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Review

Financial Mechanisms to Improve the Supply of Ecosystem Services from Privately-Owned Australian Native Forests

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Abstract: Much of Australia's native forest is privately-owned and is needing investment to maintain and improve the supply of a wide range of ecosystem services. This paper reviews mechanisms presently used in Australia to improve the supply of ecosystem services, with particular emphasis on financial mechanisms. Auction, green bond and biobanking schemes are widely and, so far, successfully used in a number of States, especially in projects where the actions required and ecosystem services can be readily measured. Measurement of biodiversity and biodiversity-based services remains problematic, despite some fairly widespread application of different measurement systems. Inadequate or variable measurement systems could engender a loss of investor interest if equivalence or gains cannot be appropriately verified. A new Biodiversity Investment Scheme is proposed, based on the structure used commercially in Managed Investment Schemes. The choice of mechanism, however, will be mainly determined by landowner attitudes to assignment of property rights, and by scale, the extent of public *versus* private consumption goods, and the transaction costs and risks.

Keywords: ecosystem services; biodiversity; auctions; bio-banking; green bonds; managed investment schemes; property rights; public consumption goods; risks

1. Introduction

Nearly one-third of Australia's forest is publicly-owned as multiple use public forest, nature conservation reserves and other Crown land, and is under the control of the relevant State or Territory government [1], as shown in Table 1 and Figure 1. With some minor exceptions, the management and supply of ecosystem services from these forests and woodlands are a responsibility of the government concerned and are essentially subject to the legislation, policies, management and finances of those governments. While much remains to be done to maintain and improve the supply of ecosystem services on publicly-owned lands, the bigger issues lie on privately owned and leasehold land, where legislation, policies and oversight vary across different States and lack effective coordinated action [1,2].

Privately-owned and leasehold forests and woodlands constitute 67 per cent of the total area of forests in Australia (Table 1) and are the focus of this paper. Location and tenure play an important role in the choice of financial mechanisms to improve ecosystem services in Australia and the vast distances and the diversity of private ownership and forests present major challenges.

Some 63% of the 15 million ha of forest in the Northern Territory (see Figure 1) are privately owned, mainly by indigenous people through Aboriginal Land Trusts, and are managed in the traditional manner by them.

Table 1. Area and distribution of native forest, by tenure and jurisdiction.

Tenure Type	Area of Native Forest ('000 ha)								
	Australian Capital Territory	**New South Wales**	**Northern Territory**	**Queensland**	**South Australia**	**Tasmania**	**Victoria**	**Western Australia**	**Totals**
Leasehold forest	9	5745	5228	30,656	1318	16	2	5559	48,533
	6.2%	25.8%	34.5%	60.3%	30.1%	0.5%	0.0%	29.7%	39.7%
Public forest, conservation reserves & other crown lands	120	7682	292	9211	1581	2450	6537	11,911	39,783
	93.0%	34.5%	1.9%	18.1%	36.2%	72.9%	84.7%	63.5%	32.4%
Private land (including indigenous land)	1	8852	9618	10,129	1455	875	1184	1281	33,394
	0.8%	39.7%	63.4%	20.0%	33.2%	26.0%	15.2%	6.8%	27.2%
Unresolved tenure	0	2	31	785	23	19	5	1	871
	0.0%	0.0%	0.2%	1.6%	0.5%	0.6%	0.1%	0.0%	0.7%
Total native forest	129	22,281	15,169	50,782	4376	3363	7727	18,752	122,581

Source: Based on ABARES [1].

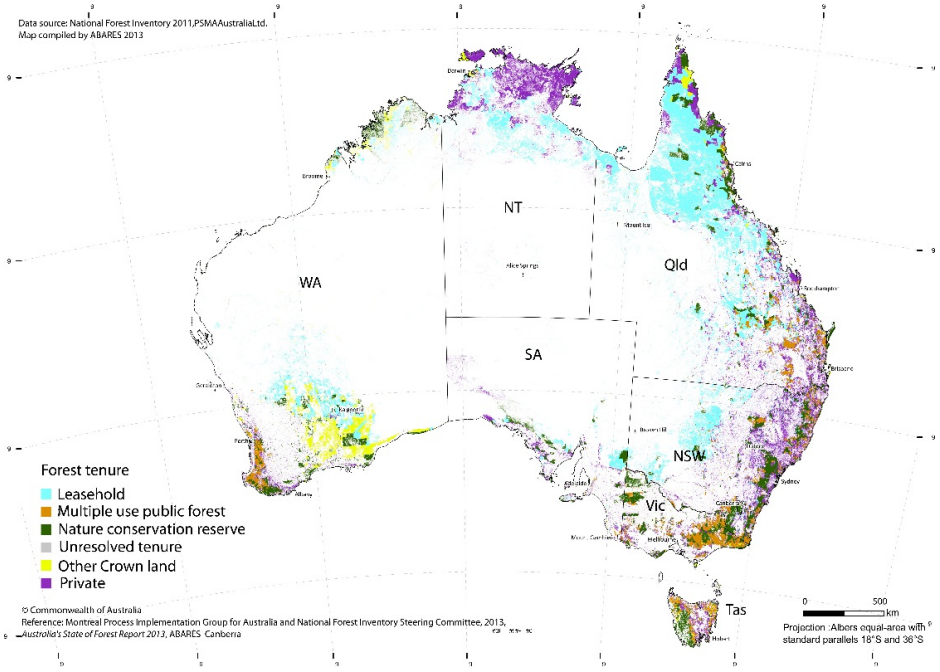

Figure 1. Australia's forest extent by tenure. Source [1].

Inland leasehold forests (see Figure 1) largely comprise open woodland. The leases are very large, sometimes hundreds of thousands hectares in extent. The low intensity of commercial use of these woodlands poses such large-scale environmental and management problems that regulatory controls seem the only viable solution for improving their supply of ecosystem services.

Privately-owned tropical closed forest is mainly located in North Queensland between the coast and the Great Dividing Range some 100 km or less inland. Cyclone damage to areas of timber plantations in North Queensland [3] has highlighted the risks to projects involving active management of remnant or newly-established rainforest on private land in that zone. In a review of past community projects, Vanclay [4] has stressed the importance of oft-neglected post-establishment maintenance in tropical conditions. The search for projects that complement the conservation of ecosystem services on public land will doubtless continue but the scale is likely to be small.

Large areas of privately-owned tall open forest, in holdings ranging from 50 ha to 500 ha, run down the East Coast of Australia from Southern Queensland to Victoria, and likewise inland of the publicly-owned forest in the South-West of Western Australia. These represent the most significant challenge for financial investment to improve ecosystem services because of the diversity and scale of ownership and forest types.

Mechanisms for funding investment in ecosystem service assets in Australia have evolved rapidly over the last decade [5], reflecting a growing government and public awareness, as well as an investor appetite for socially and environmentally responsible investment, and a willingness on the part of financial and other institutions to offer investment opportunities to meet the demand. Most of these are directed principally at privately-owned and leasehold forests and woodlands, although they may support complementary activities on adjacent public land.

2. Methodology

This paper reviews the mechanisms used in Australia with the aim of developing initiatives to maintain and improve ecosystem services provided by the privately-owned forests of Australia. The principal Australian literature on ecosystem services has often stemmed from consultancies and research reports sponsored by Commonwealth or State government departments and is relatively

sparse and of recent origin. This paper thus aims to make the findings in this dispersed reference base more accessible through integration with the Australian academic literature and with the personal knowledge and experience of the authors.

Because of the interaction of the biophysical, social and economic issues involved, we have adopted an approach for classifying mechanisms that fits the Australian experience but is by no means the only possible classification. Our classification criteria are posed in terms of broad principles, rather than fine detail, because a point-scoring exercise of assessing each mechanism is inappropriate in a general review that lacks a specific local geographic and biophysical setting. The dictates of a varied spatial structure (landscape to endangered species), temporal structure (short term to very long term), and varied scope (multiple to single) of ecosystem services inevitably favor different mechanisms for different settings.

We use these criteria to inform our description of the various mechanisms and to highlight potential strengths and weaknesses, acknowledging that a point-scoring analysis on such a broad scale would be beyond the scope of this paper:

1. Policy goals

    - Stimulate private funding and private sector involvement to maintain or improve the provision of ecosystem services.
    - Build trust between owners, financial institutions and professional agents.
    - Improve the flows of information between the entities involved and thereby reduce or eliminate information asymmetry and the unfair advantage it provides.
    - Address mixtures of ecosystem services and cross-boundary tenure and ownership issues.

