

Acknowledgments

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A number of people with specialist interests in biosequestration as a key form of carbon offsets gave generously of their time, knowledge and opinions. They are listed on page 23.

Cover: "Kellimung", Jigsaw Farms, Western Victoria October 2005. Andrew Campbell photo.

Disclaimer

This report and the options it contains are intended to stimulate discussion on possible opportunities for CMA involvement in the carbon market. It does not represent the official position of any Victorian Catchment Management Authority or the Department of Sustainability and Environment.

Executive Summary

The carbon market is real and here to stay. Biosequestration – the use of planted vegetation to offset emissions of greenhouse gases thus creating carbon credits that can be sold in the market – is currently playing a modest role. However that is likely to increase as the carbon market develops, in particular as a national emissions trading scheme emerges over coming years.

Catchment Management Authorities (CMAs) at face value are well placed to facilitate biosequestration investment into revegetation projects that meet the priorities of their regional catchment strategies (RCS). This report reviews some existing biosequestration schemes and analyses the potential roles that CMAs could play in this broad arena.

While different options will suit different CMAs in different circumstances, the overall conclusion is that CMAs should hasten carefully if not slowly as this new market evolves.

Unless there is a marked increase in the carbon price, it seems that few projects that are a high RCS priority (for example for biodiversity values) will be high performers from a pure carbon sequestration perspective. Moreover, such projects tend to use multiple species, including understory species, with different growth rates (few of which have well developed growth models). Accordingly, they are more complex to measure and monitor than a typical forestry plantation using commercial species for which there are well accepted, robust growth models. The requirements of the carbon market for certification and long term security of carbon rights (typically 70-100 years) necessitate contracts with landholders that are registered on the title of the land. This both lessens their attractiveness to landholders and increases the time required for individual contract negotiations.

As a consequence of both the measurement and property rights issues, the transaction costs involved in 'bulking up' lots of relatively small environmental plantings are likely to be very considerable in comparison to the potential returns from the carbon market at current prices. If the price were to rise from the current \$10-15 per tonne of CO₂ equivalents to say \$30-50, then demand would increase and such plantings would become more viable as sinks.

Nevertheless, there is already a differentiation in the carbon market between mandatory trades (required to meet regulatory standards for certain emitters) and voluntary trades (where firms don't have to offset their emissions but choose to do so anyway). It seems that in general the price is slightly higher in the voluntary market, and environmental values other than tonnes of carbon sequestered are more important in this market. Catchment bodies in New South Wales and Queensland are already participating in voluntary trades to attract additional revenue into their high priority projects, to some advantage. Seven NSW CMAs are undertaking a trial project with State Forests NSW that seeks to streamline some of the measurement and carbon security issues. Victorian CMAs should watch this trial closely.

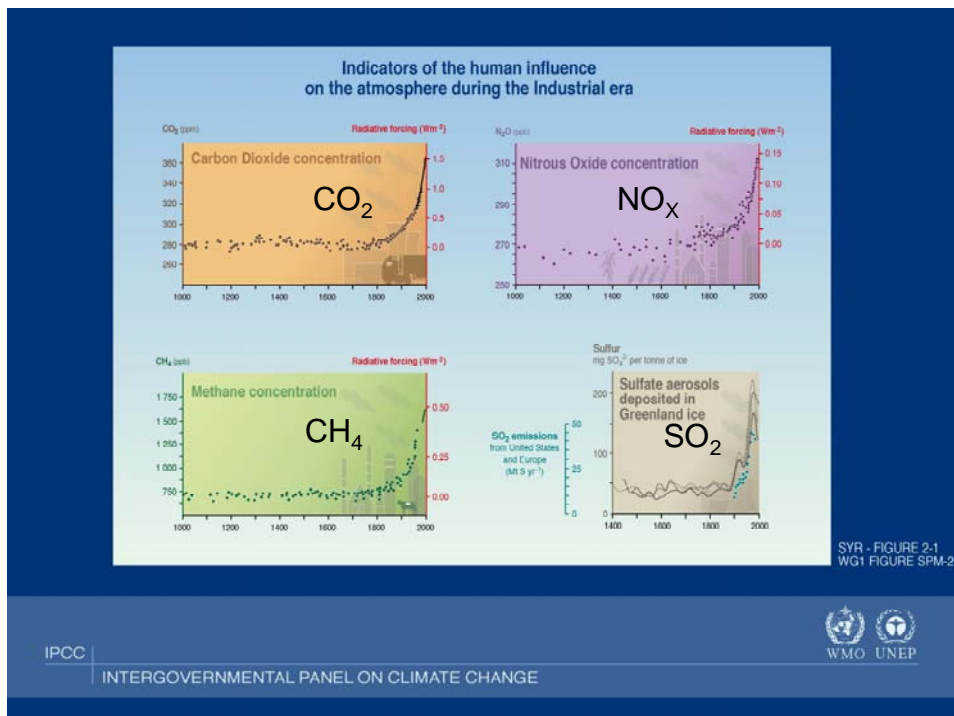
It remains to be seen whether the current 'two-tiered' carbon market will persist or whether there will be a convergence as a national scheme emerges. However to the extent that a voluntary market exists, especially with its current counter-intuitive combination of achieving higher prices with less demanding carbon accounting and security standards, then marketing their 'charismatic carbon' is the most prospective area for CMAs.

The report identifies some key issues that CMAs will need to watch as a national scheme emerges, and canvasses some policy options that state and federal governments might consider to make it easier for high priority CMA projects to compete in the biosequestration market.

Introduction

Human activities are changing the global climate at an unprecedented rate, with profound implications for human societies and the future of our descendants. Carbon emissions trading is an important option in the battle to reduce greenhouse gas emissions, and biosequestration of greenhouse gases through the establishment of vegetation offsets is an important element of carbon emissions trading. There are various ways in which Catchment Management Authorities (CMAs) can participate in emerging carbon offsets markets through their involvement in revegetation activities. This report reviews those options.

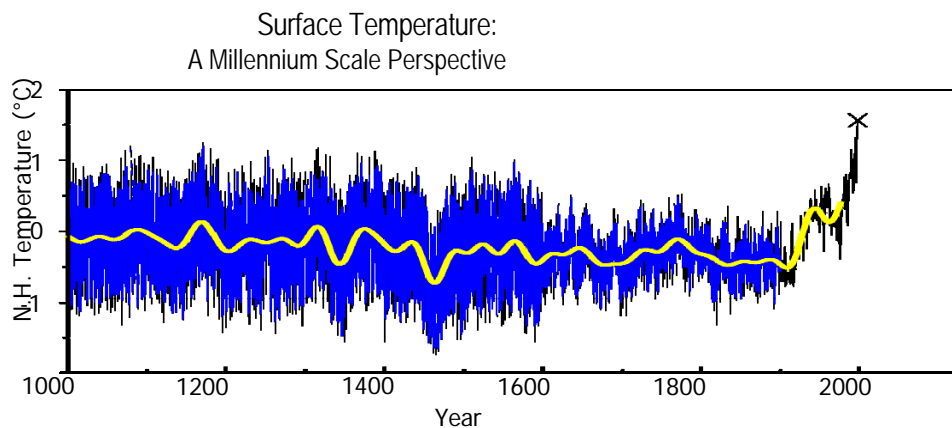
First, it is important to understand the key drivers for vegetation offsets. The most comprehensive analysis of the scientific evidence for human-induced climate change is that of the fourth assessment report of the Intergovernmental Panel on Climate Change - the IPCC - released in February 2007 <http://www.ipcc.ch/>. The graphs below summarise human influence on the atmosphere since industrialisation.



