



Biodiversity services platform scoping study



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Executive Summary

Frontier Economics is pleased to present this scoping study to the Department of Agriculture, Water and the Environment on the potential for a national biodiversity services trading platform.

Background and context

This scoping study considers the potential for a national biodiversity platform to help farmers monetise biodiversity services

Agricultural businesses have a central role in managing Australia's unique biodiversity. However, existing arrangements for farmers to receive financial return for protecting biodiversity on their farms are complex and difficult to access. This scoping study investigates the potential for a national biodiversity services trading platform to help farmers monetise the provision of biodiversity services.

While farmers are the focus of this scoping study, we consider all of the relevant participants in the markets for biodiversity services. Maximising participation on a platform will be important for its success, including the participation from a wide range of sellers and buyers.

In preparing this scoping study we undertook a desktop review of academic and official literature. We undertook targeted consultation with a small number of stakeholders across government and industry. We drew on the significant expertise of team including our panel of experts in environmental law, environmental economics, financial markets and biophysical science.

What is the problem and opportunity?

Government dominates the biodiversity market as a buyer and policy maker

Biodiversity is a public good. If left exclusively to private markets, biodiversity services will be undersupplied and too little biodiversity will be preserved. State and Federal Governments have established regulatory regimes and markets to remedy this undersupply. State and Federal Governments dominate the market for biodiversity services – purchasing services on behalf of the community and regulating to prevent biodiversity loss by imposing biodiversity offset requirements on developers.

There is increasing interest from voluntary buyers

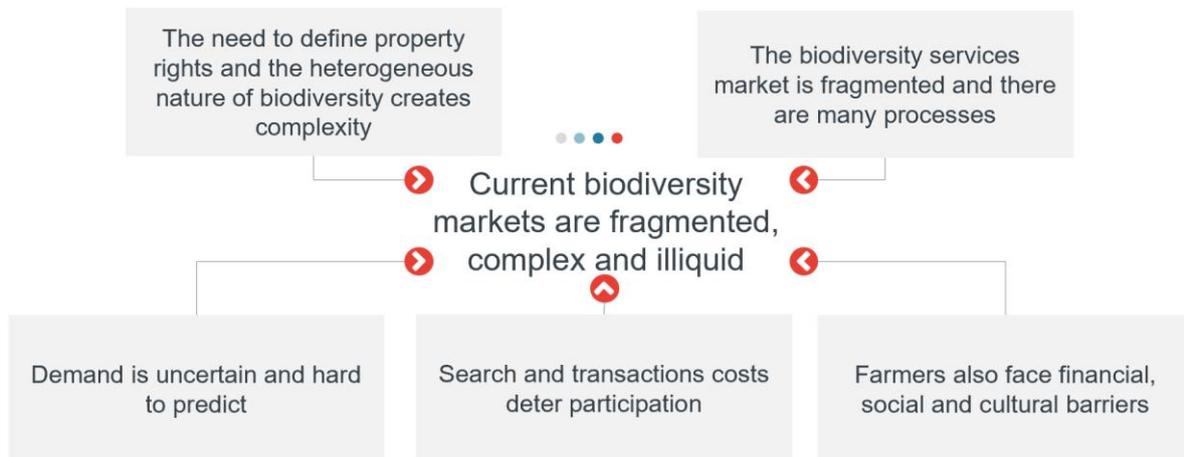
There is increasing interest in biodiversity from voluntary corporate and philanthropic buyers. This is a small but growing source of potential demand. The lack of consistent and comprehensive information means it is not possible to reliably quantify the size of demand for biodiversity services and demand from various sources. Attracting participation from voluntary and corporate buyers is a key consideration in the design and development of a platform.

Current biodiversity markets are fragmented and complex

There is no standard definition of biodiversity services or single fungible unit of biodiversity. This is partly because biodiversity is heterogeneous, embodied in many different types of plants, animals and ecosystems. There are many processes for defining, monitoring, reporting, verifying



and trading biodiversity across different government programs and different buyers. The demand for biodiversity, from governments and private purchasers, is uncertain and hard to predict. The fragmented and complex market arrangements mean high search and transaction costs, which can deter both buyers and sellers of biodiversity. Farmers face further financial, social and cultural barriers to participation.



What can we learn from other markets?

We reviewed a range of other markets, from renewable power purchase agreements to real estate platforms. We distilled a number of lessons that influenced our design and analysis of platform options.



How can a platform help?

We identified a range of platform options

We developed a series of options for a biodiversity platform using our understanding of the problem and opportunity, insights from other markets and drawing on our expertise on markets and platforms. The lessons from other markets demonstrate it is not necessary to have an exchange to improve market outcomes. We therefore consider options that involve increased information provision, without hosting trade. The nature of biodiversity services means spatial information can be used, which is likely to be attractive to both buyers and sellers, and provides a strong basis for innovation. We therefore also consider an option that uses a spatial registry.



Finally, we explore an option that involves using an exchange to improve trading opportunities for biodiversity services.

We explore three key platform options

We investigate three key options for a national biodiversity platform in this scoping paper:



Option 1: Information portal

Information for buyers, sellers and service providers for all types and locations of biodiversity

Many definitions of biodiversity services

Bulletin Board of bids and offers

Government purchase of biodiversity services via standing offer



Option 2: Spatial information portal

Information portal plus spatial registry supporting:

- Verification, monitoring and reporting arrangements
- Search for potential buyers and sellers



Option 3: Exchange

Defined biodiversity services with accreditation, monitoring and enforcement arrangements

Buyers and sellers place bids and offers for defined biodiversity products

Market clearing prices

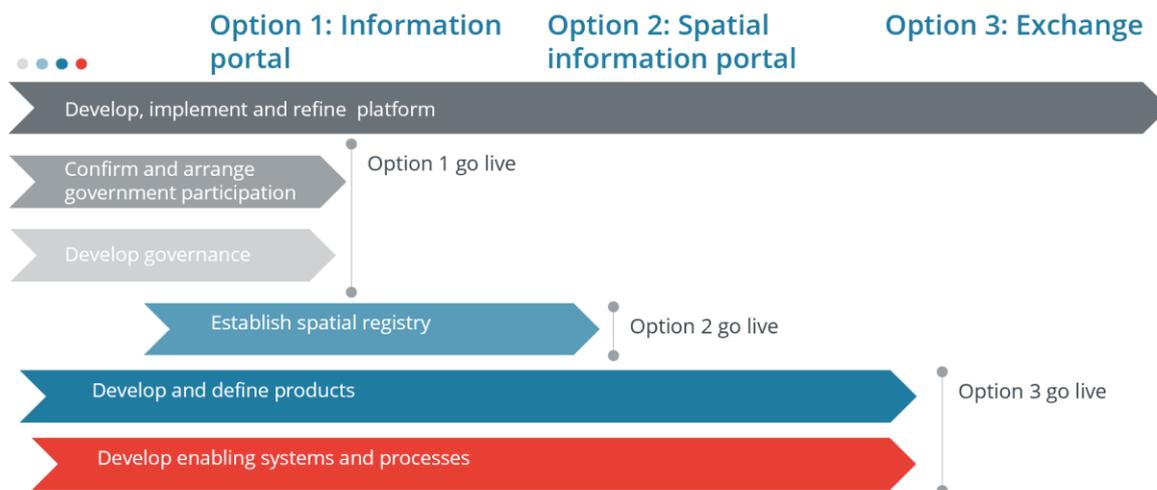
Settlement

Options 1 and 2 aim to increase awareness and understanding of, and transparency in, biodiversity markets. They would include information on markets, and bulletin boards of bids and offers, ideally regionalised to improve usability for farmers and other market participants. The primary difference between the two is that the spatial information portal would include a spatial registry of bids and offers, and mapping and modelling tools to locate and predict the distribution of relevant species and ecological communities, drawing on available information and records. It could also include carbon modelling capabilities to help integrate the carbon and biodiversity markets. While the information portals would link buyers and sellers, they would not host trades; all trades would be completed offsite. Option 3, a trading exchange, would combine the functions of the information portals but include the capacity to host trades, like share and other trading exchanges.

Option 1 and to a greater extent Option 2 are consistent with an innovation platform, while Option 3 is more consistent with a transaction platform. These three options would all work more effectively if government participates in the platform through standing offers to buy biodiversity services.

The platform options can be developed in sequence

The three key options can be considered as alternatives. However, the options could also be developed in sequence, since each option includes the functionality of the previous option. This provides the opportunity to develop and implement Option 1 relatively quickly, while work progresses to enable the development of Options 2 and 3. Progressing the options sequentially represents a 'no regrets' pathway. Work to standardise and harmonise spatial information required for Option 2 is underway in the context of the review of the Environmental Protection and Biodiversity Conservation Act. There is no requirement to progress to Option 3 if Option 2 is working effectively and/or the harmonisation required to support the development of an exchange proves difficult or costly.



The platform that delivers the greatest net benefit to the community should be preferred

The option that delivers the greatest net benefit to the community should be preferred. Identifying this option requires an assessment of the benefit of the option (primarily related to the benefits of improved efficiency) compared to the costs of the option (primarily the implementation and operating costs of the platform), recognising the risks of implementation.

A well-functioning exchange platform (Option 3) is likely to deliver significant efficiency benefits. But there are material risks associated with achieving the harmonisation of service definition and monitoring, verification and reporting arrangements to ensure this option achieves liquidity.

A biodiversity platform can solve some issues, but not others

A platform in and of itself will not resolve the most significant issues with the current arrangements. A platform cannot correct the public good characteristics and heterogeneous nature of biodiversity which make it difficult to define tradeable property rights for biodiversity services. A platform would also not address many of the issues that deter farmers and other landholders from participating in biodiversity markets, including policy uncertainty, low prices, opportunity costs, additionality and permanency requirements, and measurement, reporting and verification costs.

However, a platform could provide information that could make it easier for potential market participants, including farmers, to navigate the many systems and processes. It could also reduce search and marketing costs by helping to link buyers and sellers.

Although a national platform could provide material benefits, it would require detailed enabling and supporting arrangements to ensure a credible, liquid market that enables farmers to monetise biodiversity services.



What is next?

There is work to be done defining biodiversity services and the associated monitoring, verification and report arrangements

A platform will not resolve the most significant issues with the current arrangements. Progress is required on product definition and monitoring, verification and reporting arrangements to ensure farmers are better positioned to monetise biodiversity services. Some of this work is underway through the Agricultural Stewardship Program.

Government participation via funding is critical to the success of a platform

The nature of biodiversity means this market is necessarily complex. Harmonising government expenditure on biodiversity and simplifying arrangements by using a standing offer will make demand more predictable, encouraging farmer participation. Government participation in the biodiversity market via the platform will instil confidence, attracting buyers and sellers.

A secure digital registry accessible through an open platform is the most appropriate technology

Developing the platform via a secure digital registry accessible through an open platform ensures the platform can develop iteratively in response to community feedback. It also provides the opportunity for stakeholders to interact with the platform with their own business systems, introducing a wider audience and supporting innovation.

The role of government needs to be confirmed

More work needs to be done to confirm there is a role for government in developing a platform. Several platforms are under development. It may be more appropriate for the government to concentrate on developing the enabling and supporting arrangements, including product definition, monitoring, verification and reporting and establishing information systems, rather than to develop the platform. The relationship between the options suggests there is significant scope to start with a relatively simple platform, while arrangements are developed for more a complex platform.

State and Territory support is a key risk

Securing the support of the states required to develop a spatial registry or exchange is likely to be difficult. This is a key risk for a platform.



More work is required

We suggest the Department proceed with stakeholder engagement to test desired platform functionality and uncover any existing and proposed platforms that could assist in filling gaps before progressing. Confirming government commitment to funding and developing standing offer arrangements is critical in improving the capacity for farmers to monetise biodiversity services. In the interim, work can continue to progress supporting and enabling arrangements, including developing monitoring, verification and reporting arrangements and improving data recording and management.



1 Introduction

Frontier Economics is pleased to present this scoping study into the potential for a national biodiversity services trading platform.

1.1 Background and context

The meaning of biodiversity

Biodiversity refers to the variability among living organisms from all sources (including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part). It includes diversity within species and between species, and diversity of ecosystems.¹

Australia is one of the most biologically unique and diverse countries in the world. This reflects Australia's geographic isolation, topography, history and variable climate. Biodiversity has a pivotal role in Australia's economy and the wellbeing of its environment and community. A biodiverse natural environment supports a wide range of economic, cultural and social activities.

The role of agriculture in biodiversity

Agricultural businesses have a central role to managing Australia's unique biodiversity. The Australia Bureau of Statistics estimates that agricultural businesses manage around half of Australia's total land area.² However, there is concern that existing arrangements to protect biodiversity do not sufficiently recognise and reward the environmental stewardship role agricultural businesses play. Moreover, these arrangements are complex and difficult to access for small- and medium-sized farms.

The Agriculture Stewardship Package (see **Box 1**) recognises the important role of the agriculture industry in the delivery of ecosystems services and the preservation of biodiversity. It aims to establish a framework to:

- enable farmers to be rewarded for their role in providing biodiversity services
- diversify farm incomes, and
- recognise the increasing role of environmental stewardship in farming.

¹ Convention on Biological Diversity of 5 June 1992, Article 2. See also Environment Protection and Biodiversity Conservation Act 1999 (Cth), s 528; Biodiversity Working Group 2019, Australia's Strategy for Nature 2019–2030, Australian Government; Natural Resource Management Ministerial Council 2010, Australia's Biodiversity Conservation Strategy 2010-2030, Australian Government, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

² Australian Bureau of Statistics, 7121.0 – Agricultural Commodities, Australia–2018-19; Australian Bureau of Statistics, 4627.0 - Land Management and Farming in Australia, 2016-17.

**Box 1:** The Agriculture Stewardship Package

The four year, \$34 million Agriculture Stewardship Package seeks to promote sustainable development through a series of initiatives involving:

- **Agriculture biodiversity policy:** The development of a national, best practice agriculture biodiversity policy, delivering a common understanding of the role of agriculture in improving Australia's biodiversity outcomes
- **Agriculture biodiversity stewardship pilot program:** Making grants available to incentivise improved biodiversity practices on farms and development of a measurement, reporting and verification framework for the pilot and certification scheme
- **Australian farm biodiversity certification scheme:** Allowing farms to showcase best practice biodiversity management to enable recognition by the community and markets.

Source: Department of Agriculture, Water and the Environment, Agriculture Stewardship Package, 6 October 2020, Available at: <https://www.agriculture.gov.au/ag-farm-food/natural-resources/landcare/sustaining-future-australian-farming>

There is increasing interest in environmental markets

This scoping study takes place in the context of ongoing interest and development in environmental markets in Australia.