2. Regulatory structure

    - Ensure additionality so that outcomes provide commensurate net additions to the bundle of ecosystem services involved.
    - Enable effective compliance through transparent and measurable goals that are monitored and for which non-compliance is penalized.
    - Evaluate the net social benefits of the provision of ecosystem services that are public consumption goods, as well as those for private consumption goods, and integrate their joint provision where appropriate. Public consumption goods are those where the consumption by one individual does not reduce the capacity of others to consume the good, carbon dioxide being the best-known example but biodiversity and forest recreation are others.
    - Enforce contract conditions that discourage moral hazard and are fair to all parties involved. Moral hazard is where one entity takes more risks because another will also bear some of the burden of those risks. It can arise because of asymmetry in the information each party has or where the interests of one entity, acting as an agent, do not align with the principal entity who hires the agent (the principal-agent problem).

3. Property rights

    - Respect the allocation of private property rights and the provisions for transfer and intergenerational continuity.
    - Communicate information about the transfer about the rights and responsibilities pertaining to transfer of property rights, including public consumption goods, transparently and effectively.

4. Market structure

    - Mitigate the barriers to entry and exit to ensure contestable markets. Contestable markets represent a more realistic way of ensuring the benefits of competition than the theoretical "perfect competition".

- Reduce transaction costs by utilizing appropriate technology, avoiding unnecessary "middlemen" and utilizing professional specialists.
- Reduce regulatory, fiscal and accounting arbitrage. Regulatory, fiscal and accounting arbitrage is the generation of pure profit by utilizing ambiguities in accounting standards and differences in fiscal or regulatory mechanisms or rules between different jurisdictions.
- Increase participation of and competition between professional specialists in financing and monitoring ecosystem services.

Mechanisms need to have criteria by which investment in, and management of, ecosystem services can be made as administratively effective and economically efficient as possible. Application of the criteria to choose between alternative mechanisms can only sensibly follow the identification of an investment project in a specific local setting, which is beyond the scope of this paper.

Assessment of financial mechanisms using the above-listed qualitative criteria will often be subjective and will at times be unclear, partly because there is interaction and overlap among the criteria, and partly because the biophysical, social and economic aspects are inherently complex. Nevertheless, selecting the most appropriate mechanism for the provision of ecosystem services in a particular local setting should benefit from this qualitative review of criteria.

The diversity of settings and the generally acknowledged need to tap additional private funding makes innovation in developing new mechanisms another goal of this review. Conclusions are drawn as to the future development of mechanisms to maintain and improve ecosystem services provided by the privately-owned forests in Australia, especially those services that are biodiversity-based.

3. Mechanisms for Improving Ecosystem Services

The principal mechanisms in use or proposed for improving ecosystem services in Australia can be classified under the headings: regulatory, philanthropic, quantity-based, market friction, and price-based, to follow Lockie [6] in the case of market-based mechanisms, and noting that these focus on improvements on privately-owned and leasehold land.

3.1. Regulatory Mechanisms

Controls on clearing of native forest or woodland on privately-owned forest and woodland have been implemented by all States, after considerable pressure from the Commonwealth Government and conservation groups, and provide an example of a regulatory mechanism to protect existing biodiversity services. However, the definitions of native vegetation and the controls on clearing vary between States [7]. Furthermore, some landowners, notably in Queensland, are strongly opposed to clearing controls. Nevertheless, remote sensing is being used effectively to identify non-compliance in all States.

Another important example of regulatory mechanisms for improving ecosystem services is the Murray-Darling Basin Plan (MDBA [8]). The Murray-Darling River Basin is the largest freshwater system in Australia. It contains one-quarter of Australia's agricultural land, and it accounts for approximately 50 per cent of irrigated land and irrigated water applied nationally. The Murray-Darling Basin Plan represents the outcome of a detailed investigation of ecosystem service recovery by the Murray-Darling Basin Authority, established by the Commonwealth Government and the State Governments of Queensland, New South Wales, Victoria and South Australia. The Authority monitors compliance and applies penalties for non-compliance.

Regulation of flows from dams established largely for irrigation but also for human consumption in the four States has become a major political and environmental issue in the Murray-Darling Basin. In addition to affecting irrigated farming and human consumption of water, especially by Adelaide, the State capital of South Australia, the regulation of flows negatively affect riverine forests and woodlands, and native birds, animals, and aquatic life. An extensive study of long-term trends in flow-dependent ecosystem condition (see Figure 2) by Colloff *et al.* [9] concluded that while there

are ecological "winners" and "losers" from river regulation, the resilience of those ecosystems to fluctuations between wet and dry conditions may be higher than had been anticipated. Salinity issues further complicate the picture (Nambiar and Ferguson [10]). In addition, some riverine forest types are sensitive to human-imposed regimes of flooding that are not consistent with the seasonal needs of the species (Jacobs [11] p219). Measures have been undertaken on two important areas of forest (Hattah Lakes and Perricoota) to address these issues but the Barmah-Millewa forest is still problematic.

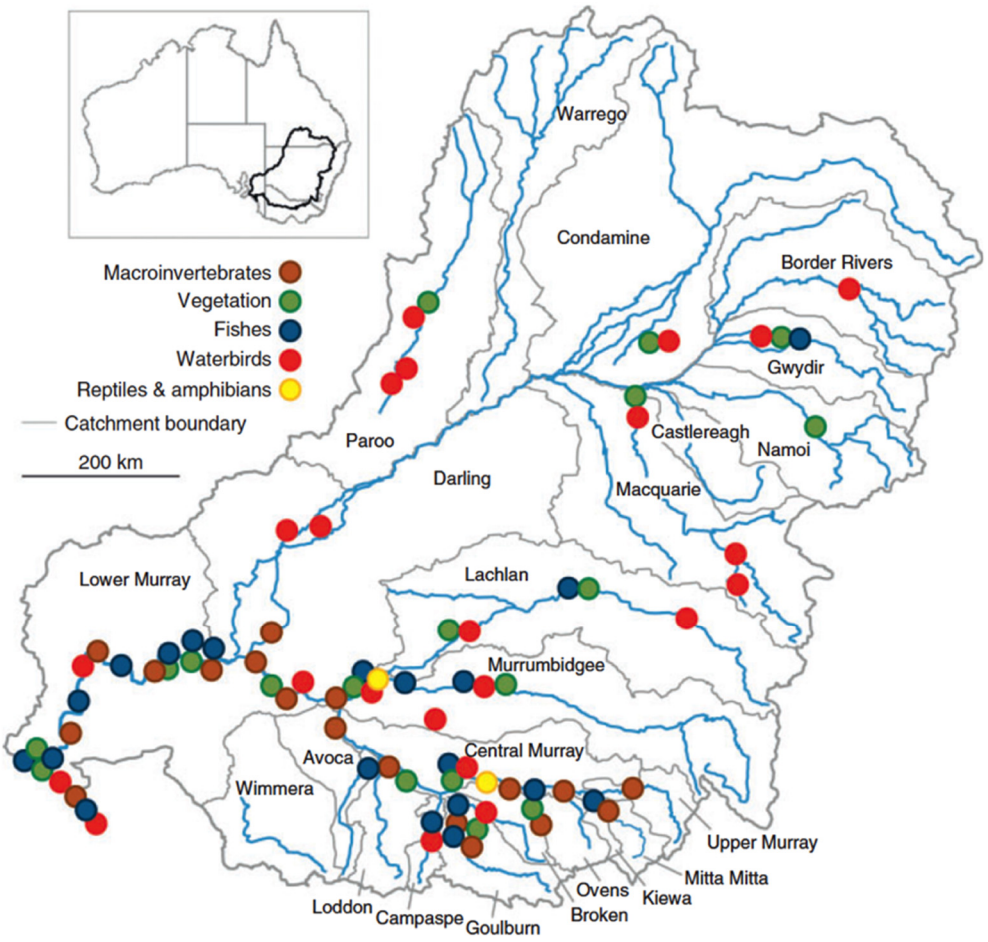

Figure 2. Locations within the Murray–Darling Basin where long-term data series were collected. Source: [9].

3.2. Philanthropic Mechanisms

Australian philanthropic mechanisms for improving ecosystem services are many and varied in size and target (Department of Environment and Water Resources [12]). Philanthropy is not as well developed in Australia as in the United States. However, all forms of monetary philanthropy increased by about 15 per cent per annum over the period 2006 to 2011 in Australia (Effective Philanthropy [13]). Conservation groups are believed to receive only about 5 per cent of all monetary donations and about 2.5 per cent of all volunteer h.

Probably the most significant contribution to the improvement of ecosystem services in Australia stems from the volunteer Landcare groups. These are local community groups in farming areas, first established in Victoria in 1986 and later spreading nationally under Landcare Australia Ltd. (Chatswood, Australia) Most of the Landcare work has involved tree planting to restore native vegetation, provide habitat for native birds and animals, and protect watercourses from erosion and land from salinity. In some cases, major companies have donated substantial amounts to such projects.

Project Platypus [14], for example, involved a collective of five local sub-committees to revegetate the Navarre hills in Victoria from the late 1990s to the early 2000s, with the assistance of funding from Rio Tinto Ltd. (Melbourne, Australia) Since 1994, it has attracted over A$6 million to undertake activities such as erosion control work, revegetation, protection of remnant vegetation, establishment of perennial pastures and control of pest plants and animals, as well as raising community awareness of environmental and land management issues.

