website: <a href="http://www.americancarbonregistry.org">http://www.americancarbonregistry.org</a></p>							

ISO-14064	Upper range \$6-10	2.1%	2006	High		Ex-post	Unknown
<p><b>Pros:</b> The standard was developed on behalf of the International Organization for Standardization (ISO) by an international working group of technical experts over the course of 2 years.</p> <p><b>Cons:</b> Unlike the other 'standards' described here, the ISO standard has not been expanded into a programme. Rather, other standards are based on ISO-14064, including the VCS and CAR. Technical discussion on standards and programmes can be read here: <a href="http://www.co2offsetresearch.org/policy/StandardsPrograms.html">http://www.co2offsetresearch.org/policy/StandardsPrograms.html</a></p>							
Social Carbon	Upper range \$6-10	1.6%	1998	Likely	As an add-on standard, SocialCarbon does not set its own project type restrictions.	n/a	Low
<p>The SocialCarbon Standard is a methodology that focuses on enhancing co-benefits such as biodiversity and active participation of local communities. It does not verify quantified carbon offsets and is therefore usually used in conjunction with another programme, such as the VCS or CDM. It can be applied to a project in any country.</p> <p>Website: <a href="http://www.socialcarbon.org">http://www.socialcarbon.org</a></p>							
Climate, Community & Biodiversity Standards (CCBS)	Upper range \$6-9	1.3%	2005	High	As an add-on standard, CCB focuses on land-based bio-sequestration and mitigation projects	n/a	Low
<p>CCB is an add-on standard that does not certify emission reductions and issue credits like other carbon standards. Instead, the CCB Standard certifies social and environmental benefits from land-based bio-sequestration and mitigation projects (unclear what kind of projects these are). This means that registration with another standard is also required. CCB has been labelled as an "icing on the cake" standard because when added to other standards it usually adds a premium to the price. A popular dual verification strategy at present is combining CCB with VCS or CDM. It is not a prescriptive rules-based standard, but instead projects are assessed on their individual merits. Two levels of verification are offered: regular and gold level. Gold level rewards exceptional benefits such as projects benefiting the world's poorest communities and endangered species.</p> <p>Website: <a href="http://www.climate-standards.org">www.climate-standards.org</a></p>							
VER+	Upper range \$8-12	0,2%	2007	Unknown	All projects except HFC projects, nuclear energy projects and hydropower projects over 80MW	Ex-post	Ranges, cheaper than CDM
<p>The VER+ was developed by TÜV SÜD, a Designated Operational Entity (DOE) for the validation and verification of CDM projects. It closely follows the Kyoto Protocol's project-based mechanisms (CDM and JI).</p>							



	<p>VER+ was designed for project developers who have projects that cannot be implemented under CDM (e.g. if the country is not a signatory to the Protocol) yet who want to use procedures similar to the CDM.</p> <p><b>Pros:</b> Developed by a credible organization and fetches good prices. VER+ uses a buffer system for forestry and is suitable for small projects.</p> <p><b>Cons:</b> The standard has a very small market share. Not yet fully developed for forestry sector projects, and does not accept REDD projects.</p> <p>Website: <a href="http://www.netinform.de/KE/Beratung/Service_Ver.aspx">www.netinform.de/KE/Beratung/Service_Ver.aspx</a></p>						
CarbonFix	Upper-range \$10-13	0.6%	2008	Unknown	Afforestation/ Reforestation/ agro-forestry (but not REDD).	Ex-ante and ex-post	Moderate
	<p>CarbonFix is a standard recently developed specifically for forestry, agro-forestry and land use change projects that takes both emission reductions and the wider social and environmental impacts of projects into account. As such, it attempts to combine the benefits of VCS AFOLU and CCB. It is administered by an NGO based in Germany. (REDD) activities.</p> <p><b>Pros:</b> Because it is specifically developed for forestry, it should be easier to apply for those projects. Offers a cheap and quick pre-validation of applications before they are sent to a third-party auditor, which can help avoid spending a lot of money on an application that will be rejected. Also offers the possibility to sell credits as 'pre-validated' while waiting. Offers ex-ante crediting. CarbonFix has tried to align its methodologies and project design with the CDM to make dual certification possible. CarbonFix also recognises projects already certified to the CCB standard. Fetches good prices on the market.</p> <p><b>Cons:</b> Because it is a new standard created specifically for forestry, the market share is still very low, and it is unclear whether the standard will survive in the future. It is also fairly unknown among brokers and customers, particularly outside of Germany.</p> <p>Website: <a href="http://www.carbonfix.info">www.carbonfix.info</a></p>						
Plan Vivo	Mid-upper - \$7-12	0.2%	Originated from a research project in Mexico in 1994	Unknown	Land use projects such as affore- station/ deforestation. A buffer system is used of at least 10% and typically 20%	Ex-ante and ex-post	Generally lower than other stan- dards but a high registry fee (EUR 0.50) is levied on the sale of each credit.
	<p>Plan Vivo was developed by the Edinburgh Centre for Carbon Management (ECCM), a consulting company that focuses on climate change mitigation strategies and policies, in partnership with El Colegio de la Frontera Sur (ECOSUR), the University of Edinburgh and other local organizations, to verify the carbon, social and environmental benefits of rural community land use projects. Project activities include afforestation &amp; reforestation, agro-forestry and avoided deforestation, for which credits can be generated. Environmental NGOs have been customers. Plan Vivo has been characterised as suiting 'boutique' projects.</p> <p><b>Pros:</b> The standard is particularly suited to small-scale projects that work with local communities through a bottom-up approach, that over time can expand to a larger scale. Though Independent verification of carbon, social and environmental project benefits is required every five years, credits are issued annually based on internal monitoring of implementation.</p> <p><b>Cons:</b> Very small market share, and not very popular amongst brokers and project developers. Customers are not likely to know the standard, and it is unclear how useful it is outside of the NGO community. Unclear whether the standard will survive in the future.</p> <p>Website: <a href="http://www.planvivo.org">www.planvivo.org</a></p>						

## 10.4 Conclusions: which standard to choose?

### Large-scale projects (More than 60,000 tCO<sub>2</sub>e per annum)

The CDM mechanism is likely to be the best option for large-scale projects – those larger than 60,000 tCO<sub>2</sub>e. This is because CDM projects consistently receive among the highest prices and are widely accepted by brokers and buyers. CDM credits (CERs) are also accepted in the EU ETS, which means access to the world's largest carbon market. However, for smaller projects the costs of verification may outweigh the benefit of higher prices. The UNFCCC is aware of this issue and there have been increased efforts to enable similar projects to bundle together during the verification process, reducing costs for all parties. Even still, costs can be prohibitive and smaller projects would be wise to look to the voluntary market.

On the voluntary market, Gold Standard stands out as a high-quality standard that takes into account both emission reductions and the co-benefits associated with the project.

### Medium scale projects (10,000 to 60,000 tCO<sub>2</sub>e per annum)

For medium-scale projects CDM certification may still be interesting, but mostly only when there is already an existing approved methodology available that can be used, and the project has not yet started, because CDM does not allow past emission reductions to be sold.

If the CDM process is too expensive or time-consuming, then there are a number of other voluntary market standards worth looking at. The Gold Standard seems an excellent choice for projects that have a great project story and would like to certify the social and environmental project benefits to make the story even more credible. Gold standard credits are in demand with buyers and fetch high prices, particularly in Europe. Its market share is still small but seems to be growing, primarily because of the smart name that oozes quality for the buyer, and the support of organisations such as the WWF. On the downside, Gold Standard certification can be expensive and time-consuming.

For those who have less of a project story, or are not prepared to spend a lot of time and money on certification, VCS is an excellent option. It is a very rigorous carbon standard because it is largely based on CDM processes, but it is roughly a third less expensive. With a market share of 35% (Hamilton et al. 2010) it is the most popular standard on the voluntary market, widely accepted by buyers and brokers, though more so in the US than in Europe. VCS credits seem to fetch solid, mid-range prices, though they are markedly lower than Gold Standard prices. It is common practice to add a CCB standard to VCS in order to certify the environmental and social co-benefits of the project. Dual VCS and CCB accreditation is highly desirable in the market at the moment, and such credits can be expected to yield an additional price premium of a couple of euros. However, if one has to add a CCB to VCS, the question is whether this will be cheaper than opting for Gold Standard in the first place. Nevertheless, spreading the risk or expenses over time can be a reason enough for choosing this combination.

### Small-scale projects (less than 10,000 tCO<sub>2</sub>e per annum)

For very small-scale projects, the costs of many of the standards is still excessive when compared with the potential revenues from the sale of certified credits. Furthermore, their limited size makes them uninteresting for most brokers and project developers. In order to facilitate sales of these projects, there are three possible strategies.

The first strategy is to find one or two medium to large-sized companies who are willing to buy all the uncertified credits from the project. The limited amount of credits means that there are not many buyers needed for all of the credits, and that one or two companies can claim the project exclusively for their marketing communication. It also makes it easy for the project to establish a more intimate relationship with the client that may result in more support and marketing material for the client. A direct relationship may solve the transparency problem that certification tries to solve. However, there will still be some investments necessary in properly calculating emission reductions and setting up an internal monitoring and evaluation system for emission reductions. This strategy was the initial route taken by MaliBiocarburant.