At the federal level, in May 2020, the Australian Government released the Report of the Expert Panel Examining Additional Sources of Low Cost Abatement (King review). The King review recognised the scope for carbon abatement incentivised through the Emissions Reduction Fund to deliver co-benefits, including positive biodiversity outcomes.³

Similarly, the June 2020 interim report of the Independent Review of the Environment Protection and Biodiversity Conservation Act (EPBC Act) (Samuel review) recognises the scope for governments to capitalise on the growing interest from the philanthropic and private sectors to invest in a way that improves environmental outcomes.⁴

1.2 Scope and approach

The scoping study objectives

The Department of Agriculture, Water and the Environment appointed Frontier Economics to undertake a scoping study to investigate the potential to create a national biodiversity services trading platform. The platform would help farmers monetise the provision of biodiversity services. The scoping study considers a range of issues including:

- sources of demand for various services

³ Report of the Expert Panel Examining Additional Sources of Low Cost Abatement, 14 February 2020.

⁴ Professor Graeme Samuel AC, Independent review of the EPBC Act: Interim report, June 2020, p14.



- key attributes for a national platform, and its relationship to other environmental systems including jurisdictional requirements and carbon markets
- the potential to stage or sequence the implementation of the platform
- any barriers to the long-term success of the platform.

The objective of a national platform is to complement and leverage both government and non-government programs to support conservation and sustainable use of biological diversity.

A national trading platform

We first define what we mean by a “national trading platform”. We use trading platform to mean a method of connecting sellers with buyers. Such a platform could be of various kinds:

- A platform could be an information platform which aims to make it easier for farmers to connect with buyers (and any associated sponsors, contributors and/or partners) of biodiversity services, but does not host trades.
- A platform could also act as an innovation platform, to support the development of other systems, services and products.
- Alternatively, a platform could be a transactional platform, hosting trade in biodiversity services.

For the purposes of this scoping study we consider the range of platforms – from information provision to transactional platforms. For simplicity we refer to the range of options as ‘platforms’ throughout this scoping paper.

A broad view of market participants

While farmers are the focus of this scoping study, we consider all of the relevant participants in the markets for biodiversity services. A broad view is necessary when examining the potential demand for biodiversity services and the issues with the current arrangements. As we discuss in this paper, maximising participation on a platform will be important for its success, including the participation from a wide range of sellers and buyers. Further, it may be difficult to establish arrangements to distinguish farmers from other landowners without adding further complexity.

We consider the specific issues facing farmers in delivering biodiversity services under the current arrangements, and the extent to which various platform options will address these issues.

Paper methodology

In preparing this scoping study we undertook a desktop review of academic and official literature. We undertook targeted consultation with a small number of stakeholders across government and industry. We drew on the significant expertise of our project team and panel of experts in environmental law, environmental economics, financial markets and biophysical science.

1.3 About this paper

This scoping study report sets out our analysis and findings. It is structured as follows:

- section 2 sets out the terminology around biodiversity services
- section 3 describes the demand for and supply of biodiversity services



- section 4 considers the challenges and opportunities in biodiversity services trading in Australia
- section 5 considers how market instruments can be used to facilitate the delivery of biodiversity services
- section 6 considers lessons from other relevant markets
- section 7 presents several options for a national biodiversity trading platform
- section 8 discusses implementation and operational considerations
- section 9 considers how the options can be compared and potential next steps.



2 What are biodiversity services?

The terminology around biodiversity can be confusing. In this section we set out the terminology and concepts that underpin biodiversity policy making and trading in Australia.

2.1 The concept of natural capital

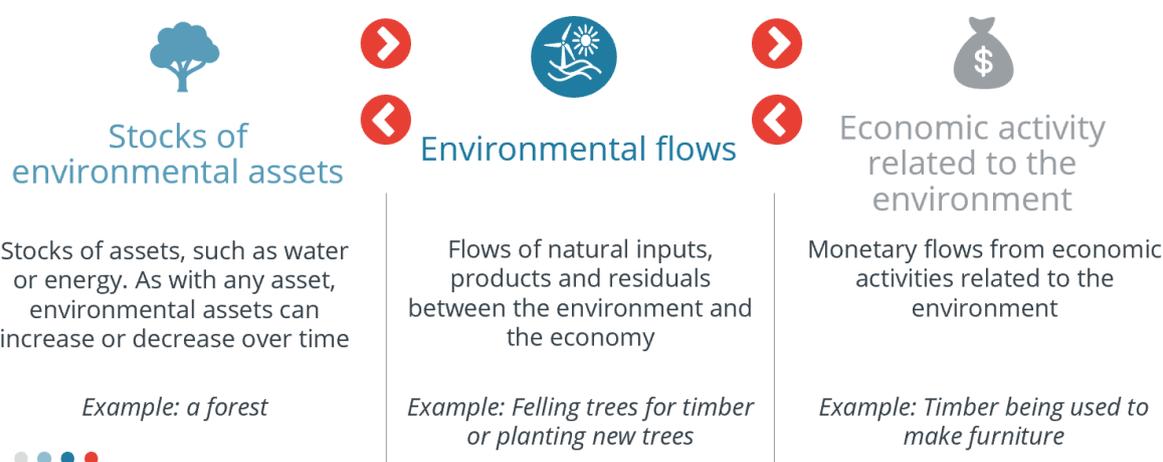
There is growing interest in the role of the environment in supporting the economy and the well-being of the community. The natural capital approach conceptualises the natural environment as one of four broad types of capital (or asset), alongside manufactured capital, human capital and social capital. As with the other forms of capital, the value of natural capital can change over time depending on level of investment and level of use.

A common framework has been developed by the United Nations to provide a systematic basis for discussing, measuring and monitoring the environment and the services it provides. This framework, known as the System of Environmental Economic Accounting, contains agreed standard concepts, definitions, classifications, accounting rules and tables for producing internationally comparable statistics and accounts. The Australian Government has committed to using it as a common national approach for tracking the relationship between the environment and the economy, the stocks of environmental assets and the changes in these stocks over time.

The framework comprises three components: stocks of environmental assets; environmental flows and economic activity related to the environment. These are illustrated in **Figure 1**. Environmental assets interact with the broader economy through environmental flows which involve:

- providing natural inputs (like resources and water)
- managing residuals (like emissions and water quality).

Figure 1: Overview of key elements of Environmental Economic Accounting



Source: Based on UN System of Environmental Economic Accounting Central Framework definitions. Available at:

<https://seea.un.org/content/seea-central-framework>



Ecosystem services

Ecosystem services have been defined as ‘the benefits people obtain from ecosystems’⁵ and, in a similar manner, the ‘contributions that ecosystems make to human well-being’.⁶ Ecosystems refer to the dynamic complex of living organisms and their non-living environment, which interact as a functional unit.⁷ Under the Common International Classification of Ecosystem Services, the services from ecosystems are divided into three categories:

- **Provisioning services:** which cover the nutritional, non-nutritional and energetic outputs from ecosystems, including abiotic outputs (e.g. water)
- **Regulation and maintenance:** which refer to the ways in which ecosystems (and their biotic and abiotic components) can mediate or moderate the environment in ways that affect human well-beings, and
- **Cultural:** which refer to the non-material, and normally non-rival and non-consumptive, outputs of ecosystems (biotic and abiotic) that affect human well-being.⁸

2.2 What are biodiversity services?

2.2.1 What is biodiversity?

Biodiversity comprises animals, plants and microorganisms, their genetic variation and their organisation into populations that assemble into ecosystems.⁹ Biodiversity provides or underpins many environmental flows. Biodiversity services are therefore a subset of ecosystem services. There are many different types of biodiversity, reflecting the diversity and scarcity of ecosystems across in Australia. Biodiversity can also therefore vary in quality across types and geographic locations.

This scoping study focuses on biodiversity conservation or improvements provided by landholders. This is achieved by delivering defined biodiversity outcomes or undertaking specified actions, as we explore in the next section.

2.2.2 What does it mean to provide biodiversity services?

Building on the definition of ecosystem services, biodiversity services can be defined broadly as the contributions that biodiversity makes to the economy and human well-being. Theoretically, these services are a subcomponent of, or potentially indistinguishable from, ecosystem services. However, in practice, the phrase ‘biodiversity services’ in Australia is often intended to mean the

⁵ Millennium Ecosystem Assessment 2005, Ecosystems and Human Well-being: Current State and Trends, Vol 1, p 26.

⁶ R Haines-Young and M Potschin 2018, Common International Classification of Ecosystem Services (CICES) V5.1, Guidance on the Application of the Revised Structure, Fabis Consulting, p iii.

⁷ Convention on Biological Diversity of 5 June 1992, Article 2.

⁸ See: <https://cices.eu/resources/> (19 October 2020). Note that the Millennium Ecosystem Assessment used four categories: provisional, regulative, supporting and cultural.

⁹ Australian Government, Department of the Environment, Water, Heritage and the Arts, Ecosystems services: Key concepts and applications, Occasional paper series no. 1, 2009, p4.



tangible activities or outcomes landholders can provide to support conservation or environmental objectives. In the context of conservation this could involve:

- **Protection:** which can be either passive (i.e. a commitment not to clear vegetation or cull native fauna species on a defined area of land) or active (i.e. a commitment to manage the land in a specific way to protect biodiversity values). Active protection could include instances where a landholder agrees to reduce grazing pressure, control weeds or fence off an area to exclude livestock and feral animals to protect biodiversity values.
- **Restoration:** which typically involves a commitment to undertake passive or active restoration activities to increase the biodiversity values on a defined area of land. This could include for example, improving riparian corridors, increasing native planting, creating biodiversity corridors and allowing native vegetation to regrow on an area that was previously cleared. It could also involve the reintroduction of native fauna species, which often requires the eradication and exclusion of feral animals.
- **Artificial (or engineered) habitat creation:** which involves the engineering of habitat for biodiversity conservation purposes. Examples include the creation of artificial wetlands, the renovation of farm dams to provide biodiversity habitat and the creation of artificial tree hollows.

It could also extend to the delivery of other environmental activities or outcomes including improvements in water and air quality and carbon sequestration.

Many of these activities are undertaken voluntarily by farmers as part of their routine environmental stewardship and land management work. However, there are also increasing opportunities for farmers to monetise the provision of these services through environmental markets. Where the services are acquired, the associated obligations can be time limited or in perpetuity.

2.2.3 How are biodiversity services measured?

Biodiversity services are linked to the land used to provide those services. The provision of biodiversity services has several components:

- **Land:** a defined area of land with a measured biodiversity value
- **Activity:** actions that conserve or promote the biodiversity of that land
- **Quality:** the quality of the biodiversity over the land area.

The value of biodiversity services of various types in different locations will vary to reflect the importance and scarcity of the ecosystems concerned. Biodiversity is highly heterogeneous, since it varies by type and location. It is therefore hard to substitute between biodiversity services.

There is no standard framework or methodology for defining the quality of a biodiversity service and verifying the delivery of this service. Accounting for Nature (**Box 2**) is one methodology that has been developed to benchmark the condition of natural assets and supports the Queensland Land Restoration Fund. The Victorian 'habitat hectares' is another methodology for assessing the condition of native vegetation at a location against a benchmark of the same vegetation type (estimated average mature condition of the relevant vegetation type pre-1788). Internationally,



CDC Biodiversité has developed and piloted a Global Biodiversity Score (GBS) to calculate a consistent metric to compare fund or company performance on biodiversity.¹⁰

Box 2: Accounting for Nature

The Accounting for Nature framework adopts a science based approach to measuring the condition of environmental assets (including native vegetation, soils, fauna, freshwater and marine ecosystems). It can be applied at a either property or landscape scale. The framework is intended to complement other certification processes, such as carbon offset requirements, and is consistent with the UN's Standard for Environmental Economic Accounting.

The framework can be used by organisations to measure the condition of environmental assets for their information. Alternately an eight-step process can be followed to gain independent assurance and certification of an environmental account. The key component of the Accounting for Nature framework is an environmental condition index which is referred to as an Econd. This is scored on a scale of 0 to 100 to indicate the condition of an asset relative to its undegraded/unmodified or natural state.

Examples of the Accounting for Nature framework being applied in practice include:

- The Queensland Government's Land Restoration Fund uses the Accounting for Nature approach to verify environmental co-benefits prior to the fund providing payment for these impacts. Specific native vegetation and soil methods have been developed to support this application.
- The Tasmania Land Conservancy has applied the Accounting for Nature approach across their 20 conservation reserves as part of their ongoing monitoring program.

Source: <https://www.accountingfornature.org/>

2.2.4 Rewarding the provision of biodiversity services

Conceptually, biodiversity provides both private benefits that accrue to landholders and public benefits that accrue to society more broadly. Where landholders derive private net benefits from the supply of biodiversity services, they will tend to provide them voluntarily, without the need for government intervention. However, as we discuss in the following section, the characteristics of environmental assets mean natural capital markets often require government intervention to support their management and use.

Governments use both negative and positive incentives to promote the provision of biodiversity services on private land. We consider these incentives in turn below.

¹⁰ Principles for Responsible Investment, Investor Action on Biodiversity: Discussion Paper, p30.
<https://www.unpri.org/download?ac=11357>



Negative incentives limit loss of biodiversity

The negative incentives generally come in the form of planning and environmental regulations that prohibit the clearing of native vegetation and capture or harming of native fauna. The regulatory regimes in all jurisdictions in Australia now have 'offset' processes. These allow for native vegetation to be cleared if compensatory actions are taken to offset the adverse biodiversity (and heritage) impacts. Depending on the applicable rules, the offsetting activities can involve protection, restoration or artificial habitat creation, with a guiding principle being that the activities must be 'additional' to what would otherwise occur. The offsetting activities or services can also be provided directly by the developer (intra-firm) or be purchased from a third party; although not all regulatory schemes allow for offset obligations to be outsourced. The purchasing from third parties can be in the form of:

- **Activity-based contracts:** where landholders are contracted to undertake specified conservation activities (protection, restoration or artificial habitat creation) on a defined area of land, and payments are made on the commencement, progress and/or completion of the activities
- **Outcome-based contracts:** where landholders are contracted to provide specified biodiversity outcomes and payments are made on the basis of measured or estimated outcomes, or
- **Biodiversity credits:** where landholders are provided with a tradable financial instrument in return for undertaking specified conservation activities and/or achieving specified conservation outcomes.

These transactions, which are motivated by a legal obligation to offset biodiversity impacts, are often referred to as the 'compliance market'.

Biodiversity credits are created when a landowner enters into an agreement which commits them to specific conservation activities on their land (protection, restoration or artificial habitat creation). Broadly, these credits are typically land-based measures (i.e. per hectare) and are adjusted according to the quality of the site, type of biodiversity services and how important the site is strategically. A defining feature of biodiversity credits is that they are tradable, meaning they can be sold to entities who are required by law to offset the environmental harm associated with developments. They can also be sold to governments and other voluntary purchasers. Generally, once a credit is generated and sold, the obligations relating to the management of biodiversity will attach to title, meaning they bind future landholders for the term of the agreement or in perpetuity. There are different types of biodiversity credits or units across jurisdictions.