Other not-for-profit NGO groups, such as Trust for Nature and Greening Australia, exist in most States and have actively pursued pest control, ecological thinning and revegetation in privately-owned forests or remnants thereof. For example, in Victoria, Trust for Nature has been active in soliciting funds to purchase properties that carry endangered species. Both organizations depend heavily on private donor or government funding for particular projects and, like Landcare groups, have minimal employed technical support and large volunteer contributions. Many other small groups for whom summary statistics are not available work under a "Friends of XYZ Forest" banner and contribute to volunteer revegetation and pest control.

Taxation concessions also play an important role in encouraging philanthropy. In Australia, two different charitable endorsements determine tax concessions. A Deductible Gift Recipient is a fund or organization that has been endorsed by the Australian Taxation Office as one for which donors can claim tax deductions. The umbrella organization to Landcare groups, Landcare Australia Ltd., (Chatswood, Australia) is an example. A Tax Concession Charity is a fund or institution that has been endorsed as charitable by the Australian Taxation Office and includes Testamentary and Will Funds, Prescribed Private Funds and Public Funds - the latter being restricted to Deductible Gift Recipients [15].

Because of the diversity of projects in scale and target, it is difficult to summarize numerically the impact of Landcare and similar programs on improving ecosystem services on privately-owned forest. The Australian Government allocated more than A$2 billion over five years to June 2013 under the Caring for our Country program [1]. This program supported Landcare and similar organisations working to conserve Australia's natural environment and productive farmland. The Australian Government has recently established a National Landcare Programme involving investment of A$1 billion over the next four years through regional natural resource organizations. National initiatives such as the 20 Million Trees Programme, the 25th Anniversary Landcare Grants and contributions have commenced. As part of this program, seven market-based competitive funding rounds were conducted. Two awards now target improvement for the endangered Weeping Myall Woodlands of inland Queensland, New South Wales and Victoria and the Peppermint Box Grassy Woodland of South Australia [1]. Much of these forests are leased for grazing and have been prone to overstocking, drought and neglect in the past.

Earlier evaluations of Landcare and similar group work (Millar *et al.* [16]) raised concerns that some of the benefits of revegetation and similar work on privately-owned land may be appropriable by the landowner through consequent increases in amenity and land values. This raised the spectre of owners "free-riding" on donated funds or volunteer resources, yet potentially receiving a financial benefit on the sale of the land. Contractual arrangements therefore now ensure that an owner contributes a substantial amount of resources or time.

Protective legal agreements are generally required of the landowner by Landcare, Trust for Nature and similar groups. Covenants and conservation concessions and easements are legal agreements whereby a landowner voluntarily foregoes certain rights or opportunities related to their use of that land in favor of a qualified conservation organization, such as a land trust or a government agency, in order to support identified conservation goals. The agreement is registered on title, and binds all future landowners according to the original terms.

By 2011, about 1.8 million hectares were covered by conservation covenants approved under the relevant income tax legislation in Australia [1]. Some 21 different covenant and conservation agreements existed in Australia in 2005–06 involving 15 different agencies across the seven different

States and Territories. Kanowski [2] provides a comprehensive summary of the tangled web of legislation and policy involved.

The structure and effectiveness of the Landcare movement is currently the subject of some debate. Community Landcare groups were initially led with minimal levels of government support, with members working together to identify and mitigate threats to ecosystem services. In 2008, however, support was absorbed within the new Commonwealth "Caring for our Country" program. Tennent and Lockie [17] argue that competitive bidding, business and investment plans, auditable targets and standards, and hierarchical decision-making now dominate policy and funding. Also, Community Landcare Officers were transferred into State-based Catchment Management Authorities (CMAs). Robins and Kanowski [18] argue that these changes have "strangled" the former collaborative Landcare model and endanger volunteer recruitment and effort. Longitudinal research in one regional-level CMA by Tennent and Lockie [17] suggest that these changes have at least temporarily undermined the particular community Landcare groups in their study. From a government perspective, however, these changes were probably inevitable, given the increasing demands of multiple environmental groups in each CMA and the need to allocate funds and resources fairly and according to government policies and strategic priorities. Where the local Landcare or other groups work well with the CMA management, the changes may yet bring the benefits of measurable outcomes based on strategic "environmental asset-based" priorities.

3.3. Quantity-Based Mechanisms

3.3.1. Emissions Trading Scheme

An Emissions Trading Scheme exemplifies an indirect quantity-based mechanism to mitigate climate change and through this a mechanism to protect and improve ecosystem services. It involves setting a national carbon tax (a "floor" price) that is adjusted periodically to achieve a lower target level (a cap) on emissions. A government agency then initially allocates carbon permits to emitters. Emitters wishing to increase emissions have to buy additional permits. Or, if they can reduce their emissions, they may sell some of their existing permits. However, the trading price for carbon cannot be lower than the carbon tax.

Such a scheme addresses market failure due to uncosted emissions, encourages less emissions-intensive activities, and raises revenue for adaptation and cost-abatement of damages. A comprehensively applied carbon tax offers the benefits of cost certainty, a relatively stable uniform price, low transaction costs, and would be economically efficient (Green *et al.* [19]).

A previous Australian Government introduced a carbon pricing scheme in 2010 as a precursor to establishing an emissions trading scheme. It contributed briefly to a decline in emissions but it was repealed in 2014 by a new Government. Historically, taxes, fees and levies have not been widely used in Australia as disincentives for pollution and similar issues such as the protection of ecosystem services. Considerable public and industry antipathy was generated towards this particular form of taxation, making it difficult to re-introduce in the immediate future.

3.3.2. Carbon Farming Initiative

A previous Australian Government introduced a Carbon Farming Initiative (CFI) in 2011 [20]. When introduced, it was designed to complement a carbon pricing mechanism. Following the repeal of the carbon price that underpinned it in 2014, the initiative was expanded to form the Emissions Reductions Fund under which the Australian Government purchases emission reductions through a reverse auction method where price caps or floors are not declared by the auctioneer. A reverse auction is where sellers compete to sell their services to buyers, rather than the converse. Fixed-price contracts, typically for seven years, are offered to successful bidders. The Fund is now the central plank of the government's Direct Action Plan to reduce emissions. It differs from a trading mechanism in that the contract prices are fixed, and the sole buyer is the Australian Government.

The Emissions Reductions Fund is a voluntary carbon trading scheme that allows farmers and land managers to create carbon credits either by reducing greenhouse gas emissions or by storing carbon in vegetation or soils. The principal potential impact with respect to forests is through the environmental plantings and reforestation components. Environmental plantings include plantings to minimize erosion, reduce salinity, improve water quality, provide shelter for stock or provide wildlife habitat. For reforestation, the scheme provides no co-payment for complementary benefits, such as improving biodiversity services. However, owners are not penalized for losing carbon due to bushfires, drought, pests or diseases, although they are responsible for taking reasonable steps to re-establish carbon stocks. The accounting methodology for credits is based on the CFI Reforestation Tool and access to a CFI Mapping Tool is also available.

The Climate Change Authority [20] reviewed the performance of the Carbon Farming Initiative at its conclusion. About half of the 178 projects funded activities that avoided deforestation, or involved forestry or alternative savanna burning. Some 10.6 million credits have been issued, equating to 2.5 Mt CO2-e per year. The review noted that some costs associated with measurement, verification and reporting had been unnecessarily high and had not matched the risks being managed.

The Climate Change Authority [20] also noted that the successor Emissions Reductions Fund had a funding commitment of A$2.55 billion. The rapid expansion of the program involved significant risks, especially for additionality, and provided challenges in achieving low-cost abatement measures. The Authority [20] saw capping of contract periods at seven years as a problem for projects with a longer abatement profile.

3.4. Market Friction Mechanisms

Certification is principally a device for reducing market friction by improving information for consumers of ecosystem services and for monitoring and ensuring compliance on the part of the owners or managers of the ecosystem assets. It involves a cost to the owner or manager that is seldom compensated by consumers. When applied to commercial products, such as timber-growing, it is a device for maintaining or increasing market share.

Third-party auditors certify most commercial timber-growing in Australia according to criteria that include recognition of the need to protect and enhance ecosystem services and to demonstrate sustainability (Ferguson [21]). Consultation with external stakeholders plays an important role in certification in identifying non-compliant activities. However, certification of commercial timber-growing is largely confined to industrial-scale entities [1]. Much of the land capable of timber-growing in smallholder ownership is not managed sustainably or certified and is subject only to State regulatory codes of forest practice with varying standards for monitoring compliance [1]. Much of this smallholder-owned native forest was heavily cut in the immediate period following World War II and has not yet reached harvestable age, posing a future risk to ecosystem services if levels of harvesting increase in the future.

