

THE UNIVERSITY OF  
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**Markets for Environmental Services: aspects of the Western Edge  
Native Farm Forestry (WENFF) project for the Blue Mountains  
World Heritage Institute**

**Final Report**

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## Executive Summary

Australia's native forests are facing ever increasing environmental threats and innovative initiatives are needed to help protect and restore forests. Government funding is never likely to be sufficient to satisfy all conservation needs which is why alternative mechanisms that make conservation commercially viable are being sought. The Blue Mountains World Heritage area is facing increased environmental threats due to degraded land adjoining the national park and increasing native vegetation via farm forestry activities presents a promising solution to this problem. This is the focus of a project being undertaken by the Future of Australia's Threatened Ecosystems (FATE) program and the Blue Mountains World Heritage Institute (BMWHI) called the Western Edge Native Farm Forestry (WENFF) project.

In this report, markets for environmental services are explored as a potential form of farm forestry that assists with the provision of environmental services, economic returns to landholders and contribution to regional sustainable development. The review of environmental markets shows that whilst this is an area of rapid development and considerable excitement worldwide, markets are still reasonably immature and most consist of pilot projects. The state of current markets and legislation in NSW is reviewed in more detail as this is directly relevant to implementation within the Blue Mountains region.

Carbon trading, biodiversity banking and salinity credit trading are reviewed in terms of key criteria identified from the literature including propensity for landholder involvement, attracting private investment, presence of a market intermediary, maturity of the market and implementation issues. The markets are then summarised in terms of their contribution to the project objectives. All farm forestry options are found to provide environmental services, whilst provision of economic returns and contribution to sustainable development depend on a number of the identified challenges being overcome.

Carbon trading is the only market that is already operational and backed by current legislation in NSW, however in order to be economically sustainable it is recommended that a combination of the environmental markets are implemented, initially as pilot projects. It is also important to combine these with more traditional farm forestry options to ensure a return on investment, whilst the project develops. This report only provides a starting point for understanding environmental markets and the possible application to the target area. Further research is required into the specific needs of landholders in the target area before detailed implementation plans can be defined.

## Introduction

The Greater Blue Mountains World Heritage area contains an important component of Australia's biodiversity that is not otherwise represented elsewhere in the world. In addition, a significant number of rare and threatened species are endemic to the area (Department of Environment and Heritage 2006). This makes preservation of this area extremely critical. This World Heritage area is currently facing growing environmental pressures. Although global environmental issues such as climate change present a major threat, immediate pressures are also occurring due to incompatible land uses in the adjoining areas. Examples of threats from these land uses include fire, inappropriate tourism infrastructure, invasion of pests and weeds and general loss of biodiversity (Department of Environment and Heritage 2005).

The Future of Australia's Threatened Ecosystems (FATE) program is currently embarking on a project under the umbrella of the Blue Mountains World Heritage Institute (BMWHI) known as the Western Edge Native Farm Forestry (WENFF) project. This project will help to address environmental pressures by increasing native vegetation in western areas adjoining the world heritage national park. They intend to do this by developing a range of commercial farm forestry options that will "provide environmental services, economic returns to landholders and investors and contribute to sustainable regional development" (Ampt and Carlton 2006). The intention is also that these farm forestry options will be implemented using a common property regime rather than private management.

Markets for environmental services such as carbon trading and other environmental goods and services present key farm forestry options for providing a potential income source to landholders. Carbon trading relates to sequestered carbon from forests for which credits can then be traded. Other environmental goods and services include ground water management (salinity), water quality improvements, reduced erosion and biodiversity conservation that may attract investment funding. Currently markets for these types of goods and services are not very well defined (Binning et al. 2002). The NSW Greenhouse Gas Abatement Scheme (GGAS), although in its infancy, is Australia's first non-voluntary carbon trading scheme and is more developed than markets for other environmental goods and services (Independent Pricing and Regulatory Tribunal 2005). Further research is required to help establish how these markets might operate to meet the needs of the project.

This project will help to explore available literature in relation to markets for environmental services so as to be able to better define how these options might be used in practice to stimulate investment and provide income from farm forestry, thus contributing to the sustainable regional development within and adjacent to the Blue Mountains World Heritage area. The key objective of this project is to review the literature to understand whether markets for environmental services are appropriate for meeting the WENFF project objectives of providing environmental services, economic returns to landholders and investors and contributing to regional sustainable development.

## Overview of Environmental Service Markets

Environmental services or ecosystems services, is a concept that is becoming increasingly important, not only to environmentalists, but also to the agriculture and forestry industries. Well managed forests can help to address many environmental issues such as dryland salinity, soil erosion, water quality, biodiversity loss and even climate change

(McGhee 2004). In the past, the value of these environmental services has often not been taken into consideration, with those who reduce environmental benefits not bearing the full cost and those who provide public benefits not receiving any financial reward. There is now a worldwide movement towards establishing markets for these environmental services, where landholders can generate revenue by creating environmental benefits from their property. Markets present a more effective means of motivating environmental protection on private land, rather than just relying on government regulation that is often costly to enforce and less flexible (Davidson 2005).