The graph in the top left is carbon dioxide, the most ubiquitous greenhouse gas. In the pre-industrial era, CO₂ concentrations were stable at about 280 parts per million (ppm) in the earth's atmosphere. They have risen steeply since industrialisation and are now at 380ppm and rising. We know from ice core sampling that temperature and the concentration of CO₂ in the atmosphere have been closely correlated for millions of years. This link has been well known for a long time by scientists. In 1896, the Swedish scientist Svante Arrhenius proposed a connection between atmospheric carbon dioxide levels and temperature. With the American geologist Thomas Chamberlain, Arrhenius calculated that human activities, especially since the industrial revolution, were contributing to global warming.

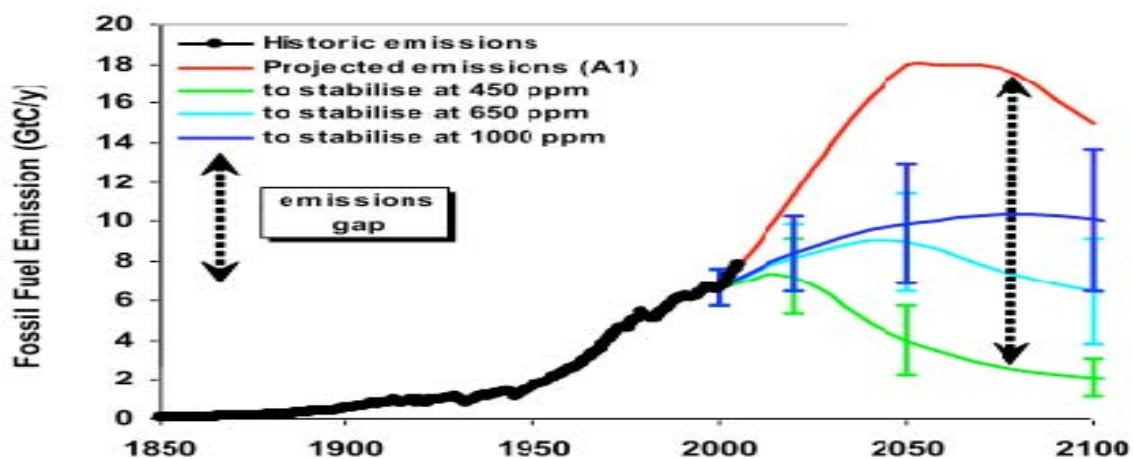
The other three graphs represent the concentrations of the other key greenhouse gases in the earth's atmosphere: methane in the bottom left, nitrous oxides in the top right and sulphate aerosols in the bottom right. The sulphate aerosols are as measured from Greenland ice cores. Note that all the curves are roughly the same shape, apart from sulphate aerosols, which appear to have dipped slightly in recent years in line with a parallel drop in sulphur dioxide emissions from the US and Europe, as have emissions of chlorofluorocarbons (CFCs).

Global temperatures have tracked the same 'hockey stick' curve, trending sharply upwards in the late 20th Century, as outlined in the graph below (from Mann et al 1999) which looks at average global surface temperatures over the last thousand years.



Mann et al. (1999) GRL 26:759-762

The graph below is the punch line. The black line is actual emissions of carbon in Gigatonnes per year, and the coloured lines are projections: red (top line) is business as usual; blue (second top) is the emissions profile needed to stabilise global CO₂ emissions at 1000ppm (i.e. almost four times pre-industrial levels); light blue (second bottom) is the emissions profile needed to stabilise global CO₂ emissions at 650ppm; and light green (bottom line) is the trajectory we will need to stabilise emissions at 450ppm - still almost 20% above current levels



Note that in the graph above, we need to reduce emissions to below half the current levels by about 2050 to have any hope of stabilising global atmospheric CO₂ concentrations at or below 450ppm. Given the substantial economic growth rates in the developing world, especially

China and India, it is likely that cuts in emissions in the rich industrialised countries will need to be deeper than 50%. Many European countries and American states have already committed to cuts in emissions in the order of 75% by 2050. Given current emissions profiles and the time taken to radically restructure and retool the stationary energy sector, the transport fleet and other critical infrastructure, it is also clear that existing alternative technologies are not yet able to meet the world's energy needs while delivering cuts of this magnitude.

This means that there will be a strong demand for ways of offsetting CO₂ emissions for the foreseeable future.

Carbon emissions trading is a key tool that can help governments, businesses and individuals to manage their exposure to climate risk. Any comprehensive strategy to manage greenhouse gas emissions must first seek to **avoid** and **reduce** carbon emissions (measured as carbon dioxide equivalent, or CO₂e- emissions). For those emissions that cannot be reduced further with current technologies and market settings, it is a viable strategy to **offset** such emissions by investing in emission reduction projects that have prevented or removed an equivalent amount of carbon dioxide elsewhere. The main carbon offset options in Australia are renewable energy, energy efficiency and forestry (known as biosequestration) projects.

EXISTING CARBON MARKETS

There is one, formal, mandatory carbon offset market in Australia: the New South Wales Greenhouse Gas Reduction Scheme (GGAS) [www.greenhousegas.nsw.gov.au], which was the first mandatory greenhouse emissions trading scheme in the world. GGAS requires electricity generators to meet specified targets for reducing their emissions, either through direct measures, or by purchasing Abatement Certificates, each of which represents one tonne of CO₂ or its equivalent. A recognised means of creating a certificate is through the use of eligible forests which form a carbon sequestration sink. Although most of the eligible forests registered within GGAS are conventional commercial tree plantations, environmental plantings established for other legitimate environmental purposes could also become part of a pool of carbon stocks managed under GGAS (Grieve et al *in press*) – provided they are in New South Wales.

The most recognised scheme globally is the European Union Emissions Trading Scheme (EU ETS) [<http://ec.europa.eu/environment/climat/emission.htm>] which became active in January 2005. In 2006, approximately 992Mt (million tonnes) of CO₂e were traded on the EU ETS, representing about 62% of the global carbon emissions trading market (Point Carbon 2007, cited in Ribon & Scott 2007).

The market for voluntary carbon offsets, where businesses choose to offset their emissions as part of their greenhouse strategy – i.e. to become 'carbon neutral' – rather than to meet a regulatory compliance imperative, is growing and evolving rapidly. The Chicago Climate Exchange (CCX) [www.chicagoclimateexchange.com] is perhaps the best recognised voluntary market. The CCX operates a voluntary "cap and trade" program, where CCX members commit to annual greenhouse gas reductions as a percentage of their baseline. Reductions beyond the contracted level can be sold to other CCX members. The program commenced in the USA, but has expanded to Europe and other countries (Clean Air-Cool Planet 2006, cited in Ribon & Scott 2007). In Australia, new entrants and new products emerge seemingly every week. Unsurprisingly for such an immature market, the voluntary carbon offsets market is highly fragmented, with lots of small players, little regulation and a variety of quality standards.

CERTIFICATION STANDARDS

Any carbon emissions offset market needs defined standards – for carbon accounting, to establish the legitimacy of projects as offsets, and to verify the claims of organisations claiming to be ‘carbon neutral’.