Positive incentives are used to increase provision of biodiversity services

Increasingly, Australian governments are using positive incentives to promote the provision of biodiversity services. The types of incentive mechanisms that are now used for these purposes include:

- **Direct government purchasing:** which takes place through activity- and outcome-based contracts
- **Tax concessions:** where landholders are provided rate and income tax relief for undertaking defined conservation-related activities



- **Revolving conservation funds:** where governments purchase a property, place a conservation covenant (or similar) on a part of the property and then re-sell it to a third party, who is then bound by the terms of the covenant, and
- **Government purchasing of biodiversity credits.**

In recent years, a number of government and non-government entities have also proposed that biodiversity services on private land could be incentivised through the provision of concessional capital. This concessional capital (discounted debt or equity) could be extended to landholders who undertake specified conservation activities and/or achieve specified conservation outcomes. In most cases, these proposals have suggested that a separate government entity, like the Clean Energy Finance Corporation, should be established for these purposes. To date, none of these proposals have come to fruition.

The voluntary private market also provides positive incentives to increase provision of biodiversity services

Governments are not alone in providing incentives for private land conservation. The voluntary private market also rewards biodiversity services. In this voluntary market, philanthropic organisations and other interested parties buy biodiversity services directly from landowners (see **Box 3**). Many farmers provide biodiversity services as a co-benefit with productive land use (see **Box 4**).

**Box 3: Midlands Conservation Trust**

Tasmania's Midlands is home to around 30 nationally threatened species of plants and animals. The region is highly productive for agriculture and most native vegetation and wildlife is under private ownership.

In light of this, Midlands Conservation Fund was developed by Bush Heritage Australia in collaboration with Tasmanian Land Conservancy to foster conservation activities on private land. Capital in the fund is provided by philanthropic donors which is then used to supply farmers with stewardship payments for conserving and improving biodiversity on their lands alongside agricultural production. A biodiversity corridor approach has been taken in the Midlands which provides benefits of a system approach to biodiversity. At a higher level, the fund itself is an example of a voluntary biodiversity services transactions.

Stewardship agreements are initiated via a tender process where farmers that own native woodlands, grasslands and wetlands bid for Midlands Conservation Fund funding to preserve this biodiversity which, if accepted by the fund, sets the price for the stewardship process. The most valuable bids that then meet Midlands Conservation Fund's criteria are accepted into a stewardship agreement which provides annual performance payments for meeting conservation targets. The value of these bids are determined on a site-specific basis depending on the flora and fauna present on the site together with the proposed management activities.

Initially, farmers are committed in these agreements for up to 10 years with the intent that they will renew on a rolling five year basis. Annual monitoring of participating properties is then undertaken through a site visit by an ecologist from Bush Heritage Australia or Tasmanian Land Conservancy. Landowners will also complete annual management reporting that documents activities undertaken such as infrastructure maintenance, feral pest control, grazing and fencing. In addition to this, a more detailed set of observations recorded every three years including ecological surveys focussed on recording lifeform groups, target species and vegetation structure. Data collected in this more detailed monitoring provides a test for whether landowners are meeting their conservation targets or 'key performance indicators' (KPIs) of their stewardship agreement.

Sources: <https://tasland.org.au/>; <https://www.bushheritage.org.au/>; <https://alca.org.au/wp-content/uploads/2020/08/Improving-Knowledge-Report.pdf>

**Box 4:** Australian Farmlands Fund

The Australian Farmlands Fund was established in August 2018 by the investment fund Kilter Rural. It invests in a portfolio of assets including southern Murray-Darling Basin farmland and water assets. The Fund invests money on behalf of institutional and high net worth individuals for which it aims to deliver financial returns and a measurable beneficial biodiversity impact as a by-product of its investment activities. This is an example of an impact investor. The Fund manages over \$500 million and has become the largest grower of irrigated, broad acre crops in Australia.

Kilter Rural's strategy is to sustainably intensify agricultural activities on farmlands that have otherwise been underutilised and undercapitalised. Typically, this involves aggregating sites to achieve scale, irrigation upgrades and improving the quality of soil. Yields are generated from this on-farm crop production, through the sale of water allocations, as well as the longer term capital appreciation of water entitlements and farmland.

In delivering these returns through the Australian Farmlands Fund, Kilter Rural sees the management of agriculture and protection of the ecosystem's biodiversity as being inter-dependent. It views biodiversity as helping to reduce the risk of and enhance the long-term returns to its investors. Kilter Rural stipulates, for example, that a key element of its duty is to address climate change related risks and accordingly designs farmland for yields that are robust to escalating weather events. This has allowed Kilter Rural to maintain yields on the capital deployed via the Australian Farmlands Fund through severe drought, floods and rainfall events. Thus, the Australian Farmlands Fund delivers against both financial and environmental objectives.

Source: <https://kilterrural.com/>

2.3 How does carbon fit?

Carbon abatement is one of the environmental flows in the natural capital framework along with water, energy and waste. Carbon is important for this scoping study for two reasons.

- First, there is a relatively well-developed market for carbon abatement in Australia. This market is supported by arrangements including methodologies to link abatement activities to carbon units, reverse auctions, registries and secondary markets which can provide useful precedents to other natural capital markets like biodiversity.
- Second, biodiversity services and carbon benefits can be interdependent. Land can provide both biodiversity and carbon benefits, and there is evidence of demand for carbon offsets which deliver biodiversity as a co-benefit. However, under the current Commonwealth arrangements for delivering and trading carbon sequestration in Australia there is no formal recognition of biodiversity co-benefits delivered with carbon sequestration. There is therefore limited transparency around the extent of this demand and the willingness of buyers to pay for carbon sequestration that delivers biodiversity co-benefits.

Carbon is therefore a useful point of reference across the remainder of this scoping study.



3 What determines the supply and demand of biodiversity services?

In this section of the report, we discuss the existing market for biodiversity services. We identify why markets ordinarily supply too little biodiversity, and how governments can and have been correcting for market failures by increasing the supply of biodiversity.

3.1 Biodiversity is prone to under-supply

Biodiversity is a public good

The case for government intervention in markets is usually built on market failure - a situation where markets are not able to effectively allocate resources in ways that maximise society's welfare.

Markets can fail for a range of reasons. The most obvious market failure with respect to biodiversity is the “public good” nature of the provision of biodiversity.¹¹ As with other public goods, private provision of biodiversity is subject to a free-riding problem; why should I pay for biodiversity when I can free ride on others that do so? Due to this, if left exclusively to private markets, biodiversity services will be undersupplied, and too little biodiversity will be preserved.¹² This provides a basis for the Government to increase supply to match society's collective willingness to pay for biodiversity.

Government can use markets to increase supply of biodiversity

Governments can directly prohibit biodiversity loss and increase supply of biodiversity by purchasing land to turn towards biodiversity uses.

Alternatively, governments can create markets for biodiversity by creating property rights. For example, governments create markets by competitively-tendering subsidies to identify which suppliers can supply a defined biodiversity service most efficiently (at lowest cost). Governments also facilitate market activity through use of permits (offsets) that limit biodiversity loss by requiring replacement activity in similar biodiversity services. It is widely recognised that market instruments can allow for the government to achieve its environmental objectives at a lower social cost than non-market approaches such as direct regulation.

¹¹ Public goods arise from *non-rivalrous* and *non-excludable* consumption: all members of society benefit from increased biodiversity, and one person's enjoyment of biodiversity does not subtract from the total benefits available to others.

¹² Private provision will tend to reflect the demand of those with the highest willingness to pay, but this will likely be materially less than the sum of the willingness to pay of all beneficiaries.



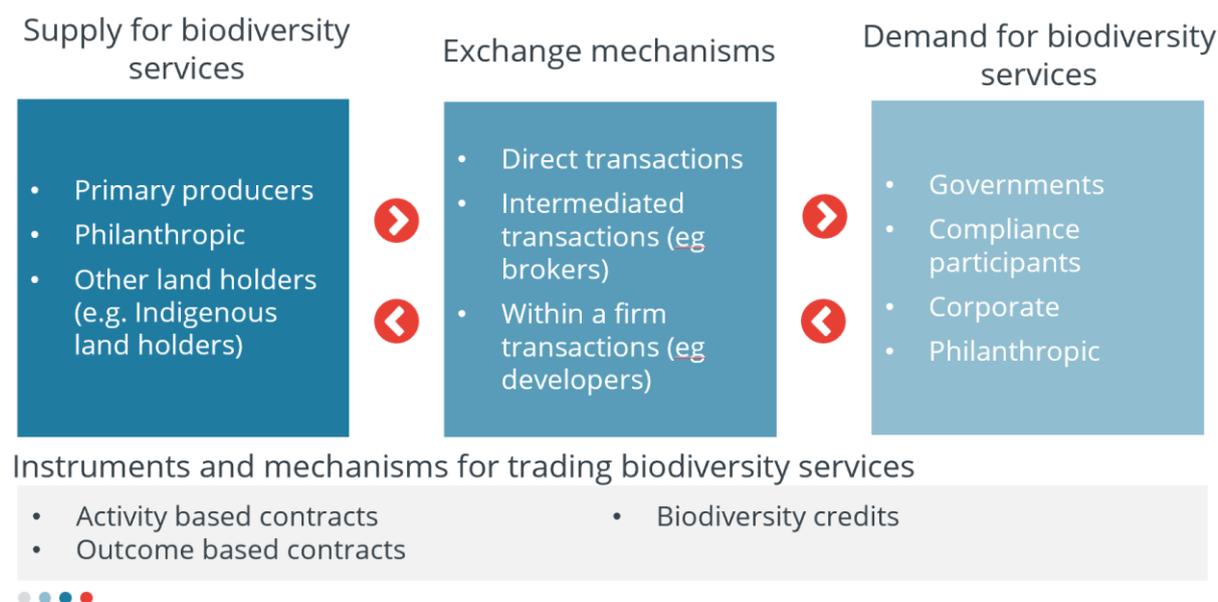
3.2 Current markets in biodiversity services

3.2.1 How supply and demand interact

Landholders supply biodiversity services by managing their land in a way that protects, restores or promotes biodiversity. The demand for biodiversity services comes from compliance activities (offsets), philanthropic investments, commercial decisions or as a “public good” investment by government.

Participants who supply and demand biodiversity services currently interact through direct transactions, intermediaries (including market platforms), or even within the firm.¹³ Participation is determined by demand and supply, and how well exchange mechanisms can facilitate transactions. **Figure 2** identifies the key participants on the supply and demand sides for biodiversity services.

Figure 2: Characterisation of supply and demand for biodiversity outcomes



Source: Frontier Economics, adapted from OECD, April 2020, *A Comprehensive Overview of Global Biodiversity Finance*

3.2.2 The markets where biodiversity is currently traded

There are a number of markets for trading biodiversity services in Australia. These can broadly be categorised as compulsory offset schemes, government-led purchasing, government-led purchasing of bundled ecosystem services and the private voluntary market. An overview of these markets is provided in **Table 1**.

¹³ For example, a firm facing obligations to replace biodiversity may purchase land to provide the biodiversity directly rather than contracting with an existing landholder to supply the service.

**Table 1:** Types of biodiversity markets operating in Australia

Type of market	Overview	Examples
Compulsory offset schemes	Developers required to offset the adverse impacts of their projects on biodiversity by undertaking or contracting some form of compensatory mitigation or by purchasing a biodiversity credit	Environment Protection and Biodiversity Conservation Act environmental offsets NSW biodiversity offsets scheme Queensland environmental offsets framework Victoria native vegetation offsets South Australia biodiversity credit exchange
Government-led purchasing	Government purchases biodiversity services, typically through a reverse auction or other tender process	BushTender EcoTender
Government-led purchasing of bundled ecosystem services	Government purchases bundled biodiversity and usually carbon services as a package	Queensland Land Restoration Fund
Private voluntary market	Philanthropic and corporate investors designing and selling biodiversity on an <i>ad hoc</i> basis	Odonata/Tiverton The Nature Conservancy Market Place

There is limited transparency around Australia's biodiversity markets

There is relatively little publicly available information on the size of Australia's biodiversity markets. For example, there are no national or state databases of regulatory offset obligations, or details of third party offset transactions, other than those involving trade in biodiversity credits. The information on government-led purchasing is also dispersed across different governments and government agencies, and difficult to track through time. Similarly, no data are routinely collected or published on the size of the voluntary biodiversity market and nature of relevant trades. This means it is not possible to comment definitively on the size and characteristics of the demand for and supply of biodiversity services in Australia. While noting these issues, the data that are available suggest government-led purchasing and compulsory offset schemes are currently the dominant biodiversity markets in Australia.

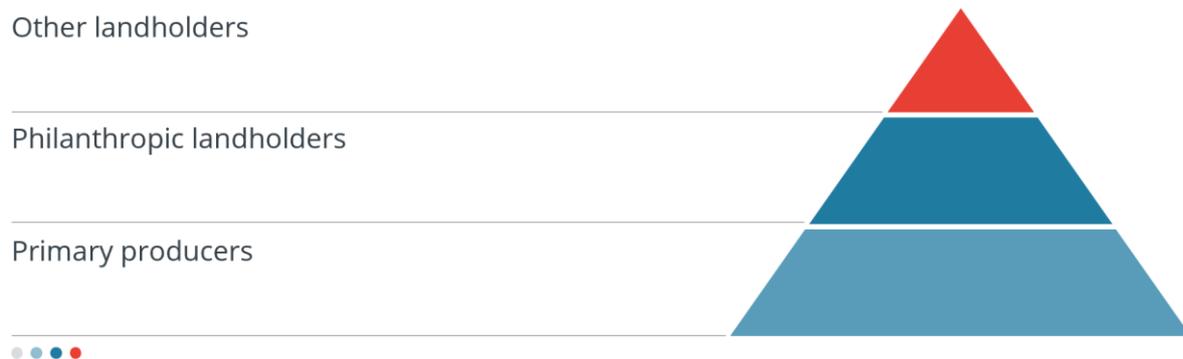


3.3 Supply of biodiversity services typically comes from landholders

3.3.1 Types of suppliers

The supply of biodiversity services derives from landholders who typically convert or maintain their land in a way that can provide biodiversity services.

Figure 3: Supply of biodiversity services



Source: Frontier Economics

These landholders can include:

- **Primary producers:** Biodiversity services may be complementary to productive land use (e.g. where a portion of unproductive farm land is set aside for biodiversity outcomes), or productive land is converted for biodiversity outcomes. Primary producers range from sole traders to institutional asset managers.
- **Philanthropic landholders:** Philanthropic organisations or individuals may purchase and/or convert land to supply biodiversity services, and may sell these biodiversity services to help fund this investment.
- **Other landholders:** Other major landholders may choose to supply biodiversity services to provide financial return for biodiversity management. These participants may include Indigenous land holders, Governments (including natural resource management boards), the mining industry and utilities.