3.5. Price-Based Mechanisms

Price-based mechanisms fall into two broad categories—non-securitized and securitized. Securitization of an ecosystem service asset is the transformation of an ecosystem asset or flow of ecosystem services into a tradable security. Securitization requires the acquisition of property rights entitling access to and use of the ecosystem asset or the flows of services it provides.

Several price-based mechanisms in use in Australia do not involve securitization. For example, various subsidies and tax breaks, which amount to the same thing, are widely used in encouraging activities that maintain or improve ecosystem services in Australian forests, as the previous discussion of volunteer groups shows. Subsidies such as taxation concessions are an effective mechanism to incentivize donations to appropriate charities, but are a very blunt instrument, often involving substantial transaction costs in money and time for major new initiatives. Subsidies do shift the demand curve and so have the potential to increase the provision of ecosystem services. But government

expenditure on subsidies more than offset the benefits (Perloff, p294 [22]), so that net benefits are negative. Despite this economic inefficiency, subsidies implemented by way of long-standing tax concessions on donations to charities seem likely to remain the major device for encouraging public donations and volunteer involvement in Australia.

Securitization of illiquid financial assets such as mortgages, credit card debts, hire purchase contracts and the like represents a well-established mechanism for increasing the supply of funds for investment and other purposes. In simplest form, the conventional market process of securitization involves the:

1. valuation of the asset,
2. establishment of a financial management vehicle to manage trading,
3. finding a financial institution willing to trade funds against those assets, and
4. independent verification of trades.

Securitization involves trading, which, unless appropriately regulated, can lead to regulatory, fiscal and accounting arbitrage in which the prices reflect the utilization of ambiguities or differences in the standards or rules. Kay [23] provides a salutary account of the history of the Global Financial Crisis in which arbitrage of these kinds played a considerable role. He argues that a greater focus on the development of specialized professional consultants and financial institutions whose reputation is at stake, together with ensuring competition between them, is more effective in combating arbitrage than prescriptive rules about trading. This seems sage advice for the trading of ecosystem services.

Securitization mechanisms represent means of attracting funds from beyond the presently dominant public finance and philanthropic sources. Existing securitization mechanisms fall into two main groups—green bonds and eco-tender mechanisms, the latter being either Commonwealth or State initiatives.

3.5.1. Green Bonds

Green bonds are an example of a form of securitization of an ecosystem service asset whose global use has grown rapidly in recent times (see "Green grow the markets, O" [24]).

Green bonds are a form of structured finance that raises debt (loan) capital from the capital market, underwritten by a guaranteed interest rate (the "coupon"). They deliver a fixed income stream to the investor (the "yield"), and are repayable at a declared maturity date, typically at least five years into the future. They are designed to create a pool of medium to long-term finance by pooling assets and disbursing finance to multiple investment targets over the life of the bond.

Not all green bonds are formally securitized. A guaranteed (usually low coupon) bond can be called a covered bond, but not necessarily securitized in an asset-backed sense. For example, some Triple-A bonds are not securitized because an issuer such as the World Bank takes the risk whilst guaranteeing the debt repayment plus the yield. Most green bonds in developed countries are securitized, but there is a range of risk and reward related to future flows of funds. Term is also vital—shorter term bonds are suitable for some purposes (e.g., solar installations), longer term bonds for others (e.g., reforestation).

In simplest form, the issuer of green bonds raises capital from investors, paying an agreed amount of interest periodically over a set period and repaying the capital at the end of that period. Green bonds provide a relatively secure cash return to the investor, generally maturing in five years, at which time the loan amount is repaid. In some cases, no yield is payable but the repayment includes an amount for accumulated interest at the coupon rate. A "zero coupon" bond, however, entails the investor foregoing any yield over the term of the investment. To date, the coupon for most of the green bonds have been based on a fixed interest rate (generally the Libor rate) plus a margin [24].

The issuer invests the funds subscribed; the returns from which are then used to pay stipulated management fees and expenses, and the residual is used to create or improve green assets that will

yield a verifiable additional stock of the ecosystem asset, or flow of ecosystem services. Green bonds generally involve a total pool of at least US$200,000 in order to reduce transaction costs [24].

Four major global banks have issued voluntary process guidelines for issuing green bonds, under the heading of Green Bond Principles [25]. The principles are couched in a very loose and general manner; surprisingly so, given questionable behavior of some major global banks in the Global Financial Crisis. For example, (1) issuers are not bound by the principles; and (2) the issuer can use second party verification of outcomes (*i.e.*, a consultant hired by the issuer). Third party independent verification is not compulsory. The looseness of the wording poses potential risks for investors given the difficulties of measurement and reporting of some ecosystem services.

The first Australian offering was of World Bank Green Bonds through the Westpac Bank, early in 2014 (E & Y [26]). The World Bank projects to be supported included renewable energy installations, energy efficiency projects, and new technologies in waste management and agriculture that reduce greenhouse gas emissions. They also finance the transition to a low-carbon economy, as well as financing for forest and watershed management, and for infrastructure to prevent climate-related flood damage and build climate resilience.

Superannuation is compulsory in Australia and some 24 of the 100 leading Australian Superannuation funds (E & Y [26]) are now offering options that support socially and environmentally responsible investments such as Green Bonds to their members. Banks and large companies have responded by offering green bonds to investors in Australia over the past two years (National Australia Bank, $300 million offered; ANZ Bank, $600 million; Stockland, A$400 million). These bonds have proved attractive to investors seeking a low-risk stable return, plus contributing to green objectives. Some have been oversubscribed.

While green bonds are a welcome initiative for investment in ecosystem assets or services, they have mostly been directed to energy-efficient and climate-related investments such as wind farms and hydro-electricity projects that have well-defined and measurable service outputs, and readily calculated prices. Although not so far used for this purpose, Green bonds are potentially applicable to ecosystem services such as water quantity and quality, where the outputs are often measurable, if public water utilities that source water from privately-owned land wished to better protect that supply.

Green bonds do not seem as readily applicable to biodiversity-based services, which remain complex and problematic in Australia. This is partly due to their scale but also due to the difficulties of defining and measuring biodiversity-based services, as later discussion shows.

3.5.2. Commonwealth Eco-Tenders

The Commonwealth Government has provided two securitized price-based schemes (Zammit [27]), in which landowners bid for contracts to improve ecosystem services.

In Tasmania, the Forest Conservation Fund ran from 2006 to 2009 and protected over 28,000 ha of high conservation value forests through contracts with over 125 landowners [26] requiring covenants. The Fund was delivered by a third-party service provider, who was responsible for landowner communication, providing trained advisers to support landowner engagement and site assessment, the conduct of four auction rounds, and developing final contracts with successful landowners. A review program [27] confirmed earlier (Yang *et al.* [28]) research on the importance of building social capital through extension, training, support networks and knowledge sharing. It also highlighted the significance of the trust placed on the conservation advisers, and concerns about the implications that long-term property commitments (through covenants) place on family succession.

In south-eastern Australia, the Environmental Stewardship Program commenced in 2008, targeting nationally endangered ecological communities on the scattered, small fragments of Box Gum Grassy Woodlands in private ownership in inland New South Wales and Queensland [27]. It has so far secured an area of over 45,000 ha and led to contracts with over 260 landowners to improve habitat condition. Landowners bid for funding contracts to undertake specific conservation works on their land for up to 15 years. Unlike the Tasmanian program, the inclusion of a covenant in the

contract was voluntary. Some 23% of successful bidders opted for a covenant, 67% did not, and the remainder could not remember if they opted for one [29]. In the event, the Program is thus a mixture of securitized and non-securitized price-based mechanisms. The high proportion of those not opting for a covenant may reflect the implications for family succession given the much larger properties characteristic of inland Australia. An independent review of the Program in 2011 indicated generally positive perceptions by landowners but a lack of understanding of reverse auctions, bidding, and the environmental metric used to rate the bid proposals [27].

3.5.3. State Eco-Tenders

The Victorian State Government initiated the first securitized price-based mechanism in Australia in 2001—the so-called BushTender program (DEPIa [30], Stoneham *et al.* [31]). In BushTender, landholders competitively tender for agreements with the State department for public funding of activities to better manage their native vegetation. The three million hectares of native vegetation on private land in Victoria supports 30 per cent of Victoria's threatened species populations and, in addition, is of high conservation significance for salinity control, water quality, land protection, landscape protection and climate change mitigation [30].

