Carbon Offsets: Saviour or cop-out?

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Summary

The phrase 'carbon offset' describes the process whereby individuals, businesses or governments purchase 'credits' generated from projects that claim to reduce greenhouse gas emissions. The idea is that the removal of greenhouse gases counterbalances emissions from other sources.

Consumers are being misled by claims that offset companies can make them 'carbon neutral'. The scope for dubious projects is compounded in Australia by the absence of a mandatory accreditation scheme. Overseas, standards are tighter. The Gold Standard, developed by 50 non-government organisations, is the most rigorous while the Federal Government's Greenhouse Friendly program and the NSW Government's Greenhouse Gas Abatement Scheme are much weaker.

The potential for carbon offsets to reduce greenhouse gas emissions is limited. In fact, the most popular type of carbon offset in Australia, tree planting, is also the least effective for dealing with climate change. The evidence indicates that offsets from renewable energy are the most effective, followed by those from energy efficiency projects, with forestry projects ranked last.

Forestry projects cannot guarantee the permanent reduction of greenhouse gas emissions because sooner or later the forest will be felled, burned or destroyed. This problem is likely to be exacerbated as the climate changes in response to global warming.

There are strong grounds for excluding forestry-based offsets from an emissions trading system in Australia, or at least placing restrictions on their use. Outside Australia, the Kyoto Protocol and the US Regional Greenhouse Gas Initiative have placed restrictions on forestry based offsets, and the European Union's scheme has excluded them entirely. If an Australian scheme is to be integrated with others abroad, similar restrictions will need to be put in place.

[1] This paper has benefited greatly from the comments and guidance of Dr Robert Passey and Dr Hugh Saddler. Any remaining errors, however, are the sole responsibility of the author.

In short, while some types of offsets can act as an effective means to address greenhouse gas emissions, they should not be seen as a license to pollute or as a means to continue unsustainable practices. Too often, offsets are being used by governments and business as a smokescreen to distract people from the need to cut emissions. By diverting people's funds and attention to projects that are unlikely to reduce emissions significantly, some offset schemes could ultimately do more harm than good.

1. Introduction

Every day it seems the climate change alarm bells are rung even louder as the media carry stories about droughts, bushfires or melting ice caps. More than 90 per cent of Australians now believe climate change is a problem (Coorey 2006). This growing awareness has led many individuals and businesses to look for ways to reduce their greenhouse gas emissions.

One of the most popular ways is the use of carbon offsets. In Australia, an increasing number of companies offer consumers the ability to offset their emissions by investing in renewable energy projects or by planting trees on their behalf. For example, Virgin Blue gives their customers the choice to offset emissions from flying for as little as 90 cents. But what is a carbon offset? Are some types of offsets better than others? How do consumers know that their emissions are really being offset?

This paper considers the different types of carbon offsets available in Australia with a focus on the most popular type – tree planting. It investigates the environmental effectiveness of carbon offsets and explores whether the offsets that consumers purchase can actually make them 'carbon neutral'. This paper also considers which carbon offsets should be included in an Australian emissions trading system.

2. Types of carbon offsets in Australia

Over the last decade a growing number of companies have been established in Australia to meet the demand from consumers and businesses for carbon offsets. As Table 1 shows, there are now a variety of companies offering different types of carbon offsets. Some companies like Greenfleet specialise in tree planting while others such as Climate Friendly focus on renewable energy. Others still like Easy Being Green or Carbon Reduction are involved in energy efficiency projects.

In broad terms, a 'carbon offset' is used to describe the process whereby individuals, businesses or governments purchase 'credits' generated from projects that claim to reduce greenhouse gas emissions in the atmosphere. The idea is that the removal of greenhouse gases via such projects counterbalances emissions from other sources. For example, the reduction of one tonne of carbon from electricity used to power an energy efficient light bulb will counterbalance one tonne of carbon produced by driving a car.

Carbon offsets can be divided into three main groups – renewable energy, energy efficiency and forestry projects. As Table 1 shows, there are other types of offset schemes which can also provide effective means of reducing emissions, such as flaring landfill gas to reduce methane emissions. Although methane flaring has proven popular because of the low costs of abatement, it has been suggested that in the future methane projects could become redundant as regulation makes it compulsory to address methane emission from oil, gas and landfill sites. Accordingly, in this paper carbon offset types are restricted to the above three categories.

Table 1 Main types of offsets offered by in Australia

Company	Standards	Forestry	Renew-able energy	Energy efficiency	Fuel switching	Flaring
Australian Carbon Traders	GF	■				
BP Global Choice	GF				■	■
Carbon Neutral		■				
Carbon Planet	GGAS	■	■	■		
Carbon Pool	GF	■				
Carbon Reduction	GS		■	■	■	
Carbon Smart	GGAS	■				
Climate Friendly	GS		■		■	
Climate Positive	GF	■	■			
CO2 Australia	GGAS and GF	■				
Easy Being Green	GGAS and GF			■		
Elementree		■				
Future Climate Australia	GF (only for flaring)	■				■
Greenfleet	GF	■				
Greenhouse Balanced	GF	■				
Neco	GGAS		■	■		
Origin Energy	GF	■		■		■
Project Andromeda	GF	■				

GF – Greenhouse Friendly; GGAS – Greenhouse Gas Abatement Scheme; GS – Gold Standard.
Table 1 is drawn from TEC (2007) and Ribon and Scott (2007).
Note: This table corrects an earlier version and now shows additional services offered by Carbon Planet.