There is a large potential for landholders to supply biodiversity services, as indicated by the participation of the agricultural sector in the Emissions Reduction Fund. Agricultural related projects make up 65% of the issued ACCUs on the Emissions Reduction Fund, worth around \$450 million since 2012.¹⁴ Most of the uptake has involved the regeneration or protection of native

¹⁴ Macintosh, A; Roberts, G and Buchan, S; July 2019, Improving Carbon Markets to Increase Farmer Participation, A report prepared for Agrifutures Australia, p31.



forests on grazing lands, in particular in semi-arid regions of Queensland and New South Wales.¹⁵ There has been less uptake in areas where the opportunity cost of agricultural production forgone is higher per unit of land.

3.3.2 The costs and benefits of supplying land for biodiversity

Landholders will supply biodiversity services if the private benefits outweigh the private costs.¹⁶ In other words, there must be sufficient financial or other benefits to the landholder to cover the fixed and ongoing costs associated with delivering biodiversity services.

The costs of supplying land for biodiversity

The full economic costs of supplying biodiversity services include:

- **Upfront investment costs** for establishing a biodiversity site: such as land purchases, planting and fencing.
- **Ongoing costs** of maintaining a biodiversity site: such as site maintenance and pest management.
- The **opportunity cost of land**: the ongoing opportunity cost of not using the land for its next highest value use, such as for primary production. For land that is unproductive, this opportunity cost may be low.
- The **transactions costs** associated with supplying biodiversity services to purchasers: including registration, measurement, reporting, verification and marketing costs.
- The **cost of capital**: funds invested require a commercial return reflective of the opportunity cost of capital including the risk of the associated cash flows. This cost may be different for biodiversity services compared with other land uses. For example, biodiversity services can provide a source of income diversification that is independent of risks typically associated with production, such as climatic conditions and price volatility.

Benefits from biodiversity supply

The benefit associated with biodiversity services includes:

- The **private benefits** that stem from the biodiversity outcomes: for example, improvements to the resilience of land to withstand drought, reduced erosion, increased soil moisture, and reduced livestock mortality and increased live weight gain (e.g. due to improvements in shelter).
- The **commercial return** on the biodiversity outcomes: this will depend on the prices paid for biodiversity services and, as above, any improvement in the resilience of returns from productive use.

¹⁵ Macintosh, A; Roberts, G; Buchan, S, 2019, Improving Carbon Markets to Increase Farmer Participation, A report prepared for AgriFutures.

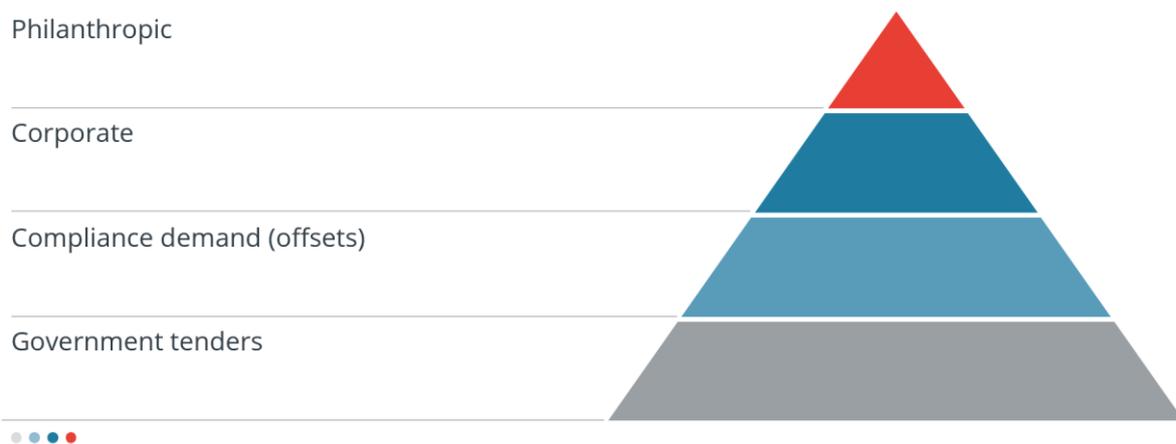
¹⁶ More specifically, if the *marginal benefit* of providing these biodiversity services exceeds the *long run marginal cost*.



3.4 Demand for biodiversity services is shaped by Government investment and compliance

Demand for biodiversity services can be characterised into four key groups, illustrated in **Figure 4** and discussed in more detail below.

Figure 4: Demand for biodiversity services



Source: Frontier Economics

These four groups include:

- **Governments:** Governments (federal, state/territory, local) may choose to invest in biodiversity services on behalf of citizens. Governments often choose to invest directly in biodiversity services (e.g. establish national parks), and may also choose to use grants and markets as a mechanism to invest in biodiversity services at the lowest cost (e.g. Queensland's land restoration fund). Government demand for biodiversity is the dominant source.
- **Participants seeking to meet compliance obligations:** Demand from participants seeking to meet compliance obligations are those who demand biodiversity services to meet requirements under various types of legislation. For example, developers who are required to offset land clearing through a biodiversity offset scheme. This demand is shaped by the requirements imposed under legislation. In some jurisdictions, schemes are well developed, although they are not consistent in approach.
- **Corporate participants:** Corporate participants may demand biodiversity services to help contribute to social and environmental outcomes. Many firms increasingly see acting on climate change and contributing to environmental outcomes as "good business" and fundamental to attracting and retain customers. For these buyers, biodiversity outcomes are not part of their core business, but demanding biodiversity services may represent a simple and approachable mechanism to contribute to environmental outcomes. This must be marketable to and supported by its customers.
- **Philanthropic participants:** Participants who demand biodiversity services for philanthropic purposes. They are likely willing to pay price premiums for investments that achieve



environmental or social co-benefits. There appears to be little data held on the demand from philanthropic sources. Discussions with stakeholders suggest philanthropic purchasers are less particular about the verification and monitoring of outcomes than government or corporate participants.

As noted in Section 3.2 the lack of consistent and comprehensive information means it is not possible to reliably quantify the size of demand for biodiversity services and the contribution from various sources of demand. While noting these issues, the data that are available suggest government-led purchasing and compulsory offset schemes are the dominant biodiversity markets in Australia, while demand from philanthropic and corporate participants is currently low. Government policy is therefore the key determinant of the demand for biodiversity services, both directly through its biodiversity expenditure and indirectly by imposing offset obligations.

In the remainder of this section we characterise the nature of Government demand by describing the Commonwealth and NSW Government actions before considering voluntary demand in the carbon market as a proxy for biodiversity services demand. We further consider the opportunity associated with increased philanthropic and corporate demand in Section 4.

3.4.1 The Commonwealth Government is a significant purchaser of biodiversity, but programs vary over time

The Commonwealth Government is a significant purchaser of biodiversity. But there are many programs and the nature and extent of these programs varies over time.

An overview of existing purchasing programs

In terms of government-led purchasing, the Australia Government is currently investing \$1.1 billion over six years (from 2017-18 to 2022-23) in the second phase of the National Landcare Program. The largest component of this is the \$450 million Regional Land Partnerships program, which runs from July 2018 to June 2023. The program aims to 'protect, conserve and provide for the productive use of Australia's water, soil, plants and animals and the ecosystems in which they live and interact, in partnership with governments, industry and communities'.¹⁷ Six high-level long-term outcomes have been set for the program, which include improving the conservation trajectory of nationally listed threatened ecological communities and threatened species targeted under the Threatened Species Strategy.¹⁸ To achieve these outcomes, 50 service providers (mainly regional Natural Resource Management organisations) have been engaged in 54 management units across the country to design and deliver on-ground environment and agriculture projects at a regional scale, in consultation and collaboration with communities.¹⁹ As of 30 June 2020, 223 projects had been funded under the program.²⁰

Under the National Landcare Program, the Australian Government is investing \$136 million between 2017-18 and 2022-23 in the Smart Farms program. This program has three elements:

¹⁷ Australian Government 2018, Regional Land Partnerships Assurance Framework, p 2.

¹⁸ Australian Government 2017, Regional Land Partnerships Program Logic.

¹⁹ Australian Government 2020, 'Regional Land Partnerships', <<http://www.nrm.gov.au/regional-land-partnerships>> (21 October 2020).

²⁰ Department of Agriculture, Water and the Environment, Annual Report 2019-20, Australian Government, Canberra, p 63.



- Smart Farming Partnerships (\$57.5 million over 6 years), which provides grants of between \$250,000 and \$4 million for, amongst other things, the protection of biodiversity and natural resources through the use of innovative farm management practices and technologies;
- Smart Farms Small Grants (up to \$43.5 million over 6 years), which provides grants of between \$5,000 and \$200,000 to build the capacity and capability of farmers, fishers and foresters to adopt best practice natural resource management methods; and
- Building Landcare Community and Capacity Program (\$34.9 million over 6 years), which provides ad-hoc grants for initiatives that support the Landcare community and farmer organisations.

In addition to the National Landcare Program, the Australian Government is investing \$100 million over four years from 2019-20 to 2022-23 in the Environment Restoration Fund. One of the three priorities for the program is 'protecting threatened and migratory species and their habitat'. As at 30 June 2020, 45 projects had been contracted under the program and a further 13 were in the process of being funded.²¹

These types of federal level beneficiary pays programs are not new. The Australian Government has a 40 year history of investment in agri-environment programs that have sought to purchase biodiversity services from farmers and support broader conservation activities. This investment stretches back to programs like the National Tree Program, One Billion Trees and Save the Bush programs in the 1980s, and includes the more recent Natural Heritage Trust (1997-2008), Environmental Stewardship Program (2008-2012), Caring for Country (2008-2013) and now the National Landcare Program (since 2014, although a program of the same name ran between 1990-2008).

There is a federal government-led compliance market

These government-led purchasing programs are complemented by the federal compliance market, which stems from offset conditions imposed on projects under the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act).

To illustrate this, we randomly sampled 336 approval decisions issued under the EPBC Act over the period 2012-2017 (approximately 75% of the total number of approvals issued over this period). Of these, 78% (262) contained offset conditions. A total of 805 offset conditions were imposed on these projects, almost 90% of which were direct offsets and the remainder were indirect (i.e. involving the payment of money or undertaking of actions not directly related to the conservation of affected species or communities).

Generally, the direct offsets required the proponent to directly secure and covenant an offset area or undertake restoration works on a specified area of land. In most cases, these offset requirements are likely to have been obtained infra-firm through the direct purchase of relevant land or use of land already owned by the proponent. This is partly because the EPBC Act does not allow for offset obligations to be transferred to third parties. The EPBC Act also does not provide for the creation of biodiversity credits. Despite this, on 12 occasions proponents were required to, or had the option of, retiring credits under the New South Wales BioBanking Scheme (now the Biodiversity Offset Scheme). In addition to the direct offset requirements, 88 indirect offset obligations were imposed on projects. Many of these required or gave the proponents the option



of paying an amount of money to compensate for the environmental impacts of their projects. The total amount disclosed in relation to sampled projects with these conditions was \$134.5 million (in a significant number of cases the amount payable was not disclosed).

3.4.2 Government-led purchasing and compliance activity is also evident in NSW

A similar mix of government-led purchasing and compliance market activity is evident in New South Wales. At present, there are four main government-led purchasing programs in the state:

- Protecting our Places Program
- Environmental Restoration and Rehabilitation Program
- Conservation Management Program
- Conservation Partners Program.

The **Protecting our Places Program** and **Environmental Restoration and Rehabilitation Program** are both administered by the NSW Environmental Trust. The Protecting our Places Program provides grants to Aboriginal community organisations and groups in New South Wales to assist with the management of significant Aboriginal cultural landscapes and help build natural resource management capacity in Indigenous communities.²² So far in 2020, 4 projects have been funded totalling \$230,006 (the total announced funding for the program is currently \$500,000). The Environmental Restoration and Rehabilitation Program provides grants of up to \$100,000 to state and local government agencies and community groups to assist with the management and stewardship of significant environmental assets.²³ A total of \$4 million was allocated to the program for 2020, split 50/50 between government agencies and community groups. Although the grants can only be provided to these entities, the projects can and have involved activities on private land and the provision of funding to landholders to support on-ground conservation works.

The NSW Biodiversity Conservation Trust – a statutory agency established under the Biodiversity Conservation Act 2016 (NSW) – administers both the **Conservation Management Program** and **Conservation Partners Program**. Both are beneficiary pays programs that purchase or otherwise seek to promote biodiversity conservation outcomes on private land. The Conservation Management Program is the state's flagship government-led purchasing biodiversity services program.

The Conservation Management Program provides payments to landholders to encourage and support conservation outcomes. These payments are tied to particular land use and management obligations and generally take the form of a specified amount per hectare per annum over the duration of the agreement. Landholders who receive funding are required to enter into conservation agreements, which, amongst other things, can restrict development on the subject land and require the owner to carry out specified management, reporting and

²² For details, see: NSW Environmental Trust 2020, 'Protecting our Places', <<https://www.environment.nsw.gov.au/funding-and-support/nsw-environmental-trust/grants-available/protecting-our-places>> (22 October 2020).

²³ For details, see NSW Environmental Trust 2020, 'Environmental Restoration and Rehabilitation Program', <<https://www.environment.nsw.gov.au/funding-and-support/nsw-environmental-trust/grants-available/environmental-restoration-and-rehabilitation>> (22 October 2020).



monitoring activities. The agreements can be in perpetuity or for a term (typically 15 years), and they can be registered on title, meaning the obligations run with the land and bind successors in title. While the landholder obligations run with the land, the reciprocal obligations on the Trust also continue, ensuring future owners continue to receive payments for the services they provide under the agreement.

The Biodiversity Conservation Trust is an important mechanism for buying biodiversity in NSW

The Biodiversity Conservation Trust uses three main mechanisms to encourage uptake of conservation agreements and select projects under the Conservation Management Program: fixed price offers, tenders and a revolving fund.

- The **fixed price offers** are a set amount per hectare per annum, with the amount determined on the basis of land values and the assessed land capability of the subject land.²⁴ These offers are only made in high priority investment areas, where there is are important species and habitats that are under protected. Landholders can apply at any time to take up the offers but they are assessed in two batches each year.
- The **tenders** are run three times per year, each with a focus on specific areas and issues that align with the Biodiversity Conservation Investment Strategy, which is determined by the environment minister. Through the tender process, applicants bid in specified conservation activities, a per hectare price and a duration. These are then assessed, ranked and selected using a 'biodiversity value index' that incorporates four variables: the conservation value of the site and surrounding landscape; the duration of the agreement (as a proxy for the security of the benefit); the risk the site would be cleared in the absence of a conservation agreement (i.e. additionality); and the size of the site.
- The **revolving fund** is used to purchase properties for sale within priority investment areas or that contain specific conservation assets. After being purchased, properties are re-sold on the condition the new owner enters into a funded conservation agreement at the applicable fixed price.