BushTender bids are selected on the basis of a quantitative assessment of the additionality using the so-called Habitat Hectare metric (DEPIa [30]). McCarthy *et al.* [32] enumerated some concerns over several aspects of the Habitat Hectare approach. Nevertheless, some 35,000 hectares of native vegetation (including some grasslands) were funded over the period 2001 to 2012 (DEPIb [33]). BushTender is an approved Conservation Covenanting Program for the purposes of income tax assessment, providing tax concessions to the owner for their expenditures on the project. Stoneham *et al.* [31] provide details of the ranking scheme. Their analysis of the mechanism indicated that the reverse auction scheme offered substantial cost savings to governments, notwithstanding the potential perils they acknowledge in auction design. The perils include the possibility of collusion between landowners, the so-called "winner's curse" (where the bidder with the lowest valuation for the project succeeds but at a price well below the true cost), asymmetry in the information available to different bidders, and the difficulty of setting a reserve price. Milgrom [34] provides a detailed discussion of auction designs to reduce these perils.

BushTender now complements a broader program of trading and offsets called BushBroker (DEPIb [33]). BushBroker assists landowners to permanently protect and manage their native vegetation. Alternatively, it will find a third party offset site for landowners with permits who wish to clear some native vegetation, if no offsets are available on the landowner's property. The program is based on an evaluation of the additional gains in quantity or quality of native vegetation (or offset) that are subject to a secure and ongoing agreement registered on the land title. Landowners can also generate native vegetation credits by transferring freehold land carrying native vegetation to State ownership in parks or reserves.

Operationally (DEPIb [33]), BushTender involves a landowner contacting the department to arrange a preliminary discussion about the land and process. Site assessment is then carried out by an accredited organization that prepares a draft Landowner Agreement and management plan to generate the native vegetation credits. The landowner either signs the agreement or waits until a suitable trade arises with a Permit Holder seeking to clear some native vegetation. The Permit Holder can then negotiate a price to be paid to the landowner for the offset through an accredited broker. Once signed, the details are recorded on the land title and the native vegetation credit register, making those credits available to a Permit Holder, if appropriate. The department collects all trade funds and holds them on behalf of the landowner. The Landowner Agreement includes a ten-year annual schedule specifying when funds will be paid, subject to compliance with the management plan.

BushBroker offers a mechanism for improving the quality of privately-owned native vegetation in Victoria, much of which is highly fragmented over several properties, and under threat from a range of sources including salinity, soil acidification, edge effects and nutrient accessions. The program

itself is too new for its environmental impact to be comprehensively evaluated. Anecdotally, the offset arrangements offered some comfort to landowners concerned about the earlier restrictions on land clearing, which some say encouraged some landowners to subvert the restrictions. Nonetheless, BushBroker has also gathered criticism in terms of a focus on management actions rather than environmental outcomes, as well as on the problems of additionality and equivalence that beset many offset schemes.

The New South Wales Government (Department of Environment, Climate Change & Water [35]) introduced a Biobanking and Offsets Scheme in 2009 that is similar to the BushBroker scheme. One difference is that it distinguishes between Ecosystem credits and Species credits:

Ecosystem credits are created for all ecological communities, as well as threatened species, that can be reliably predicted using habitat surrogates for a given ecological community or threatened species. The number of ecosystem credits calculated depends on the site condition and the landscape context (for example, connectivity and area of vegetation).

Species credits are created for threatened species that cannot be reliably predicted using habitat surrogates. The number of species credits is calculated based on targeted surveys.

The BioBanking Assessment Methodology uses the information from each to predict improvement in biodiversity-based services arising from the planned management activities. The extent of BioBanking agreements is at yet relatively small, as Table 2 shows, but is expected to increase over the next decade.

Table 2. Private land conservation mechanisms and area protected in NSW.

Conservation Mechanism	Number	Area Protected (ha)
Conservation agreements	396	146,000
Wildlife refuges	678	1,936,358
Nature Conservation Trust agreements	91	24,886
Incentive property vegetation plans	1885	860,258
Registered property agreements	336	52,606
BioBanking agreements	32	4845
Land for wildlife	1125	87,242
Indigenous protected areas	9	16,000
Total		3,218,195

Source: Byron *et al.* [36].

In 2014, The Queensland Government [37] introduced an Environmental Offsets program similar to BushBroker. The South Australian Government [38] has a less elaborate Significant Environmental Benefit Offsets program established in 2003, and likewise the Western Australia introduced an offsets program in 2006 (Western Australia EPA [39]).

A recent independent review of biodiversity legislation in New South Wales (Byron *et al.*, [36]) recommends the development of a more comprehensive system for monitoring and reporting on the condition of biodiversity in New South Wales and a statewide biodiversity offsets fund to support biodiversity certification and BioBanking. The concerns about the existing system of monitoring highlight the central dilemma facing trading, offset and securitization schemes. Equivalence and additionality need to be measured in a sufficiently precise manner to reduce the risk to lenders or donors to an acceptable level. Given the complexities of defining and measuring biodiversity (and hence biodiversity-based services), which are discussed in the following section, the present systems in use in EcoTenders and BioBanking run the risk of either being misused by fund managers (or their agents) or misunderstood by investors, such that a major failure or objection could damage the investment climate for the conservation of biodiversity-based services.

Bekessy *et al.* [40] argue that because proposals for offsets, biobanking and biodiverse carbon sequestration are uncertain, they should be banked in a savings bank, and proven as to gains before accepting the trade. This seems an impractical proposal and a disincentive to landowners, who

would then bear the burden of "doing good" for a considerable period, unless the government carried all the risk of default in the event that the managers of the mechanism were unable to meet their debt obligations. However, a government guarantee invites dishonesty and arbitrage in the project. Alternatively, Credit Suisse *et al.* [41] propose that non-government organizations should aim to supply a sufficient stock of large-scale conservation projects that have clearly defined environmental and financial benefits and local regulatory backing, and should act as verifiers. Given the measurement difficulties and vested interests involved, this seems an especially risky proposition as those organizations would also be tempted by the possibilities of arbitrage that arise from their role as both proponent and verifier. Kay [23], as noted earlier, provides some striking examples of misbehavior that has occurred in the past in the finance sector. Non-government organizations would not be immune from the temptations posed by interactions involving similar transactions.

The mechanisms reviewed above offer no "silver bullet" for increasing private funding of investment in ecosystem services on privately owned land. Biodiversity-based services seem the most problematic of all. These concerns prompted some reflection on the definition and measurement of biodiversity that spawned a possible new approach on how investment in the provision of biodiversity-based services might be approached to reduce the perceived risks to private investors and landowners.

4. Biodiversity Definition and Measurement

Norton [42], an environmental philosopher, argues that "biodiversity—whether conceived as an inventory of differing objects or as a difference function applicable to groups of entities—cannot be defined as an additive index capable of ranking systems or collections of entities as more or less diverse". A more recent and comprehensive paper on biodiversity offsets (Bull *et al.* [43]) points out that "no single metric . . . objectively captures the full extent of biodiversity, which itself has no universal, unambiguous definition".

Yet, as Norton aptly puts it:

> *We need not be dismayed by the lack of a quantifiable definition of biodiversity, however, because here we can return to what we learned from Dewey. We should not expect that biodiversity will denote some pre-existent, biological parameter; nor should we expect biodiversity to be precisely measureable. What we are looking for is a term and attendant definition that fulfills two conditions: it must be "clear enough" to enable communication about what to do. Can practitioners use the term to agree upon policies that will protect biodiversity, as understood in that community? The second requirement is that the term must also be rich enough to capture all that we mean by, and value in, nature. And these features are so diverse that they cannot be made precise and measurable. The question is not: can we precisely define it? The question is: are members of the community usually able to act in concert? And the answer is that all of the major environmental groups in the United States agree about a great many steps should be taken to protect biodiversity. There will be disagreements in the priorities placed on different methods of achieving a diverse landscape, and differences in tactics, but all of the major environmental groups favor policies that create open space, protection of riparian corridors, and countless other concrete objectives. So the term has proved itself to be "clear enough" to guide policy.*

While apt, this characterization of biodiversity poses problems for securitization of biodiversity or biodiversity services but is not necessarily an impenetrable barrier if we focus on the two conditions that Norton [42] identifies in the context of the community as potential investors: (i) whether potential investors support specific actions to protect biodiversity-based services, and; (ii) whether potential investors are able to act in concert.

If potential investors, landowners and a financial institution can reach a collective agreement on the actions needed to protect biodiversity-based or other ecosystem services, monitoring of the asset

can be cast in collectively-agreed (albeit incomplete) metrics, with the participants also agreeing to share the risks involved in monitoring those metrics.

5. Proposed Biodiversity Investment Scheme

We propose a Biodiversity Investment Scheme as another possible form of securitization that is better suited to investment in biodiversity assets and can potentially meet Norton's two conditions. The use of the term "biodiversity" rather than "ecosystem" is arguable and reflects a belief that the former is more readily accepted by and attractive to the general public. It is modeled on Managed Investment Schemes (MIS) that are quite common in the Australian investment sector where they play an especially important role in the property and commercial real estate markets. A "Managed Investment Scheme" is any pooled direct investment in a venture that is managed by some other company or person. A direct investment is where investors are directly involved in the business or property as owners or beneficial owners, or in which investors are directly contracting for services to be carried out on their behalf.