The concept of environmental or ecosystem services gained much attention internationally in the early 90's with the US EPA establishing the Ecosystem Valuation Forum (Bingham et al. 1995). Research into environmental services in Australia began to gain momentum in the late 1990's, initially with the focus being on assessing the nature and value of these services (Cork and Shelton 2000). Valuation of environmental services is a key issue. Predicting how environmental service flows will change as a result of human action is often very difficult (Bingham et al. 1995). For some environmental services it is possible to measure this directly, such as for carbon sequestration where reasonably accurate carbon accounting techniques exist for calculating the quantity of carbon sequestered. However, for other environmental services, the benefits are not so directly visible. This might be due to the large number of inputs, such as for salinity or water quality improvements, or it might be that it takes a long time for benefits to become apparent, such as for biodiversity improvements. For these indirect types of situations, it is often necessary to agree on an indicator or surrogate measure (Grieve and Uebel 2003).

Projects to investigate the value of environmental services in Australia include the CSIRO ecosystems services project (CSIRO Sustainable Ecosystems 2004) and the NSW Environmental Services Scheme (Grieve and Uebel 2003). This has further developed into extensive investigation into markets for environmental services and numerous pilot projects have sprung up to help establish these markets.

Possible markets for environmental goods and services include a power station buying carbon credits to offset emissions, a water authority buying salinity credits, cost sharing for catchment management and also ethical investments (Binning et al. 2002). Markets for ecosystem services are expanding, but currently most consist of pilot projects. Strategies for turning them into real markets include areas such as rewarding local participation and knowledge, turning beneficiaries into buyers, linking to climate change which has an international push behind it and creation of legislation and policy frameworks (Jenkins et al. 2004).

There are a number of market based mechanisms that are being used in practice to provide private landholders with an income for environmental goods and services generated by farm forestry. An overview of some of these markets is provided below.

### **Carbon Trading**

Carbon trading, the trading of greenhouse gas allowances or reduction credits, is one of the most mature markets for environmental services. Carbon credits can be generated from a number of different sources, however carbon sequestration is of most relevance to farm forestry, whereby carbon credits are generated from forestry revegetation projects. Carbon markets have emerged due to the framework established under the Kyoto protocol which introduced three frameworks – International Emissions Trading (IET), Joint Implementation (JI) and Clean Development Mechanism (CDM). The International

Emissions Trading scheme provides a framework for global carbon trading, however this is not expected to be in place until after 2007 (Stowell 2005).

Because of the lack of an international standard, markets are still fairly fragmented with great differences in scheme design. Schemes that are dependent on government regulation, for example cap and trade, have been slow moving due to lengthy policy decisions required. Voluntary schemes have been most active due to the ability to get them up and running more quickly (Hasselknippe 2003). Key carbon trading markets around the world include the EU emissions trading scheme, the UK Emissions trading system, the Chicago Climate Exchange and the NSW Greenhouse Gas Abatement Scheme (Jindal 2006).

### *Carbon Trading in Australia*

Forests NSW are a key player in the carbon trading market in Australia and have been involved in some of the first initiatives for the exchange of carbon credits. They negotiated initial trades with Delta Electricity and Pacific Power in 1998 which helped to identify the need for a legislative framework. Forests NSW are also involved in a carbon trading agreement with Tokyo Electric Power Company (TEPCO). Carbon trading in Australia is now facilitated by legislation through the carbon rights legislation amendments Act (Salvin 2000).

#### **Box 1: Greenhouse Gas Abatement Scheme (GGAS)**

##### *Rule 5 – Carbon Sequestration*

Necessary to apply to the Scheme Administrator to become a Abatement Certificate Provider (ACP) in order to be able to create NSW Greenhouse Abatement Certificates (NGACs). Conditions Include:

- Land must be Kyoto-consistent, that is predominantly non-forest prior to 1 January 1990
- Applicant must be a ‘Sequestration pool manager’ who controls and is responsible for the carbon sequestration rights
- Must demonstrate ability to store carbon for 100 years
- Must have adequate procedures in regard to risks and hazards

Source: (GGAS 2006)

In the late 1990’s, Sydney Futures Exchange looked set to set up a market for carbon trading, however this was later abandoned (Bloomberg 2000). Since then Forests NSW have pursued carbon trading as part of the NSW Greenhouse Gas Abatement Scheme and also manage the National Carbon Accounting Standard (NSW Department of Primary Industries 2005).

The NSW Greenhouse Gas Abatement Scheme is one of the first mandatory schemes for emissions trading in the world, whereby electricity companies are required to offset their greenhouse emissions by purchasing carbon credits. Carbon credits, known as abatement certificates under this scheme, can be generated a number of different ways including carbon sequestration. To obtain certificates from carbon sequestration, there are a strict set of conditions and guidelines for how the forestry is to be operated and managed. Both permanent forests and farm forests are eligible (GGAS 2006). Over 10 million greenhouse abatement certificates were registered by February 2005. Trading based on carbon sequestration has only formed a small part of this overall figure with plantations by CO2 Australia and Forests NSW (The Katoomba Group 2005).