The Conservation Partners Program seeks to encourage landholders to conserve biodiversity by entering into conservation agreements and wildlife refuge agreements (which are essentially 'entry level' conservation agreements). Unlike the Conservation Management Program, landholders who enter into agreements under the Conservation Partners Program do not receive annual conservation management payments. However, they are eligible to apply for grants to assist with the maintenance of the ecological values of their properties. The Trust also uses the revolving fund to acquire properties under the Conservation Partners Program in areas outside of the priority investment areas. These properties are re-sold on the condition the purchaser enters into an unfunded, in-perpetuity conservation agreement.

The Biodiversity Conservation Trust was established in 2017 with a commitment from the NSW Government to invest \$350 million over five years from 2019 and \$70 million thereafter subject to performance. To date, under the Conservation Management Program, there had been:

²⁴ Land capability ratings are based on land and soil hazards that restrict land use (e.g. landform position, slope gradient, drainage, climate, soil type and soil characteristics). The system in New South Wales uses eight rating classes (1 being extremely high capability land and 8 being extremely low capability land). See Office of Environment and Heritage 2012, The land and soil capability assessment scheme: Second approximation – A general rural land evaluation system for New South Wales, NSW Government.



- two rounds of fixed price offers, investing a total of \$7.1 million in 22 conservation agreements over 8,698 hectares, with annual payments of between \$19-\$71 per hectare;
- 11 tenders, the first 10 of which invested \$97 million in 99 conservation agreements over 26,000 hectares, with annual payments of between \$21-\$1637 per hectare; and
- one property had been purchased through the revolving fund.

NSW also operates an offset scheme

As with the federal arrangements, the NSW Government's purchasing programs are complemented by an offset scheme. The demand for offsets under this scheme stems from planning and environment laws, which require developers who are clearing native vegetation in certain areas and over prescribed thresholds to offset the impacts on biodiversity.

Offsetting can proceed in three main ways:

- by retiring biodiversity credits (either like for like or, if that is not possible, using credits from similarly or more threatened species or communities)
- funding a biodiversity conservation action that benefits the threatened entity impacted by the development, or
- making a payment to the Biodiversity Conservation Fund calculated using the offset payments calculator.²⁵

In order to generate biodiversity credits, landholders must enter into a biodiversity stewardship agreement with the Environment Minister.²⁶ At a high level, biodiversity stewardship agreements are similar to conservation agreements in that they require the landholder to conserve and manage a specified area of land, are registrable and their obligations bind successors in title. However, they provide for the creation of biodiversity credits (as either ecosystem or species credits) either on the registration of the agreement, on specified dates or the happening of specified events. They also include a management plan that sets out proposed annual management actions and the cost of those actions over a 20 year period. The present (discounted) value of the management costs is called the 'total fund deposit'. Before credits are first transferred (or retired, in the event they are retired without having been transferred), the owner of the offset site must pay the total fund deposit (or a proportion of the total fund deposit) into the Biodiversity Stewardship Payments Fund. The money in the Fund is invested by the Trust and then draw on to make annual payments to owners of active biodiversity stewardship sites in accordance with the terms of the agreement. Sites go into active management when landholders have paid their total fund deposit in full, which typically occurs when they have sold sufficient credits to pay the amount.

Biodiversity stewardship agreements can be entered into by developers with offset obligations. In these cases, the credits required to meet their obligations are generated and retired without any external credit transfers or transactions. In addition, independent landholders without offset obligations can also enter into biodiversity stewardship agreements in order to sell credits into the compliance and voluntary markets. As at the end of March 2020, there were 192 stewardship

²⁵ Mining projects can also commit to delivering mine site ecological rehabilitation that creates the same ecological community or threatened species habitat as is impacted by the development.

²⁶ The counterparty can also be a delegate of the Minister. At present, the authorised delegate is a senior executive from the Biodiversity Conservation Trust.



agreements in New South Wales covering a total of 22,700 hectares. Only four of those (covering a total of 392 hectares) were biodiversity stewardship agreements entered into under the *Biodiversity Conservation Act 2016* (NSW). The remainder were biobanking agreements created under the previous BioBanking Scheme. Between the end of March and 22 October 2020, a further five biodiversity stewardship agreements were entered on the public register, bringing the total area covered by stewardship agreements to approximately 23,111 hectares. As at 30 June 2020, there was \$141.5 million in the Biodiversity Stewardship Payments Fund and, over the previous 12 months, \$8.2 million was paid out to owners of offset sites under stewardship agreements.

Where developers choose to meet their offset obligations by paying money into the Biodiversity Conservation Fund, the obligation to purchase and retire credits passes to the Biodiversity Conservation Trust. The Trust can meet these obligations by acquiring and retiring credits (like for like or similar), fund a biodiversity action that benefits the entity impacted, or any other conservation action approved by the Environment Minister. Between August 2017 and 30 June 2020, 108 developers paid \$20.8 million into the Fund in respect of 231 offset obligations. At that time, 18 of these obligations had been met, all with like for like credits. These credits were all acquired through tenders.²⁷

In addition to purchasing from the Biodiversity Conservation Fund, the Biodiversity Conservation Trust can also be funded by the NSW or Australian governments to purchase and retire offsets under place-based biodiversity offsets schemes. The only instance of this to date concerns the Growth Centres Biodiversity Offset Program. In 2017, the NSW Government commissioned the BCT to purchase and retire offsets under the program, which aims to protect threatened species and ecological communities in Western Sydney to offset the impacts of the development of the North West and South West Growth Centres. The program, which has been running since 2008, is scheduled to receive at least \$370 million over its lifetime.

In order to promote transparency in the market for biodiversity credits, and link sellers with buyers, the Biodiversity Conservation Act 2016 (NSW) requires a number of public registers to be maintained. These include a credit supply register (which details the credits available for purchase, expressions of interest for potential credit supply and details of pending credits), credit demand register (which details of credits wanted to meet obligations) and a transactions register (which details credit transfers, retirements, suspensions and cancellations).

3.4.3 The carbon market is a useful precedent for voluntary demand in biodiversity

The Australian carbon market provides a useful precedent for corporate participation in similar markets, including the market for biodiversity services. The market is dominated by two types of units:

- Australian carbon credit units (ACCUs), which are generated by domestic projects
- Kyoto units (units created under the Kyoto Protocol), which are generated from projects in other countries.

Over the three financial years 2016-17 to 2018-19, voluntary cancellations accounted for 12% (4.6 million units) of the domestic market for ACCUs and Kyoto units (**Figure 5**). The remainder of the

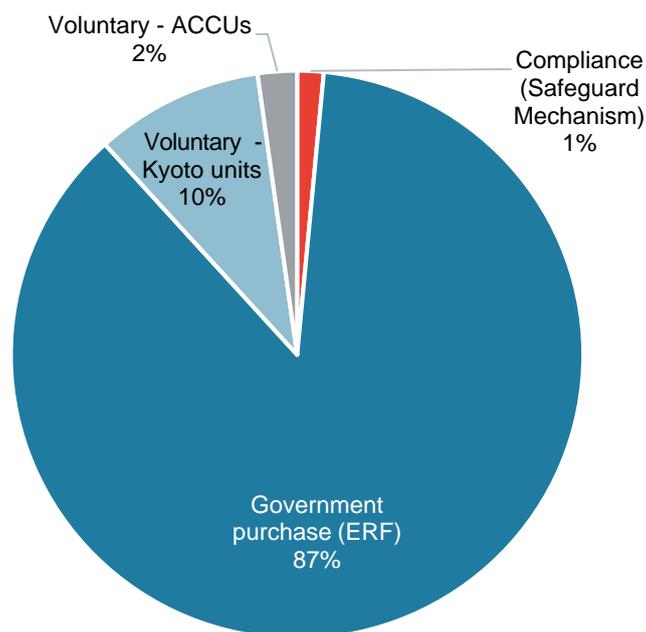
²⁷ The Trust also made a state-wide fixed price credit offer, however, it appears no relevant credits were purchased through this process.



market was comprised of the mandatory surrender of ACCUs by designated large polluters under the Australian Government's Safeguard Mechanism (590,000 ACCUs) and purchases by the Clean Energy Regulator under the Emissions Reduction Fund (34.4 million ACCUs).

Over this period, the voluntary market was dominated by Kyoto units (mainly Certified Emission Reductions), which comprised 81% of voluntary cancellations. The dominance of these units is largely because they sell at a lower price compared to ACCUs.

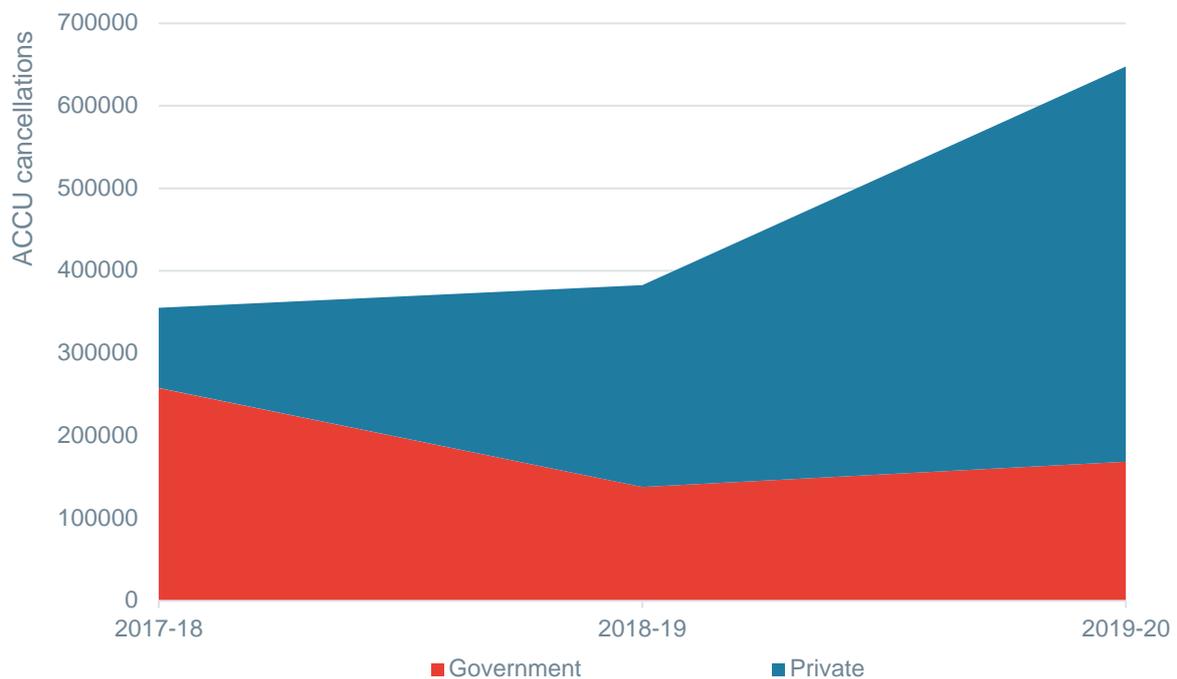
Figure 5: Breakdown of the Australian carbon market, 2016-17 to 2018-19



Source: Frontier Economics, using data from the Clean Energy Regulator.



Figure 6: Voluntary ACCU cancellations, government vs private, 2017-18 to 2019-20



Source: Frontier Economics, using data from the Clean Energy Regulator.

A notable feature of the voluntary carbon market is that it includes units purchased and cancelled by federal, state and local governments and government agencies, other than the Clean Energy Regulator. Conceptually, these are the same as purchases and retirements under the Emissions Reduction Fund.

The available data suggest most of these additional government cancellations involve the use of ACCUs rather than Kyoto units. In the 2017-18 financial year, government cancellations made up more than 70% of all voluntary ACCU cancellations, most of which were made by the South Australia Water Corporation in relation to the Adelaide desalination plant (**Figure 6**).

In the two most recent financial years, the proportion of the voluntary ACCU market represented by government purchases has declined significantly, while corporate and other non-government cancellations have increased. In the 2019-20 financial year, almost 650,000 ACCUs were voluntarily cancelled, 74% of which was by corporate and other non-government entities.

These data suggest there is growing interest from the private sector in making voluntary contributions to greenhouse gas abatement, a trend that could potentially be mirrored in domestic biodiversity markets.

3.4.4 Further links to the carbon market and green finance

The carbon market provides an important mechanism for corporate participants to buy biodiversity services as a co-benefit to carbon abatement. Consultation with stakeholders indicates an increasing demand for ACCUs generating biodiversity benefits, and a willingness to pay a premium for ACCUs that deliver biodiversity benefits, although the depth of that market remains uncertain. Voluntary carbon standards, such as the Climate, Community and Biodiversity



Standards, have been developed to recognise the co-benefits of carbon offset projects, including biodiversity.²⁸

Finally, the demand from philanthropic and corporate sources also includes support in the form of concessional finance. For example, investors may choose to offer finance at sub-commercial rates to a farmer that incorporates biodiversity services into their agricultural activities. While the size of this sector is not readily ascertainable, it is an important potential future source of demand (see section 4.2).

²⁸ More information about the Climate, Community and Biodiversity Standards is available at: <https://verra.org/project/ccb-program/>



4 Challenges and opportunities in the supply of biodiversity services

This section considers the current arrangements for trading biodiversity services in Australia, and the issues with those arrangements. In identifying these issues, we recognise that most markets in Australia are jurisdictional, but have adopted a national perspective.

We further comment on opportunities for increased supply and demand for biodiversity, including through tapping private and corporate demand.

4.1 Challenges have emerged for biodiversity markets

Figure 7 summarises the issues with the current arrangements, which are discussed in turn below.

Figure 7: Issues with the current arrangements



Source: Frontier Economics

4.1.1 The need to define property rights and the heterogeneous nature of biodiversity creates complexity

The market for biodiversity services is heterogeneous. This reflects the inherent characteristics of biodiversity, particularly in Australia. There are approximately 150,000 described species in Australia, including almost 386 mammal species, 828 bird species, 98,703 invertebrates and 25,000 plant species, several thousand of which are threatened.²⁹ New species are also frequently being discovered and described.

²⁹ A.D. Chapman 2009, Numbers of Living Species in Australia and the World, 2nd Edition, Australian Biodiversity Information Services.



This heterogeneity makes it difficult to create secure property rights for tradeable biodiversity services. Diversity in and within species and ecological communities means it is not possible to create a single fungible unit of biodiversity value, as has been possible with greenhouse gas emissions through the use of carbon dioxide equivalents and global warming potentials. Species and ecological communities also have different conservation status, which drives differences in preferences and spending and regulatory priorities.