In the 1990s forestry and horticultural MISs flourished in Australia for a period but succumbed to the impact of the Global Financial Crisis and Ponzi-like behavior under inadequate regulation and oversight (see Ferguson [44]), highlighting the need for proper regulation and monitoring of any financial mechanism for improving ecosystem services. Ponzi-like behavior is where the managers of the financial mechanism raise new tranches of funds to service the debt commitments on previous tranches. In the Australian forestry and horticulture MISs, many managers overestimated the growth rates of trees and horticultural crops. As such, the age at which substantial trading revenues would be available to cover their debt obligations to investors and financial institutions extended well beyond that initially expected. Consequently, many MIS managers became reliant on promoting new tranches to fund those obligations. The impact of the Global Financial Crisis and some erratic changes in government policy increased the pressures and most MIS schemes then failed.

A Biodiversity Investment Scheme prospectus would have to meet requirements laid down by the Australian Securities and Investment Commission. The prospectus would also be subjected to approval by the Australian Taxation Office through a formal Product Ruling that enables investors to be secure regarding the taxation concessions applicable to their investment. The taxation concessions would allow deductibility of the amount of the investment against taxable income, even if the actual expenditure by the Fund Manager is disbursed in the following year. Experience suggests that many investors are most likely to contemplate such as investment towards the end of the financial year, when they have otherwise under-utilized funds that they may wish to invest in a socially or environmentally responsible activity. Given appropriate safeguards, such a scheme could operate nationally with respect to investors, who could be individuals, companies or trusts.

With an appropriate structure, a Biodiversity Investment Scheme is well suited to biodiversity projects as it provides a vehicle that is suitable for relatively small investments, say a $5,000 minimum by individual investors with provision for multiple parcels. Several successive projects could be scheduled for investment, each being the subject of a Prospectus and a common advertising campaign. This would reduce transaction costs by collectively providing sufficient scale for advertising and funds management.

The activities to be funded will depend on the characteristics and problems of the area but need not be restricted to a single activity. For example, ecological thinning might be used in areas where it is desirable to accelerate the formation of mature structural characteristics of the canopy to suit particular birds or animals. Fencing might be needed to protect endangered areas of orchids or other rare and endangered plants. Artificial bird boxes, bole hollows or pest control might be needed to protect endangered animals. Reforestation might be a possible activity in areas cleared of forest—especially if a landscape-scale view is taken and improving connectivity among forest patches is desired.

Proposed activities would need to be accompanied by published research that enables credible predictions of the outcomes of those activities as evidence that investors will gain their rewards from

environmental outcomes, as well as the financial returns. Those outcomes have risks attached to them and, to the extent practicable, those risks need to be described and enumerated by a qualified independent contractor, perhaps building on the BushBroker-type infrastructure. The multiple streams of benefits typically arising from biodiversity-based outcomes offer scope for mitigating the overall risk through mutual cross-cancelling of the risks, compared to those from, for example, an individual species outcome.

This scheme would have to have Commonwealth Government approval. The detailed Prospectus to be approved by the Australian Taxation Office would need to set out the details of the forest or woodland including Area Description, Management Plan, Biodiversity Manager, Independent Verification and Trustee.

Financial details of a model scheme are the topic of another paper. They involve investors making a collective loan to a fund manager in return for a promised annual cash return (coupon rate) to investors of, say, 2% per annum, plus some funding for the provision of ecosystem services. The fund manager invests the proceeds to achieve the best return, relative to the risks involved, let us say at a rate of return of 6% per annum. They have to meet their costs and receive some reward for doing so, say 2% per annum. The remaining 2% per annum is then available for investment to improve ecosystem services. In some respects, this is just an equity-funding variant on debt-funded Green Bonds that taps a different group of environmentally and socially responsible investors who have spare funds at the end of the financial year. Here we do not attempt to draft the necessary detail for the Prospectus but instead focus attention on what are some important principles and risks in each.

5.1. Area Description

In addition to describing boundaries, ownerships, assignable rights of the area, and methodology, the inventory needs to be precise and cost-effective to reduce overheads. Depending on the nature and scale of the activities, it may need to be supplemented by maps and photographic imagery for the benefit of potential investors.

5.2. Management Plan

The Management Plan should describe the nature of the activities, their rationale, predicted outcomes and timing. Timing needs to differentiate between short-term investment activities up to the maturity of the Scheme and the long-term sustainability goals. The former should be geared to measurable outcomes over shorter timescales. The long-term sustainability goals are more aspirational but require review at the conclusion of the maturity period (see Ferguson [21]). The Plan should allow for periodic review and revision, linked to continuing verification and certification.

The outcomes need to identify additionality and distinguish between those that are normal ongoing management activities required of the manager, and additional activities and outcome that are associated with new investment via the Prospectus.

5.3. Biodiversity Manager

While experience and qualifications are important pre-requisites for the Biodiversity Manager, the role is as much a business as a technical manager, requiring human resource and financial management skills. The role needs to be independent of the other entities in the Biodiversity Investment Scheme and incentivized to achieve the goals required of the investment.

The various Codes of Forest Practice of the individual States of Australia set out prescriptions, guidelines and penalties for operations in commercially-oriented harvesting of timber from forests and plantations. Similar codes exist for other operations (e.g. infrastructure operations, fire protection *etc.*) on national parks and conservation reserves. The Commonwealth Government would need to develop a Biodiversity Management Code for biodiversity investment, based on the BushBroker and similar schemes, including appropriate penalties for non-compliance, such as the withdrawal of Commonwealth tax concession provisions.

5.4. Independent Verification

A certification process based on independent and competitively-sourced consultants is the best solution for verification. Alternatively, a double independent verification may be needed. The BushBroker scheme provides a model.

Based on experience with other Managed Investment Schemes, independent consultants should not be hired by Fund Managers and, in the absence of a Trustee, the Australian Taxation Office or ASIC should assume that responsibility.

5.5. Fund Manager

A bank or major financial institution should issue the Prospectus and manage the funds. Fund managers should be institutions for whom the reputational risk would be such as to avoid engaging in Ponzi-like behavior or involving a multiplicity of agents and commissions.

Given the transaction costs involved, the scale of a Prospectus offering by the Fund Manager is of critical importance. An offering of similar size to that used for green bonds (A$200 to A$500 million) seems too large and unwieldy for investment in biodiversity on the diverse and scattered privately-owned forests and woodlands in Australia.

At most, projects should be developed on a regional basis, perhaps using the regions defined for plantation inventory in Australia (see [1]). The financial and areal extent of investment activities will vary considerably. However, the entire regional area concerned does not need to be embraced in a single Prospectus. A prioritized succession of prospectuses for linked projects could be developed within regional subdivisions.

Whether the Scheme offers an income stream on a very low coupon (*i.e.* rate of return to investor) or a lump sum on maturity (*i.e.*, a zero coupon) is a matter for the Fund Manager to develop. The choice may hinge on whether revenue streams from the project management activities are available. The likely candidates are from "carbon farming" via programs like the Carbon Farming Initiative, firewood and timber produce from thinning and harvesting, and water, in the case of catchments.

5.6. Trustee

Experience suggests that Fund Managers should not have the right to appoint Trustees. All States have Public Trustees who would be far more appropriate for this role.

6. Choosing Mechanisms

The manifold nature of ecosystem services complicates the choice of financial mechanism to be used, especially where one asset produces multiple ecosystem services. Governments and financial institutions may have very different views of the benefits, costs and risks involved. Since much of the present search for additional funding focuses on financial markets rather than government funding, some reflection on the primary characteristics that influence the choice of mechanism by financial institutions, private investors and landowners is appropriate. In particular, the potential for a mechanism to attract funds from socially and environmentally responsible investors who are seeking wealth preservation or secure returns on investment needs to be examined.

6.1. Property Rights

To improve ecosystem services, landowners and lessees who are not themselves motivated to place constraints on their land use generally need to be encouraged to accept some constraints on their land rights. This typically involves covenants, agreements or contractual arrangements to secure the changed rights over time. The classic economic solution for similar problems of pollution, according to Coase [45], is to enable the consumers of the ecosystem services to negotiate collectively with the landowner-providers to arrive at an agreed solution and compensation. This is clearly difficult to implement and, therefore, generally impractical. As a result, government agencies often become

negotiators, engendering adverse reaction from landowners, who see the outcomes as being dictated by bureaucracies or political interests, rather than a Coasian bargain.

The advantage of the proposed Biodiversity Investment Scheme is that it effects a voluntary trade of property rights in return for a secure basis of compensation. This is in contrast to EcoTender auctions, which are, for the landowner, a gamble to obtain a contract with the government, often involving high transaction costs to the landowner. Furthermore, EcoTender auctions may result in a spatially and environmentally uncoordinated patchwork of activities for government agencies.