Becoming involved in a carbon trading project using sequestration is an involved process requiring much up front investment and planning. ‘Planning forest sinks’ is a report that provides landholders with guidelines as to how they can get involved in establishing a carbon sink (Australian Greenhouse Office 2006). This provides a valuable tool consistent with the national approach, for landholders or those that are planning to become involved in a carbon sequestration project. Information and advice in the

document ranges from project planning and management, carbon accounting and finally reporting on the project.

Some innovative business models have sprung up in Australia that utilise the idea of trading carbon credits. Carbon planet provides a mechanism by which carbon credits from the Forests NSW pool is sold to individuals who wish to offset their own personal carbon emissions (Carbon Planet Pty Ltd 2005). CO2 Australia, who also formed their business model around carbon trading, is an organisation that creates carbon credits through establishing long term Mallee Eucalypt plantings. They pay landholders for use of their land as well as ongoing maintenance costs for management of the plantations which they use to sequester carbon (CO2 Australia 2006). These are just some of the new business ideas that are arising out of the trade of carbon credits.

### **Environmental Banking and Offsets**

Environmental banking and offsets are both similar concepts where land is managed for environmental values that compensate for damage elsewhere (Dwyer 2002). This is a popular model in the United States where it is used for Wetland Banking, whereby real estate and developers purchase wetland credits from a mitigation banker to offset their own impacts to wetlands. This is the most active environmental services market in the United States (The Katoomba Group 2006). Conservation banking is another approach used in the United States to help ensure the protection of habitat for rare species on private land and contribute to biodiversity conservation. This scheme allows for the creation and trading of species credits to address mitigation required by law. This scheme has been extremely successful in supporting both conservation and economic growth (Fox and Nino-Murcia 2005).

#### *Environmental Banking and Offset schemes in Australia*

Green offsets is a government pilot scheme that is looking at linking payment by industry to private landholders who provide an environmental service that offsets the industry pollution (Environment Protection Authority 2004). This may present a method for financing revegetation whereby polluters could pay for revegetation schemes to offset nearby pollution.

Another scheme that has been developed in NSW and is supported by the Threatened Species Conservation Amendment (Biodiversity Banking) Bill 2006 (introduced into parliament in June 2006 and currently being reviewed) is the NSW BioBanking scheme. This scheme is designed to be an offsetting tool that will allow developers to offset their environmental impacts by purchasing biodiversity credits in other areas. The scheme is currently under development with implementation expected to occur in mid 2007 and demonstration sites are being established to trial the scheme (DEC 2006c).

#### **Box 2: BioBanking – Biodiversity Banking & Offsets**

Key features of this scheme include:

- Landowners enter into an agreement with minister for environment to establish a BioBank site
- Department of Environment & Conservation NSW registers the BioBank site
- The BioBanking assessment methodology is used to determine numbers and classes of credits
- Credits can be traded and then retired to offset development activities or retired voluntarily which means they can no longer be traded
- Partial funds from credit sale are kept in the BioBanking trust fund for on-going management
- BioBanking statements replace developers requirement for a threatened species assessment

Source (DEC 2006b).

## Salinity Credit Trading

Salinity credit trading schemes are currently in their infancy, mostly consisting of trials and pilot project with some schemes developing as mature markets in isolated areas. Australia is a market leader in development of environmental service markets for salinity control. Salinity credit trading schemes have arisen for a number of reasons such as controlling saline discharges into rivers (Hunter River Salinity Trading Scheme) or for controlling salinity levels from groundwater. It is in the latter type of program that revegetation projects can have an impact, and a number of projects have trialled salinity credit trading in this manner.

The Hunter River Salinity Trading Scheme (HRSTS) is the most mature salinity scheme in Australia that is leading the world in the use of environmental service markets for protecting rivers. This scheme operated very early on as a pilot scheme from 1995 and has now developed into a permanent scheme operating under legislation. This scheme is based on limits being set on saline discharges into the waterways, whereby participants are given an allocated amount of credits. These credits can then be traded between participants, controlling the overall amount of saline discharges. Credits are able to be registered and traded via an Internet site. Credits expire and new credits are auctioned each year, with companies either purchasing new credits or implementing cleaner technologies to reduce their saline discharges (EPA 2004). Currently this scheme does not allow for generation of offset credits via salinity reduction techniques such as revegetation, however there is scope for this in the future. Despite this, it provides an example of a salinity credit trading scheme that has developed into a successful community based scheme, utilising market based mechanisms to provide environmental improvements.

One of the earliest examples of a salinity credit trading pilot project that involved the generation of salinity benefits from revegetation, was conducted by Forests NSW. They were involved in a credit trading deal with Macquarie River Food and Fibre (Action Salinity & Water 2002). This project sought to provide downstream users with the environmental service of improved salinity via revegetation in the Macquarie valley. The project was geared towards the future creation of a salinity credit trading scheme, whereby upstream landholders provide a service to downstream users of the water. They define salinity control credits in terms of megalitres of water transpired. Currently the finance to the landholders is provided by Forests NSW who forward sold salinity benefits to Macquarie River Food and Fibre (MRFF). Forests NSW have also bought the rights to all benefits including carbon sequestration, timber and any other products associated with the forest (Action Salinity & Water 2002). Some of the issues associated with this project include the difficulty in finding landholders who want ownership tied up for 20 years (note that this would not be an issue in direct landholder credit trading schemes) and also there is a high cost of establishing the initial plantation.