The second strategy is to go for a relatively cheaper voluntary standard such as VCS and to bundle and sell all the expected emission reductions over the next five to ten years in one (prepaid) forward purchase agreement. In this way, a seemingly uninteresting project of 5000 credits can suddenly become a package of 50,000 credits that is very interesting for brokers. This is the strategy that Native Energy uses with the help-build system (box 10) and Trees for Travel with Mali Biocarburant.

A third strategy is bundling with other projects. Perhaps a series of smaller projects can be bundled together in one certification procedure so that credits can be sold in one package. This may require bundling of multiple projects from one organisation or cooperation with other organisations who have similar projects. If the latter is the case, intense cooperation will be necessary to ensure that all projects are set up and managed in an identical way, otherwise certification will be difficult. It may be necessary to formally allow one organisation manage the carbon credits for all of the projects.

### **For forestry projects**

At the moment, the voluntary market seems to be the only option for forestry and other land use projects. The compliance market is currently not a real option because CDM only issues temporary credits (tCERs and ICERs) for forestry projects, for which there is no clear and proven market. The underlying reason is that temporary credits are difficult to understand, have to be replaced and are not accepted in the EU ETS, the biggest part of the compliance market.

Within the voluntary market, CarbonFix and VCS AFOLU seem to be the best options. VCS has the advantage of having by far the biggest market share on the voluntary market and being respected by most brokers and project developers, whereas CarbonFix is new, mostly focused on Germany and Europe, and still has to prove it is here to stay. CarbonFix, on the other hand, is likely to have lower buffer costs at the start (30% versus 40%), and it supports ex-ante credits, whereas with VCS a more complicated prepaid forward purchase agreement needs to be constructed. Furthermore, CarbonFix seems to fetch considerably higher sales prices, though this estimate is based on limited transactions and may be influenced by CarbonFix projects achieving more retail sales. Many VCS certified projects add a CCBA certification in order to increase the sales price, but this adds more cost and effort to the process.

In conclusion, for those who are planning to sell mostly in the US and like to play it safe, VCS AFOLU seems to be the best option. If, on the other hand, you are planning to sell in Europe, are prepared to take a bit of risk, and really need to make the maximum out of the sales of your carbon credits, CarbonFix may be your best bet.

If your project is smaller than 20,000 credits per year, you may want to find out if you can sell uncertified credits directly to a client. However, if you cannot find a buyer that is willing to buy uncertified credits, VCS and CarbonFix certification is still the best choice. You will probably need to bundle future credits and sell them for cash-up-front anyway in order to solve the cash flow challenge that is particularly daunting for forestry projects. If, however, you have a small-scale community-based and managed forestry project, you may want to consider Plan Vivo. The certification costs and buffer costs are lower than those of VCS and CarbonFix, and it also issues ex-ante credits. The downside is that it is largely unknown and has a small market share, but then again many buyers do not know any standards by name anyway and may find it sufficient enough if your project is externally audited and adheres to an external standard, regardless of the name. Larger brokers and project developers may not like the standard, but then again if you are a small-scale forestry project, they probably won't be interested in you anyway.

### **Box 30: Which standard should Mali Biocarburant choose?**

Based on the characteristics of Mali Biocarburant, CarbonFix seems to be the best standard for certification of the carbon sequestration component. Firstly, because there is no real market for tCERs, the CDM is not an option, and Gold Standard will not accept the project because it does not accept forestry. Plan Vivo will not accept the project because it is managed by a private business. This leaves VCS AFOLU and CarbonFix as the only serious options. Both are accepted in the European market which is already the most important market for MBSA, where it has the best network. However, the expected net-prices of CarbonFix credits seem to be much higher than those of VCS; firstly because sales prices seem much higher, and secondly because the CarbonFix buffer is 30% while the expected VCS buffer is 40%. Furthermore, cash flow is a major constraint, and CarbonFix is about the only standard that fully supports ex-ante credits that will provide cash early on in the project. Finally, the CarbonFix standard is more developed and used than the VCS AFOLU, therefore the expectation is that it is easier to apply.

The main disadvantage of CarbonFix is that the carbon credits for replacement of diesel cannot be certified under CarbonFix. However, because it will take about 3 years before the potential income from this source starts to show, and seven years before it reaches its maximum level, this is not essential at the start. At a later stage, MBSA can choose for CDM, Gold Standard or VCS certification for these carbon credits. There is already an improved CDM methodology for biodiesel from *Jatropha*, and perhaps in a few years time there will be methodologies for other standards as well that MBSA can use to reduce the cost of the application. The company will then also have more data based on its own experiences that will make certification much easier and less costly.

# 11 Calculating the amount of credits you can produce

It is crucial to obtain a rough estimate early on of the amount of carbon credits you will be able to produce. In addition to estimating the sales prices, one also has to estimate the amount of carbon credits you can produce in order to be able to estimate the potential revenues from carbon credits. The amount of credits also determines whether it is worthwhile to invest money in certification at all, and if so, which certification, because some are considerably more expensive than others. For example, it makes no sense to invest €200,000 in CDM certification if you are only going to produce 10,000 credits each year, because it will take too long to earn the money back.

The estimated production of credits also determines your marketing strategy and your chances of obtaining up-front finance. For example, brokers and project developers are generally only interested in amounts over 10,000 credits per year, and larger brokers such as JP Morgan Climate Care prefer to deal with tranches of 100,000 credits or more per year. If your amount is smaller than 10,000 then you are probably better off finding a client yourself who is not worried about certification.

## 11.1 Estimating production volumes: a complex task

Estimating the production capacity of credits for any business or project may be one of the most complicated things around. Generally speaking, it is not merely a matter of making measurements and calculations on the back of an envelope. Often, the technologies used are new and proper information, scientific data and experience lacking. There may be multiple calculation methods that lead to different amounts and different data sets that you will have to choose from, none of which may be completely applicable to your project. Therefore, along the line a lot of information will need to be gathered and correctly interpreted, and many assumptions and choices will need to be made. Obviously, these will need to be supported by data and sound reasoning. If, like most projects, you choose to certify your project, then your measurements, calculations and assumptions will need to be in line with the chosen standard. But even if you choose not to certify, it makes sense to comply with certain existing rules in order to withstand a possible credibility check by your customers.

Unfortunately, there is likely to be a difference between actual emission reductions made and credits issued for these reductions. All certification standards want to avoid selling more credits than they actually produce, which means that they will use very conservative estimates until they have real data that will allow them to be less conservative. It is therefore crucial that you too remain very conservative in your estimates, otherwise you may end up facing a financial shortfall.

Exactly how complex estimating the production volume is depends on your particular situation. There are five factors that have a large influence on how complex it will be to calculate the amount of carbon credits you can produce:

The project type is the most important factor. (It also ties in closely with the other four factors). Clearly, for some types of projects, calculations and measurements are much easier, which means fewer assumptions will need to be made. Or there is simply much more experience with the technology, thereby increasing the availability of data and models. For example, hydro energy has already been used on a large scale for decades, and there is sufficient experience, skills and methodologies available for calculating electricity production. Wind energy is newer, but the supplier can tell you what the capacity is at given speeds of wind, and wind is a standard ingredient for climatic data recorded everywhere in the world. Solar is perhaps a bit more complicated because the technology is a bit newer. Methane gas collection from garbage dumps is already more complicated, while forestry will require even more difficult calculations. Finally, bio-diesel is so complex and new that there is very little information available.

The availability of information on the experiences of similar projects, in particular those who are certified. Even if you are busy with a relatively new technology, you may be lucky and find there is a project similar to yours that has been certified. This means that there is an approved calculation method out there with approved data sets and assumptions, though the data may not be completely applicable to your specific situation. The development of this methodology is generally the most expensive and difficult part of certification. Luckily, approved methodologies tend to be publicly available. But even if you cannot find a certified project similar to your own, other projects can also be a great source of information. Perhaps certain calculation methods were already rejected, or a lot of experience and data has already been gathered. Check the Project Design Documents (PDDs) for other similar projects to learn about their setup and also to find the project developers' contact details. Chapter 11.3 contains a number of sources you can use to find these methodologies and PDDs.

The availability of data from credible sources that can be used for your own calculations. Even if there are no similar projects, you may still be able to find the data you need for your calculations as well as the calculation methods themselves. For example, there may not be another project that produces carbon credits with pine plantations, but pine is a well-studied tree species. Data regarding the growth rate of pines in different climates, soil and planting density is readily available, including calculation models for yields. *Jatropha*, however, is a new crop, for which apparently only 2 datasets on growth are available. If you are in wind energy, you need statistics for wind, and for most smaller areas in the United States there is likely to be reliable climatic data. But finding the same data for, say, Senegal may be more complicated.

The ease with which data can be collected. Though datasets may not be available for the amount of carbon stored in a pine forest, pine forests of different ages are common around the world. If we want to estimate the amount of carbon stored in a 25-year old pine forest in a subtropical area with poor soils, it is not difficult to find a forest that we can use for taking samples. However, finding a drip-irrigated 15-year old *Jatropha* plantation on poor soils is virtually impossible.

The certification standard chosen. Though most standards are based on the same principles, some are more strict and complex than others. For example, CDM is probably the strictest standard,



while Gold Standard is also based on CDM and therefore almost as tough. VCS, though based on CDM as well, appears to be less strict. CarbonFix is much more geared towards (agro) forestry projects and thus perhaps easier to use than VCS.