Renewable energy offset schemes refer to projects that invest in alternative sources of power that do not rely on fossil fuels. They include wind, solar and biomass

technologies. Energy efficiency projects are any project that reduces energy consumption. Examples include projects to install more efficient light bulbs and to re-fit office blocks with energy efficient technologies. Finally, forestry offsets are based on the fact that trees sequester, or store, carbon dioxide from the atmosphere.[2] The principle behind forestry offset schemes is that one tonne of carbon dioxide that is removed from the atmosphere and stored in forests through tree planting would have been equivalent in its climate forcing effect to one tonne of carbon dioxide emitted into the atmosphere by the combustion of fossil fuels.

2.1 Renewable energy offsets

Renewable energy projects are generally considered effective to the extent that they displace fossil fuel-based electricity generation. Renewable energy is derived from sources such as wind, solar and hydro that do not produce as many greenhouse gas emissions as energy produced from fossil fuel combustion. Consequently, investment in a new wind farm, for example, can reduce the amount of greenhouse gases in the atmosphere if it displaces energy produced from a coal fired power plant with a high emissions intensity. As a result, the development of renewable energy projects assists in the transition away from a carbon intensive economy (Kollmuss and Bowell 2006).

Although renewable energy offsets are considered effective, there is some uncertainty about how much fossil fuel-based energy renewable projects actually displace. Offsets from renewable energy projects are often referred to as Renewable Energy Credits or Renewable Energy Certificates (RECs), where one REC represents the delivery of one megawatt-hour of renewable power. While it is relatively simple to determine how much energy a wind farm or a solar project produces, it is much more difficult to estimate the amount of emissions displaced from fossil fuel-based energy. In other words, the problem for renewable projects is quantifying the greenhouse gas emissions offset.

Take a wind farm in Australia for example. To calculate the extent to which wind generation reduces greenhouse gas emissions, it is necessary to determine what types of generators are displaced by wind energy and the amount of carbon dioxide emitted by those generators. In Australia, around 90 per cent of the electricity supply comes from fossil fuel generators and so it is likely that the vast majority of energy displaced by a wind farm will have been derived from fossil fuels. However, different fossil fuel generators will emit different amounts of carbon dioxide, in other words, they will have different emission intensities. Given the difficulty of determining exactly which fossil fuel generator is being displaced by the wind farm and its emission intensity, the amount of greenhouse gases offset are often calculated by using an average amount of emissions from each unit of electricity produced (Macintosh and Downie 2006).

[2] This principle is based on the workings of the global carbon cycle. Forest plants and soils sequester carbon dioxide and release it through respiration, decomposition and combustion. The rate at which this occurs is influenced by various factors including climate, topography, soil, species and age of the plants. As forest plants and soils process the carbon under the influence of these mediating factors they drive the global carbon cycle by precipitating the exchange of carbon between the land, the ocean and the atmosphere (IPCC 2000; MOHC 2007; Dury *et al.* 2002).

In summary, while renewable energy projects are an effective means to offset emissions and to help move towards a low carbon economy, there are some difficulties with measuring the amount of greenhouse gases they offset.

2.2 Energy efficiency offsets

Energy efficiency projects aim to reduce the amount of energy consumed by implementing more efficient methods to undertake the same task. For example, if a new air conditioner of the same capacity is installed in a house to replace an older less-efficient one, then the amount of energy consumed is reduced.

Energy efficiency projects are generally considered a good way to address climate change because, as the International Energy Agency reported in 2006, 'improving energy efficiency is often the cheapest, fastest and most environmentally friendly way to meet the world's energy needs' (IEA 2006, p. 31). It means there is less need to increase the energy supply by building more coal-fired power plants for example. However, there is some concern that while energy efficiency projects are a cheap and effective way to reduce emissions they may not make good offsets, and could be better encouraged through government rebates and regulation.

Can energy efficiency offsets generate 'additional' emission reductions?

The aim of an offset project is to create 'additional' reductions in greenhouse emissions that would not have occurred under business-as-usual conditions. For example, an offset company that installs new energy efficient light bulbs in houses should show that these light bulbs would not have been installed without the project. To demonstrate 'additionality' a baseline scenario has to be established to calculate the emissions that would have occurred in the absence of the project. Once the baseline scenario is established, the quantity of offset credits generated by the project can be estimated by calculating the difference between the amount of emissions *without* the project (the baseline scenario) and the amount of emissions *with* the project.

The problem with most offset projects is not the theoretical definition of additionality but determining it in practice (Kollmus and Bowell 2006; Greiner and Michaelowa 2003). Carbon offsets from energy efficiency correspond to greenhouse gas emissions avoided, in other words, the absence of emissions. However, it is almost impossible for energy efficiency projects to directly measure what would have happened in the projects absence. For example, it is impossible to determine whether the light bulbs installed in a house by a carbon offset company would have been installed anyway.

Moreover, it is difficult to determine whether energy efficiency projects are simply the result of existing government policy. For example, a company that claims to be offsetting emissions from retro-fitting an office block could also be undertaking such actions to comply with building regulations or industry standards and therefore the project may not be additional.[3] An international study of 54 energy efficiency projects found that in only a few projects was additionality well established (Umamaheswaran and Michaelowa 2006).

[3] Personal communication with Dr Robert Passey, 25 June 2007.