Another more recent pilot project that is targeted towards generation of salinity credits via land management practices such as revegetation has been conducted in the upper Bet Bet catchment in Victoria. This trial relates to dryland salinity credit trade as part of the National Market-Based Instruments Pilot Program. Participants are able to obtain credits via land management outcomes such as revegetation or through credit trade among participants (Conner et al. 2006). This pilot project provides an interesting insight into some of the issues inherent in implementing these types of trading systems including property rights, incentives, costly information and thin markets. In addition, it provides an interesting case on community management and the use of collective incentives. This

project provides a model that could be useful for setting up similar farm forestry schemes in other catchment areas.

### **Conservation Funds & Auctions**

There are a number of different schemes that aim to place a market value on the conservation value of private land. These include mechanisms such as revolving funds, stewardship programs and conservation auctions.

Revolving funds are a type of mechanism that which look at the purchase of land which then has a conservation rating placed on the title. Property is then sold on to other buyers and the conservation component becomes a type of capital (Figgis 2004). An example of a scheme such as this includes the Nature Conservation trust in NSW (Nature Conservation Trust 2005). This revolving fund obtains finance to purchase properties from government and other donations. Properties are either held by the fund or listed as available for sale on the website. The Victorian Trust for Nature is another similar scheme (Whitten et al. 2004). Most other states in Australia have similar revolving funds in place that are sponsored by the Australian government.

Another type of mechanism that could be used is a stewardship program where farmers are paid to protect and manage native vegetation on private land (Action Salinity & Water 2002). The Bush Tender Program in Victoria is an example of such a scheme. This is a Victorian government initiative whereby landholders place bids to provide a service. This is then ranked against other bids in terms of conservation value of the land and service provided and funding is provided to winning bidders (Bennet Prof J. et al. 2002).

Conservation Auctions is a concept that is similar to the bush tender program. This has been used by WWF in partnership with other groups to try and create markets where environmental goods and services are valued. The private landholder develops a plan regarding how they will change their land use or carry out conservation. There is a contract between two parties where a buyer (usually government or regional group) pays for a service from the landholder (WWF 2006). WWF have been involved in specific pilot studies in the NSW Liverpool plains and also the WA wheat belt. The WA wheat belt pilot is known as the Auction for Landscape Recovery (ALR) and provides documentation on a significant number of lessons learned for this type of implementation (Gole et al. 2005).

### **Other Environmental market facilitators**

There are a number of programs that assist with facilitating the development of environmental service markets. CSIRO's Ecosystem Services Project is one such program championed by CSIRO that involves trialling a number of market opportunities for environmental goods and services. This includes a pilot study in the Blackwood Basin in WA that looks at implementing a program via a co-operative of landholders (CSIRO Sustainable Ecosystems 2004).

The National Market-Based Instruments Pilot Program is an Australian Government initiative that is piloting market based tools for environmental management. Round 1 of this pilot program has been completed resulting in many lessons learned in the use of markets for environmental goods and services as well as useful information as to how cost effective and easy they are to implement (Grafton 2005).

Katoomba Group's Ecosystems Market Place provides a hub of information about ecosystems markets worldwide and up to date information on what is happening in the

industry. This site provides information on what is happening in each of the different ecosystems markets including the latest price information for the more mature markets (The Katoomba Group 2006). These types of programs and groups help to pull together information on research on a wide range of areas, which can assist in the development of new markets for environmental services.

## Case Information

The case study area is the Western Edge of the Blue Mountains. A summary of the key characteristics of the target area for the research is provided from a background paper (Ampt 2006). This information is at a fairly high level as it relates to the topic area and will be used to review appropriateness of environmental service markets that are likely to add value to the target region.

Key features of the land and landholders in Western Edge of the Blue Mountains include:

- There is an underlying issue in the area with high rates of subdivision and degraded land from land clearing and long term agricultural use. Increased land value has made subdivision more attractive resulting in a wide range of different land uses.
- There is a wider range of different land uses including “traditional graziers, hobby farmers, weekender recreation, wilderness retreats, B&B and ecotourism enterprises, motorcycle clubs and private trails, horse riding ranches, shooters and hunters, grape and olive growers, Alpaca producers, timber getters etc” (Ampt 2006). Land uses are influenced by the close proximity to Sydney. This wide variety of land uses may also present some challenges in achieving a coordinated effort for establishing markets for environmental services that will actually provide significant revegetation corridors.
- Given the large variety of land uses, it follows that there is also a wide range of viewpoints. These range from conservational to antagonistic. Although it is likely that these market mechanisms may have some strong support, strong antagonistic presences may be able to block initiatives from being successful.
- There is some existing communication mechanisms between landholders that may be used to facilitate environmental markets including landcare and catchment groups that work closely with national park staff and also a number of conservation and environment groups. These groups could be leveraged for management and monitoring of environmental services markets.
- Many landholders have little understanding of the boundaries and management objectives of neighbouring national park areas.
- Other features are that landholders do not seem to make their sole income from their land and that the land tends to be unoccupied for a large proportion of the time.
- There are some existing environmental services in the area in the form of eco-tourism that gives an example of private landholders gaining an income from these types of services. One example of this is a fenced off area where native species are being re-introduced. However, there has also been some local opposition to other eco-tourism projects. Potential opposition to environmental

markets need to be considered when drawing conclusions as to whether these type of mechanisms will be successful.