## 11.2 How to do a rough estimate: basic methods for calculating carbon credits

It is crucial to estimate how many credits you will be able to produce initially. This section will explain a number of methods that allow you to make a rough estimate, and thus provide you with an indication of whether you have enough scale to make your project, and certification, worthwhile. The majority of projects fall into one of four main groups: renewable energy, energy efficiency, carbon capture and storage, and carbon sequestration (forestry). Each group has a basic method for calculating the potential production of carbon credits, which we will discuss in this section. Though useful for estimations, the formulas are too simplistic to provide the kind of calculations necessary in a project design document for a rigid carbon certification standard. Nevertheless, doing these basic calculations will help you understand the principles of calculations, which in turn will help you to understand the work of the experts you may need to bring in at a later stage.

### Renewable energy

Examples of projects that fall into this category are electricity production from solar, wind or hydro power, and bio-fuel production (from ethanol and biodiesel). The basic formula to calculate the potential production from these kind of projects is:

Carbon credit production = *Total Energy generated X emissions per unit of conventional energy replaced – project emissions*

Total energy generated can be calculated using the formula:

Total Energy generated = *capacity of the technology X number of production units X environmental factor on location*

DEFRA, the UK department of environment, food and rural affairs, has published an extensive list and Excel models that contain the emissions per unit of conventional energy replaced in kg of CO<sub>2</sub> equivalent. Their calculations take into account emissions of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) released from burning fuels, which are considered direct emissions, as well as emissions from mining and transporting fuel, which they refer to as indirect emissions.

It is best to illustrate the formula with an example. If, for example, we want to install solar panels, the supplier can tell us that the panel can produce 0.5Kw in one hour of sunshine, and using climate statistics we know that the project location receives an average of 2000 hours of sunshine per year. If we assume that we buy 2 panels, the total energy generated is 0.5kwh X 2 X 2000 = 2000kWh. According to DEFRA, 1KwH of electricity from the grid leads to an emission of 0.54522 kg of CO<sub>2</sub>. Therefore, our total emission reduction is 2000kwh X 0.54522 = 1099.44kg of CO<sub>2</sub>, which is a little more than 1 carbon credit. From this we need to subtract emissions caused by the production and installation of the panel.

If we were to replace a diesel generator instead of electricity from the grid, we would need to find out from the manufacturer of the generator how much diesel is needed for 1kWh, and how much CO<sub>2</sub> is emitted from 1 litre of Diesel. Assuming the manufacturer tells us we need 0.5 litres of diesel to generate 1 kWh, we know that we need 2000 X 0.5 = 1000 litres of diesel, while according to DEFRA each litre of diesel leads to an emission of 2672 kg of CO<sub>2</sub>. Therefore, if we replace diesel, we reduce emissions by 1000 x 2672 = 2.672 kg of CO<sub>2</sub>. In other words we could produce 2.7 carbon credits

### **Energy efficiency**

Examples of projects that fall into this category are installing more energy efficient equipment, installing equipment such as heat exchangers that reuse energy, and changing production and transport processes to reduce energy usage. The formula is basically the same as for Renewable energy:

*Total Energy saved X emissions per unit of energy saved – project emissions*

For example, if we install a heat exchanger in our mango drying factory in South Africa that transfers the heat from air that exits the oven and use this to pre-heat the air flowing in, we save 20% on the use of gas that normally heats the air in the oven. Assuming we use 50,000 litres of Liquid Petroleum Gas (LPG) in a season, we would save 10,000 litres of LPG. Each litre of LPG that is burned leads to 1492kg of CO<sub>2</sub> emissions according to DEFRA. Therefore, we will produce (10,000 X 1492)/1000 = 14.92 carbon credits.

### **Carbon capture and storage**

Examples of projects that fall into this category are capturing methane gas from manure and garbage that would normally enter the atmosphere and mounting a filter on the chimney of a factory to capture CO<sub>2</sub>.

The formula here is:

*Total emissions captured – project emissions*

Where often:

*Total emissions captured = capture rate X amount of fuel X emissions per unit of fuel*

As an example let us assume we install a filter on the chimney that captures 30% of all CO<sub>2</sub> released while burning coal to heat the boiler in our factory. Let us further assume that we normally burn 100 tonnes of coal per year and the type of coal that we use releases 2.718 tonnes of CO<sub>2</sub> e per tonne. The total production of carbon credits will then be 30% X 100 X 2.718 = 81.3 carbon credits. From this amount we then need to subtract the emissions caused by the project, in this case the emission from the transport and storage of the captured CO<sub>2</sub> as well as the extra energy it costs to capture the emissions. It has to be noted however that carbon capture and storage technology is still at its infancy stage.

### **Carbon sequestration**

Examples of projects that fall into this category are forestry, agro forestry and land use change.

Production volumes for carbon sequestration projects are probably the hardest to estimate. Where the 'production equipment' in other projects is machinery and equipment, carbon sequestration uses 'natural production equipment' i.e. trees and shrubs. With machinery the production capacity is known, and relatively constant over time. Sure, there may be more wind or sun in one year compared to another, but as long as the equipment works you know more or less what you can expect. But trees absorb carbon credits at different rates depending on their age, and eventually they stop growing all together. They may also die, which decreases your production capacity for the next year and releases carbon back into the atmosphere which may have to be subtracted from the amount of credits you can sell. The consequence is that one needs to continuously keep track of the tree stock in order to estimate production capacity.

To estimate the potential production in the long-term, the following formula can be used:

$$\text{Carbon credit production} = \text{Project area in hectares} \times \text{net sequestration per hectare}$$

If you do not remove any vegetation, the net sequestration can be calculated as the sequestration of what you plant minus the project emissions and leakage. If you remove vegetation, you need to do an estimate of the amount of carbon stored in the vegetation that you remove. The sequestration of what you plant can in turn be estimated by multiplying the number of trees planted with the absorption of CO<sub>2</sub> per tree during the chosen period (for example 30 years) for that species under the particular conditions of the project area. Each species will have a different absorption rate, so if you use multiple species you will need to calculate absorption according to the amount of trees planted for each species.

Taking all of this into account, the formula is:

$$\text{Carbon credit production} = \text{Project area} \times \sum_{s,t=1} [ \text{Number of trees}_{s,t} \times \text{CO}_2 \text{ absorptions} ] - \text{project emissions \& leakage} - \text{emissions from removed vegetation}$$

If there is selective thinning and harvesting of trees, this can be accounted for in this formula by either deducting the amount of trees harvested from the amount of trees planted or by adding the removed trees to the emissions from removed vegetation.

For example, let us consider a forest that we plant with species A and B. Species A absorbs 1kg of CO<sub>2</sub> per year in its first year and 2 kg each year thereafter until maturity in year 60. Species B absorbs 2kg in its first five years and 3kg each year thereafter until it reaches maturity in year 50. If I plant 1000 trees of each, I will have a total production of credits of 1000 trees type A x (1+59x2) + 1000 trees type B x (5x3+45x3) = 269,000Kg of CO<sub>2</sub> in total, from which we have to deduct emissions caused by tractors preparing the land etc.

However, in reality not all trees will be planted in the first year. Therefore it is important to map the production of credits over time. The production of credits in any given year uses the following basic formula:

$$\text{Production in year } T = \sum_{s,t=1} [ \text{Number of trees}_{s,t} \times \text{CO}_2 \text{ absorption}_{s,t} ] - \text{emissions from project}$$

The first part of the equation is the sum of the number of trees of a certain age(t) and of a certain species (s), multiplied by the absorption of CO<sub>2</sub> of a tree of that particular species s and age t.

If we return to our example and assume that half the trees of species B are planted in year 1 and the other half in year six, the production for year 7 is as follows:

*(tree species A, 6 years old X absorption A,6) + (trees type B,6 years old x Absorption B,6) + Trees type B,1 year old)*

Filling in the numbers gives us:  $(1000 \times 2) + (500 \times 3) + (500 \times 2) = 4500\text{kg CO}_2$

Adding things such as the number of trees that die during the first year and a forest thinning after 15 years makes the calculations more complicated, but the principle remains the same: we need to assess how many trees there are for each batch and then calculate the production for each batch in that year.

For those involved in commercial forestry projects where batches of forests are being planted and then cut after a few years, the carbon credits can be estimated by looking at the median or average net carbon sequestration over the project period.

So far the calculation has been straightforward, but calculating the absorption of CO<sub>2</sub> of each species under the specific soil and climatic circumstances of the project area may be the most complicated part. To estimate the absorption of the wood, we need to look not only at how big the tree grows, but also at the density of the wood. Hardwoods are much heavier and stronger and store more carbon than, for example, the soft fast-growing pine. We also need to look at how much carbon is stored in the roots, the so-called underground bio-mass, and in the soil itself. Trees change the structure of the soil, and carbon is also stored in the humus that is formed when leaves drop on the soil, while the roots of trees and the leaf cover protect this top soil from being washed away.

When calculating the production, one needs to pay attention to the difference between Carbon (C) and Carbon dioxide (CO<sub>2</sub>). Though they tend to be used for describing the same thing, they are not in fact interchangeable. Plants absorb CO<sub>2</sub> from the atmosphere and store the carbon when releasing the oxygen back into the atmosphere, and it takes 3.67kg of CO<sub>2</sub> to make 1 kg of carbon. Therefore, each kg of carbon stored in a plant represents an emission reduction of 3.67 kg of CO<sub>2</sub>.