Carbon emissions offsets need to be generated from projects that are reliably verified and are additional to business as usual activity. Offset purchasers need to have confidence in this. Currently, it is difficult for offset purchasers to differentiate between a low-quality and high-quality offset, and it is often difficult for purchasers to be assured that their purchases of carbon offsets are in reality offsetting their emissions (Ribon & Scott 2007).

Mandatory emissions trading schemes like GGAS are quite specific as to what constitutes a valid offset, and their standards are usually derived from parameters agreed by the vast majority of developed countries during the negotiations of the Kyoto Protocol. Voluntary schemes are likely to become increasingly demanding of assurance that they are offering or purchasing high-quality carbon offsets, given that organisations who seek to offset their emissions voluntarily, usually do so in a high profile manner and seek to enhance their reputation in doing so. They do not want to be associated with ‘dodgy’ sinks projects. The RMIT review (Ribon & Scott 2007) reports on a recent study by U.S. organisation Clean Air-Cool Planet [www.cleanair-coolplanet.org] that summarises the characteristics of high-quality carbon offsets:

- **Additionality:** the carbon offsets produced make the project viable, that is, the project would not have occurred in the absence of a carbon signal. In the Kyoto context, the crucial biosequestration criterion is that revegetation has occurred on land that was cleared in 1990.
- **Baseline Determination:** a credible approach is taken to determine the emissions that would have occurred in absence of the project.
- **Benefit Quantification:** the quantification of emissions reductions resulting from a project does not overstate benefits. It reflects uncertainties.
- **Permanence:** potential future reversal is not an option for the resulting offsets.
- **Ownership and Registration:** ownership of the offsets is clear and formally registered, providing a paper trail and reducing the possibility of offsets being sold many times.
- **Monitoring and Verification:** the offset project will be monitored and verified over time.

These criteria underpin most of the existing standards including the Voluntary Carbon Standard [theclimategroup.org/assets/Voluntary_Carbon_Standard_Version_2_final.pdf] (VCS) and the Gold Standard [www.cdmgoldstandard.org] for Voluntary Emission Reductions (Gold Standard VER). Ribon & Scott (2007) review the various standards in more detail.

In the Australian context, the two key standards are those established for the New South Wales Greenhouse Gas Reduction Scheme (GGAS) [www.greenhousegas.nsw.gov.au/acp/forestry.asp] and the Greenhouse Friendly framework [www.greenhouse.gov.au/greenhousefriendly] of the Australian Greenhouse Office (AGO).

The types of projects certified under Greenhouse Friendly include energy efficiency projects, renewable energy projects and bio-sequestration projects - including reforestation, afforestation and avoided deforestation projects. They will also certify projects that capture and flare landfill gas, and waste diversion and recycling projects. Abatement projects must

occur in Australia, and meet criteria for additionality, be permanent and generate verifiable emission reductions or sequestration. Greenhouse Friendly approved abatement can be used within the Greenhouse Challenge Plus framework, but also sold outside this framework (Ribon & Scott 2007).

The rationale for CMA involvement in carbon trading

Catchment Management Authorities are interested in carbon trading for a range of reasons. These in essence revolve around the potential for investments in carbon offsets through vegetation sinks to progress the objectives of their Regional Catchment Strategies (RCS). Involvement by CMAs in various aspects of carbon trading could, under favourable circumstances, deliver benefits including:

- The generation of an additional revenue stream independent of State or Commonwealth grants;
- The ability to extend the influence of CMAs' other monies to fund additional work or to invest further in existing priorities;
- Additional incentives for landholders to invest in re-establishing native vegetation;
- Opportunities to provide access to the carbon market for smaller and/or more 'environmental' revegetation projects than might be possible in the absence of CMAs;
- Opportunities for CMAs to influence the investments and behaviour of other organisations, including large corporates and external investors, in ways consistent with the RCS; and
- The ability to prevent or discourage carbon trading investments and practices that may be inconsistent with the RCS.

Whether or not such aspirations are realised will depend on a range of factors, some of which may be influenced by CMAs and others much less so. These factors are described in more detail later.

Some exemplar existing biosequestration schemes

This section describes briefly some examples of existing biosequestration schemes. More are described in Appendix A. These have emerged rapidly in recent years and new versions seem to be emerging almost on a weekly basis. The three schemes described below are quite different models that represent a good cross section of the available possibilities. The material here draws on material provided by Graeme Anderson of DPI Victoria, and a review of carbon offset providers done by Global Sustainability at RMIT University (Ribon & Scott 2007). CHOICE magazine is scheduled to review and compare these schemes (presumably from a consumer perspective at the voluntary end of the market) in a coming edition.

Greenfleet

(www.greenfleet.com.au)

Greenfleet was established in Victoria in 1997 as a not for profit organisation, providing carbon offsets for vehicles, office energy use, staff air travel and conferences. For \$40 per year (tax deductible) Greenfleet offsets one vehicle's carbon emissions through the planting of 17 native trees in environmental plantings for a range of benefits. This works out at \$8.80/t. Greenfleet pays landholders for the costs of permanent revegetation up to certain

limits, and prefers sites larger than 10 hectares. It does not require a covenant on the title of the land and its carbon accounting requirements are less demanding than GGAS or Greenhouse Friendly, although it is working towards accreditation under the latter. Its website provides a useful range of information for working out the carbon footprint of businesses, families and individuals.

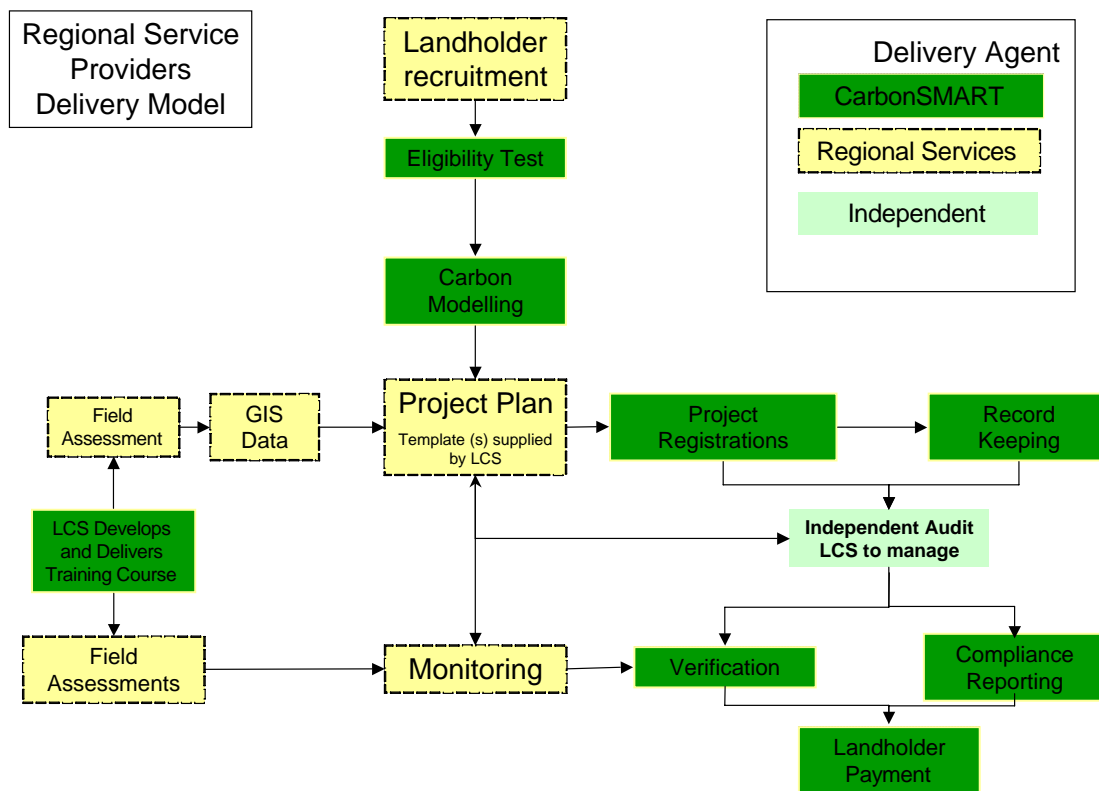
Landcare CarbonSMART
(www.carbonsmart.com.au)