- Prediction of future trends is that the area will become more fragmented by sub divisions and without any coordinated effort land areas will continue to deteriorate further environmentally.

## Analysis

Carbon trading, biodiversity banking and salinity credit trading all present opportunities for landholders to generate income from private investment via farm forestry. However, conservation funds and auctions are not considered as directly relevant to the target area due to the fact that much of the funding and on-going income is obtained from government sources. The key environmental service markets will be reviewed in terms of a number of critical success factors, described below, as well as the project objectives including provision of environmental services, economic returns and contribution to sustainable regional development.

A key factor in producing a successful market is *landholder involvement*, the challenge of getting the landholders involved in providing environmental services from Farm forestry. Given the diverse range of landholder goals and attitudes in the target area, this may be particularly challenging for implementation of environmental services markets. Barriers for private landholders for entry into reforestation projects includes high upfront establishment costs, long time period for revenue realisation and the project risk contributing to uncertainty of the future value of the investment (Goldstein et al. 2006).

*Private investment* relates to the need to encourage investment into or buyers for services provided by environmental markets. An important objective of the Blue Mountains project is private investment so that the markets become sustainable over the longer term. Access to sufficient funds is seen as an impediment to commercial investment in this type of facility, which is why much of the investment currently tends to come from government sources (Allen Consulting Group 2001). There is also currently a lack of financial incentives for private investors to get involved in funding ecosystems and biodiversity conservation (Jenkins et al. 2004). However, some techniques are being utilised that can help to stimulate demand, such as enforceable targets (Bueren 2001).

It is also critical to have some type of *market intermediary* to link landholders with investors. Binning (2002) discusses the need for an appropriate investment vehicle between buyers and sellers, to ensure trading is efficient and targeted towards the required environmental outcomes.

The other area to consider is the *maturity of environmental markets*. The case studies being uncovered as part of the literature review are very specific pilots that often take significant time and funding to set up and are often dependent on government funding and donations at the outset. Even carbon trading, which is probably the most mature of the environmental markets, is made up mostly of large plantations by NSW Forests or similar body. Immature markets create a high risk to landholders.

It is also important to consider logistically what type of *implementation issues* are faced in establishing and managing markets. Binning (2002) discusses the need for appropriate monitoring, enforcement and quality assurance for implementation to be successful. Other issues raised with implementation include the great variation in farm forestry locations resulting in measurement difficulties and also issues with thin markets (Bueren

2001), something that may create problems for the target area if small numbers of landholders are involved.

## **Carbon Trading**

### *Critical Success Factors*

One of the key barriers to *landholder involvement* in getting involved in carbon trading is the high upfront costs of establishing the plantation as well as on-going management. Although research has shown that overall implementation costs are marginal when compared to the amount of carbon sequestered (Dixon et al. 1993), part of the problem lies in the fact that much of the investment is up front and financial gains are not realised for some time. The carbon farmer model is a tool that was developed to assist landholders with the decision as to whether it is worthwhile to engage in carbon farming by reviewing the productivity and management of plantations, the costs of cultivating and administering the scheme and the price for which the sequestered carbon or the timber may be traded (Hassall & Associates 2001). The research conducted in developing this model confirmed that carbon farming is difficult for small landholders, something that needs to be considered in the Blue Mountains case, and also that it is usually only cost effective if combined with other profitable timber activity (Hassall & Associates 2001).

Emissions trading schemes can help to encourage and facilitate *private investment* into carbon credits. Although there is some voluntary investment, these markets are most likely to be facilitated by government regulated cap and trade schemes where allowances or limits are set for companies that create emissions. For example the UK and EU emissions trading schemes (Johnson and Heinen 2004). In NSW, there is a mandatory market under the Greenhouse Gas Abatement Scheme where electricity companies are obliged to offset their greenhouse emissions by purchasing carbon credits (GGAS 2006). This means that there is a definite market for any carbon credits generated in the target area, through purchase by electricity companies.

A *market intermediary* is provided in NSW by the Greenhouse Gas Abatement Scheme registry where you can register the transfer of ownership of certificates, however the sale must be negotiated independently. This can be done privately or through a broker such as Next Generation Energy Solutions (Nextgen 2006). Nextgen have helped to negotiate the international sale of carbon credits generated in Australia through the Greenhouse Gas Abatement Scheme (Grigg 2006).