### **Mixed projects**

Some projects do not fall neatly into one of these four basic project categories but have elements of two of the categories. For example, bio-diesel production from *Jatropha* has both a renewable energy component, the bio-diesel production, and carbon sequestration, the planting of the trees on farmland. Calculating the carbon credit production for these projects involves splitting up of the different components, calculating the production for each component and then adding them up. In this example, one would calculate the sequestration part and then add this to the bio-diesel part.

## 11.3 How to get started on assessing your potential credits

The best way to start is by looking for projects similar to yours that have already been certified, and to then look at the methodology they used. The VCS and CDM websites provide an overview of approved methodologies, which you can download. You can check to which extent these projects are similar to yours, and which calculations, assumptions and numbers were used.

You can also contact the projects directly; generally other projects are willing to share their experiences and knowledge with you. Though, theoretically, different projects are competitors, in reality the market is so small that most people welcome new pioneers into the carbon credit world and the opportunity to share experiences and frustrations. Generally, their contact details can be found on the websites and in the methodologies. CarbonFix does not provide a data base of approved methodologies, but they do provide an overview of all certified projects on their website, with their contact details. You can also speak to the standards themselves and they are generally willing to do a quick assessment of your eligibility and provide contact details for similar projects.

Secondly, a number of publicly available tools and databases have been developed by various groups to help assess the potential for the generation of carbon credits:

- The CDM technology and methodology overview: a detailed overview published by UNEP that can help you find out whether there is an existing CDM methodology for your kind of project. <http://dfcgreenfellows.net/Documents/CDM2010TechnologyMethodologyOverview.pdf>
- Proform (<http://poet.lbl.gov/Proform/>) is software designed for the assessment of Renewable Energy and Energy Efficiency projects.
- Retscreen<sup>22</sup>. (<http://www.retscreen.net/ang/version4.php>) is another toolbox developed for renewable energy, cogeneration and district energy, renewable energy, heating and cooling technologies, and energy efficiency measures. It includes NASA climate data that you can use, for example, for solar energy projects.
- TARAM (Tool for Afforestation and Reforestation Approved Methodologies) is a complex excel- based model used to calculate carbon storage in forests. The toolkit contains a dataset for the wood densities of a large number of tree species.
- CO<sub>2</sub>fix is a model for quantifying carbon sequestration in forest ecosystems. The software appears relatively easy to use and guides you through the different steps needed to estimate the amount of carbon stored in a forest at different points in time. The programme will help you to determine which data you need to gather, but contains no data itself, such as wood densities.
- The UK department of environment, food and rural affairs (DEFRA) has published a list of conversion factors and a calculation model that can help you calculate the emissions from the use of different forms of energy such as coal, oil, gas and electricity. Please pay attention to the unit of measurement; for example, 1 kg of diesel is not the same as 1 litre. (<http://archive.defra.gov.uk/environment/business/reporting/conversion-factors.htm>).

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<sup>22</sup> For Proform see <http://poet.lbl.gov/Proform/>, while for Retscreen see

- List of conversion factors: the UK organization Carbon Trust has published a simple list and leaflet of conversion factors based on the DEFRA model that is much easier to use for quick estimates. However, they only take direct emissions into account (the emissions from burning fuel) and not indirect emissions (coming from transport and production of fuel) (<http://www.carbontrust.co.uk/cut-carbon-reduce-costs/calculate/carbon-footprinting/pages/conversion-factors.aspx>)
- CER estimation toolkit: The Japanese Ministry of the environment and the Global Environment Centre Foundation have developed a toolkit for estimating CERs for a number of projects, such as electricity production from biomass residues and waste heat, landfill gas recovery and flaring and methane avoidance through composting (<http://gec.jp/gec/EN/Publications/CERToolkit.pdf>)
- Tool for the estimation of carbon credits from biogas, developed by climate focus ([http://www.climatefocus.com/documents/tool\\_for\\_the\\_estimation\\_of\\_carbon\\_credits\\_from\\_biogas](http://www.climatefocus.com/documents/tool_for_the_estimation_of_carbon_credits_from_biogas))



Solar panel retailer (Photo: Trees for Travel/REF)



### **Box 31: Calculating the production of carbon credits from Mali Biocarburant: a formidable challenge**

The first estimate of the credits to be produced from carbon sequestration in the *Jatropha* trees was based on a study by IER, a research institute in Mali. MBSA assumed that 1 tree would fix 5.8kg of CO<sub>2</sub> per year for 10 years. After ten years the tree is expected to continue to grow but it would be pruned to avoid overgrowing of other crops and keep the picking of nuts easy. Therefore, no net sequestration is expected to take place after year ten. Each plant would sequester 58 kg of CO<sub>2</sub> in its first ten years after planting or, at 1000 plants per hectare, 58 tonnes per hectare (t/ha). The original plan was to plant 21 million trees over three years, which would lead to a total carbon sequestration of 1,218,000 tonnes of CO<sub>2</sub>. This estimate turned out to be much too high, for a number of reasons.

Firstly the sequestration per tree was overestimated. When KIT asked Flemming Nielsen, an experienced consultant, to look into the matter he found the IER estimate of 58 tonnes per hectare to be problematic. IER seemed to have averaged the sequestration rate of 36 t/ha from a study in Egypt and the 8kg per plant from a study in Australia. The Egyptian study did not seem to be relevant because it was based on irrigated *Jatropha*, while MBSA does not use irrigation, and they used the standard wood density of 0.58 t/m<sup>3</sup> for African dry-land trees instead of 0.30 t/m<sup>3</sup> for *Jatropha*. A lower wood density means less carbon per cubic meter of wood and therefore lower sequestration. The Australian study seemed irrelevant because it was unclear how they had arrived at their estimate of 8 kg per plant, and a Western Australian Biofuels Task force Report from April 2007 had actually estimated a yield potential of 6 t/ha, but again with irrigation and mechanized farming. A new estimate was clearly needed. Flemming Nielsen found two studies of non-irrigated *Jatropha* planted on dry land with poor soils in India that had arrived at estimates of 2.30 t CO<sub>2</sub> ha/yr (Francis et al. 2005) and 2.62 t (IFEU-Heidelberg 2007), but these studies used plants that were only 3.5 years old instead of mature plants and were therefore not applicable. The studies found to be most applicable were Struijs, J. (2008) with 39.6 t/ha and Muijs et. al 2008 with 32.9 t/ha, based on 1100 mature *Jatropha* plants per hectare. Because MBSA plants *Jatropha* in a dryland area with poor soils, it was decided to go for the lower estimate of the two, which once adapted for a lower planting density of 1000 plants per hectare gives 29.9t/ha. The next step was to deduct for biomass that was already there, which was obtained from a CDM application on biodiesel from *Jatropha* in Mali, and set at only 1 ton per hectare, leaving 28.9 t/ha. The same CDM application estimated that 15% of the emission reductions are lost due to leakage within the project, such as the use of motor vehicles by field workers supporting the farmers. The final estimate from Flemming Nielsen was thus 24.6 t/ha or 24.6kg per plant during the first ten years, after which the sequestration stops; less than half of the original estimate of 5.8kg per plant. In an ideal situation, an existing scientific model such as CO<sub>2</sub>FIX or Century would have been used to make the calculations, but there is simply not enough data available for *Jatropha*.

The second issue was that far fewer trees survived than initially estimated. It was assumed that *Jatropha* is a hardy shrub that survives in tough conditions, but in 2009 it became clear that only 60% of the first batch of trees had survived. The right planting method (nurseries instead of cuttings) timing, soils and maintenance turned out to be crucial to keep the trees alive. At

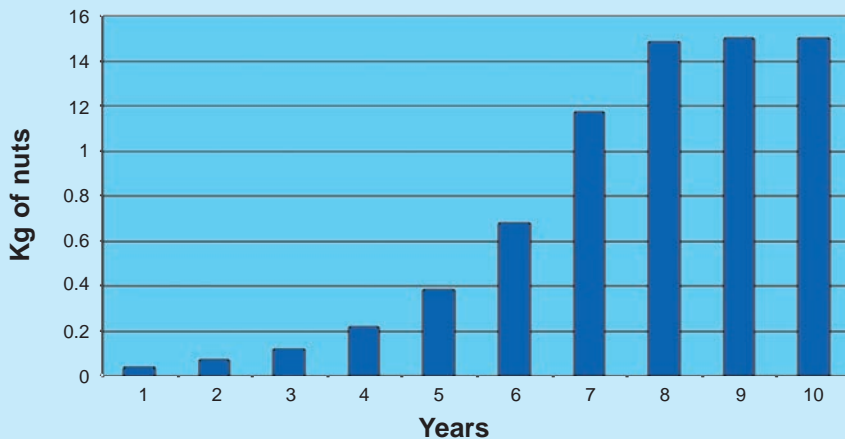
that point KIT and MBSA assumed that with more training and specific incentives in place for farmers to maintain the tree survival rate could be improved to about 80%.

The third issue was that certification standards require a project buffer to manage the risk of non-performance. Even for projects that are not certified it is common practise for project developer or brokers to demand the project keep a buffer in case of unforeseen losses. Given the fact that the Carbon fix standard uses a 30% buffer and Trees for Travel also uses a 30% buffer on its non-certified projects, this seemed a realistic percentage. However it meant that the final estimate of revenues would be 30% lower.