However, the measurability of the assigned property rights to ecosystem services is critical. Financial markets and institutions are accustomed to dealing with risky outcomes and valuations within the framework of a regulatory code of practice and standards that, while far from perfect, provide sufficient confidence in asset valuation. Some ecosystem services are capable of valuation to a level of precision acceptable to financial markets and institutions. Greenhouse gas mitigation in the form of measurable carbon stocks, and energy generation are obvious examples. Water quantity [46] and quality [47] are other potential examples. Biodiversity-based services, as noted earlier, are problematic, particularly because they often involve a mix of ecosystem services.

As Bull *et al.* [43] point out, "biodiversity of high conservation value does not necessarily coincide with provision of ecosystem services". Nor are improvements of biodiversity, ecosystem function and ecosystem services always mutually compatible goals. This offers an agenda for much-needed research to refine biodiversity measures and address issues relating to metrics, baselines, uncertainty and multiple criteria. More information needs to be afforded potential investors so that they can weigh the risks involved in the environmental and financial outcomes. Much hinges on being able to satisfy the perceptions of the investors and financial institutions as to the precision and relative freedom from bias of those measures of change and the monitoring of them.

Scale is also important, both spatially and temporally. The spatial scale, other things being equal, will greatly influence the transaction costs of the transfer of property rights and subsequent actions. There are considerable economies of scale in planning, managing funds, advertising or preparing prospectuses for larger projects with longer timescales, as well as the contracting out of activities. On the other hand, shorter timescales are more attractive to investors and fund managers. The scale of BioBanking projects is generally so large that it may be difficult to maintain temporal continuity. Project planning inevitably involves juggling these conflicting influences about scale.

6.2. Market Structure

Freedom of entry and exit into a market are critical to maintain contestability [48] and so to approximate the desired theoretical outcomes of a perfectly competitive market. Transaction costs [49] and the asymmetry of information are the principal barriers to entry and exit, not just to landowners and individual investors, but also to financial and regulatory institutions.

Exit from the market is an oft-neglected and critical matter for individual investors because personal circumstances can change. If investors are given the right to withdraw, the conditions need to cater for withdrawal whether the investment scheme is liquid or not, but the terms of withdrawal may vary accordingly. Disclosure of the terms and risks is essential.

Evidence cited earlier from existing mechanisms shows that information about environmental investment projects is often not well understood among participants. Those responsible for refining the codes of practice and standards for measuring and monitoring need to involve investors, institutions and landowners, as their perceptions will be critical in achieving standing in the financial sector and the community.

The incentives for additionality and equivalence are likely to rest on taxation concessions. Regulatory approval and effective oversight of compliance will therefore be an important complement to whatever form the financial mechanisms take.

7. Conclusions

More mechanisms are needed for raising investment in the active management of ecosystem services provided by the privately-owned forests of Australia. They should not, of course, substitute for on-going management of publicly-owned forest. However, where additional gains stem from new initiatives that link State- or Commonwealth-controlled forests with privately-owned forests, some investment on State- and Commonwealth-controlled forests should be permitted. One example would be the purchase of adjacent private land requiring fencing or firebreak change to the new boundaries.

Securing investment over sufficiently long time periods to ensure a change in ecosystem service provision is problematic whatever the financial mechanism used. A covenant to protect the continuity of services becomes essential. This poses a cost for the landowner because land tax has to be paid annually on the area involved. In theory, the landowner could be compensated in advance by an amount of capital sufficient to pay that annual tax. While that might be satisfactory for the duration of the investment activities, memories are short once the activities cease, making that solution untenable in the long term. Transfers of ownership also complicate the issue. Governments at all levels therefore need to waive land taxes on the areas involved in covenants, if private funding on an increased scale is to be encouraged.

The advantage of the proposed Biodiversity Investment Scheme is that investors otherwise remote from the geographic and scientific basis of the project can choose to invest relatively small amounts in projects that have an identifiable impact on ecosystem service outcomes, albeit outcomes that are diverse and imprecisely measured. These outcomes are monitored, reported, and provide an environmental return, complementing whatever cash return was negotiated with investors. The nature of the Scheme seems to meet the Norton [42] imperatives that investors and participants be able to choose to support specific measures to protect biodiversity, and to act voluntarily in concert to do so under a Scheme that pools benefits and reduces risks by verification and cross-cancelling unfavorable outcomes across different ecosystem services. However, the proposed Biodiversity Investment Scheme is but one of a number of alternative mechanisms. The choice in any one context will be mainly determined by landowner attitudes to assignment of property rights, scale, the extent and nature of public *versus* private consumption goods, transaction costs, and risks. Any substantial ecosystem project needs to assess all available mechanisms and choose the best horse for the particular course.

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References

1. Montreal Process Implementation Group for Australia and National Forest Inventory Steering Committee. *Australia's State of the Forests Report*; 2013. ABARES: Canberra, Australia, 2014; p. 347. Available online: http://www.agriculture.gov.au/abares/forestsaustralia/sofr/sofr-2013 (accessed on 30 June 2015).
2. Kanowski, P.J. Australia's forests: Contested past, tenure-driven present, uncertain future. *For. Policy Econ.* **2015**. [CrossRef]
3. Lindsay, A.; Dickinson, G. *Influence of Cyclonic Winds on the Performance of Hardwood Plantations in Tropical North Queensland. Report for the Timber Queensland Project: Best Practice Guide for Timber Plantations in Cyclonic Areas. By Alex Lindsay and Geoff Dickinson*; Horticulture & Forestry Science, Agri-Science Queensland, Department of Agriculture Fisheries and Forestry: Mareeba, Queensland, 2012; p. 388. Available online: http://www.timberqueensland.com.au/Docs/Growing-Processing/Processing/TQ_Cyclone_DAFF_Final_Report_290612_2.pdf (accessed on 12 August 2015).
4. Vanclay, J.K. Can lessons from the Community Rainforest Reforestation Program in eastern Australia be learned? *Int. For. Rev.* **2006**, *8*, 256–264. [CrossRef]
5. Pittock, J.; Cork, S.; Maynard, S. The state of the application of ecosystems services in Australia. *Ecosyst. Serv.* **2012**, *1*, 111–120. [CrossRef]

6. Lockie, S. Market incentives, ecosystem services, and property rights: Assumptions and conditions for sustained social and ecological benefits. *Land Use Policy* **2013**, *31*, 90–98. [CrossRef]
7. Senate Finance and Public Administration References Committee. *Native Vegetation Laws, Greenhouse Gas Abatement and Climate Change Measures*; Senate Finance and Public Administration Secretariat, Parliament House: Canberra, Australia, April 2010. Available online: http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Finance_and_Public_Administration/Completed%20inquiries/2008-10/climate_change/report/index (accessed on 10 August 2015).
8. MBDA. *Basin Plan, Water Act 2007*; Murray-Darling Basin Authority: Canberra, Australia, 2012; p. 245. Available online: http://www.mdba.gov.au/sites/default/files/Basin-Plan/Basin-Plan-Nov2012.pdf (accessed on 30 June 2015).
9. Colloff, M.J.; Caley, P.; Pollina, C.A.; Saintilan, N.; Crossman, N.D. Long-Term Trends of Flow-Dependent Ecosystems in a Major Regulated River Basin. *Mar. Freshw. Res.* 2015. Available online: http://www.publish.csiro.au/nid/126/OnlineEarlyFlag/1.htm (accessed on 30 June 2015).
10. Nambiar, S.; Ferguson, I.S. *New Forests: Wood Production and Environmental Services*; CSIRO Publications: Melbourne, Australia, 2005; p. 248.
11. Jacobs, M.R. *The Growth Habits of the Eucalypts*; Forestry & Timber Bureau: Canberra, Australia, 1955; p. 262.
12. Department of Environment and Water Resources. *Encouraging Environmental Philanthropy: Lessons from Australian Case Studies and Interviews*; Australian Government, Department of Environment and Water Resources: Canberra, Australia, 2007; p. 54. Available online: http://www.environment.gov.au/resource/encouraging-environmental-philanthropy (accessed on 30 June 2015).
13. Effective Philanthropy. *Strategies for Increasing High Net Worth and Ultra High Net Worth Giving. Report for Commonwealth Department of Families, Housing, Community Services and Indigenous Affairs on behalf of Philanthropy Australia*; Philanthropy Australia: Melbourne, Australia, 2011; p. 70. Available online: http://www.philanthropy.org.au/images/site/misc/Tools__Resources/PA-High-Net-Worth-Giving-Report-170211.pdf (accessed on 30 June 2015).
14. Upper Wimmera Landcare. *Project Platypus: Strategic Plan 2015–2018*; Upper Wimmera Landcare Group, Stawell: Victoria, Australia, August 2015; p. 9. Available online: http://www.platypus.org.au/docs/strategic_plan/Project%20Platypus%20Strategic%20Plan%202015-2018.pdf (accessed on 10 August 2015).
15. Johnson, P.D. *Global Institutional Philanthropy: A Preliminary Status Report*; Part Two: Country Profiles. TPI & Wings: Washington, DC, USA, 2010; p. 109. Available online: https://www.cbd.int/financial/charity/several-countryprofiles.pdf (accessed on 30 June 2015).
16. Millar, K.; Ferguson, I.; Hawkins, H.S. *Evaluation of Community Involvement in Revegetation. Consultancy Report for the Australian National Parks and Wildlife Service*; Faculty of Agriculture and Forestry: Parkville, Australia, 1993; p. 205.
17. Tennent, R.; Lockie, S. Vale Landcare: The Rise and Decline of Community-Based Natural Resource Management in Rural Australia. *J. Environ. Plan. Manag.* **2013**, *56*, 572–587. [CrossRef]
18. Robins, L.; Kanowski, P. "Crying for our Country": Eight ways in which "Caring for our Country" has undermined Australia's regional model for natural resource management. *Australas. J. Environ. Manag.* **2011**, *18*, 88–108. [CrossRef]
19. Green, F.; McKibbin, W.; Picker, G. *Confronting the Crisis of International Climate Policy: Rethinking the Framework for Cutting Emissions*; Policy Brief. Lowy Institute for International Policy: Sydney, Australia, 2010; p. 25. Available online: http://www.lowyinstitute.org/publications/confronting-crisis-international-climate-policy (accessed on 13 July 2015).
20. Climate Change Authority. *Carbon Farming Initiative Review Report*; The author. Canberra, Australia, 2014; p. 81. Available online: http://climatechangeauthority.gov.au/reviews/carbon-farming-initiative-review (accessed on 30 June 2015).
21. Ferguson, I. Assessing sustainability in certification schemes. *Aust. For.* **2013**, *76*, 183–193. [CrossRef]
22. Perloff, J.M. *Microeconomics*, 3rd ed.; Pearson: Boston, MA, USA, 2004; p. 724.
23. Kay, J. *Other People's Money: Masters of the Universe or Servants of the People*; Profile Books Ltd.: London, UK, 2015; p. 336. ISBN: 9781782831549.
24. Green grow the markets, O. The Economist, Finanace and Economics, 5 July 2014, 2.