The heterogeneous nature of biodiversity produces complexity in the markets for biodiversity services. Amongst other things, there need to be different eligibility rules to ensure investments are appropriately prioritised towards the areas of greatest conservation need, and different measurement, reporting and verification processes to account for the differences in species and ecological communities. The preferences of groups towards specific types of biodiversity also drive legitimate differences in market design. While there is typically a good logical for the differences, they create barriers to participation, including high initial learning and other transaction costs.

4.1.2 The biodiversity services market is highly fragmented and there are many processes

The biodiversity services market in Australia is highly fragmented with numerous different sub-markets. These sub-markets vary with respect to the nature of demand, the biodiversity services provided, the geographic location, the trading arrangements and the verification, monitoring and reporting arrangements. The lack of consistency between these sub-markets can make them difficult to navigate for potential market participants on both the demand and supply side.

The lack of a standard approach to defining, trading and verifying, monitoring and reporting biodiversity services is particularly evident between jurisdictions. Inconsistencies between jurisdictional offset schemes relate to the nature of product being sold, eligibility criteria and the basis for entering into a trade. For example, the Victorian offsets scheme attempts to limit the number of categories by focusing on specific types of native vegetation in defined geographic regions having regard to underlying condition. In contrast, the NSW offsets scheme relates to vegetation type, species habitat and ecosystems and quality parameters including the strategic importance of the site. In NSW alone there are more than 1,000 vegetation types that can be reflected in biodiversity credits. Government tenders often adopt specific definitions of biodiversity services and associated arrangements for each tender. This can increase the complexity for buyers and sellers alike.

Identifying, understanding and complying with the many processes across these sub-markets is complex and confusing for buyers and sellers. The lack of a standardised approach to defining biodiversity services makes them hard to compare and value. Without widely accepted methods to communicate quality, it is difficult for buyers to distinguish between biodiversity services offered. In practice, buyers assess the quality differences based on the verification and reporting requirements, rather than the actual quality of the site and the biodiversity services it provides.

4.1.3 Demand is uncertain and hard to predict

The close interactions between government policy and biodiversity markets make it difficult for landholders to predict and manage uncertainty.

As noted, demand for biodiversity services is dominated government-led purchasing and compulsory offset schemes. Government-led purchasing schemes are run at federal, state and



local government levels and, at any point in time, there are typically multiple schemes in any state or territory. These schemes can be short-lived and unstable, with frequent rule changes not being uncommon. The layering of programs and their variability increases complexity for landholders and the transaction costs associated with participation.

The demand for offsets in a number of jurisdictions has also been affected by frequent changes in planning and other native vegetation regulations, which increases the uncertainty for landholders interested in developing offset projects to supply the market.

There is a small and potentially growing voluntary market for biodiversity services. However, with the available information, it is not possible to estimate the size and nature of this market.

This uncertainty in demand and prices makes it difficult for sellers to make an informed decision about the potential revenue associated with providing biodiversity services.

4.1.4 The resulting search and transactions costs deter participation

The fragmented and complex market arrangements mean search and transaction costs can be high for both buyers and sellers of biodiversity

Economists define search costs as those costs incurred in finding a suitable trading partner, and transactions costs more broadly as the costs of undertaking a transaction. Key costs can include:

- Navigating eligibility criteria
- Assessment of a biodiversity site for sale to identify the quantity, and potentially types, of biodiversity services which can be sold
- Developing a management plan for a biodiversity site for sale
- Matching a buyer to a seller
- Acquiring information necessary to value particular land (e.g. on the value of similar transactions)
- Agreeing a sale price (this can vary from auctions, direct bargaining or take it or leave it offers by a market coordinator)
- Completing required paperwork to complete a trade
- Monitoring and enforcement to ensure the biodiversity services purchased are supplied.

These search and transaction costs can be (and generally are) significant. As an illustrative example, transactions costs for assessment and verification of biodiversity credits have been estimated at \$20,000-\$50,000 per site over a time period of 18 months for the NSW Biodiversity Offset Scheme.³⁰ This level of cost would likely make it uneconomic for many landowners with potential biodiversity sites to enter the market.

³⁰ "Mining offsets in NSW" in Jeff Bennet (ed.), *Protecting the Environment, Privately*, World Scientific Publishing, Singapore, 2016.



In addition, brokers and aggregators are commonly used for biodiversity services transactions. While brokers provide a service, there is some anecdotal evidence that brokers may take a relatively large proportion of the proceeds of a biodiversity services transaction. This could be due to a combination of:

- A lack of competition between brokers.
- The level of complexity and associated support required to complete a transaction.
- The lack of market liquidity for particular biodiversity services, meaning search costs are high.

Whatever the reason, the prevalence of brokers is consistent with the market for biodiversity services having high search and transaction costs. These costs are likely to be acting as a significant deterrent to participation by farmers. Research on Australia's carbon markets has



highlighted the same issue for several project types.³¹ Many farmers may be deterred from engaging brokers and other intermediaries given the issues that have arisen around their participation in water markets (see **Box 5**).

Box 5 : Brokers in the Murray Darling Basin water market

Water markets in the Murray Darling Basin are complex. Governance and regulatory arrangements differ between states and water zones. In addition, information asymmetry and lack of interoperability between trading platforms and registers makes it difficult for smaller participants in effectively engage with water markets.

This complexity has given rise to brokers and other intermediaries who assist smaller participants in water markets. Competitive and competent intermediaries can contribute to increased market liquidity and depth, reduce searching costs, improve information availability and otherwise reduce transaction costs associated with water trade.

However, the ACCC in their interim report on water markets support the concerns raised by stakeholders on intermediaries in the market, due to the lack of obligations brokers owe to their clients and inadequate regulatory oversight of broker practices. Issues particularly relate to conflicts of interest and information asymmetries amongst brokers who may not act in the best interest of clients. In addition to intermediaries, sophisticated traders and investors are also able to take advantage of information asymmetries and technological resources in ways that other participants, such as farmers, cannot.

The consequence of this there is significant distrust of the market by some water users, particularly farmers, who are deeply concerned about the fairness of the markets and question. The ACCC note this distrust of the market as one of the more significant barriers for a well-functioning water market. Encouraging the participation of smaller players including farmers requires transparency and integrity, a competitive environment for intermediaries whose incentives are aligned with buyers and sellers and assurance these markets cannot be manipulated by more sophisticated participants.

Source: ACCC, Murray-Darling Basin water markets inquiry, Interim Report, 30 July 2020.

4.1.5 There are further barriers to participation by farmers

In most cases, a seller of biodiversity services is committing to providing biodiversity services on a defined site in perpetuity or for an extended period in excess of a decade. For example, in NSW, offset providers must enter into biodiversity stewardship agreements that apply in perpetuity. Similarly, landholders who agree to provide biodiversity services under the Conservation Management Program in return for annual payments must agree to enter into conservation agreements that generally run for a minimum of 15 years. Indeed, to date, approximately 70 per cent of funded conservation agreements have been in perpetuity. The need for a long-term commitment can deter participation as it limits flexibility. The general requirement to covenant the land can also decrease the value of land, reducing the returns from projects.

³¹ Macintosh, A; Roberts, G and Buchan, S; July 2019, Improving Carbon Markets to Increase Farmer Participation, A report prepared for Agrifutures Australia.



Other relevant barriers to participation by farmers include:

- **Additionality** requirements which are intended to ensure an incremental improvement in biodiversity can be difficult to establish. The nature of biodiversity services together with data limitations mean establishing a baseline is not straightforward. Moreover, landholders that have been proactive in voluntarily raising the quality of biodiversity in the past (either to improve land productivity or to attract impact investments) are often not able to access remuneration because this improvement is existing and therefore not additional.³²
- Establishing a site can require significant upfront capital investments, including for site assessment and fencing. **Financing** these upfront costs can also be difficult to obtain if the return obtainable is uncertain due to illiquid trading markets.
- **Price uncertainty** is difficult to manage for biodiversity services as prices are susceptible to policy induced shocks which are hard to forecast. For farmers this is made harder by the uncertainty in agricultural revenue. This makes it difficult to predict the opportunity cost associated with retiring land from productive use. This price uncertainty can also have implications on the cost of financing.
- **Tax and accounting** can have major balance sheet implications for businesses, and can impact whole of business financing and operations. For instances where the site cannot have any other productive use, then selling the biodiversity services for a site is effectively liquidating an asset. From an accounting point of view, a seller of biodiversity services is writing down the value of their site on their balance sheet and recording the annual payment on the profit/loss statement. These implications are often complex, can differ between programs and there is anecdotal evidence that these implications are not well understood.
- **Social and cultural factors** can deter participation by farmers. Previous research on agri-environmental and carbon markets has highlighted that farmers' decisions to undertake projects are not made exclusively on the basis of the expected financial returns. A collection of personal, social and cultural factors also influence these decisions. These include personal and community attitudes towards the environment and succession.

Whilst measures have been introduced to address some of these barriers in some markets, such as longer term contracts under the Queensland Land Restoration Fund, they are still likely to act as material deterrents to participation. The consequence of this is illustrated in the Emissions Reduction Fund, where there is greater participation on larger properties such as the semi-arid regions of Queensland and New South Wales. These properties can typically leverage economies of scale to overcome these barriers of entry. This is more difficult in most biodiversity markets, as they tend to be concentrated in coastal areas and the intensive agriculture zone, where landholdings are smaller and land costs are substantially higher.

4.2 What opportunities are emerging?

While there are clear challenges for biodiversity markets, there are opportunities to deepen market participation in the form of both supply of and demand for of biodiversity services.

³²

See for example <https://kilterrural.com/investment-thesis/> and Box 4.



4.2.1 Private demand is encouraging, but uncertain

We have identified a nascent private demand for biodiversity services. This evidence is primarily anecdotal. For example, KPMG estimates that “sustainable” investments constitute 63% of all professionally managed assets in Australian and New Zealand.³³ Sustainable agriculture, biodiversity offsets and other physical biodiversity assets are said to represent the highest growth areas for these sustainable investments in the next 5 years.³⁴

The rapid growth in Environmental, Social and Governance investments (**Box 6**) provides evidence of the increasing interest of investors in a broad range of metrics, including environmental performance. However, it is important to recognise:

- ESG is a broad concept. It covers everything from conditions for workers to managing supply chains to responding to climate change. While biodiversity services certainly fit within ESG, it is only a small subset.
- ESG is primarily related to equity and debt finance rather than funding. The implication here is that investors are looking for returns, even if the returns are sub-commercial. This suggests a need for biodiversity services to be embedded within a broader business model in order to attract finance. Impact investors are particularly relevant in this context.

A notable sub-set of corporate participants are impact investors. Such investors are seeking projects which deliver social and environmental benefits in addition to financial returns. Our understanding is that, at the margin, impactors are willing to forego some level of financial return for greater social and environmental benefits. This is a growing segment of demand. Responsible Investment Association Australasia report that the market has grown from \$5.7 billion in 2017 to \$19.9 billion in 2019. They also estimate a potential demand of \$100 billion over the next five years for impact investment products.³⁵

³³ KPMG and the National Farmers Federation, 2019, A Return on Nature - Enabling the market for sustainable finance and ecosystem services.

³⁴ The Nature Conservancy, 2019, Investing in Nature – Private finance for nature-based resilience.

³⁵ Responsible Investment Association Australasia, Benchmarking Impact: Australian Impact Investor Insights, Activity and Performance Report 2020.

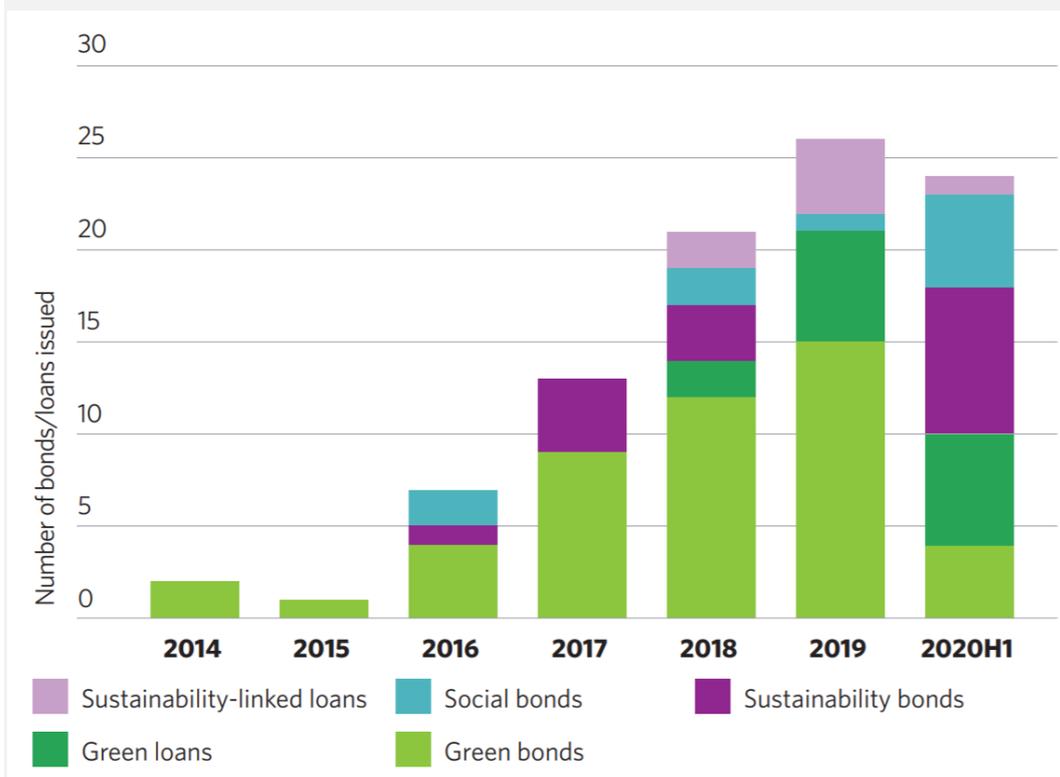


Box 6: Environmental, social and governance (ESG) as a growing source of finance

The term ESG was coined in a 2004 paper entitled ‘Who cares wins: connecting financial markets to a changing world.’ The report made the case for ESG considerations being embedded across the financial sector. There is evidence that this has occurred over time. For example, McKinsey estimate that in the USA the value of ESG-rated investments at around US\$12 trillion or a quarter of the value of assets under management.

ESG is a growing segment of finance demand in Australia too. Responsible Investment Association Australasia report that the market was \$19.9 billion in 2019 and estimate a potential demand of \$100 billion over the next five years for impact investment products. Similarly, **Figure 8** shows an increase the number of ESG-related bonds/loans issued in Australia in recent years. This suggests that there is increasing finance available for ESG initiatives. There are a range of ESG related financial products of relevance to biodiversity, including for example sustainability-linked loans and sustainability bonds.