Keeping these three issues in mind, the estimate of the amount of carbon credits that would become available for sale until 2020 needed to be reduced to 289,296 tonnes of CO<sub>2</sub> (80% of 21 million trees absorbing 24,6 kg of CO<sub>2</sub> minus a 30% buffer). This was less than a quarter of the original estimate.

The second estimate that needed to be made was for the amount of carbon credits that could be produced by replacing conventional diesel with the bio-diesel produced. Estimating the potential production capacity of bio-diesel was the biggest challenge because there is little experience with the yields of Jatropha in intercropping in the climatic conditions and soil of Mali. CEO Hugo Verkuyl estimated yields to peak at 1.5kg of nuts per tree and, based on data of Jatropha yields under different climatic conditions in Paraguay and Nicaragua, the expert also reached the same conclusion. Furthermore, it was estimated it would take 8 years to reach this level, and that over a ten-year period 7,164kg could be harvested per tree. Figure 13 contains the estimated yield per plant.

**Figure 13: Estimated yield per tree for Jatropha in Mali**



Source: Calculations by Flemming Nielsen

Tests in the factory confirmed the estimates from earlier studies that 3.5kg of Jatropha nuts are needed to produce 1 litre of biodiesel. A tree would thus produce  $7,164 / 3.5 = 2.05$  litres of diesel in its first ten years. However, during the production of biodiesel about 10% of the energy is lost in the form of electricity and methanol, and this has to be deducted and reduces

production per tree to 1,845 litres. According to DEFRA each litre of regular diesel that is replaced with biodiesel cuts emissions by 32 kg of CO<sub>2</sub>e, taking into account emissions from burning fuel (direct) and production and transport of fuel (indirect). Therefore, each tree can produce 1,845 x 3.2kg CO<sub>2</sub>e = 5.904 kg of CO<sub>2</sub>e during the first ten years. Table 11 contains the total production of carbon credits from bio-diesel up to 2020.

**Table 11: Estimated total production of vcarbon credits for Mali Biocarburant till 2020**

Planting year	trees to be planted (million)	trees survived (million)	no. harvests until 2020	Nuts per tree (kg)	Total amount of nuts (tonnes)	Diesel produced (1000 l)	Emission reduction (tCO <sub>2</sub> e)
2008	5	2,904	11	8,664	25160	6470	20703
2009	8	6,4	10	7,164	45850	11790	37728
2010	8	6,4	9	5,664	36250	9321	29828
<b>Total</b>	<b>21</b>	<b>15,704</b>		<b>21,492</b>	<b>107259</b>	<b>27581</b>	<b>88259</b>

The total production of carbon credits from bio-diesel production for the period 2008 – 2020 was thus estimated at 88,259 tonnes of CO<sub>2</sub>e. Because this is not a carbon sequestration activity, no buffer was applied. This is less than a quarter of the emission reductions from carbon sequestration. The main reason is that because it takes around 7 years for the trees to mature and reach a decent yield, it takes the same length of time after planting before the carbon credits from the biodiesel reach a decent scale. Hardly any credits are produced during the first years, while after ten years, when all 16 million trees have reached maturity, 19,749t of CO<sub>2</sub>e will be reduced annually.

In conclusion, KIT estimated that during the first 12 years of operation of MBSA a total of 377,555 tonnes of CO<sub>2</sub>e could be produced and sold. Roughly three quarters of this would be from carbon sequestration. After this period there is no more carbon sequestration, but the project will continue to generate 19,749 tonnes per year from the production of bio-diesel. This was considerably less than originally anticipated, and so the planting program and management system for carbon credits had to be adapted to deal with dramatically lower revenues from carbon credits.

In hindsight these calculations were still far too optimistic. The planting target proved to be too challenging, partly because with lower carbon credit income and more income needed to improve tree survival rates, the planting program needed to be scaled down. Over the 2009/2010 and 2010/2011 season 0,9 and 1,75 million trees were planted instead of the planned 5 and 8 million. Tree survival rates proved to be even lower than first observed, with less than 20% of the first planting batch still alive. Survival rates have improved substantially since. 50% seems to be a realistic long term survival rate. Finally production of nuts in the first 2 years is virtually nil, because those nuts are now used in nurseries to make new plants.



Tree nursery in Mozambique for reforestation with native tree species (Photo: Michiel Arnoldus)

## 12 Conclusion: what we have learned about the carbon markets

The aim of this book was to provide an overview of the most important aspects of carbon credits for those new to carbon markets and who are considering developing a carbon offset project. As such, each chapter gives an overview of an important aspect of carbon credits. Therefore, our conclusion is not an extensive discussion on a single hypothesis. Instead, in this chapter we wish to point out a number of the key lessons we have learned about the industry and which we think are relevant to carbon offset producers.

### **Most trade in carbon credits does not come from carbon offset projects but from trading scheme allowances**

For a carbon credit producer, it is important to realize how small the trade in carbon offsets is when compared to emission allowances from trading schemes. Globally, about 82-85% of carbon credit trade volumes are trades in emission allowances, whereas only 15-18% of trade is in carbon offset credits. Furthermore, most of the trade in carbon offsets is in secondary CERs – offset credits that are traded multiple times, often for speculation. Primary CERs - those traded for the first time between the producer and first buyer - account for only 1.5% of total market trade. A further 1.5%-2% of global trade in carbon offsets comes from the over-the-counter (OTC) voluntary market trade, although it is unclear how many times each credit is traded (known as the churn rate) because primary trades are not recorded.

### **The voluntary market is only a fraction of the size of the compliance market, but crucial for smaller carbon offset projects in developing countries**

The voluntary market accounts for only 2% of trade in carbon credits, with the vast majority of trade being done on the compliance market. Nevertheless, the volume of voluntary market OTC trade is increasing. In 2010, for the first time, more offset credits were traded from projects certified to voluntary market standards than from primary CDM projects. This shows that the voluntary market is maturing and gaining acceptance with buyers. Smaller projects in developing countries are almost exclusively sold on the voluntary market.

### **For offset projects, certification is important, but choosing the best standard for your project can be difficult**

Most compliance markets, including the EU ETS, only accept offset credits that have CDM certification. This widespread acceptance and the rigour of the CDM certification process make CDM offsets credits desirable for most buyers, and often a good choice for projects looking for certification. On the voluntary market, certification is not obligatory, however it is recommended in order to give buyers the assurance that the emission reductions you claim are real, additional and verifiable. In 2010, 93% of all credits sold on the voluntary market were certified. While certification costs money and can be expensive, it gives you a better chance of attracting buyers and achieving better prices.

Unfortunately, there is no one ideal standard, because all of them have important advantages and disadvantages. There will be few cases in which choosing the optimal standard for a project is straightforward, and your choice will always carry a certain amount of risk. Generally speaking, the CDM is usually the best option for large-scale projects due to its widespread acceptance and good prices. However, as the scale of the project decreases, the voluntary market will, in many cases, be a better option due to lower costs and faster certification. The Gold Standard regularly attracts the highest prices on the voluntary market, while the VCS has the largest market share, attracts mid-range prices and is widely-accepted among buyers. Prices can also be enhanced through dual certification with standards like CCB which certify the extra social and environmental benefits of a project. Small-scale projects may wish to consider boutique standards, such as Plan Vivo, which are relatively cheap to certify. However, a better option might be to bundle several small projects together. Where projects are similar in type, technology and timing, and where the project participants are the same, economies of scale and efficiency gains can be achieved.

An exception to this advice is forestry and land use projects. We are not confident that the CDM is the best option for these projects because it only issues temporary credits (tCERs and ICERs) due to concerns about the permanence of emission reductions from this project type. tCERs and ICERs are difficult to understand, have to be replaced regularly by the buyer, and are not accepted in the EU ETS. So long as the CDM only issues temporary credits, voluntary market standards, such as VCS AFOLU and CarbonFix, may well be better options.

### **Forestry and land use change projects can be particularly difficult to develop, certify and sell**

Forestry projects are the first thing to spring to many people's minds when they think about carbon offset projects. They also do not seem to be complicated because all that is apparently required is the planting of a tree. However, in reality these projects are among the most difficult to develop and certify, for a variety of reasons. For a time there was a lack of CDM methodologies for these project types, and arguably this is still the case. Development of a new methodology is a significant additional expense and can be very time-consuming. Calculation of emission reductions can be difficult and leakage can be difficult to (dis)prove. When choosing a certification standard, the best choice is not often obvious as the CDM only issues temporary credits, while voluntary market standards withhold a buffer of credits in case of project failure. Finally, trees take many years to grow and sequester carbon, so it can take a long time before one sees a return on investment.

### **Forward financing of offset projects is extremely important for producers of carbon credits, but is poorly supported**

Cash flow is probably the biggest problem for any start-up business, and this is particularly the case for projects that rely on carbon credits to be profitable, because they will struggle more than others to secure finance from investors and banks. Ex-ante credits seem like a logical solution, but only two standards (CarbonFix and Plan Vivo) officially recognize these. Many producers try to work around this lack of support by signing emission reduction purchase agreements (ERPAs), which are a kind of forward purchase agreement with buyers. Sometimes these are prepaid at large discounts, whereas in other cases these agreements can be used to raise collateral from financial institutions. Nevertheless, we found that potential buyers are fairly adverse to ERPAs and so forward financing remains one of the key barrier to the development of offset projects.