A Landcare Australia Limited project, Landcare CarbonSMART (LCS) is designed to create a carbon pool that offers returns to farmers for environmental plantings and protects biodiversity. CarbonSMART is currently seeking GGAS accreditation, and then intending to seek Greenhouse Friendly accreditation also. LCS is a carbon pool manager which undertakes the management, accreditation and monitoring on behalf of the landholders.

Sites of interest are those which landholders consider permanent plantings and unsuitable for ongoing agricultural use. Landholders need to meet the GGAS requirements (e.g. 100 year security of carbon credit). Importantly, LCS will consider existing plantings, as long as they have been planted since 1990 on formerly cleared land.

Landcare CarbonSMART (LCS) is keen to partner with CMAs in sourcing and managing vegetation sinks projects that contribute to wider environmental objectives (Ben Keogh *pers comm*). A flowchart illustrating how such a partnership could work, indicating which tasks LCS would expect CMAs to undertake (yellow shading) is outlined below.

This diagram outlines some of the generic tasks that need to be undertaken in establishing biosequestration projects that could meet carbon market requirements under most of the schemes listed here. The assignment of roles between CMAs and commercial partners/contractors would vary from scheme to scheme, but the generic roles — that need to be undertaken irrespective of who does the job — are well presented in this diagram.



LCS = Landcare CarbonSMART

CO2 Australia
www.co2australia.com.au

CO2 Australia is one of very few companies accredited under GGAS. The company establishes long term (150 yr) mallee plantings on cropping and grazing land in the mid-low rainfall (290mm to 450mm) zone. The plantations are measured in order to receive certificates under the NSW GGAS. Plantings are made in unfenced belts, blocks or alleys integrated with existing farming and grazing operations. Stock need to be excluded from the new plantings only for the first year, after which grazing can be reintroduced without damaging the trees. Several species of mallee are considered depending on the soil type and the rainfall zone. The farmers retain full ownership of their land and are not expected to make any cash outlay. All associated costs are paid for by CO2 Australia. The trees and the carbon within them are owned by CO2 Australia.

CO2 Australia is led by Andrew Grant, who is also the Chair of the Port Phillip and Westernport CMA and thus is able to look at this issue from a unique perspective wearing two of his many hats. His view is that the best option for CMAs is to partner with firms for whom the carbon market is core business. Interestingly, Andrew says that for every ten inquiries that CO2 Australia receives from farmers interested in selling their carbon, only one results in a signed contract after farmers have evaluated the returns against the constraints on their land use and property rights. This ratio could well hold true for many of the types of projects that CMAs might consider to be desirable elements of a carbon pool.

Possible developments

Carbon trading is taking place in an environment of considerable uncertainty.

Table 1 overleaf sets out the key design parameters for an Australian emissions trading scheme as recommended by the Prime Minister's Emissions Trading Task Force (PM&C 2007). The key features from a CMA perspective are that:

- Carbon offsets through vegetation sinks are expressly recognised, including during the transition phase to a new national scheme;
- Agricultural emissions (for example methane from ruminants or carbon released during soil cultivation) are excluded at this stage due to measurement difficulties;
- Land use change (for example land clearing) is also excluded.

However the task force recommends that in principle, any national scheme should aim for maximum coverage of all carbon sources and sinks, and it is explicit that agriculture should be included when measurement difficulties are resolved.

The implications of these points for CMAs is that for the next few years, probably at least until 2012, vegetation sinks are likely to remain 'the main game' from a greenhouse perspective. It is possible that at some stage in the future it may be possible for carbon credits to be earned through other changes to farming systems that reduce emissions or create sinks. But the carbon accounting complexities involved are formidable and it is by no means clear for most farmers whether they would be buyers or sellers in a carbon credits market were agriculture to be included.

Table 1. Design parameters for an Australian emissions trading scheme (PM&C 2007)

The key design features of an Australian emissions trading model should be based on a 'cap and trade' model. It should exhibit the following features.

- ⇒ **a long-term aspirational emissions abatement goal and associated pathways** to provide an explicit guide for business investment and community engagement
- ⇒ **an overall emissions reduction trajectory that commences moderately, progressively stabilises, and then results in deeper emissions reductions over time** and:
 - is sufficiently flexible that it can be **periodically recalibrated** by government to changing international and domestic circumstances through regular and transparent reviews;
 - provides markets with the ability to develop a **forward carbon price path** to guide business investment decisions and help drive longer-term technology development – markets would be expected to establish a low initial carbon price and a forward price curve that rises over time.
- ⇒ **maximum practical coverage of all sources and sinks, and of all greenhouse gases:**
 - with permit liability placed on direct emissions from large facilities and on upstream fuel suppliers for other energy emissions;
 - with those sectors initially excluded from the emissions trading scheme subject to other policies designed to deliver abatement.
- ⇒ **initial exclusion of agriculture and land use** from the scheme
 - though agricultural emissions should be brought into the scheme as practical issues are resolved
- ⇒ **a mixture of free allocation and auctioning of single-year dated emissions permits that:**
 - **provides an up-front, once-and-for-all, free allocation of permits as compensation to existing businesses** identified as likely to suffer a disproportionate loss of value due to the introduction of a carbon price;
 - **ameliorates, through free allocation, the carbon-related exposures of existing and new investments in trade-exposed, emissions-intensive industries** while key international competitors do not face similar carbon constraints, but which also provides ongoing incentives for abatement and adoption of industry best practice;
 - **allows for the periodic auctioning of remaining permits.**
- ⇒ **a 'safety valve' emissions fee** designed to limit unanticipated costs to the economy and to business, particularly in the early years of the scheme, while ensuring an ongoing incentive to abate;
- ⇒ **recognition of a wide range of credible carbon offset regimes**, domestically and internationally;
- ⇒ **capacity, over time, to link to other comparable national and regional schemes** in order to provide the building blocks of a truly global emissions trading scheme;
- ⇒ **incentives for firms to undertake abatement in the lead-up to the commencement of the scheme**, including through the purchase of offset credits from carbon plantations, and potentially from other accredited activities;
- ⇒ **revenue from permits and fees to be used, in the first instance, to support emergence of low-emissions technologies and energy efficiency initiatives**
 - the focus might shift more toward households and business as the scheme matures.

From the report of the Prime Minister's task force, and from discussions with interested players, it is clear that a national emissions trading scheme will emerge.

Some key features are likely to include:

- A 'cap and trade' system with wider mandatory participation than just the electricity retail sector;
- Requirements for eligibility of vegetation sinks based on some combination of the GGAS and Greenhouse Friendly standards;
- Continuation of 'voluntary trades' outside the scheme – with probably less demanding carbon accounting and security standards; and
- A gradual consolidation of the market into two tiers of mandatory and voluntary trading, with more consistency in the key parameters at each level compared with the current proliferation of schemes.