A further concern is that carbon offsets derived from energy efficiency projects could create a market for lemons. Because many consumers who purchase energy efficiency offsets will be unable to determine whether the project is generating additional emission reductions, companies selling offsets will have an incentive to sell non-additional offsets because they are cheaper to deliver and pass them off as additional. This could create a 'race to the bottom' in the quality of offsets on sale. Although this may be ameliorated by rigorous offset standards (see section 6 and 7), where standards are lax or non-existent, offset certificates could be created by energy efficiency projects that do not drive additional abatement.[4] In short, it is very difficult for energy efficiency projects to guarantee that they are creating 'additional' reductions in greenhouse emissions from what would have occurred under business-as-usual conditions.

Do energy efficiency offsets reduce emissions now?

In general, consumers purchase carbon offsets to offset their current emissions. For example, some airlines offer customers the option to purchase carbon offsets at the same time as they purchase their airline ticket to 'neutralise' the emissions from their flight. However, carbon offsets are sometimes sold from projects that are yet to realise emission reductions. Purchasing 'future offsets' creates the risk of buying carbon offsets that may never actually happen. In other words, some companies are not selling carbon offsets but rather the 'promise' that emissions will be offset in the future (Trexler *et al.* 2006; Kollmus and Bowell 2006).

This can be a problem for energy efficiency projects. Because energy efficiency offsets correspond to greenhouse gas emissions avoided, offset companies that want to claim the full value for the life-time abatement of the project must estimate the amount of emissions avoided far into the future. For example, a company that installs energy efficient light bulbs has to estimate the amount of emissions avoided from the light bulb over the course of the projects life. The risks with this approach are self-evident as companies are forced to second-guess the usage of the product, the lifetime of the product and the likelihood that the product would not have been installed in future years. Although many energy efficiency projects use discount factors to account for these risks, they cannot overcome the inherent uncertainties associated with offsets that are promised in the future as opposed to those that are realised at the time of purchase.

Could energy efficiency offsets actually increase energy consumption?

The point of energy efficiency projects is to reduce the amount of energy consumed. However, some economists have argued that the money that is saved will be spent on other activities that use energy, which could cause a rebound in demand for energy. If a more energy efficient heater is installed in a house the household may decide to heat the house to a warmer more comfortable temperature since it costs less to operate the heater. Or alternatively, the installation of a water-saving showerhead may mean that people shower longer before running out of hot water.

[4] Personal communication with Dr Robert Passey, 25 June 2007.

The ‘rebound effect’, as it is known, is a matter of ongoing controversy in debates about the effectiveness of energy efficiency projects. While some argue that the rebound effect undermines the environmental rationale for energy efficiency, others argue that it is of marginal significance (UKERC 2007). For example, Pears (2004) has noted that the impact of energy efficiency projects can range from large rebound effects to large amplification effects. If the money that is saved from energy efficiency projects flows through the economy and is allocated to more energy intensive activities the total energy consumption could increase. However, if the money saved is invested in other energy saving measures, so for example, the money saved from an energy efficient air conditioner is used to buy a more efficient fridge, then there is a large amplification effect because even more energy is saved. Whether energy efficiency measures increase energy consumption will depend on the energy intensity of subsequent activities. On balance, the rebound effect is not considered sufficient to undermine the large energy savings that can be generated from energy efficiency projects, although in some cases it may reduce the benefit (Pears 2004).

In summary, uncertainties about the capacity of energy efficiency offsets to result in additional emission reductions underpins concern that energy efficiency projects may not make good offsets. Although energy efficiency measures are rightly considered as a cheap and effective way to reduce emissions, the additionality problems coupled with concern that some offsets from energy efficiency activities may never be realised suggests that offset companies and consumers would do better to focus on offsets from renewable energy. In addition, government rebates and regulation could be a better way to drive energy efficiency than offsets.

2.3 Forestry offsets

Offsets created from forestry projects are by far the most popular type of offset, however, they are also the most controversial. While tree planting is the most common, forestry activities can also include projects designed to prevent trees from being cut down, often referred to as ‘avoided deforestation projects’.[5] Part of the reason offset companies market forestry projects is because of the symbolism of trees. As one company executive explained, ‘we have been using trees as the imagery of environmental conservation forever, and trying to re-educate consumers to understand methane flaring is too hard’ (cited in Brand and Meizlish 2006). The easy-to-understand, simple, green message that trees convey has precipitated the burgeoning demand for forestry-based offsets.

[5] Under the Kyoto Protocol forestry is divided into three areas: afforestation, reforestation and deforestation. Each is defined in the Marrakesh Accords, decision 11/CP.7 as follows:
“Afforestation” is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources;
“Reforestation” is 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, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989; and
“Deforestation” is the direct human-induced conversion of forested land to non-forested land.

Many offset companies in Australia promote tree planting to individuals and businesses as means to become 'carbon neutral'. For example Carbon Neutral, which specialises in tree planting claims:

> One effective way we can combat greenhouse gas emissions is to plant trees.
>
> The average Australian can completely offset their carbon dioxide emissions for as little as $0.50 per day! (Carbon Neutral 2007).

Another company involved in forestry projects, Carbon Planet, offers a variety of offset packages. The 'offset your lifetime emissions' package states:

> You can offset your whole life in one purchase! Choose between the whole of your life so far, or your entire life (Carbon Planet 2007a).