25. Bank of America Merrill Lynch, Citi, Crédit Agricole Corporate and Investment Bank & JPMorgan Chase. *Green Bond Principles 2014*; Bank of America Merrill Lynch, Citi, Crédit Agricole Corporate and Investment Bank & JPMorgan Chase: New York, NY, USA, 2014; p. 7. Available online: http://www.ceres.org/resources/reports/green-bond-principles-2014-voluntary-process-guidelines-for-issuing-green-bonds (accessed on 14 July 2015).
26. E & Y. Bonds. Green Bonds E&Y Let's Talk Sustainability Issue 3, 2015. Available online: http://www.ey.com/AU/en/Services/Specialty-Services/Climate-Change-and-Sustainability-Services/EY-lets-talk-sustainability-issue-3-bonds-green-bonds (accessed on 30 June 2015).
27. Zammit, C. Landowners and conservation markets: Social benefits from two Australian government programs. *Land Use Policy* **2013**, *31*, 11–18. [CrossRef]
28. Yang, W.; Bryan, B.A.; MacDonald, D.H.; Ward, J.; Wells, J.; Crossman, N.D.; Connor, J.D. A conservation industry for sustaining natural capital and ecosystem services in agricultural landscapes. *Ecol. Econ.* **2010**, *69*, 680–689. [CrossRef]
29. Coggan, A.; Measham, T.; Whitten, S.; Fleming, D. *Socioeceonomic Monitoring for the Environmental Stewardship Program*; Report Prepared by CSIRO Ecosystem Sciences for the Department of Sustainability Environment, Water, Population and Communities: Canberra, Australia, 2013; p. 68.
30. DEPIa. BushTender. Department of Environment & Primary Industry: Melbourne, Australia, 2015; p. 2. Available online: http://www.depi.vic.gov.au/environment-and-wildlife/environmental-action/innovative-market-approaches/bushtender (accessed on 30 June 2015).
31. Stoneham, G.; Chaudri, V.; Ha, A.; Strappazoni, L. Auctions for conservation contracts: an examination of Victorias BushTender trial. *Aust. J. Agric. Resour. Econ.* **2003**, *47*, 477–500. [CrossRef]
32. McCarthy, M.A.; Parris, K.M.; van der Ree, R.; McDonell, M.J.; Burgman, M.A.; Williams, N.S.G.; McLean, N.; Harper, M.J.; Meyer, R.; Hahs, A.; *et al*. The habitat hectares approach to vegetation assessment: An evaluation and suggestions for improvement. *Ecol. Manag. Restor.* **2004**, *5*, 25–27. [CrossRef]
33. DEPIb. BushBroker. Department of Environment & Primary Industry: Melbourne, Australia, 2015. Available online: http://www.depi.vic.gov.au/environment-and-wildlife/biodiversity/native-vegetation/native-vegetation-permitted-clearing-regulations/native-vegetation-offsets/bushbroker#nvc (accessed on 30 June 2015).
34. Milgrom, P. *Putting Auction Theory to Work*; Cambridge University Press: Cambridge, UK, 2004; p. 368.
35. Department of Environment, Climate Change and Water. *Biobanking: Biodiversity Banking and Offsets Scheme*; NSW Office of Environment and Heritage: Sydney, Australia, 2009; p. 12. Available online: http://www.environment.nsw.gov.au/ accessed Feb. 2016 /images/site/misc/Tools__Resources/PA-High-Net-Worth-Giving-Report-170211.pdf (accessed on 30 June 2015).
36. Byron, R.N.; Craik, W.; Keniry, J.; Possingham, H. *A Review of Biodiversity Legislation in New South Wales*; Final Report. Office of Environment and Heritage: NSW, Australia, 2014; p. 96. Available online: http://www.environment.nsw.gov.au/resources/biodiversity/BiodivLawReview.pdf (accessed on 30 June 2015).
37. Queensland Government, 2015. Environmental Offsets. Environmental Offsets Framework. Available online: http://www.qld.gov.au/environment/pollution/management/offsets/ (accessed on 30 June 2015).
38. South Australia Government, 2015. Native Vegetation Regulations Dealing with Agriculture. Native Vegetation Information Sheet No 7, updated Jan 2013. Available online: http://www.sa.gov.au/__data/assets/pdf_file/0017/50273/Native-Vegetation-Clearance-and-Agriculture.pdf (accessed on 30 June 2015).
39. Western Australia EPA. *Environmental Offsets-Position Statement No 9*; Western Australia EPA: Perth, Australia, 2006; p. 31.
40. Bekessy, S.A.; Wintle, B.A.; Lindenmayer, D.B.; McCarthy, M.A.; Colyvan, M.; Burgman, M.A.; Possingham, H.P. The biodiversity bank cannot be a lending bank. *Conserv. Lett.* **2010**, *3*, 151–158. [CrossRef]
41. Credit Suisse, WWF and McKinsey & Company. *Conservation Finance: Moving Beyond Donor Funding Toward an Investor-Driven Approach*; Credit Suisse, WWF and McKinsey & Company: Switzerland, 2014; p. 32. Available online: https://www.credit-suisse.com/media/cc/docs/responsibility/conservation-finance-en.pdf (accessed on 30 June 2015).
42. Norton, B. Chapter 5. Towards a Policy-Relevant Definition of Biodiversity. In *The Endangered Species Act at 30*; Goble, D., Scott, M.J., Davis, F., Eds.; Island Press: Washington, DC, USA, 2005; Volume 2, p. 361.

43. Bull, J.W.; Milner-Gulland, E.J.; Suttle, K.B.; Gordon, A.; Singh, N.J. Biodiversity offsets in theory and practice. *Oryx* **2015**, *47*, 369–390. [CrossRef]
44. Ferguson, I. Australian plantations: Mixed signals ahead. *Int. For. Rev.* **2014**, *16*, 1–12. [CrossRef]
45. Coase, R.H. The problem of social cost. *J. Law Econ.* **1960**, *3*, 1–44. [CrossRef]
46. Ferguson, I.S. Timber production and streamflow benefits: A contrary analysis of options. *Aust. For.* **1995**, *58*, 142–146. [CrossRef]
47. Viscusi, E.K.; Huber, J.; Bell, J. The economic value of water quality. *Environ. Resour. Econ.* **2008**, *41*, 169–187. [CrossRef]
48. Baumol, W.J. Contestable markets: An uprising in the theory of industry structure. *Am. Econ. Rev.* **1982**, *71*, 1–15.
49. Coggan, A.; Whitten, S.M.; Bennett, J. Influences of transaction costs in environmental policy. *Ecol. Econ.* **2010**, *69*, 1777–1784. [CrossRef]