## **Carbon credits can be an important additional source of revenue but they will not make you rich**

At a first glance, carbon credits may seem lucrative for a producer. But if you take into account the fact that the production needs to be estimated in a conservative manner, the costs for certification are high and that prices tend to be much lower than often expected, then carbon credits are not exactly what you would call a gold mine; particularly for smaller projects. One should not forget that the principle behind carbon offset credits is that they make an offset project possible when it would otherwise not be economically feasible. If you are a smaller producer, the maximum you can expect is a modest income stream that is the difference between running at a loss or being sufficiently profitable to attract investors and make your project feasible. You will have to work hard to benefit from carbon credits.

## **Carbon credits are not quick cash: certification and sales of credits will take an entrepreneur several years of hard work**

Though some project developers and consultants may claim they can get your project certified within a year, the full procedure, from the moment of first thinking about carbon credits to selling your first credits, is likely to take several years. Understanding the market and industry and its basic concepts alone may take you several weeks or months. It may then take another couple of months before you have found the right people to assist you with doing a quick feasibility check, the certification of your project and finding clients. The certification process itself will take at least a year, and then the first emission reductions still need to be verified and the credits issued, registered and sold. It will more than likely take a few years to reach the stage of carbon credit issuance.

## **You will need advice and assistance from experts with expertise relevant to your specific project**

Developing a carbon offset project is a complex process and so it is likely, and advisable, that you will seek the assistance of experts. There are many brokers, project developers, consultants and certification agencies that can offer specific services, at a price. Unfortunately, different project types can vary considerably, so there is no guarantee that expertise can be transferred from one project type to another. We strongly recommend seeking out experts with relevant experience in your field, however difficult it may be to find them. In order to assess their credentials and specific knowledge, it is essential to ask any expert for his/her specific experience in projects similar to your own. We suggest contacting projects like your own to find out which experts they used, for which roles, and whether they would recommend them or not. Finally, you will also need to calculate whether the real price of these services is worth it in relation to your bottom line.

## **Always try to estimate the financial consequences of your decisions**

In the end, from the point of view of a producer, carbon credits are all about generating as much income as possible for your carbon offset project. Everything is an economic decision; from the decision whether or not to pursue carbon credits to the choice of certification standard, selling credits ex-ante or ex-post, or whether to use a project developer, broker or university. It is therefore crucial to always try to estimate the effects of the different options open to you on your revenues and cash flow. For example, what will the expected net earnings be if I sell all my credits via a broker as opposed to selling them myself? And what is the difference between certification standards such as CDM and VCS?



### **It is important to do a quick feasibility check with an expert early on in the process**

Given the high investments in terms of time and money for the development of a carbon offset project, it is important that you do a feasibility check early on in order to assess whether it will be worth your time and money. Try to find an expert and/or phone as many project developers, brokers, auditors, standards and similar projects as you can to assess the options for certification, the amount of credits that can be produced and sold, a conservative and realistic sales price, and the investments in cost and time needed. This seems logical, but many people embark on a certification trajectory straight away without doing any of the above. Then, only when they are well into the process and when substantial investments have been made do they discover that the potential net benefits are actually disappointing. Be particularly conservative when it comes to estimating prices and emission reductions. Are the quoted prices wholesale or retail? Are they for similar project types in similar countries? Are they ex-ante or ex-post? Are the estimated reductions based on 'proven' numbers or on wishful thinking?

### **The industry is still young and changing fast, and the future is uncertain**

One has to take into account the fact that the carbon credit industry is still young and continuously changing. Standards, intermediaries and trading platforms come and go, (e.g. the Chicago Climate Exchange), prices change continuously and the rules of eligibility for certain projects may also change. Information that is one to two years old may need to be updated and so you need to continually seek the latest information. Furthermore, negotiations on a successor to the Kyoto protocol are still ongoing and it remains to be seen what kind of international agreement can be reached. On the one hand, the lack of a successor to Kyoto might mean a reduction of demand for CERs from certain countries. On the other hand, the EU ETS and new regional and national trading schemes look set to continue accepting CER offset credits, so the market for CERs will continue to grow. Nevertheless, some trading schemes don't accept CERs from all project types – such as the EU ETS rejection of CERs from large hydro, HFC23 and forestry projects, so the details for different project types need to be looked at carefully.

### **Carbon credits could play an important role in combating climate change, but the way the industry is organised is too complex and a barrier to its development**

Finally, following a great deal of research, we cannot resist the temptation to reflect on the principle of carbon markets and the way the industry is organised. In our opinion, carbon markets have shown their potential. Greenhouse gas emissions have been reduced as a result of carbon offset projects that would not have been commercially viable were it not for the additional income stream from carbon credits. Yet we are left with the feeling that, while the general principle of carbon offsetting is simple enough, the way the market is organised (with all its different structures, rules, procedures, organizations, concepts and standards) is prohibitively complex for many potential producers, and for small projects in particular.

A large part of the problem is that carbon credits is a very abstract concept build on a lot of complex science and principles that require considerable effort to understand. For example it takes time and effort to understand the concept of leakage and how it is measured. To make matters worse, a tremendous amount of rules have been added, and the language and terminology used to describe and explain the matter tends to be complex . Yet Worse still, we found the terminology generally poorly explained by a lot of sources, and is even poorly understood by some people we talked to working in the industry. For example, it is difficult to find clear explanations of how temporary CERs (tCERs and ICERs) work. During the course of our research we were frequently

surprised by rules, regulations and exceptions that we had not encountered earlier. Every time we thought we fully understood a concept, we uncovered new information that showed us that our previous understanding was incomplete. In some cases, researchers are able to invest time in understanding such concepts and structures, but the average small-scale producer invariably cannot.

Complexity is also caused by the large number of different actors a producer has to deal with. A producer has to deal with project developers, brokers, potential clients, certification bodies, independent auditors, consultants, knowledge institutes and registries. It takes a lot of time and effort to understand what these organisations exactly do and don't do. It can be difficult, for example, to find out exactly what a project developer does, whether you can trust them and the extent to which you need them.

Much of the complexity is found in certification systems. Achieving certification in the carbon market appears to be more difficult, time consuming and expensive than it is for many other commodities.

Voluntary market certification is often mentioned as being cheaper and faster than the CDM for small producers. However, while certification may not cost you €150,000, it can still easily cost more than €70,000 (depending on project type, size, country etc). Furthermore, many of the processes of CDM certification have been brought across to the voluntary market standards.

Complexity not only acts as a barrier for the development of new programs, but also reduces the revenues that producers can receive from the sale of carbon credits as they require more support from third parties. This is particularly problematic for smaller projects. They are less likely to have the means to hire experts that can help them understand the market, assess potential revenues and certify and sell credits. If small producers do manage to take these hurdles, they are lucky if there is anything left from the sales revenues by the time all consultants, brokers, registries, standards and external auditors are paid. Many intermediaries earn a good living because of the complexity in the market.

All this being said, our research has reinforced our belief that rigour and reliability in carbon accounting is fundamental to offset credits having credibility in the market. The role that standards play in the voluntary market has given buyers the confidence that the credits they are buying represent real, additional emission reductions. The growth in the market is in no small part due to this confidence.

The challenge is how to keep rigour in the market but reduce the complexity, particularly for smaller projects. This would ensure better access to the market for small projects, and a larger percentage of earnings from carbon credits actually end up with the producer. In some cases, the cause of this complexity is historical – the Kyoto protocol emerged out of intense political negotiations. The rules had little concern for the practicalities faced by producers of offset credits. Their voices need to be heard too, as both the compliance and voluntary markets streamline the rules.

Luckily there have been recent initiatives to simplify things for smaller producers. Recent developments include a small scale CDM methodology, a specific standard for carbon sequestration with a standardised toolbox (CarbonFix, VCS AFOLU), an increase in accepted CDM methodologies

etc. Nevertheless, these initiatives only solve a part of the problem, because even with those initiatives certification still costs in excess of €70,000 and costs years.

We believe that ongoing efforts are required to simplify processes and provide clear, practical documentation to help smaller projects. We would like to see three quarters of the revenues from carbon credits to end up in the hands of producers, as has been advocated by the project developer Trees for Travel.

### **Box 32: MaliBiocarburant: the current state of affairs in October 2011**

Between 2007 and 2011, a little over 7 million trees were planted in Mali, of which 3.45 million trees are expected to be still alive in 2012. The low tree survival rate and lower than expected planting rates by farmers have been key challenges. Nevertheless, the factory is operating on a daily basis and bio-diesel is sold on site to local businesses and consumers without any problems. From time to time, other feedstocks are used for bio-diesel production as well, for example, batches of palm oil and cotton seed that were unsuitable for human consumption have been bought and processed into biodiesel. Experiments with biogas from *Jatropha* press cake and diesel from castor oil have also started. Currently, the small factory in Koulikoro is just about profitable.