Elementree, goes even further in its attempts to persuade consumers of the virtues of tree planting, declaring:

> Why plant trees? Because science has proven that trees have the ability to clean the atmosphere by absorbing enormous amounts of carbon dioxide emissions. They are the Earth's natural lungs. When purposefully reintroduced into the landscape, they can be the simplest and most effective environmental defence at our disposal (Elementree 2007).

Despite their popularity, forestry offsets are controversial. While offset credits derived from renewable energy projects, and to an extent energy efficiency projects, are generally considered an effective means to reduce greenhouse gas emissions, serious concerns have been raised about projects that involve tree planting. There are five main technical and scientific concerns that relate to the capacity of forestry projects to result in real, measurable and permanent reductions in greenhouse gas emissions.

Can forestry projects store carbon permanently?

The major concern with forestry projects is that sooner or later the forest will be cut, burned or destroyed, either because of human or natural causes and the large amounts of carbon held in forests will be released into the atmosphere. It is already proving difficult for government to prevent existing forests from being cleared, without attempting to ensure new forests are maintained for 100 years or more. Forests therefore could easily turn from carbon sinks, which store significant quantities of carbon into a net source of carbon emissions.

In 2000, the Intergovernmental Panel on Climate Change (IPCC) special report on forestry and land use change explicitly noted the 'potential reversibility' of forestry activities in contrast to activities in other sectors (IPCC 2000, p. 10). Similarly in the United Kingdom (UK), a House of Commons Environmental Audit Committee inquiry into carbon offsets has questioned whether the science is 'sufficiently coherent' to accurately assess the long-term carbon impact of forestry projects (EAC 2006). In short, it is argued that forestry offsets that are likely to be temporary are being used to counterbalance the permanent release of carbon through the burning of fossil fuels.

Moreover, other studies show that forestry projects can affect levels of soil carbon. It is estimated that the amount of carbon held in the soil is almost twice that held in the atmosphere (Paul *et al.* 2004). Fallen leaves, twigs and roots all help to bind soil particles that can store carbon for more than 1,000 years. As a result, a slight change in soil carbon would substantially alter the amount of carbon in the atmosphere. One Australian study found that soil carbon could decrease in the first years after tree planting before gradually increasing again. These changes in soil carbon were correlated to the initial amount of soil carbon, annual rainfall and differences between plantations and the previous pasture (Paul *et al*. 2002). Similarly, a New Zealand study found that while tree planting can give rise to large carbon sinks it can also lead to losses of mineral soil carbon, which would need to be accounted for in offset projects (Tate *et al.* 2003). Together these studies, by demonstrating that forestry activities can affect stores of soil carbon, raise further uncertainties about the capacity of forestry offsets to guarantee the permanent reduction of greenhouse gas emissions.[6]

Can forestry offsets generate 'additional' emission reductions?

As discussed, all offset projects are meant to create greenhouse reductions 'additional' to what would have occurred under business-as-usual conditions. While all types of offset projects experience some difficulty in determining additionality and baseline scenarios (Trexler *et al.* 2006), for forestry projects it is particularly difficult.

In 2000, the IPCC special report found that that the 'scientific literature to support' the necessary analysis for forestry projects was 'quite limited' (IPCC 2000, p. 13). Part of the problem lies in defining emission sources and carbon sinks. Emissions sources are the causes of emissions, and carbon sinks are the stores of carbon like oceans or trees. However, as the IPCC report noted, synthesising the technical and scientific data to measure the exact impact of emission sources and carbon sinks on a forestry project remains problematic. In addition, there are concerns that project developers could choose scenarios that inflate their baseline estimates to maximise their projected benefits.

The problem of showing additionality is especially difficult for projects that derive offsets from avoided deforestation. These projects must prove that trees on a particular site would have been cleared had it not been for the offset project preserving the forest. Even if this can be shown, the company must then preserve the trees on the land in perpetuity.

Can forestry offsets lead to carbon leakage?

Land is generally cleared for agriculture or for timber products. If however, trees are planted on land that was previously used for agriculture, people may simply find another area of land to clear. Where this happens, the apparent emission reductions from a forestry projects could 'leak' out of another forest area (Chomitz 1999).

[6] The results of these studies were dependent on a number of variable factors including, soil type, tree type and rainfall.

While the problem of carbon leakage is not confined to forestry projects, there is evidence to indicate that without proper monitoring and accounting, leakage could undermine forestry offsets. The IPCC noted that projects that reduce access to land, food and timber among other things without providing alternatives 'may result in carbon leakage as people find needed supplies elsewhere' (IPCC 2000, p. 15). It also noted that if leakage occurs, then the accounting system could fail to give a complete picture of the changes in emissions. In addition, a recent assessment of carbon leakage from forestry projects in Indonesia found that leakage in the studied area could be large enough to more than ocounter the projects carbon sequestration benefits (Boer *et al.* 2006).

What impact could climate change have on forestry offsets?

A growing concern about forestry activities is that climate change itself could undermine their capacity to offset greenhouse gas emissions. Specifically, rising levels of carbon dioxide in the atmosphere and the associated climate changes due to this increase, have the potential to turn forests from carbon sinks into sources of carbon emissions (DEH 2006a).

One area of concern, especially in Australia, is that increased temperatures and changing rainfall patterns caused by climate change could result in some forests dying. Climate change models indicate that rainfall may decline over southern Australia while temperatures increase. The Australian Greenhouse Office has undertaken some preliminary studies into the likelihood that long periods without rain could lead to forest mortality, although as yet no definitive conclusions can be drawn (DEH 2006a). However, any increase in forest mortality as a result of changes in Australia's climate would seriously undermine the ability of forests to permanently store carbon.