The key issues likely to shape any national scheme include:

- The level at which the cap is introduced;
- Whether or not end uses of timber are factored into calculations for forestry schemes (if so, then commercial plantations will become even more competitive);
- The timeframe for which carbon rights need to be secured;
- International developments including the emergence of a global carbon price.

One of the interesting elements to watch will be the extent to which the current distinction between 'industrial' and 'charismatic' carbon is either sharpened or blurred as the market develops and matures.

'Charismatic carbon' is a term coined by Marisa Meizlish of New Forests Pty Ltd for carbon generated through projects that seek to deliver other environmental benefits in addition to sequestration, such as habitat values for endangered species, or protection of significant environmental assets - for example filtering runoff into significant wetlands or revegetating critical salinity recharge zones. In such cases the carbon may be a relatively minor component of the value proposition for investors. Such investors may be less fussed about meeting the more demanding certification criteria of the 'industrial' schemes for the carbon component, but will still require some third party endorsement about the overall environmental benefit delivered by their offsets.

'Industrial carbon' is shorthand for carbon generated through sinks projects that seek to maximise carbon sequestration and net economic returns, by generating some commercial returns and minimising net costs per tonne of carbon, including transaction costs. Such projects are likely to be characterised by large block plantings of one or two commercial forestry species for which robust growth models are readily available and where long term ownership of the carbon rights is secure and unambiguous.

Potential opportunities and risks for CMAs in carbon trading

OPPORTUNITIES

If a national emissions trading scheme emerges in which bio-sequestration projects are eligible for offsetting carbon emissions, then there will be a demand for suitable revegetation

and reforestation projects across Australia. There is already such a demand in NSW through GGAS.

Even in the unlikely event that such a mandatory national scheme does not emerge, it is clear that there will be an increasing demand for vegetation offsets in the voluntary market. Several high profile companies have already announced publicly their intentions to become 'carbon neutral' across all their operations, including News Corporation, PWC and KPMG, and that number appears likely to grow rapidly. These companies will need access to 'good' revegetation projects as part of the mix of offset options for their business.

At face value, CMAs are well placed to have some involvement in carbon trading. Most CMAs have been involved in funding revegetation projects for many years. They have well developed databases and geographic information systems (GIS) that locate projects spatially. They work at an operational scale, employ staff in extension roles and are able to maintain on-going relationships with landholders. Above all, CMAs know what the priorities are in their regions - i.e. where large scale revegetation is most desirable for particular environmental objectives.

So in principle, CMAs could potentially achieve some or all of the objectives listed earlier. Carbon trading is potentially another tool that can help CMAs to progress the implementation of their Regional Catchment Strategies.

RISKS

BUT, there are many uncertainties and risks for CMAs in this arena.

Fundamentally, carbon trading is a specialist field that is not core business for CMAs. It requires particular expertise, dedicated systems and a sophisticated approach to managing risk. Some of the risks include:

- **Financial:** the costs of getting set up for carbon trading and of meeting standards for measurement, certification and compliance are considerable, yet the returns may be modest. For environmental mixed species plantings in particular, there is a serious risk that carbon returns may not offer a reasonable margin over the considerable transaction costs involved.
- **Technical:** measurement issues in established, single species commercial plantations of *Pinus radiata* and *Eucalyptus globulus* are tricky enough, but in mixed species environmental plantings they are much more complex. Grieve et al (*in press*) evaluated the two most promising systems, the Carbon Sequestration Predictor (CSP), and the National Carbon Accounting Toolbox (NCAT). They concluded that both systems:

“provide generally unbiased estimates for plantings of typical dryland eucalypt species over 5 years of age, however, for younger plantings the estimates were inaccurate. Neither model provided a precise measure, and the level of uncertainty associated with these methods would result in very conservative estimates of the quantum of carbon sequestration for which for abatement certificates can be created. Nevertheless either model may be suitable for use by CMAs, subject to calibration for a wider range of species and planting types, and additional assessment of uncertainty.”

In other words, depending on regional conditions and the types of plantings, considerable technical development work is needed to develop regionally calibrated, robust, user-friendly measurement techniques for mixed species environmental plantings. The NSW pilot project should make some progress on this point.

- **Return on investment:** unless CMAs can achieve significant economies of scale across multiple revegetation projects, or the carbon price rises considerably, or CMAs can deliver 'charismatic carbon' that commands a substantial market premium, net returns from carbon trading will be modest at best. A recent review (Grieve et al *in press*) of carbon offset potential in NSW estimated that the gross carbon value of all CMA revegetation projects in NSW is currently about \$12m per annum, from which costs would need to be deducted to estimate net returns.
- **Policy:** carbon trading and the carbon market generally is immature at this stage. Key market parameters will be affected by government policy settings, and any subsequent changes in those settings, which are inevitable, but unlikely to be influenced much by CMAs.
- **Resourcing:** successful participation in carbon trading will require specialist expertise, especially in the early stages of the evolution of the market, and development of the systems for measuring, monitoring and securing the carbon for very long periods of time (70-100 years) will be expensive in both funds and expertise. CMAs have limited expertise in-house, and the opportunity costs of allocating key people to the carbon market may be significant.
- **Reputational:** if the cap is set too high and/or the price of carbon falls sharply, as it has in Europe, leaving landholders with encumbrances on their property rights for marginal returns, or if the net returns are modest, the standing within their regions of CMAs that have actively promoted such schemes would suffer accordingly.

Options for CMA involvement in carbon trading

Carbon trading is an inherently risky business for CMAs to get involved in. It is also a potentially valuable new weapon in the CMA armoury to achieve broader environmental objectives at a landscape scale.

There are a number of ways for CMAs to manage the above risks, and a range of options for involvement in carbon trading. There is no need to jump in 'boots and all' in the first instance. The range of options is summarised below. These are by no means exhaustive, nor mutually exclusive. It would be possible to adopt several of these roles, either sequentially or in parallel. Nevertheless, they are presented roughly in order of increasing engagement in the carbon market and increasing risk. There is no preferred option. The risk versus return equation will be an individual judgment for each CMA according to its particular circumstances.

" DO NOTHING " – reasoned inaction

Given the risks and uncertainties outlined above, it would be a valid response for individual CMAs to make a judgment that carbon trading is a low priority at this stage and to take no further action. This minimises all of the risks identified above, but it carries a new risk of missing out on any opportunities that might arise for early movers in the carbon market.

“ WATCHING BRIEF ”

– wait and see how a national market evolves

This is a slightly more proactive version of the ‘do nothing’ option. It would involve CMAs allocating some resources (e.g. a proportion of the time for a senior member of staff or active participation in relevant networks) to keep a close watching brief on the carbon market and CMA opportunities in that market, and to regularly review the desirability of CMA participation in the market. This could be done at the level of individual CMAs or clusters of CMAs. An obvious first step is to keep a close eye on the NSW pilot project involving Forests NSW and seven CMAs.

“ GUARDIAN ”

– promoter and defender of the Regional Catchment Strategy

CMAs may choose not to participate in carbon trading directly, but to seek to influence the carbon market so that it favours projects that are consistent with the aims of the Regional Catchment Strategy (RCS) and not projects that undermine the RCS. For example, CMAs can steer carbon projects towards their high priority revegetation zones, or allocate extension resources towards helping their landowners and NRM stakeholders to better understand the carbon market.