Although this is an established operating market, it is still *reasonably immature* as it has only been operating for a few years and to date only four companies are registered as certificate providers for carbon sequestration (The Katoomba Group 2006). One of the benefits, however is that it is supported by legislation in NSW under the Greenhouse Gas Abatement Scheme.

*Implementation* could create some issues, as the guidelines for becoming accredited are reasonably complex and require minimum standards to be met. You need to establish a Sequestration Pool Manager who can be responsible for on-going management, quality control, methods of carbon accounting and more (Independent Pricing and Regulatory Tribunal 2005). This would require reasonably high level of management coordination.

### *Project Objectives*

The most obvious *environmental service benefit* from this Farm forestry option is the sequestration of carbon and consequently the contribution to mitigation of climate

change. However, there are also many other incidental environmental benefits that result from the revegetation. Some of the additional environmental service benefits that can stem from carbon sequestration projects include maintenance and restoration of above-ground and below-ground biodiversity, maintaining watershed quality and decreasing soil erosion. Farm forestry can support 50-80% of natural biodiversity and also act as a buffer to protected areas such as the world heritage area (Pandey 2002). In addition, the revegetation can help to improve quality of degraded farmland which can help to protect against further land clearing. Farm forestry can also help with pest control by providing habitat for the pests natural enemies thereby improving both agricultural and protected area benefits (Pandey 2002).

The need to provide *economic returns* to landholders is met by the income generated from the sale of carbon credits. Market value of credits is currently approximately around \$12 per tonne of carbon sequestered (The Katoomba Group 2006). There is also the opportunity of economic returns for deals that are brokered internationally as carbon credits are much cheaper in Australia than locations of other mandatory trading schemes such as Europe (Grigg 2006). Carbon credits generated in the target area could capitalise on this lower price.

Revegetation for carbon sequestration contributes to *sustainable development* by providing an income for the current farmers, while protecting forest resources for future generations and assisting with addressing climate change concerns. However, this option may not be able to be sustained as the sole income stream once all available carbon credits have been traded. Farm forestry also contributes to sustainable regional development via the environmental service benefits provided. Improvements in soil quality and nutrients in nearby agricultural systems can help to maintain productive agriculture promoting long term sustainability of the farmland. Combining trees with agriculture is critical to sustainable land use in areas with high population pressures (Oelbermann et al. 2004).

## **Biodiversity Banking**

### *Critical Success Factors*

Some of the benefits of biodiversity banking that may encourage *landholder involvement* in the scheme include, investment into conservation on private land without effecting ownership, biodiversity recognised as a positive rather than a negative and additional value added to the land in preserving or restoring the conservation value (DEC 2006a). Research into conservation banking in the United States showed that programs are more likely to be successful at getting landholders involved if they trust the organisation that is helping to set up the program. It is also important to get a flagship landowner involved who is respected by their peers who can help to champion the program (Wilcove and Lee 2004).

*Private investment* in biodiversity banking would be from developers who wish to offset negative impacts to the environment. Some of the benefits to developers that would encourage them to invest in credits under a scheme such as this include transferring liability to a third party, a consistent approach for provision of offsets and reduced costs compared to if they had to purchase land themselves to provide habitat for biodiversity. Investment can also occur from philanthropists that wish to secure habitat for particular species or contribute generally to biodiversity conservation (DEC 2006a). There is also the possibility that credits could be traded for speculation in the hope that the price will

rise in the future. In this case the credits would not be retired until sold to a developer or philanthropist who wished to secure the habitat.

The legislation provides provision for conservation brokers who can act as the *market intermediary*. Conservation brokers can help landowners with establishing a biobank site and then with selling the credits. They can assist with all stages of the setup and also assist developers with registering for the scheme as well (DEC 2006b). However, it is not clear if any of these conservation brokers currently exist or if they are just theoretical.

Although this concept is in its infancy in Australia and therefore the *market immature*, it has been proven in the United States, with 63% of conservation bank owners reporting that they would set up conservation banks again if given the opportunity (Fox and Nino-Murcia 2005). The legislation has been passed for the NSW Biodiversity Banking scheme, however the scheme is still being fully developed and is expected to be implemented in 2007 (DEC 2006d). This means that it is yet to be fully tested in the NSW environment.

Under the NSW biobanking scheme, a conservation broker can help to overcome *implementation issues*, with the initial set up of a biobank, including registration and sale of the credits (DEC 2006b). In terms of on-going management, a Biobanking Trust fund has been set up, whereby when credits are sold, a small amount of the revenue is put into this fund and then utilised to help finance on-going management fees (DEC 2006b). Research into similar schemes in the U.S. has shown that implementation of the program will go more smoothly if a good working relationship is developed with a representative of the regulatory body involved in authorising the various stages (Wilcove and Lee 2004).

### *Project Objectives*

The key *environmental service* provided through use of biodiversity offsets is to conserve biodiversity, particularly protected or threatened species. Some of the benefits that this initiative is seen to provide to biodiversity includes a reduced threat to biodiversity from development, improvements to biodiversity on private land and an overall increase of biodiversity benefits in NSW (DEC 2006a).