Moreover, other studies indicate that climate change could reduce the capacity of soil to store carbon (Heath *et al.* 2005). One study concluded that if increasing temperatures cause the soil to release more carbon dioxide, then carbon sinks could become saturated and even turn into net sources of carbon dioxide, which would accelerate global warming (Jones *et al.* 2003).

Finally, there is considerable evidence in Australia which indicates that changes to weather conditions due to climate change will increase the risk of fire (Hennessy *et al.* 2005; Downie 2006). More frequent and intense bushfires will negatively affect forestry projects. While the amount of carbon emitted during bushfires is generally equivalent to the amount consumed in subsequent regrowth, changes to the fire regime caused by climate change could alter this balance. As a result, the size of the carbon sink could be significantly reduced, precipitating the release of large amounts of carbon into the atmosphere (DEH 2006a).[7]

[7] A further area of uncertainty is that increased carbon dioxide concentrations could affect forest growth. See Steffen and Canadell (2005) and (Korner *et al.* 2005).

Do forestry offsets reduce emissions now?

As discussed, carbon offsets sold from projects that are yet to reduce emissions carry the risk that they may never actually happen. Companies that trade in these offsets are not selling offsets as such, but rather the promise that emissions will be offset in the future. Almost all offsets sold from forestry projects fall into this category. For a forestry project to store the carbon that it claims, the forest must be maintained for a minimum of 100 years. Consequently, when an individual purchases offsets from a forestry project with their airline ticket what they are actually buying is a promise that the immediate emissions from their flight will be gradually offset over the next 100 years. Yet, because sooner or later forests will be cut, burned or destroyed, offsets from forestry carry a particular risk that they will never actually reduce emissions. This risk increases in light of the growing body of evidence that indicates that climate change itself could undermine the capacity of trees to offset greenhouse gas emissions.

In summary, the technical and scientific concerns about forestry offsets undermine claims by some offset companies that planting trees 'can be the simplest and most effective environmental defence at our disposal' (Elementree 2007). Significant concerns about the ability of forestry offsets to guarantee the permanent reduction of greenhouse gas emissions, especially under climate change conditions, indicate that offset companies would be better off to focus on offsets from renewable energy followed by energy efficiency projects. Irrespective of which offset type is employed, the cheapest and most reliable way to reduce greenhouse gases is not to emit them in the first place.

3. Standards in the international voluntary carbon market

Over the last five years a growing number of companies have entered the voluntary carbon market. It is estimated that the size of the market was 20 million tonnes of carbon in 2006, up from approximately six million tonnes in 2005 (Carbon Planet 2007b). However, because there is no uniform set of standards regulating the voluntary carbon market, there is concern that consumers could be misled by offset companies which claim to be able to achieve carbon neutral outcomes for their customers.[8]

In the UK, the House of Commons Environmental Audit Committee has launched an inquiry into the voluntary carbon offset market citing concern over 'how the market and its funded projects operate'. The terms of reference also raise concerns about 'clarity within the offset market to allow customers to make informed choices' (EAC 2006). The Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC), Yvo de Boer, expressed concern that consumers could be confused about the quality of different offsets because of 'the growing number of unregulated or self-regulated enterprises' (de Boer 2007). More recently, a group of major international banks including Morgan Stanley and Barclays Capital proposed new standards fearing a public backlash against the voluntary carbon market because of the absence of uniform standards and the associated public confusion (Kanter 2007).

[8] Offset credits created in the voluntary market are commonly referred to as Verified Emission Reductions (VERs), where one tonne of emissions reduced creates one VER credit.

Although there is no uniform set of standards in the voluntary carbon market internationally, offset companies can have their products certified and verified by a range of different standards – see Table 2.

Joint Implementation/Clean Development Mechanism

The Kyoto Protocol, which came into force in 2005, stimulated significant activity in the offset market through the creation of Joint Implementation (JI) and the Clean Development Mechanism (CDM). JI encourages polluting industries in developed countries to invest in projects that reduce emissions in other developed countries.[9] For example, a coal company in England can earn carbon credits by investing in a wind farm in New Zealand. Similarly, the CDM encourages polluting industries in developed countries to invest in projects that reduce emissions in developing countries.[10] For example, the same coal company in England can also earn credits by investing in an energy efficiency project in Nigeria.

For offset companies, the rules and procedures established under JI and the CDM provide a set of standards that they can use to have their offsets certified. Hence, credits from CDM projects can be traded in mandatory markets (like the European Union's market, see section 8) and in voluntary carbon markets. Under the JI/CDM rules, offsets created from renewable energy, energy efficiency and forestry projects are permitted. The JI/CDM rules, however, have in place certain conditions on the type of forestry projects permitted.[11] For example, offset credits can be created from projects that plant trees but not from projects that avoid deforestation. In addition, all forestry projects must be guaranteed for a minimum of 5 years to a maximum of 60 years depending on the project. However, the unique aspect of the rules under the Kyoto framework is that all credits generated form these projects must be replaced with credits from other projects when they expire.[12] [13]

To show JI/CDM registered projects create additional emission reductions to what would have occurred in the absence of the project, four main steps are employed.