In essence, individual landowners are selling their privately owned carbon asset to another party to then on-sell into a market (regulatory or voluntary) - for commercial gain. CMAs need to decide if getting involved in this activity serves their strategic interest.

One has only to look at the impact of blue gum plantations in the Green Triangle region of south-west Victoria and in south-west Western Australia to see the potential for blunt instruments like taxation or markets to change landscapes on a large scale very rapidly. It is in the interests of CMAs to ensure that any large scale revegetation or reforestation investments further the aims of their Regional Catchment Strategies, or at least do not compromise RCS objectives. The blue gum example shows that, depending on how projects are planned, sited, implemented and managed, there is potential for large scale plantings that seek to maximise carbon sequestration to cause clearing of important habitat (and CMA- or NHT-funded revegetation projects), ripping of native grasslands, soil erosion, reductions in catchment water yield and hence streamflows, and considerable impact on landscape amenity.

Influencing a market in which you are not a participant is easier said than done. It means trying to influence the individual transactions between landholders and carbon traders or buyers, or the rules under which they operate. Neither is straightforward for CMAs. The carbon market, in the main, will be privately driven and delivered, just as blue gums have been. It may be useful for CMAs to analyse the extent to which Regional Catchment Strategies have had any influence at all on the location, establishment and management of blue gum plantations, and to think about how that influence might have been improved. CMAs need to work out how they could better influence the actions of others who will be making major investments in their catchments.

“ QUALITY ASSURANCE ”

– certifies environmental value of projects

CMAs are well placed to play some form of certification role (formal or informal) in establishing the broader environmental credentials of vegetation sinks projects. Many

purchasers of carbon, especially in the voluntary market, will be keen to ensure that they are not investing in projects that are environmentally damaging, because they are interested in improving their personal or corporate image, not damaging it. There may well emerge either a component of the formal accreditation system or an additional component, that describes and certifies that projects are achieving broader environmental goals than just carbon sequestration. CMAs may choose to play a role in assessing and verifying the environmental 'value added' of such projects. Taking on such a role would require appropriate resources, skills and systems, but it would also put CMAs in a more influential position to ensure that the carbon market is environmentally beneficial and that perverse outcomes inimical to RCS objectives are minimised.

" CARBON COUNTER "

– measures and monitors carbon in its projects

As the carbon market develops, the business of counting carbon has to develop accordingly. CMAs are already engaged in mapping and monitoring on-ground projects including revegetation works to varying degrees. These projects are described in project files and in databases and GIS systems, with varying degrees of precision and rigour. It would be an extension of this role for CMAs to improve their systems to the extent that they can sell carbon accounting services to the market. In this option the carbon market would in effect be subsidising the improvement of CMA measurement and monitoring systems for vegetation projects, that may have some spillover benefits for CMA project monitoring more generally. The volume of such work and the returns generated may not be sufficient to justify such a role for individual CMAs, but an investment in such capacity across several CMAs could be more realistic.

" FACILITATOR "

– steers carbon investors towards desirable projects from RCS perspective

This is an extension of the Guardian option, in that it seeks not just to influence carbon trades, but to facilitate specific projects that progress RCS objectives, without necessarily being directly involved in the ultimate transactions between buyers and sellers of carbon. It implies having a good understanding of the carbon market and its requirements, and access to potential purchasers, either directly or through specialist brokers. It is probably more likely in the voluntary market and could be seen as a milder version of the Strategic Investor option below.

" STRATEGIC INVESTOR "

– through partnerships/joint ventures with specialists

There are already more than a dozen specialist firms offering a range of products in the Australian carbon market. It makes sense for CMAs to form partnerships (contractual or informal) with such firms to bring about the sorts of projects that CMAs would like to see, while sharing or outsourcing the risks. Such partnerships would enable CMAs to access specialist expertise, systems and networks without having to own them. CMAs would bring to such partnerships their own strengths in terms of local knowledge of projects, environmental credibility and relationships with landholders. CMAs would be able to concentrate on their core NRM business, leaving the intricacies of the carbon market to the experts. Where projects meet the CMA criteria in terms of their contribution to RCS objectives, then CMAs could choose to become co-investors.

The joint venture between New Forests Pty Ltd and the Gwydir-Border Rivers CMA in New South Wales [http://www.newforests.com.au/insights/pdf/New_Forests_Cambium_Release.pdf] exemplifies this option. This is a large scale forestry project on 8,500 hectares of land (with a 105ML water licence) purchased by New Forests on behalf of Cambium Global Timberland Limited, that is integrated with large scale environmental plantings and habitat restoration works on environmental assets that are a high priority for the CMA. In this instance a large grant by the CMA was instrumental in the overall viability of a project integrating commercial and environmental outcomes. The carbon market alone would not have justified the on-ground environmental works in this project, but the project would not be viable in the absence of the carbon revenue.

Other firms seeking to form partnerships with CMAs to develop and manage biosequestration projects include CO2 Australia [<http://www.co2australia.com.au/CO2Australia.aspx>] and Landcare CarbonSMART [<http://www.carbonsmart.com.au/Page/Get+Involved.aspx>]. They are quite different models again from the New Forests example above, and will suit different circumstances. There are likely to be others.

A CMA could choose to partner with just one firm offering one model for landholders, or it could choose to partner with different firms depending on the type of projects desired. The former option is simpler, but it 'puts all the eggs in one basket' and the model on offer may not suit all landholders. Joint ventures would enable CMAs to outsource some of their risks, but the reputation of the CMA remains potentially at risk if the commercial partner does not deliver for landholders.

“ MARKET PLAYER ”

– acts as a carbon pool manager and broker either directly or through a subsidiary

The final option is for CMAs to develop a new line of business by becoming direct players in the carbon market as carbon brokers and/or managers of carbon pools generated through CMA investments. There are a number of ways CMAs could do this, but in essence it would involve 'bulking up' the carbon from a number of CMA revegetation projects and on-selling that carbon into either the mandatory (if a Victorian or national carbon trading scheme develops) or voluntary markets, either directly or through a broker. This would mean CMAs would have to negotiate legally robust sub-contracts with landholders (including Land Victoria for plantings on crown lands such as riparian frontages) that secure the carbon rights for up to 100 years, professional carbon accounting capabilities, and systems that meet independent external audit and certification requirements. At current carbon prices, few landholders other than the Crown are likely to regard 100 year (or 70 year) covenants on their land title to be justified by the carbon returns from environmental plantings. For CMAs, such sub-contracting activity is expensive and would seem justifiable only if considerable economies of scale can be achieved to reduce the transaction costs per tonne of carbon sold.

One way of achieving such economies of scale would be for several CMAs to combine forces to create a larger carbon pool, and to invest jointly in either an out-sourcing arrangement or a subsidiary project to measure and market that carbon pool. One

It is arguable whether establishing, managing and marketing a carbon pool is core business for CMAs. Here's how a senior Victorian government official with some experience in facilitating carbon projects sees it:

“I'd suggest that they should not become an direct/active player in the market - they should perform a role of an independent facilitator and helping achieve positive outcomes for landowners and catchments without themselves entering the game. CMAs are no better placed

to perform the role of managing a complex and long term carbon marketing pool for growers than they would be to manage a grain or lamb marketing pool - it's just not their key business or role. There are substantial risks for CMAs (no matter how well intentioned their actions may be) in becoming an active player - they should ensure they have identified these before entering the market.”