In 2009, *Jatropha* planting was also started in Burkina Faso in response to interest from local farmer organizations. During 2009 and 2010 about 2.5 million trees were planted. A storage facility and oil press have been built, and when volumes of oil are sufficient a bio-diesel unit will follow. The planting activities are organized in a foundation, of which 3 farmer organizations, MBSA and the ICCO Fair Climate fund (see box 21) are members. The fund acts as a project developer and finances the activities of the foundation through a loan. It also finances and manages the certification of carbon credits, for which it has contracted an experienced consultancy firm, Bridgebuilders. Building on the work of KIT, Plan Vivo and CarbonFix were seen as the best options for certification. However, Plan Vivo did not turn out to be an option because of the involvement of a for-profit company (MBSA). Talks are currently under way with the board of CarbonFix to see how agro-forestry can be fitted into the standard, and the drafting of the Project Design Document is about to commence. The budget for certification is €90,000 and the whole procedure, from feasibility to validation and sales of the first credits, is expected to take 3 to 4 years. The fair climate fund will become the owner of the credits, which it intends to sell directly to consumers and (small) businesses using their links to the religious community in the Netherlands and links to similar organizations in other European countries. The target sales price is €12.50 per tonne; how much of that will be leftover as income for the foundation depends on the cost of certification and sales. CDM certification of credits for biodiesel was also assessed, but the earn-back time was deemed too long.

Meanwhile, in Mali, a similar foundation was registered, MBF, again with 3 local farmer organizations and MBSA as members, but this time with Trees for Travel as the fourth member and project developer. Trees for Travel is funding the project development until 2015 and is responsible for the sales of carbon credits and offers assistance with certification, if needed in the future. It receives a trade margin on each credit sold and a number of credits as compensation

for the time and money invested. As a result of the lower survival rate and planting uptake, the amount of potential credits has not yet risen much beyond the demand through KIA Motors the Netherlands and Sweden, who currently pay €0.30 per tree or €5.00 per ton of CO<sub>2</sub> e in the form of a prepaid forward purchase contract for 10 years. The retail price on the website is €7,50 per tonne. Because KIA is more interested in financing tree planting than in buying certified carbon credits, certification has been postponed until the volume have increased to a level that makes it worthwhile to invest in certification and the results of the CarbonFix certification efforts in Burkina Faso are available. KIA finds it easier to use trees in their communication with consumers than an abstract concept like carbon credits. In addition, KIA Netherlands is still trying to convince KIA organizations in other European countries to join the programme. The income from KIA is now the main source of revenue for the planting scheme and training of farmers.

With the structure of an NGO and the income from KIA, the MBF foundation has been able to attract many additional sources of finance, as well as support in tackling important issues. The first issue is the low survival rate of trees (50% after one year), which is either due to planting in severely depleted or otherwise unsuitable soils, or a lack of water after planting. In cooperation with the University of Copenhagen, and with the support of the donor DANIDA and Leuven University, research is being done into the performance of different varieties under different conditions in order to establish minimum planting conditions. The second issue is the lower rate of planting by farmers than was hoped for, mostly because additional income that is four years away is too limited an incentive for many poor farmers. What is needed is a package of interventions to make participating more attractive. With USAID funding, new varieties of drought and pest-resistant maize are being distributed, and the yields and revenues in the Jatropha intercropping system evaluated. Biogas production from Jatropha presscake for local energy generation is being researched with the support of the FACT foundation and funding from the Ministry of Economic affairs in the Netherlands. Finally, Michigan State University is testing various methods of removing the main toxic element from Jatropha presscake to make it suitable as animal feed. All these initiatives should lead to higher incomes for farmers adopting the Jatropha intercropping system. What is interesting is that though the income from carbon credits is not sufficient to cover all activities needed to significantly scale up Jatropha production, it is certainly instrumental in attracting other donors and partners.

What is clear from the Mali Biocarburant case is that carbon credits are not easy money by any means, but they can be instrumental in starting a renewable energy project. Without the discussion on climate change and the introduction of carbon credits, KIA, Trees for Travel and ICCO would never have put their money in the project, and without this money the business would have failed. Looking at all the failed Jatropha projects around the world, it becomes clear that using private money to plant Jatropha is not economically feasible. Public money and/or carbon credits are essential to making it work. Within the next five years it will become clearer whether MBSA as a business can survive. Ultimately, this depends on whether the Jatropha planted achieves sufficient yields for the scale needed to make the business profitable.



# Glossary

The following glossary has been adapted from Point Carbon (2011)

**Additionality** A principle whereby a project should only be able to earn credits if the GHG emission reductions produced by the project are additional to what would have happened in the absence of the carbon credit component.

**Afforestation and Reforestation (A/R) Projects** Projects that involve the growing of forest on land that has not been forested for a period of at least 50 years (afforestation) or on non-forested land (reforestation) through planting, seeding and/or the promotion of natural seed sources.

**Agriculture, Forestry and Other Land Use (AFOLU):** see Land Use, Land Use Change and Forestry

**Allowance** A legally defined unit (EUAs, AAUs, RGAs, NZUs and others) that entitles the holder to emit one ton of CO<sub>2</sub>e or another quantity of greenhouses gases. Also known as emission allowance or emission permit. See also European Union Allowance (EUA).

**Assigned Amount (AA) and Assigned Amount Units (AAUs)** The assigned amount is the total volume of greenhouse gases that each Annex B country is allowed to emit during the first commitment period (see explanation below) of the Kyoto Protocol. An Assigned Amount Unit (AAU) is a tradable unit of 1 ton of CO<sub>2</sub>e.

**Baseline** The baseline represents forecasted emissions under a business-as-usual scenario, i.e. expected emissions if the emission reduction activities were not implemented.

**Bundle** Bundling signifies the bringing together of several CDM project activities, to form a single project to reduce CDM-related transaction costs.

**California Climate Action Registry (CCAR)** A non-profit voluntary registry for greenhouse gas emissions in California.

**Cap and Trade** A design for emissions trading systems under which total emissions are limited or 'capped'. Tradable emission allowances corresponding to the total allowed emission volume are allocated to participants for free or through auctioning. Contrasts with baseline-and-credit approaches where only deviations from a baseline are tradable. Examples are the EU ETS, RGGI, international emissions trading under the Kyoto Protocol.

**Carbon Credit** A generic term that assigns a value to a reduction or offset of greenhouse gas emissions. A carbon credit is usually equivalent to one ton of carbon dioxide equivalent. A carbon credit can be used by a business or individual to reduce their carbon footprint by investing in an activity that has reduced or sequestered greenhouse gases at another site.

**Carbon Dioxide Equivalent (CO<sub>2</sub>e)** Measurement unit used to indicate the global warming potential (GWP) of greenhouse gases. Carbon dioxide is the reference gas against which other greenhouse gases are measured. See Global Warming Potential for conversion rates.

**Carbon Neutrality** The practice of purchasing and retiring emission credits or allowances corresponding to the amount of GHG emissions from for instance an activity, company or country.

**Carbon offset project** A project that reduces the emission of greenhouse gases. This reduction can be used to offset (compensate) for emissions made elsewhere.

**Carbon Sink** Natural or human-made systems that absorb carbon dioxide from the atmosphere and store them. Forests are the most common form of sink, in addition to soils, peat, permafrost, ocean water and carbonate deposits in the deep ocean.

**Certification** A process by which a GHG reduction project is audited by a government agency or independent authority to determine whether it meets established criteria. For instance, the act of approving emission reductions from a carbon project and issuing emission reduction credits to the entity that owns the rights to the project credits.

**Certified Emission Reductions (CERs)** CERs are carbon credits generated through the CDM. It can be used to meet an Annex B Party's emission commitment or as a unit of trade in GHG emissions trading systems.

**Chum rate:** The amount of times a carbon credit is sold

**Clean Development Mechanism (CDM)** The CDM is a mechanism for project-based emission reduction activities in developing countries (non-Annex B countries). Certified emission reductions (CERs) are generated by projects that lead to certifiable emissions reductions that would otherwise not occur.

**Chicago Climate Exchange (CCX)** Voluntary cap-and-trade scheme that started trading in 2003. Members made a voluntary commitment to reducing GHG emissions. Among the members were companies from North America, municipalities, US states, universities. The CCX also certified and traded offset credits under its own standard. The CCX closed its cap and trade market on December 31 2010 due to lack of interest.

**Climate Community and Biodiversity Standard (CCB Standard)** A certification standard for credits from land use and forestry carbon mitigation projects. The standard rewards projects that simultaneously address climate change, support local communities and conserve biodiversity. The standard helps mitigate risk for investors and increases funding opportunities for project developers.

**Commitment Period** The five-year Kyoto Protocol Commitment Period is scheduled to run from calendar year 2008 to calendar year-end 2012.

**Crediting Period** The crediting period is the duration for which a project generates carbon credits. The crediting period shall not extend beyond the operational lifetime of the project. For CDM projects the crediting period can either be a 7-year period, which can be renewed twice to make a total of 21 years, or a one-off 10-year period. However, for forestry the crediting period is 20 years, renewable twice to make a total of 60 years, or a single 30-year crediting period.

**Designated National Authority (DNA)** The official body representing the government of the host country for CDM/JI projects. For CDM host countries, the designated national authority issues a non-objection letter necessary for project approval, if it agrees that a project is in line with its sustainable development objectives. The DNA also issues the Letter of Approval (LoA) needed for the registration of a CDM project. A project will need both host country approval as well as investor country approval.

**Designated Operational Entity (DOE)** A domestic legal entity or an international organization accredited and designated by the CDM EB. The DOE validates and requests registration of a proposed CDM project activity and verifies the emission reductions of a registered CDM project activity.



**Emission Reduction Unit (ERU)** Permits achieved through a Joint Implementation (JI) project.

**Emission Reduction Purchase Agreement (ERPA)** Binding purchase agreement signed between buyer of CERs or ERUs - or other emission reduction credits - and seller. See primary market.