1. *Policy additionality*. This identifies possible alternatives to the project that are consistent with existing laws and regulations. The aim is to determine whether the project is simply complying with existing regulation or industry standards, and or is due to other government programs.

[9] Kyoto Protocol, Article 6(1).
[10] Kyoto Protocol, Article 12(3).
[11] The rules referred to for forestry projects, or Land Use, Land-Use Change and Forestry (LULUCF) projects as it is referred to in the Kyoto Protocol, are the established rules and procedures under the CDM. The rules for forestry under JI are still being fine-tuned.
[12] See UNFCCC, COP/MOP 1, FCCC/KP/CMP/2005/Add.1.
[13] In 2003, negotiations at the Ninth Conference of the Parties to the UNFCCC agreed to a temporary crediting approach to address this issue. This approach created two new types of Certified Emission Reductions (CERs): Temporary CERs (tCERs) which expire at the end of the commitment period following the one in which they were issued, and Long-term CERs (lCERs) which expire at the end of the crediting period of the project activity. lCERs can be nominated as either fixed or renewable. Fixed lCERs are for up to 30 years, and renewable lCERs are for a period up to 20 years and they can be renewed a maximum of two times, in other words, a maximum of 60 years. (Boyd *et al.* 2004; Rosenbaum *et al.* 2004; Sawyer *et al.* 2003; Passey *et al.* 2007).

2. *Investment additionality*. This determines whether the project is only economically feasible because of the income received from the sale of carbon offsets.

3. *Barrier test*. If investment additionality is inappropriate or unsuitable because the major barrier to the project is non-financial then the barrier test is employed. This identifies other barriers that would prevent the project from occurring without the creation of carbon credits.

4. *Common practice test*. This complementary step checks whether similar projects are common practice in the country of the proposed project. If similar technologies are already commonly used, the project may not be additional because the carbon offset benefits do not play a critical role in making the project viable.[14]

Together these steps, to the extent that it is possible, provide a rigorous framework for assessing whether an offset project will create additional emission reductions.

The Gold Standard

The Gold Standard, launched in 2003 and supported by almost 50 non-government organisations is a non-profit foundation, which aims to ensure offset projects make 'a genuine reduction in CO_2 emissions as well as being of benefit to the host country and sustainable development' (GSF 2007). The Gold Standard only includes JI and CDM registered renewable energy and energy efficiency projects. It excludes forestry projects. For a project to be certified by the Gold Standard it must meet the strict additionality criteria of the JI/CDM rules and be checked by a UNFCCC-accredited organisation. In addition, Gold Standard projects seek to maximise associated environmental, social and economic benefits. For example, it encourages local participation in the design of the project. However, because of the high transaction costs associated with this standard, there is also the Voluntary Gold Standard for projects that are smaller and not CDM registered (GSF 2007).

The Voluntary Carbon Standard

The Voluntary Carbon Standard (VCS) is currently being developed by the International Emissions Trading Association, the Climate Group and the World Economic Forum. It aims to be 'a global benchmark standard for project-based voluntary emission reductions' (VCS 2007). According to the proposed rules and procedures, the VCS will permit offsets from renewable energy, energy efficiency and forestry projects, but it remains to be seen what conditions will be placed on forestry projects. Like the Gold Standard, the additionality criteria for the VCS are expected to be based on the JI/CDM rules (VCS 2006).

[14] This is a summarised version of the assessment process. For more information see UNFCCC (2004).

Table 2 Types of offsets permitted under international carbon offset standards*

Standard	Forestry	Renewable Energy	Energy Efficiency
Kyoto JI/CDM	Yes	Yes	Yes
Gold Standard	No	Yes	Yes
Voluntary Carbon Standard**	Yes	Yes	Yes

* It should be noted some of these standards permit other offset types beyond these three categories.
** The Voluntary Carbon Standard is still being developed.

Table 3 Conditions for forestry offsets under international carbon offset standards

Standard	Reforestation	Avoided Deforestation	Maintenance (in years)
Kyoto JI/CDM	Yes	No	5-60 (all credits must be replaced prior to expiry)
Gold Standard	No	No	N/a
Voluntary Carbon Standard*	Likely	Uncertain	Uncertain

* The Voluntary Carbon Standard is still being developed.

4. Standards in the Australian voluntary carbon market

Since Australia has not ratified the Kyoto Protocol or established a national emissions trading system, offset companies operate in a voluntary carbon market where individuals and businesses can choose to participate in the trade of carbon credits. As a result there is much less discipline in the Australian carbon market and much more scope for dubious projects. This is compounded by the fact that there is no mandatory accreditation scheme, which companies must comply with before they sell carbon offsets. However, there are two main standards by which carbon offset projects in Australia can be evaluated.

Greenhouse Friendly

Greenhouse Friendly was established by the Federal Government in 2001. It is designed to provide 'businesses and consumers with the opportunity to sell and purchase greenhouse neutral products and services' (DEWR 2007a). Greenhouse Friendly permits offsets from renewable energy, energy efficiency and forestry projects. All types of forestry projects are permitted anf they are required to be maintained for a minimum of 70 years to ensure permanence. For additionality the

criteria appear to mirror the four steps outlined in the JI/CDM rules (DEH 2006b; DEWR 2007b).