CMAs could establish carbon pools, only to find themselves being out-competed by other carbon players. This is particularly likely if CMAs concentrate on ‘bulking up’ lots of smaller (<20 hectares) revegetation projects, which have high transaction costs per tonne of carbon sequestered. Landholders will choose the carbon product that best suits their individual situation, and would not be expected to have any long term allegiance to a CMA. It may be tempting from an efficiency perspective for CMAs to adopt one option from the schemes above to market to their landholders, but different landholders will prefer different options. Managing a carbon pool over the longer term is a complex and specialist business. Rules are likely to change frequently over coming decades, requiring constant staff training and systems upgrades accordingly.

A variation on the Market Player option that may be less onerous in carbon accounting terms would be for CMAs to concentrate solely on the voluntary market, with projects that have wider environmental benefits, like for example Greenfleet [www.greenfleet.com.au]. Such projects may be harder to market in the first instance, but less costly to maintain in the longer term, and with clearer links to RCS objectives. However, while market players currently feel that the voluntary market will be around for a long time to come, some suggest that when a national scheme does become established, its standards for measuring and securing carbon rights are likely to become the default. The gap in transaction costs between mandatory and voluntary trades may narrow over time as even voluntary purchasers of carbon expect projects to meet national standards in terms of secure, quantifiable carbon rights.

In a recent project funded by the Joint Venture Agroforestry Program, Alastair Grieve, Sam Wood and Annette Cowie (Grieve *et al in press*) of Forests NSW (a division of the NSW DPI and formerly State Forests NSW) analysed the potential for CMAs in New South Wales to become accredited as carbon pool managers under GGAS, using the Murrumbidgee CMA as a case study. Their conclusions (see below) are also pertinent to Victorian CMAs:

“This study has allowed a number of conclusions to be reached regarding the feasibility of a CMA becoming a pool manager under GGAS:

- 1. The business systems currently in use by CMAs, with minimal modification would enable the administrative requirements of GGAS to be met.*
- 2. Legal issues that surround the process for establishing forestry rights and carbon rights on the title of private land included in a CMA-run pool could present a major obstacle to participation by landholders, and therefore become a barrier to such a pool becoming viable. These issues will therefore need further investigation and consideration.*
- 3. The potential total area of plantings suitable for inclusion in a pool within the Murrumbidgee CMA (c. 5,000ha) indicates that it may be more viable to include a larger area of plantings spread across several CMAs in order to create a pool which is viable.*
- 4. Suitable carbon accounting methods exist (the CSP and NCAT); however both methods would require a supporting program of data collection using existing plantings to refine estimates and to quantify uncertainty of sequestration predictions.*
- 5. On the basis of these findings, a pilot project should be conducted to seek accreditation of one or more CMAs as a pool manager.”*

The cautious optimism of Grieve *et al* about the potential for NSW CMAs to become accredited carbon pool managers under GGAS is tempered by three key reservations: whether the margins are sufficient at current carbon prices at the current scale of activity for environmental plantings to generate viable returns (they estimated a gross carbon value of annual plantings by NSW CMAs as only around \$12m); whether the legal restrictions on landholders’ property rights are too heavy compared with available returns; and whether carbon accounting methods are sufficiently developed to enable robust inventories of mixed species environmental plantings to be done efficiently.

Seven CMAs in NSW have subsequently joined forces in commencing a pilot project with Forests NSW that will investigate in particular the inventory issues involved in multi-species environmental plantings (Alastair Grieve *pers comm*) that would need to be resolved were one or more CMAs to become a pool manager. Victorian CMAs should observe this pilot project with interest, as its findings will be almost as relevant in Victoria.

Comparative evaluation of options

The table below summarises the pros and cons of these options. As indicated above, these options are not mutually exclusive. Further, all of these options could be done collaboratively across several CMAs, or even all Victorian CMAs, rather than by each CMA unilaterally. In fact for several, it would be desirable to spread the risk, share resources and expertise, minimise inter-CMA competition in the market, and achieve economies of scale by working together, just as the CMAs are doing in New South Wales.

Table 2. Summary evaluation of options for CMAs in the carbon offsets market

OPTION	Advantages	Disadvantages
Do Nothing	Cheapest, simple to implement	Risk of being left behind
Watching Brief	Cheap, simple to implement	Relatively passive, could miss out on ‘low hanging fruit’
Guardian	Consistent with CMA core business and underlines the CMA link to the RCS - may lift awareness of RCS.	Trying to influence a market without being a participant is not easy - may soak up resources to little effect
Quality Assurance	Consistent with CMA core business and underlines the CMA link to the RCS - may lift awareness of RCS.	CMAs could be seen to be ‘picking winners’. Endorsing some commercial projects but not others requires rigorous, defensible systems
Carbon Counter	Gives CMAs a good handle on revegetation activities, builds skills and systems	Arguably not core business for CMAs, needs rigorous systems to manage risk, returns likely to be modest or negative
Facilitator	Active promotion of RCS objectives, and opportunity to attract high priority projects that deliver RCS objectives. A good way of getting some involvement in carbon trading without bearing financial risk, especially if in partnership with a specialist commercial firm.	Resource-intensive - requires staff or consultants with knowledge of the carbon market, networking constantly to link buyers and sellers. Some reputational risk if carbon price crashes or projects fall over, or the commercial partner does not perform.

Strategic Investor	Gives CMAs more direct control over projects of interest – and may bring about high priority projects that might not get up without CMA buy-in. Builds CMA capacity and attracts co-investment to the region.	Increased financial risk if projects don't deliver. CMA funds may be seen to be subsidising corporate commercial activity – equity concerns among catchment residents.
Market Player	CMAs could capture any 'early mover' advantages, in either voluntary or mandatory market by attracting funds that are seeking a bigger environmental bang for their carbon bucks.	Riskiest option, exposure to real market risk, with key parameters still uncertain. Needs rigorous systems and good in-house skills in an area that is not necessarily core business for CMAs.

Policy implications

The general immaturity of the carbon offsets market in Australia and the fact that neither a national or Victorian emissions trading scheme has yet emerged mean that CMAs should see this area as exploratory. CMAs could however get a better feel for carbon trading opportunities ahead of a national scheme by becoming involved in the voluntary market.

In thinking about the likely emergence of a national emissions trading scheme, it is worthwhile considering some enabling interventions that might speed up and/or improve the design of any such scheme from a carbon offsets perspective. Some suggestions that CMAs may wish to pursue – whether unilaterally, multilaterally or as recommended components of the bilateral agreements between the Victorian and Commonwealth governments – are canvassed below.

- A key priority for CMAs must be to increase the rigour and precision of carbon accounting for mixed species environmental plantings. The NSW trial will be worth watching, and it may be possible out of that to recommend detailed improvements to either or both of the carbon accounting models analysed by Grieve et al (in press). Importantly, improved rigour, accuracy, precision and defensibility should also be accompanied by more simplicity in measurement at less cost. This is a huge challenge. CMAs may find that major changes are required to their existing project mapping, recording and monitoring systems. Such changes may have spillover benefits beyond the carbon market.
- The second biggest issue is to develop simplified contractual arrangements with landholders that satisfy the requirements of the carbon market for security over the carbon, while minimising transaction costs and restrictions on landholders' property rights. Again, such measures cannot be designed with specificity before knowing the detailed requirements of a national scheme, however generic templates for both the contracts with individual landholders and for people purchasing credits from a carbon pool, could be developed drawing on the best elements from all the existing schemes.
- The potential for plantings on Crown frontages to be marketed as offsets by Victorian CMAs is worth further investigation. At face value, the Crown should not have the same concerns as farmers about carbon rights impinging on future management options, and it may be possible for the Crown to simply assign the carbon rights for such plantings to CMAs, thus removing the negotiation costs. This is clearly an issue that needs to be sorted out at a State level rather than a CMA level, and may be worth specific exploration in the White Paper on *Land and Biodiversity at a time of Climate Change*.
- Given the interest in this issue by CMAs from Victoria and elsewhere, and given the trial underway with NSW CMAs, it could be fruitful for the NRM joint team within the Australian Government to convene a workshop for CMAs across Australia to share

experiences, information and ideas on this issue, drawing in particular on this report and the work of Grieve *et al* in New South Wales.