**European Union Allowances (EUA)** The tradable unit under the EU ETS. Each allowance equals 1 ton of CO<sub>2</sub>.

**European Union Emissions Trading Scheme (EU ETS)** Trading Scheme within the European Union, which was launched on January 1, 2005.

**Ex-ante credit** Carbon credit that is sold, paid for by the client and verified by a carbon credit standard before it has been produced. The credit is thus based on emissions reductions that have yet to take place and need to be verified in the future.

**Ex-post credit** Ex-post credit: the credit is sold and paid after the credit has been produced and issued by the standard.

**Global Warming Potential (GWP)** The global warming potential is the impact a greenhouse gas (GHG) has on global warming. By definition, CO<sub>2</sub> is used as reference case, so it always has a GWP of 1. GWP changes with time, and the IPCC has suggested using 100-year GWPs for comparison purposes. Below is a list of 100-year GWPs used in the Kyoto Protocol for the six Kyoto gases: Carbon dioxide (CO<sub>2</sub>): 1; Methane (CH<sub>4</sub>) 21; Nitrous oxide (N<sub>2</sub>O): 310; Hydrofluorocarbons (HFCs): 150 – 11 700; Perfluorocarbons (PFCs): 6500 – 9200; Sulphur hexafluoride (SF<sub>6</sub>): 23,900

**Gold Standard** Initiated by WWF, SSN and Helio International, the Gold Standard for CDM projects offers project developers a tool with which they can ensure that CDM, JI and VER projects have real environmental benefits and, in so doing, give confidence to host countries and the public that projects represent new and additional investments in sustainable energy services. Eligible project types are renewable energy and energy efficiency.

**Greenhouse gases (GHGs)** Greenhouse gases (GHGs) are trace gases that control energy flows in the Earth's atmosphere by absorbing infra-red radiation. Some GHGs occur naturally in the atmosphere, while others result from human activities. There are six GHGs covered under the Kyoto Protocol - carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>). CO<sub>2</sub> is the most important GHG released by human activities.

**Host Country** A host country is the country where a JI or CDM project is physically located. A project has to be approved by the host country to receive CERs or ERUs.

**International Organization for Standardization (ISO)** The world's largest developer and publisher of International Standards. The ISO is composed of a network of the national standards institutes of 157 countries, with a Central Secretariat in Geneva, Switzerland. In March 2006, ISO launched the ISO 14064:2006 standards for GHG accounting and verification.

**Intergovernmental Panel on Climate Change (IPCC)** The IPCC was established by the World Meteorological Organisation (WMO) and the United Nations Environmental Programme (UNEP) in 1988 to assess scientific, technical and socio-economic information relevant to understanding climate change, its potential impacts and options for adaptation and mitigation. It is open to all Members of the UN and of WMO ([www.ipcc.ch](http://www.ipcc.ch)).

**Joint Implementation (JI)** Joint Implementation is one of the three flexible mechanisms under the Kyoto Protocol for transfer of emissions permits from one Annex B country to another. JI generates ERUs on the basis of emission reduction projects leading to quantifiable emission reductions.

**Forward Emission Reduction Purchase agreement (ERPA)** An agreement in which a certain amount of credits are sold before they are produced and issued. The actual hand-over and payment of the credits happens when the emission reductions have been verified and the credits issued.

**Kyoto Protocol** The Kyoto Protocol originated at COP-3 to the UNFCCC in Kyoto, Japan, December 1997. It specifies emission obligations for the Annex B countries and defines the three so-called Kyoto flexible mechanisms: JI, CDM and emissions trading. It came into force on 16 February 2005.

**Land Use, Land Use Change and Forestry (LULUCF)** The land use, land use change and forestry (LULUCF) sector was included under the Kyoto Protocol to take into consideration certain human-induced activities that remove greenhouse gases from the atmosphere, also known as carbon “sinks”. The following activities were referred to in Article 3, paragraphs 3 and 4 of the Kyoto Protocol, as defined in paragraph 1 of the annex to decision 16/CMP.1: afforestation, reforestation, deforestation (the direct human-induced conversion of forested land to non-forested land), re-vegetation, forest management, cropland management, grazing land management.

**Offset credits or offsets** Emission reduction credits from project-based activities that can be used to meet compliance or voluntary objectives as a supplement or alternative to reducing one’s own emissions. In a cap-and-trade scheme, offsets may be used instead of allowances, sometimes up to a limit. CERs and ERUs are common types of offset credits.

**Over-The-Counter (OTC) market** Trades arranged by brokers, as opposed to trades on exchanges or bilateral (direct) trades.

**Prepaid forward emission reduction purchase agreement** An agreement in which carbon credits are sold and paid for before they are actually produced and issued. At a later stage, verification will need to take place to establish whether the emission reduction has actually taken place, and when the credit is issued it is handed over directly to the buyer. This type is also commonly called ex-ante or up-front credit.

**Project Design Document (PDD)** Document describing the characteristics of a CDM or JI project, completed by project developers in order to register their project. The draft JI PDD form shall be applied provisionally until the COP/MOP has adopted it in accordance with the JI guidelines.

**Project Idea Note (PIN)** This is a short form of project description (about 6 pages) that provides basic information about the project like type, size and location of the project, estimation of the anticipated total amount of Greenhouse Gas (GHG), reduction compared to the “business-as-usual” scenario, etc.

**Project story** The larger story behind the project that can be critical to selling the credits of a project on the voluntary market. The story is composed of three elements: project type (e.g. solar energy, small-scale community forestry), co-benefits (e.g. biodiversity conservation, income for poor communities) and the possibilities for communicating this story to buyers and consumers (quality pictures and photographs etc.).

**Primary transaction** A transaction where the seller is the original owner (or issuer) of the carbon asset. A commonly used acronym for primary CER is “pCER.”

**Reduced emissions from deforestation and degradation (REDD)** Reducing emissions from deforestation and [land] degradation. Mitigation action that seeks to preserve existing carbon stocks in forests (typically tropical rainforests), peat lands etc. This approach would be additional to project-based efforts such as the CDM. Issues to be solved are permanence, leakage, monitoring and baselines.

**Registration** Registration is the formal acceptance by the Executive Board of a validated project activity as a project activity. Registration is the prerequisite for the verification, certification and issuance of credits related to that project activity.

**Retail** This term is used in two ways: sale of carbon credits directly from the producer to end-users wanting to compensate for their own emissions or sales of small amounts of carbon credits to individual consumers.

**Retroactive crediting** Some standards allow a project once it is certified to verify the emissions reductions from before the project's certification date, upon which these emissions can be sold as verified emission reductions. Usually this period is two years; hence a project certified on January the 1st of 2012 could verify its 2010 and 2011 emission reductions in 2012 and sell these as verified emission reductions.

**Secondary Transaction** A transaction where the seller is not the original owner (or issuer) of the carbon asset. A commonly used acronym for secondary CERs is "sCER."

**Temporary Certified Emission Reductions (tCERs), see also Long-term Certified Emission Reductions (ICERs)** Credits issued for an afforestation or reforestation project activity under the CDM that expires at the end of the commitment period following the one during which it was issued. tCERs are issued for the net anthropogenic greenhouse gas removals by sinks achieved by the project activity since the project start date.

**Validation** The process of independent evaluation of a CDM project by a designated operational entity according to requirements for CDM projects.

**Verification** The process of formal confirmation by a recognized independent third party that inventories and carbon reductions claimed by participants in carbon trading schemes conform with reality and established rules. Under the CDM, verification is performed by designated operational entities (DOEs).

**Verified Emission Reductions (VERs)** VERs are generated by carbon reduction projects that are assessed and verified by third party organisations rather than through the UNFCCC. These credits can be bought on the voluntary market.

**Voluntary carbon market** The sum of all transaction of carbon credits in non-compliance markets. The generation of non-compliance credits — or voluntary offset credit supply — comprises the reduction of GHG emissions for the purpose of selling them to voluntary end-users and not to compliance buyers. Voluntary markets for emissions reductions include generation and transaction of carbon credits in non-compliance markets. The voluntary market permits the use of credits such as verified emission reductions (VERs), non-verified emission reductions (ERs) and prospective emission reductions (PERs), as well as the non-compliance use of CERs, ERUs, EUAs and other credits and allowances generated for the compliance market.

**Voluntary standard** Any standard that aims to ensure the quality of carbon credits in the voluntary carbon market. It sets various requirements for project developers, such as third-party verification and measures to avoid double counting of carbon offsets, e.g. the use of registries.

**Verified Carbon Standards (VCS)** VCS is a certification standard for offset credits in the voluntary market. The standard provides for project-level quantification and monitoring, and reporting, validation and verification of greenhouse gas emission reductions or removals. The VCS is an initiative of the World Business Council for Sustainable Development, International Emissions Trading Association, The Climate Group and the World Economic Forum.

**Wholesale** This term is used in two ways: sales of carbon credits to intermediaries such as brokers and sales of large amounts of carbon credits to larger corporate clients.



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# Colophon

## **KIT Development Policy & Practice**

KIT Development Policy & Practice is the Royal Tropical Institute's main department for international development. Our aim is to contribute to reducing poverty and inequality in the world and to support sustainable development. We carry out research and provide advisory services and training in order to build and share knowledge on a wide range of development issues. We work in partnership with higher education, knowledge and research institutes, non-governmental and civil society organizations, and responsible private enterprises in countries around the world.

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