In comparison to the international standards discussed, the Greenhouse Friendly standards are not as rigorous. For example, while the Gold Standard excludes forestry projects entirely and the Kyoto framework places restrictions on their use, Greenhouse Friendly permits all types of forestry projects including avoided deforestation projects. However, credits from projects that avoid deforestation simply prevent things from getting worse and they do not generate any carbon benefits. Furthermore, despite the additionality criteria outlined, there does not appear to be a formal step-by-step process to prove that a project is additional as is the case with the standards in the international voluntary carbon market

The Greenhouse Gas Abatement Scheme

The Greenhouse Gas Abatement Scheme (GGAS) was established by the NSW Government in 2003. GGAS permits all three types of offset projects but with respect to forestry it excludes avoided deforestation projects and, in contrast to the Federal Government's scheme, forestry projects need to be maintained for 100 years.[15] Although it appears to have stronger rules on forestry offsets that the Federal scheme, its criteria for ensuring additionality, which is critically important for all offset projects, is much weaker. Passey *et al.* (2007) in their latest review of the scheme, argue that the rules do not formally address abatement additionality at all, and that GGAS could delay meaningful action by creating the perception that emissions are being reduced more than they actually are.

Table 4 Types of offsets permitted under Australian carbon offset standards*

Standard	Forestry	Renewable Energy	Energy Efficiency
Greenhouse Friendly	Yes	Yes	Yes
NSW GGAS	Yes	Yes	Yes

* It should be noted some of these standards permit other offset types beyond these three categories.

Table 5 Conditions for forestry offsets under Australian carbon offset standards

Standard	Reforestation	Avoided Deforestation	Maintenance (in years)
Greenhouse Friendly	Yes	Yes	70
NSW GGAS	Yes	No	100

While these voluntary standards can help to improve the quality of offsets, there remain concerns that, on the whole, the voluntary market is a bit like the Wild West, with different rules in different places where consumers could be misled. Because there is no compulsory accreditation scheme in Australia, offset companies can either

[15] Greenhouse Gas Benchmark Rule (Carbon Sequestration) No. 5 of 2003.

choose to have their products certified by one of the international or Australian schemes or to certify their projects themselves.

There are considerable differences between the various international and Australian voluntary standards. Of the carbon offset standards discussed, the Gold Standard is the most rigorous. Not only does it exclude forestry offsets because of the scientific and technical concerns about the capacity of forests to store carbon permanently, but it also has a thorough certification and verification process. At the other end of the spectrum are the Federal Government's Greenhouse Friendly and the NSW Government's GGAS. Greenhouse Friendly has particularly weak rules on forestry projects including the permission of avoided deforestation projects, while GGAS does not formerly address additionality.

Further, many of the offsets available for Australian consumers operate under these two weaker standards. Worse still, some offset companies in Australia operate outside these voluntary standards altogether and are therefore self-regulated. For example, Carbon Neutral and Elementree are both self-regulated.[16] Consequently, there remains a risk that in the voluntary carbon market consumers could be misled because of the situation in Australia, where if a company does not want to have it offsets certified by a government scheme like Greenhouse Friendly or GGAS, it can simply choose not too.

In fact in the UK, the Scottish and Southern Energy Group was found to have breached the advertising code of conduct by claiming to 'plant trees to balance out the CO_2 that your gas heating and household waste produces'. The UK Advertising Standards Authority found that the claim contravened the substantiation and truthfulness clauses of the code because the company could not provide evidence to support the claim.[17] Yet similar claims are made by companies in Australia without any regulatory oversight.

5. Carbon offsets and emissions trading

In May 2007, the Australian Prime Minister's Task Group on Emissions Trading released its report on the possible design of an emissions trading system. The Task Group stated that an emissions trading system that 'recognises a wide range of offsets is highly desirable' and that the inclusion of offsets from land use and forestry 'should be priorities' (DPMC 2007, p. 111). However, given the scientific and technical concerns about forestry offsets, should they be included in an Australian scheme? This section considers what types of offsets are included in emissions trading systems outside Australia, given that an Australian scheme needs to be internationally consistent so it can trade with other schemes.

As Table 6 shows, the main emissions trading frameworks are the Kyoto Protocol, the European Union's (EU) Emission Trading Scheme and the proposed Regional Greenhouse Gas Initiative (RGGI) in the US. The Kyoto Protocol, which was signed in 1997, permits offsets created from renewable energy, energy efficiency and

[16] Carbon Neutral and Elementree are applying to be certified under the Greenhouse Friendly program. Personal communication with Carbon Neutral and Elementree 4 May 2007.
[17] Advertising Standard Authority adjudication, Scottish & Southern Energy Group t/a Scottish Hydro Electric, 11 October 2006.

forestry projects. However, it imposes strict rules on carbon offsets from forestry activities (Boyd *et al.* 2004). The Kyoto framework only permits reforestation projects until 2012, although this could be extended, and it prohibits carbon offset credits derived from projects that avoid deforestation. In other words, while projects that reforest land can generate credits, projects that protect existing forests cannot. In addition, for each Annex I country there is a limit of one per cent on the amount of offset credits that can be generated from forestry projects per year.[18]

Under the EU's Emission Trading Scheme, which is the largest in the world and covers 25 countries, renewable energy and energy efficiency projects are permitted but all forestry offset projects are excluded (EC 2007). The EU reasoned that because forestry activities 'can only temporarily store the carbon, which will at some time be released into the atmosphere', they are not to be included in an emissions trading system, 'which aims at achieving permanent reductions from emission sources' (EC 2003, p. 40).