Figure 8: Australian labelled loan and bond growth



Source: Climate Bonds Initiative, Green Loans: Australia and New Zealand

Source: The Global Compact, Who cares wins: connecting financial markets to a changing world

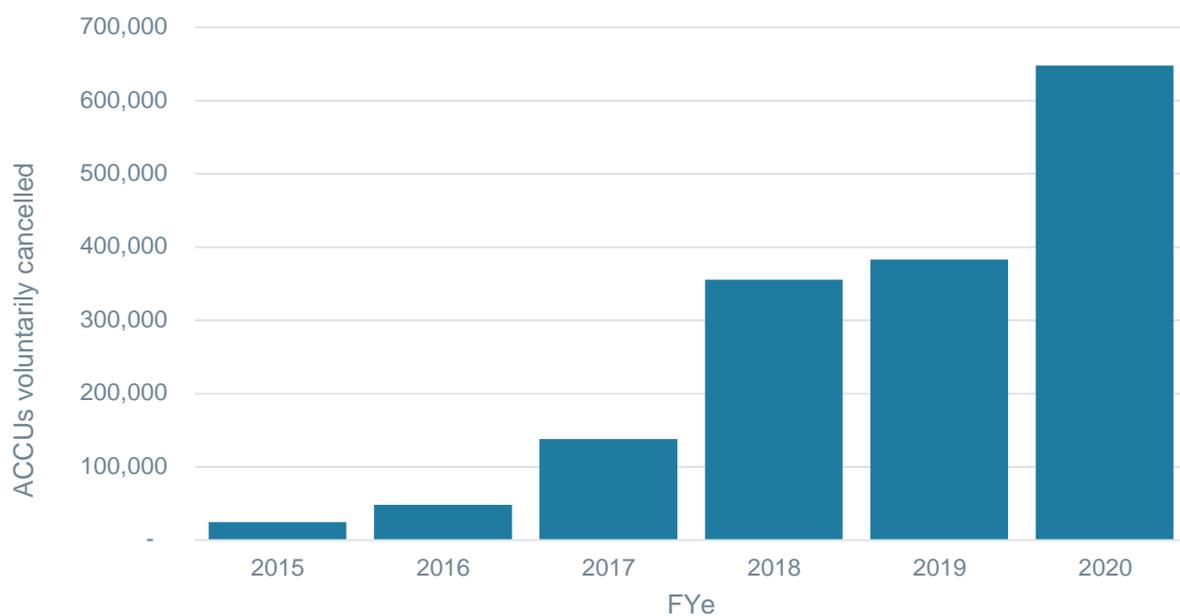
McKinsey, Why ESG is here to stay. Available at: <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/why-esg-is-here-to-stay>

Climate Bonds Initiative, Green Loans: Australia and New Zealand



The potential for growth in the voluntary biodiversity market is illustrated in carbon markets, where there has been a substantial increase in the voluntary cancellation of Australian carbon credit units (ACCUs). Between 2015 and 2020, voluntary cancellations went from approximately 25,000 units to almost 650,000 units per annum (see **Figure 9**), evidencing a willingness amongst some corporates and others to make voluntary contributions to reduce greenhouse gas emissions. This could be for altruistic or reputational reasons. Due to a lack of market transparency, it is difficult to gauge whether there has been a similar rise in voluntary trades in biodiversity markets. However, the trends in carbon markets suggests there may be scope for this aspect of the biodiversity market to expand.

Figure 9: Emerging voluntary demand for ACCUs



Source: Frontier Economics analysis of Clean Energy Regulator data

Note: Voluntary demand includes corporate and state demand. 2021 includes one quarter of data.

In addition to domestic demand, there is significant potential international demand from philanthropists seeking to invest in environmental outcomes.³⁶ Australia is well-placed to attract international philanthropic investment due to:

- Australia's unique status as an international biodiversity hotspot. Australia is one of seventeen countries described as being 'megadiverse'. This group of countries has less than 10% of the global surface, but support more than 70% of the biological diversity on earth. Australia is home to between 600,000 and 700,000 species, many of which are endemic, that is they are found nowhere else in the world. These include, for example, 84% of our plant species, 83% of mammals and 45% of birds.³⁷

³⁶ A common international standard of measurement is important in attracting international demand.

³⁷ Department of Agriculture, Water and the Environment, Biodiversity hotspots (12 November 2020) <https://www.environment.gov.au/biodiversity/conservation/hotspots>.



- Australia's rule of law, including its robust legal and compliance systems, mean it is regarded as a 'safe' place to invest.

Finally, we note however that whilst the willingness to *invest* in biodiversity services may be high, this does not necessarily directly translate into actual willingness to *demand* biodiversity services. Returns on the investments will require buyers to pay for biodiversity services.

4.2.2 Government and compliance demand will continue to be important

Direct government support and support through offset schemes will continue to be the primary drivers of biodiversity demand. Major investments have been made at the Commonwealth and state levels, reflecting both increased community concern for biodiversity loss and the more direct costs of environmental degradation on farmers. **Table 2** summarises the potential opportunities for demand of biodiversity services.

Table 2: Potential opportunities for demand of biodiversity services

Participant	Potential opportunities
Government	<p>Governments in Australia will continue to demand biodiversity services as a public good investment.</p> <p>Major recent investments in biodiversity services from Government include the Australian Government's \$1.1 billion investment in the National Landcare Program, the Queensland Land Restoration Fund (\$500 million), and the New South Wales Government's \$350 million, five-year investment in the Biodiversity Conservation Trust. The Government also demands biodiversity services through other means, such as purchasing and establishing land for biodiversity sites (e.g. the NSW Government purchase of Narriearra Station).</p> <p>Demand from Australian Governments will depend on Government appetites for biodiversity services. This is expected to increase over time due to increasing risks to biodiversity and to support resilience for primary producers.</p>
Compliance participants	<p>Demand from those who require biodiversity services for compliance will be shaped by government regulations and levels of development.</p>
Philanthropic participants	<p>Philanthropic participants include charitable organisations and individuals who demand biodiversity services.</p> <p>Philanthropic demand for biodiversity services will depend on the appetite of donors to support biodiversity outcomes in Australia in the future. They will likely remain a small proportion of biodiversity demand.</p>
Corporate participants	<p>Many firms increasingly see acting on climate change and contributing to environmental outcomes as "good business". In many cases</p>



customers are demonstrating a willingness to pay for biodiversity outcomes (for example participants in the Qantas offsetting program).

Major participants often include industries where there is increasing pressures for social responsibility, such as transport, mining and energy. Smaller participants also consider supporting biodiversity outcomes as a worthwhile business decision.

Source: Frontier Economics

4.2.3 A shift from primary production is the key supply opportunity

Opportunities for supply of biodiversity services are summarised in **Table 3**. While there is a strong potential for primary producers to participate, the returns from supplying these biodiversity services depends on the prices in the markets. Often these prices are too low to cover the costs associated with the projects, and higher prices will depend on the willingness to pay of those who demand the services. Farmers may be more willing to provide biodiversity services under schemes where compliance arrangements are less onerous and therefore less costly to comply with.

Table 3: Potential opportunities for supply and demand of biodiversity services

Participant	Potential opportunities
Primary producers	<p>Primary producers represent the majority landholders in Australia, with approximately 50% of Australia's land used for production. Growing climate risks will encourage producers to diversify land use and contribute to environmental outcomes.</p> <p>Opportunities to supply biodiversity services could be encouraged by linking carbon and biodiversity markets. The Carbon Market Institute has estimated that, by 2030, carbon-based agricultural projects where biodiversity co-benefits are recognised could generate an estimated \$10.8-24.0 billion in revenue (see Box 8 for more details).</p> <p>Better access to sustainable or "green" finance is another potential opportunity. Governments and some private entities have been able to use bond markets to fund activities with broader environmental benefits, such as investments in renewable energy.³⁸</p>
Philanthropic investors	<p>Philanthropic investors are those that supply biodiversity services. Supply of biodiversity services from philanthropic investors will likely remain small relative to other suppliers.</p>

³⁸ See Australian Sustainable Finance Initiative, Developing an Australian Sustainable Finance Roadmap: Progress Report, 2019, p18.



Other landholders include governments, utilities and other major landholders who might make biodiversity services available for supply.

Other landholders

Incremental supply of land from other landholders will likely be anecdotal and small relative to other suppliers. Currently, supply of biodiversity services from governments and utilities are not typically sold commercially.

Source: Frontier Economics

There are also technological opportunities that may facilitate the supply and demand of biodiversity services. Technology to assist with site identification, mapping, the quantification of biodiversity services and reporting is continually being improved upon across the different biodiversity markets. These opportunities will likely reduce the barriers for entry for suppliers and the transaction costs in the markets.

For those who demand biodiversity services, innovation in the available products to purchase, and methodologies to validate and report on biodiversity services will reduce the transaction costs for buyers in the markets. Technology has an important role to play in this context.

Box 7: Carbon Market Institute

The Climate Market Institute is an independent peak industry body whose focus is on helping businesses transition to a net-zero emissions economy. The Institute has a diverse range of members including major energy, resources, engineering, financial and legal businesses.

In 2017 the Carbon Market Institute released a Carbon Farming Industry Roadmap. For this roadmap carbon farming is defined as “land management activities that reduce greenhouse gas emissions (GHG) from agricultural practices or sequester carbon dioxide in the landscape.” The roadmap identifies the opportunity for carbon farming to provide environmental, social & cultural and economic co-benefits including biodiversity conservation. The opportunity by 2030 was estimated at \$10.8-24.0 billion revenue from carbon projects and supporting 10,500-21,000 direct and indirect jobs.

The roadmap sets out four phases to move from carbon farming being underpinned by the Government’s Emissions Reduction Fund to being underpinned by private sector demand and investment. A key aspiration of the roadmap is for ‘projects on agricultural land to become economically viable due to improved methods, valuing co-benefits and new tolls to support participation.’

A September 2020 national carbon farming forum highlighted opportunities for soil carbon and included a federal government announcement that they are making this a priority technology. The initial focus will be on overcoming barriers to growth of soil carbon including measurement and assurance costs.

Source: Carbon Market Institute including Carbon Farming Industry Roadmap available at: <http://carbonmarketinstitute.org/wp-content/uploads/2017/11/Carbon-Farming-Industry-Roadmap.pdf>



5 Using market instruments to correct biodiversity market failures

This section considers the role of market instruments in correcting the market failures associated with biodiversity.

5.1 Creating better biodiversity markets

Many markets can function effectively through rules that emerge from the “bottom up” interactions between buyers and sellers. This is not true for markets in many environmental services; generally, rules must be imposed from the “top down” by government to correct for market failures.

The use of market instruments to address market failures, including in environment markets, is now well established. The preceding sections have shown that markets in biodiversity exist, and that there is established supply and demand channels. But using market instruments to address the under-provision of biodiversity still requires careful market design if the benefits are to be maximised.

5.2 Conditions for effectively functioning markets

Markets that work well allocate resources efficiently and economise on search and transaction costs. There are certain conditions under which market mechanisms will bring together buyers and suppliers to produce those good outcomes:

- **Property rights are clearly defined and readily enforceable:** you must be clear what you are buying and selling, and that you can take ownership of it when purchased.
- **Participants in the market trust each other:** buyers must trust that sellers can deliver what is promised, and sellers must trust that buyers will pay what they have promised.
- **Information flows between buyers and sellers:** buyers and sellers need to know what options they have. Both parties will want to know prevailing market prices, but also when and what price trades occur.
- **Competition is fostered:** competition provides options for buyers and sellers, and will promote prices that reflect the opportunity costs of supply.³⁹
- **Side effects on third parties should be curtailed:** Market transactions can impose positive or negative effects on third parties (externalities). These externalities need to be managed to achieve good outcomes.

³⁹ John McMillan, *Reinventing the Bazaar: A Natural History of Markets*, 2002, p. 2.



5.3 Different kinds of market arrangements

There is a concern that opportunities are being forgone on the supply and demand side of biodiversity markets. As we have outlined, there may be a range of possible reasons for this; for example, a lack of clear and secure property rights will hinder effective trading regardless of other market characteristics.

A particular focus of our scoping paper is the role of exchange mechanisms (including trading platforms) in promoting efficient biodiversity markets. Trading platforms are a characteristic of many well-functioning markets. But it is first worth noting that a trading platform is only one kind of market arrangement. For example:

- **Centralised platform markets**, such as stock exchanges, which match buyers and sellers in a continuous double auction system (where both sellers and buyers offer prices)
- **Broker markets**, such as the home lending market, with brokers acting as intermediaries to organise transactions between buyers and sellers
- **Over the counter markets**, such as foreign exchange markets, where participants rely on “market makers” to act as counterparties to trade on their behalf
- **Consumer markets**, such as retail supermarkets, with sellers making “take it or leave it” offers to buyers.

It is also feasible that transactions do not take place in markets at all – biodiversity transactions can take place entirely within the firm. For example, this can occur if it would be cheaper or easier for a firm to acquire land itself to generate biodiversity credits to offset losses of biodiversity. These types of intra-firm offsets are commonly used under federal and state planning and environmental laws.

5.3.1 What kind of market arrangement is most efficient?

Price discovery and transactions costs provide a comparison point

Different market trading models may work more or less well depending on numbers of buyers and sellers, frequency of trading, types of trades, and so on.

There are two characteristics by which we can compare market efficiency:

- The speed and accuracy of price discovery (the true value of the item to sellers and buyers).
- The costs to participants of transacting in the market.

Achieving an efficient marketplace

The key to achieving efficiency has been described by Roth (2002) as follows:

The first task of a successful marketplace is bringing together many participants who want to transact, so they can seek out the best transactions.⁴⁰

⁴⁰ Alvin Roth, Who gets what - and why, 2015, p. 8. See also Roth, The Theory and Practice of Market Design: Nobel Prize Lecture, December 8, 2012.