Conclusions

This report has reviewed the options for CMA involvement in carbon trading. Consistent with the terms of reference for the project, there is no recommended or preferred option. Different options are likely to suit different CMAs to differing degrees. However the New South Wales experience suggests that if environmental plantings are to play a more widespread role as carbon sinks than as isolated projects in the voluntary market, then some scaling up from individual CMAs will be required, as will improved systems for mapping and monitoring revegetation projects. The necessary economies of scale are unlikely to be achieved by a single CMA acting alone.

Catchment Management Authorities should hasten carefully if not slowly in the carbon market. Boards should think hard about whether to develop expertise and systems in-house or rather to enter into partnerships with specialist commercial firms. At this stage it is too early to say whether the inevitable national emissions trading scheme will deliver big opportunities for CMAs, but its development will merit close on-going attention.

Victorian CMAs would do well to monitor closely the trial being undertaken by seven NSW CMAs with Forests NSW in an attempt to streamline some of the carbon accounting and carbon security issues involved with marketing environmental plantings for biosequestration offsets.

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APPENDIX A. More existing biosequestration schemes

Treesmart Australia Pty Ltd
(www.treesmart.com.au)

Treesmart is a private offsetting company which plants eucalypt plantation species to offset carbon dioxide emissions from vehicles. Unlike other carbon offset schemes, trees planted under this scheme can be harvested. Treesmart sources its eucalypt plantations through private farm forestry, farm forestry cooperatives and its own plantations. It offers offsets to motorists, road freight operators, public transport travellers, air travellers and conference attendees at an average price of \$12/t. Farmers must commit to managing the farm to ensure sequestration of carbon, as well as detailing the harvesting plans.

Carbon Neutral
(www.carbonneutral.com.au)

Carbon Neutral offers individuals the opportunity to offset their own carbon emissions as measured by the tonne of GHG or for their annual domestic carbon dioxide emissions, including air travel, driving and electricity use.

Carbon Neutral will plant native trees to provide this offsetting. Carbon Neutral was set up by Men of the Trees in Western Australia in 2001 and is seeking accreditation under Greenhouse Friendly. Planting sites are chosen principally for improvement and protection of the rural environment. Each site contains four different species indigenous to that location. Site owners are contracted to keep trees in the ground for a minimum of 30 years, however the intention is for the site to remain under trees for perpetuity.

Carbon Planet (www.carbonplanet.com.au)

Carbon Planet was founded in January 2000 in Adelaide and began trading in June 2005. The Carbon Planet website offers individuals the opportunity to purchase carbon offsets, provided through the planting of trees. Carbon Planet carbon credits (priced at \$23/t) are fully accredited under the NSW Greenhouse Gas Abatement Scheme.

[Forests NSW](#) (the forestry division of the NSW State Government Department of Primary Industries) is Carbon Planet's principal supplier of carbon credits and is a fully-accredited provider of NGACs (NSW Government Abatement Certificates). There are 32 individual forests that make up the accredited carbon pool, located in north-eastern New South Wales (NSW) Australia, ranging from Taree to the Queensland border. The forests comprise 13 hardwood species that occur naturally in north-eastern NSW, of which the four main species are spotted gum (*Corymbia maculata/variegata*), Dunn's white gum (*Eucalyptus dunnii*), blackbutt (*E. pilularis*) and flooded gum (*E. grandis*).

Greenhouse Balanced (www.greenhousebalanced.com.au) (www.ecologicalcredits.com)

Greenhouse balanced is partnered with a Bendigo Bank program providing corporate carbon solutions and consulting services. Their focus is to provide carbon offsets through the planting of indigenous vegetation for the provision of environmental benefits. For landholders Greenhouse Balanced can undertake all the revegetation works or partner with the landowner. Projects are described in more detail at the ecological credits website.

Bendigo Bank (teamed with Greenhouse Balanced)
(www.bendigobank.com.au/public/generationgreen)

Bendigo Bank offers offsetting through the revegetation of cleared land with native tree species. Emissions offsets are available for a car's emissions for one year, a home's annual emissions, or one person's annual emissions.

Climate Positive (www.climatepositive.com)

Climate Positive is a not for profit company established in 2006 that provides offsetting services for individuals and businesses - claiming to provide offsets that go 30% beyond simply replacing emissions - hence the 'carbon positive' title. Offsets offered include Renewable Energy Certificates (RECs) under Greenhouse Friendly, and in the near future, Voluntary Carbon Units (VCUs) under the Voluntary Carbon Standard (VCS). Various combinations of RECs and VCUs are offered at prices from \$20 to \$35 per tonne of CO₂ equivalents depending on the product.

Elementree (www.elementree.com.au)

Elementree has several goals which are currently being achieved in WA only. The first is listed as establishing sustainable tree lines and forests in low rainfall areas of Australia already suffering from salinity and soil degradation. The second is to maximise the ecological benefits of tree planting for the land and local communities.

Elementree operates two projects in low rainfall regions and is working towards Greenhouse Friendly accreditation. A retail forestry project is a Landcare project planting local native species to fulfil an environmental need, offering offsets at \$10/t. Farmers are approached and offered revegetation services free of charge in exchange for contractual agreements of their long term management.

The wholesale forestry project provides commercial scale carbon offsets for businesses. Species are chosen for their unique carbon and crop-integration properties.

Australian Carbon Traders
(www.australiancarbontraders.com)

Australian Carbon Traders (ACT) is a for profit company based in Victoria and established in 2004, that offers both businesses and individuals carbon offsets from reforestation projects and conducts auditing and verification for existing forestry projects to either GGAS or Greenhouse Friendly standards. ACT provides advice about tapping into the income stream associated with forestry and carbon trading. ACT is essentially a carbon broker employed by the farmer to ensure carbon transactions are completed with transparent terms and conditions.

ACT offers a carbon matching service *Australian Forest Abatement Registry* which matches investors and growers over the web. The site is a voluntary register displaying spatial data and basic site attributes including expected or estimated sequestration.

Australian Carbon Biosequestration Initiative Limited
(www.biggreenumbrella.org.au)

ACBI is another carbon matching system which aims to connect CO2 emitters with landowners who have land to plant trees. ACBI can help with planning, contracts, compliance and monitoring.

ACBI also plant trees to create carbon sinks and register the carbon credits on land titles, which is committed for 100 years.

Table 3 overleaf (from Ribon and Scott 2007) provides a summary comparison of a wide range of offsets schemes, including biosequestration, energy efficiency, renewable energy and gas flaring.

Table 3. Comparison of Carbon Offsets Service Providers (from Ribon & Scott 2007)

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are needed to see this picture.