Finally, the Regional Greenhouse Gas Initiative (RGGI), which is currently being developed by nine US states to establish an emissions trading scheme for power plant emissions, is expected to permit offsets from renewable energy, energy efficiency and forestry projects. It is likely to permit offsets from reforestation projects, but not from avoided deforestation activities (RGGI 2007).[19]

Table 6 Offsets permitted in emissions trading systems outside Australia

Emissions Trading System	Forestry	Renewable Energy	Energy Efficiency	Rules Governing Forestry Offsets
Kyoto Protocol	Yes	Yes	Yes	Reforestation* projects are permitted, but avoided deforestation projects are excluded. Forestry projects are only eligible to 2012 and there is a cap of one per cent per year on the amount of credits that can be created from forestry projects.[20]
European Union	No	Yes	Yes	All forestry projects are excluded.
Regional Greenhouse Gas Initiative** (US)	Yes	Yes	Yes	Reforestation* projects are permitted, but avoided deforestation projects are excluded.

* Reforestation is used here generically in reference to both afforestation and reforestation activities as defined under the Kyoto Protocol.
** The Regional Greenhouse Gas Initiative is still being developed.

[18] Although this paper refers only to forestry offsets, under the Kyoto framework the cap applies to all offsets generated from land use, land use change and forestry (LULUCF) activities. See UNFCCC, Marrakesh Accords, 11/CP.7 and Annex D.
[19] Regional Greenhouse Gas Initiative, model rule, Subpart XX-10.3.
[20] As noted, the eligibility period for forestry projects could be extended beyond 2012 and the limit of one per cent is for each Annex I country.

Accordingly, if an Australian emissions trading system is to be consistent with the Kyoto Protocol and the RGGI it would permit offsets from renewable energy, energy efficiency and forestry activities. However, it would need to exclude offsets from avoided deforestation projects and consider placing a limit on the amount of credits that can be generated from forestry projects. If an Australian system is to be consistent with the EU's emissions trading system, it would permit offsets from renewable energy and energy efficiency projects, but it would need to exclude forestry projects entirely.

Given the restriction placed on forestry offsets internationally and the technical and scientific concerns about their ability to sequester carbon, there are strong grounds for either excluding or placing restrictions on forestry projects in an Australian emissions trading system. Indeed, an overview of submissions to the Prime Minister's Task Group on Emissions Trading highlights the controversy that surrounds forestry-based offsets. While some submissions supported forestry offsets, such as that by the Business Council of Australia (BCA 2007), others, such as the submission by the Australian Network of Environmental Defender's Offices, argued that, like in the EU, offsets from forestry should be excluded (ANEDO 2007). The Australian Conservation Foundation also raised concerns about the capacity of tree planting to store carbon permanently, and its submission argued for forestry offsets to be excluded (ACF 2007).

6. Implications

There is now a considerable body of evidence indicating that the potential for carbon offsets to reduce greenhouse gas emissions is limited, and that the most popular type of carbon offset in Australia, tree planting, is also the least effective for dealing with climate change. The evidence indicates that even offsets from renewable energy and particularly from energy efficiency projects cannot guarantee emission reductions that are measurable and additional to would what would have occurred under business-as-usual conditions. Moreover, allowing for offsets from forestry in an Australian emissions trading system is likely to be inconsistent with the rules governing offsets in trading schemes abroad, thereby jeopardising the tradability of Australian permits

Many offset companies in Australia promote forestry projects as the best way to offset greenhouse gas emissions. Yet the significant technical and scientific concerns about the ability of forestry projects to guarantee the permanent reduction of greenhouse gas emissions, especially under climate change conditions, indicates that forestry offsets are the worst type of offset. In fact, there is a possibility that forests could turn from being carbon sinks that store significant quantities of carbon, into net sources of carbon emissions.

Similarly, while energy efficiency measures can act as a cheap and effective means of reducing greenhouse gas emissions, the evidence indicates that they too do not make a good offset. In particular, the inability of energy efficiency projects to guarantee that they are creating additional emission reductions, coupled with concern that some offsets from energy efficiency activities may never be realised, suggests that government rebates and regulation could be a better way to drive energy efficiency.

Nevertheless, many Australian consumers are purchasing offsets from forestry and energy efficiency projects. There are concerns that, as has already happened in the UK, consumers in Australia could be misled by companies that claim that offsets can make them 'carbon neutral'. The risk to consumers is heightened by the maze of differing carbon offset standards that exist in the voluntary market. The evidence indicates that offset companies should focus on offsets from renewable energy projects and where possible, consumers should purchase offsets that are certified by the most rigorous standards, such as the Gold Standard.

There are strong grounds for excluding forestry-based offsets from an emissions trading system in Australia, or at minimum placing restrictions on their operation. Of the three main emissions trading frameworks outside Australia, the Kyoto Protocol and the RGGI have placed restrictions on forestry-based offsets, and the EU's scheme has excluded them entirely. If an Australian scheme is to be internationally consistent so it can be integrated with other schemes, similar restrictions will need to be put in place.

Some types of offsets, such as those from renewable energy projects, can provide consumers and businesses with an effective means to offset their emissions. However, offsets should only work to complement domestic actions that cut greenhouse gas emissions and they should not be seen as a license to pollute or as a means to continue unsustainable practices. Too often, offsets are being used by governments and business as a smokescreen to distract people from the need to cut emissions. By diverting people's funds and attention to projects that are unlikely to significantly reduce emissions, offsets could do more harm than good.

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