*Economic returns* to landholders would be via the sale of biodiversity credits. In the US under the conservation banking scheme, financial incentives or returns are competing with development returns and most conservation banks are breaking even or making money, although this is based on qualitative research as specific figures are unavailable due to sparse recording of information (Fox and Nino-Murcia 2005). In terms of the NSW scheme, no benchmark has been set for the price range of credits and the number of credits that have been obtained. Therefore possible economic returns would have to be considered on a specific project basis for the target area.

Biobanking helps to meet the key principals of *sustainable development*, particularly in terms of biodiversity conservation for current and future generations. In addition, the revegetation would also contribute to other environmental services as for carbon trading, while providing economic returns to landholders.

## **Salinity Credit Trading**

### *Critical Success Factors*

*Landholder involvement* can be encouraged by a variety of means. The trial conducted in Bet Bet found that a collective performance incentive helped to increase voluntary participation levels by landholders in the scheme. This involved a payment only being

dispersed to participants if the sum of individual outcomes reaches a set combined level (Conner et al. 2006). In other instances, involvement in schemes may be required by legislation, such as for the Hunter River Salinity Trading Scheme (EPA 2004).

The pilot project conducted by NSW Forests provides an example of the type of *private investment* possible in a salinity credit trading program where downstream users pay upstream landowners for salinity benefits. The actual benefit provided is calculated based on actual transpiration of water out of the soil by the planted forests (Action Salinity & Water 2002).

The *market intermediary* is different for each type of salinity credit trading scheme. In the case of the Hunter River Salinity Trading Scheme, ownership of credits is managed via an Internet registry, similar to the GGAS program (EPA 2004). In the case of pilot projects, the project instigators tend to act as the market intermediary in the first instance to get the project up and running.

Salinity trading represents an *immature market*. There is no comprehensive salinity trading market that could be adopted in the Blue Mountains target area. Currently salinity trading has only occurred on a case by case basis and although individual schemes such as Hunter River Salinity Trading scheme are reasonably mature, this is only applicable in the Hunter river catchment area. One of the success factors in the implementation of the Hunter scheme is that it was supported by legislation (EPA 2004). On the other hand, the pilot scheme in Bet Bet, Victoria was based on voluntary participation, however this relied on external funding to provide incentives (Conner et al. 2006). Therefore, any salinity trading scheme attempted in the Blue Mountains target area would have to be undertaken as a pilot project.

In order to successfully overcome *implementation issues* surrounding salinity trading, it is important to have a good knowledge base regarding the long term salinity conditions in the catchment that are the source of the problem. One of the critical success factors for the Hunter River Salinity Trading scheme was that they had many years worth of data and a good model of the river's behaviour on which to base the scheme design (EPA 2004).

One of the issues raised with this type of program, is that you are often dealing with thin markets. This is because the locations tend to be isolated catchments or sub-catchments where a landholders land management activities can impact the common pool resource at stake. The small number of landholders involved may lead to small numbers of buyers and sellers that may lead to the market becoming ineffective (Conner et al. 2006), (Ward 2004). Thin markets present a potential issue for the target area due to limited buyers and sellers available in the sub-catchment.

### *Project Objectives*

*Environmental services* provided by this market include reduction of dryland salinity or saline discharges into rivers. Other environmental service benefits would be provided by the farm forestry activities as discussed for carbon trading and biodiversity banking.

It is difficult to predict the *economic returns* that would be available to the landholders, due to the immaturity of these markets and the diverse nature of the results from the pilot projects. Although the Hunter River Salinity Trading Scheme is a mature scheme it does not provide an example of landholder farm forestry projects. The NSW forests case provides a case of a once off transaction with industry and the Bet Bet trial was driven predominantly by funding in the first instance.

Salinity credit trading would help meet *sustainable development* through provision of salinity reductions and other environmental services. It would also contribute to the overall productivity and hence economic sustainability in the region. However how this translated into individual income sources for the landholders is still in question.

### **Common Pool Resources**

Management of *common pool resources* also presents challenges for successful markets. It is often difficult to assign ownership or responsibility for environmental services as these are often thought of as public goods or common pool resources, which can create an issue for management (Binning et al. 2002). Ostrom (1998) outlines that successful management of common pool resources is facilitated by open discussion and communication amongst communities. In practice, this is demonstrated by the pilot in Bet Bet, Victoria where community cohesiveness and solidness of landcare groups contributed to the project success (Conner et al. 2006). In the Blue Mountains case area, the hope is that management will take the form of a common property regime.

### **Discussion**

The analysis highlights the fact that markets for ecosystems services still lack some maturity and whilst environmental benefits are clear, economic returns are not always guaranteed. A number of challenges would be faced in successful implementation of these markets in the target area, however a number of factors can also make a positive contribution.

### **Carbon trading**

Some of the challenges faced in implementing carbon trading in the target area include:

- There are high up front costs associated with establishment of a carbon plantation. This also includes the complexity of requirements for becoming accredited under GGAS.
- Issues with complexity of on-going management and potential risks to the plantation associated with pests, fire etc.
- Financial gains are not realised immediately due to waiting time for carbon to be sequestered.
- These factors are all made more difficult for small landholders as characterised by the landholders in the target area.

Some of the factors that will make a positive contribution to implementation of carbon trading include:

- There is a definite market for carbon credits in NSW due to mandatory GGAS scheme requiring electricity companies to offset their emissions.
- This market is backed by legislation of carbon credits which helps to guarantee the investment and provide specific guidelines for how the credits should be created and measured.
- Credits are cheaper in Australia than overseas which creates additional demand for any carbon credits generated in the target area.

- There are market intermediaries available for trading credits which reduces the transaction costs associated with having to find buyers directly.

### **Biodiversity Banking**

Some of the challenges associated with the implementation of biodiversity banking in the target area include:

- Credit sale is dependent on the type of biodiversity conservation being conducted and this could limit available buyers of the credits. It is currently difficult to estimate potential buyers of credits in the Blue Mountains area without being aware of a specific development project to be undertaken.
- A market intermediary is proposed, but this is still being developed. Therefore there will be higher transaction costs associated with seeking out buyers and also limited assistance with establishment and recording of credits in the first instance.

Some of the factors that will make a positive contribution to implementation of biodiversity banking include:

- As the guidelines are still in progress for NSW, there is the opportunity to get involved in being a demonstration site and getting official backing as part of this program.
- There is success of similar initiatives in the US where wetland mitigation banks and conservation banks have become viable businesses.

### **Salinity Credit Trading**

Some of the challenges associated with the implementation of salinity credit trading in the target area include:

- There is no current support by legislation in NSW, and is currently done on a case by case basis. Therefore it would be necessary to establish conditions for the Hawkesbury-Nepean catchment or the sub-catchment that would result in additional lead time.
- Buyers and sellers of services are defined by unclear boundaries with no set method for accounting for salinity benefits from tree-planting. It is necessary to establish how the downstream beneficiary would be required to pay under a voluntary scheme.
- There is also the issue of thin markets due to limited buyers and sellers which could reduce the effectiveness of the market.

Some of the factors that will make a positive contribution to the implementation of salinity credit trading include:

- Strong involvement by landholders in landcare and catchment groups that assists with information sharing and community cohesiveness. This is important in managing common pool resources with diffuse point sources such as salinity.
- Landholders can obtain direct salinity improvement benefits on their own land from tree planting that will encourage involvement in the scheme.
- Schemes that have started from pilot projects have developed into successful markets, such as with the Hunter River Salinity Trading Scheme.

## Conclusion and Recommendations

Do environmental service markets meet the project objectives of provision of environmental services, economic returns to landholders and contribution to sustainable development? There is no question that markets for environmental services will contribute to environmental goals such as carbon sequestration, biodiversity conservation, salinity, water and soil quality improvements. It is, on the other hand, not always quite as clear how easily private investment and hence economic returns to landholders can be provided. Carbon trading has only recently developed an active market in NSW, with only four companies currently registered for carbon sequestration, however there is a strong market for credits due to the mandatory GGAS scheme, combined with overseas demand. Biodiversity banking, soon to be legislated in NSW has been an extremely successful model overseas in terms of providing returns, but is yet to be proven in Australia. Salinity credit trading has no overall NSW scheme, but has been shown to be a successful business model for individual cases in specific areas such as the Hunter River Salinity trading scheme. Objectives for regional sustainable development are supported by the provision for environmental services, the positive contribution to protection of the world heritage area and the productivity improvements to existing agricultural activities. In order to ensure that it will be sustainable over the longer term, many of the challenges described would have to be overcome to ensure economic returns provide sufficient incentives for farm forestry.

One of the key ways to ensure that environmental service markets provide sufficient economic returns is to implement a combination of different markets so that the landholders are not just dependent on one source of income. The benefit of markets for environmental services is that multiple services can be generated from the same farm forestry activity. In addition it is recommended that these markets are combined with other farm forestry activities, such as biomass harvesting or more traditional farm forestry activities, but without compromising the environmental service being provided.

Another issue that most of these markets face is high initial establishment costs and complexity to get the project up and running. One option to help overcome this is to apply for funding from a pilot program such as the National Market-Based Instruments Program or other environmental funding body. Getting started with carbon trading and becoming accredited under the Greenhouse Gas Abatement Scheme, appears to be quite complex and difficult for small landholders. One way to handle this issue is to amalgamate holdings into a common pool for the purposes of carbon sequestration. This can help to improve economies of scale and reduce risks. It also fits in well with the goals of management under a common property regime. Another way to deal with the complexity is to seek assistance from companies that are already accredited under GGAS such as CO2 Australia. To overcome complexity with getting Biodiversity banking up and running, it may be possible to get involved as a demonstration site as part of the NSW BioBanking scheme, if an appropriate development project can be identified in the Blue Mountains area. Salinity credit trading could be developed as a pilot project working in conjunction with the catchment management who may be able to contribute background data and expertise.

Environmental service markets help to bridge the gap between conservation and economic returns. If the challenges can be overcome and economic returns secured, these markets will provide an innovative solution to contribute to sustainable regional development in the Blue Mountains World Heritage area.

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