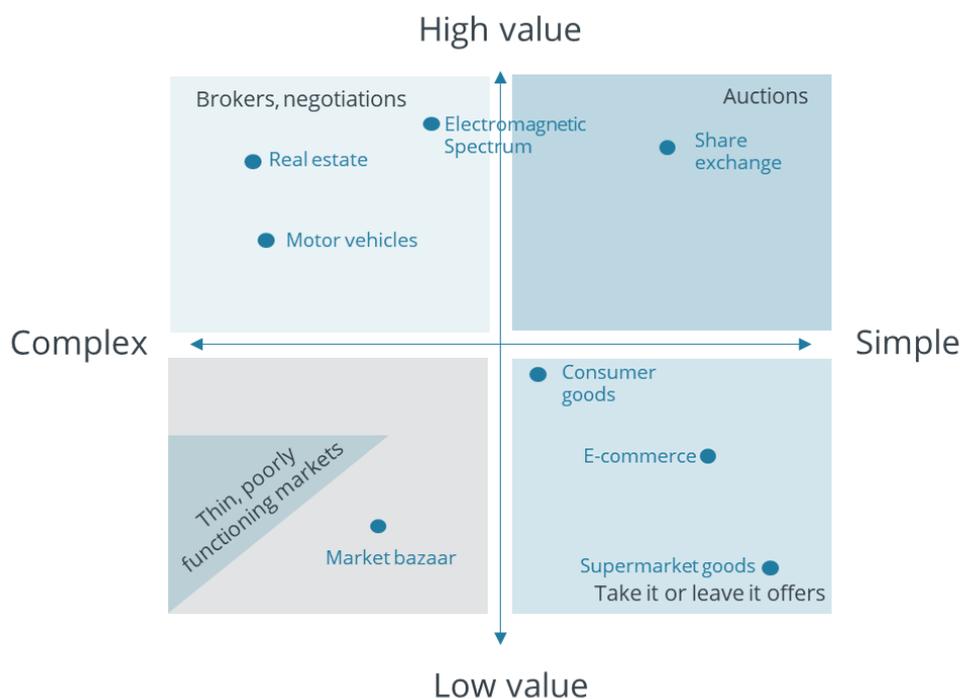


We say that such markets are liquid or “thick”. Liquid or thicker markets facilitate many transactions at low cost and result in fast, accurate price discovery. An objective of market design is therefore to maximise market liquidity.

Share exchanges (such as the ASX) are platform markets, and often held as examples of highly efficient markets. It is true that share exchanges are generally very liquid and therefore very efficient. However, this is not true of all products traded on such markets. Illiquid or thin markets for a particular share may exist because shares are tightly held by a small number of owners.

Equally, many types of consumer market are very liquid / thick. There is no one market mechanism that is optimal in all situations; as **Figure 10** suggests, two important features of markets that determine what market mechanism is most useful is the value and complexity of the product. Markets in the bottom left quadrant - complex and low value products - do not tend to trade in efficient markets due to either high transaction costs or relatively high search costs.⁴¹

Figure 10: Products and markets



Source: Frontier Economics

Innovation and transaction platforms

A distinction that is made in some literature on platforms is between transaction platforms and innovation platforms.⁴² While transaction platforms host transactions, innovation platforms provide the building blocks for users to develop products that add functionality to the platform

⁴¹ Where search costs are high, suppliers undercutting on price would find that they may not attract more custom because it is costly for consumers to search for lower prices. This was formally modelled by Diamond, P, (1971), "A model of price adjustment", *Journal of Economic Theory*, 3, pp.156-68.

⁴² See for example Cusumano et al., "The future of platforms", MIT Sloan Management Review, 11 February 2020, Available at: <https://sloanreview.mit.edu/article/the-future-of-platforms/>



and which may be traded. An example of an innovation platform is Apple's operating system, iOS, or Sony's Playstation.

A key question for this study is whether a platform for biodiversity would be an innovation platform, a transaction platform, or a hybrid. In this context an innovation platform would provide basic functionality and allow users to innovate to provide services or packages of services that might be useful for other users. A transaction platform would host biodiversity transactions.

Capturing network effects is critical for exchange platforms

Platform markets are also often characterised by network effects. Network effects describe the increase in the value of a platform from a participant joining to other participants. So, for example, my use of a share exchange to buy shares is enhanced by more sellers of shares, as this increases liquidity and minimises the price impact of my trading. For markets that host transactions, the key network effect is "cross side" – if I am a buyer, I don't benefit from more buyers, I benefit from more sellers. Similarly, sellers benefit from more buyers but not more sellers. To be successful and create a liquid market, a platform must capture network effects.⁴³

Given that platforms are subject to network effects, the key design elements of a platform are how to capture them:

- The first element is to have something of value to platform users. For example, this might be a new technology to make transactions simpler.
- The second element is to consider the value of the platform to the different types of users. This affects the pricing strategy adopted.

Platforms need to determine a pricing strategy that maximises the number of users of the platform (and transactions on the platform) as this maximises its value. This may involve one or more of the strategies set out in **Table 4**. The general strategy is to price low⁴⁴ to those consumers with a high sensitivity to price (say because they face a number of options) and price high to those with low sensitivity to price.

⁴³ Network effects explain why there are frequently monopoly or duopoly platforms (the Australian Share Exchange, Facebook in social media, Uber in ridesharing, Apple/Google app stores). In these markets, network effects are so significant that smaller platforms cannot survive and there may only be room for one or two.

⁴⁴ This can be free, or even negative prices. For example, credit card users with reward point options were effectively paying negative prices for their use prior to interchange fee reform by the Reserve Bank of Australia.

**Table 4:** Pricing strategies for platform businesses to drive market size

Pricing strategy	Examples
Provision of free services to all types of platform users, at least in the initial stages	<ul style="list-style-type: none"> Social media, search, many apps Whatsapp
Provision of free basic services to users and paid premium services	<ul style="list-style-type: none"> LinkedIn Dating platforms (eHarmony, RSVP) Apps with in-app purchasing
Free services to one set of platform users, paid services to other side	<ul style="list-style-type: none"> eBay, AirBnB (commission charged on sellers) Facebook, Google (charges only advertisers) Classifieds (charge listers) Job matching sites (charge listers)
Lower-margin prices to one set of platform users, higher-margin prices to other users	<ul style="list-style-type: none"> Credit cards - lower prices to card issuers/consumers than card acquirers/merchants Video games and consoles - lower prices to game developers (and consoles), higher prices on games

Source: Frontier Economics

A further consideration is that pricing and product decisions are not static. Hagui notes that:

Most importantly, it is a dynamic [decision]: the most successful platforms do not sit still; they are constantly evolving, increasing their depth and/or reach and in the process redefining their boundaries and those of entire industries.⁴⁵

Hagui provides the example of eBay, which has continuously evolved in its pricing structure, its methods of assuring seller and buyer trust, and payment security (through its ties and later break with PayPal).

5.3.2 The challenges for a biodiversity platform

For a platform to be effective, it will need to encourage many participants who want to transact. In the following table, we consider the five elements of functioning markets highlighted earlier, and the challenges likely to be faced for a biodiversity platform. We also highlight pricing structure, as this is likely to be a further key to capturing network effects and platform success.

⁴⁵ Hagui, A., Multi-Sided Platforms: From Microfoundations to Design and Expansion Strategies, 15 November 2006, p23.



Table 5: Challenges for effective operation of biodiversity markets

Requirement	Challenges for a biodiversity platform
<p>Property rights must be well defined</p>	<p>The biodiversity “product” does not ordinarily exist in a market. Nor is there a nationally accepted product definition for biodiversity services. The product/s must be created and packaged.</p> <p>Biodiversity is a multifaceted service that varies with respect to location, type and quality.</p> <p>The fragmented nature of the market for environmental services across Commonwealth and state and local government arrangements creates considerable product complexity. This additional complexity imposes more search and transactions costs, creating another potential barrier to the participation of suppliers and buyers.</p> <p>“Commoditisation” of a product may be helpful to reduce search costs, but not absolutely necessary. For the market to be successful, it is more important that participants understand the products that are available to buy and sell without incurring large search/transactions costs.⁴⁶ If products are very different, then it will be more difficult to create matches and will increase search / transactions costs.</p>
<p>Participants in the market must trust each other</p>	<p>If the market is to work effectively, users must have certainty about what they are buying and selling. Otherwise, this makes it hard for buyers and sellers to find each other and reach an agreement.</p> <p>There is no established framework for monitoring and enforcing biodiversity outcomes to ensure you get what you pay for.</p> <p>The key issue is one of integrity associated with product definition and enforcement. How can you be sure the improvements in biodiversity you are paying for are real improvements (additionality)? How can you be sure they persist over time (permanence)? You need methodologies to help you determine a baseline and the improvement (as for the carbon market or a fishery) and monitor and enforce delivery of the service over time. Better suppliers may be willing to independently undertake some actions to signal their integrity (e.g. allowing independent auditing) but given the difficulty with monitoring commitments this is not likely to be sufficient.</p>

⁴⁶ This is somewhat analogous to markets for real estate. No one house (product) is like another. But matching platforms are useful because participants can readily assess and value the different attributes of property to fit their needs e.g. by suburb, no. of bedrooms, etc.



Requirement	Challenges for a biodiversity platform
Information must flow between buyers and sellers	<p>A useful platform will ensure that information flows about prices and quality available within the market.</p> <p>Information gaps cause a lack of trust, and increase search costs for participants (to find what they are looking for, at the lowest available price). This hinders trades.</p>
Competition should be fostered	<p>Markets will function more effectively with numerous buyers and sellers. This should be achievable in biodiversity markets as there are a range of potential suppliers, and governments and private participants as buyers</p>
Side effects should be curtailed	<p>Defining property rights in biodiversity accounts for the externality that would otherwise lead to under provision. But these property rights need to be clear and enforceable.</p>
The price structure must maximise participation and usage	<p>In initial stages, the challenge of a platform will be to create something to attract users to the platforms (e.g. information or trading opportunities) and facilitate innovation.</p> <p>This will almost certainly require the government to offer some liquidity to potential suppliers as a buyer of biodiversity. It will also require attention to platform prices, as pricing errors will hinder innovation and the usefulness of the platform. Free access to farmers may not be sufficient, of itself, to generate liquidity on the supply side if the benefits to participants of trading (including transactions costs) are insufficient.</p>

Source: Frontier Economics



6 What can we learn from other markets?

There is considerable scope to incorporate learning from elsewhere into the scoping study. This includes both existing biodiversity and environmental trading schemes and examples of the introduction of markets and platforms in other sectors. This section considers the lessons from other markets that are relevant for the development of a biodiversity services platform.

6.1 Compliance market: NSW Biodiversity Offsets Scheme

Market overview

The NSW Biodiversity Offsets Scheme provides a framework to avoid, minimise and offset impacts on biodiversity from development and clearing. The scheme ensures land used to offset impacts is secured in perpetuity. Developers and landholders who undertake development or clearing generate a credit obligation. This obligation must be retired to offset their activity. Landholders who establish a biodiversity stewardship site generate credits to sell to developers and landholders, offsetting activities at other sites.

The NSW Biodiversity Offsets Scheme is delivered through the Biodiversity Offset and Agreement Management System. The platform is managed by the Department of Planning, Industry and Environment (DPIE), where developers identify and purchase credits through the public register or through a broker. Alternatively, developers can pay into the Biodiversity Conservation Trust, who will take on the obligation to obtain and pay for credits. Credits are also assessed and monitored through the platform.

More detail on the NSW Biodiversity Offsets Scheme is provided in section 3.4.

Key lessons

There are several key learnings from the NSW Biodiversity Offsets Scheme:

- **A focus on “like for like” biodiversity offsets can be overly prescriptive and make matching buyers to sellers difficult.** The NSW Biodiversity Offsets Scheme deals with this through having an alternative should a buyer be unable to purchase like for like credits. In such instances a buyer can instead make a payment to the Biodiversity Conservation Fund. This fund, which is managed by the Biodiversity Conservation Trust, purchases biodiversity services.

According to the Biodiversity Conservation Trust’s Annual Reports in 2018-19 there was \$9.1m of payments in the Biodiversity Conservation Fund. By means of comparison the Biodiversity Offsets Scheme transactions register shows a total of \$7.0m of like for like credits sold with transactions covering November 2019 – September 2020. That is to say, around half the Biodiversity Offsets Scheme transactions (in terms of value) were required to undertake a two-step process: first seeking like for like credits, then entering into a transaction with the Biodiversity Conservation Fund. Discussions with stakeholders indicate many developers choose to establish their own biodiversity stewardship site and retire credits rather than participate in the scheme.



- **Transaction costs can be significant for biodiversity services trades.** Transactions costs for assessment and verification of biodiversity credits have been estimated at \$20,000-\$50,000 per site over a time period of 18 months for the NSW Biodiversity Offset Scheme.⁴⁷ This is only one cost associated with the NSW Biodiversity Scheme.

Transaction costs can compound for a developer or land clearer which impact on multiple fauna and flora. In such cases, to purchase like for like credits it is likely that it would be required to enter into agreements with multiple sellers and hence need to incur multiple transaction costs. Given that offsets are to maintain levels of biodiversity services, these transaction costs represent a deadweight loss from the point of view of society.

From the perspective of a potential seller, these transaction costs are likely to be a significant barrier to entering the market. First, there is a timing issue. Sellers incur an upfront costs in order to receive revenue from the sale of biodiversity sales in the future. A seller would need a high level of certainty around the timing and quantity of revenue to enter the market given the magnitude of these upfront costs. Second, as mentioned in section 4.1, the transaction costs would be likely to make it uneconomic for many landowners with potential biodiversity sites to enter the market.

- **Robust accreditation, measurement and verification arrangements are critical to market integrity (and participation).** The NSW arrangements, including the classification of biodiversity types, accreditation system, verification arrangements and payment system managed by the Biodiversity Conservation Trust are widely regarded to be high quality, giving integrity to the market. During discussions stakeholders referred to the NSW arrangements as the “gold standard” offset market. However, these arrangements can create barriers to entry that limit the participation of market participants.
- **Pricing approach may not reflect the economic value of biodiversity.** The sale of like for like credits is a market price as it is agreed between buyers and sellers. Given that the scheme is for offsets the implication is that this cost of a credit reflects the economic value of biodiversity to NSW. However, as biodiversity is a public good, the NSW community’s willingness to pay for biodiversity services is the best measure of value. The extent to which the market price agreed reflects the NSW community’s willingness to pay for biodiversity services would vary by transaction. Correspondingly, the extent to which an individual transaction reflects the economic value of biodiversity being offset would vary. The fixed price process used by Biodiversity Conservation Trust has the potential to act as a floor price and could deter potentially beneficial trades.

Victoria also has an offset system though the focus is more narrow, covering just native vegetation. Learnings from a review of the underlying native vegetation regulations is set out in **Box 8**.

⁴⁷ “Mining offsets in NSW” in Jeff Bennet (ed.), *Protecting the Environment, Privately*, World Scientific Publishing, Singapore, 2016.

**Box 8:** Review of the native vegetation clearing regulations in Victoria

The Victorian Department of Environment, Land, Water and Planning recently reviewed their native vegetation regulations including their offset market. A consultation paper from 2016 noted the following issues with the offset market:

- "Lack of readily available information in the offset market limits the ability of the market to function effectively. Many stakeholders involved in the offset market have indicated that more information is needed about current and future demand and supply for offsets, offset locations and offset prices."
- "There are costs associated with participating in the offset market. Set up costs for credit sites range from \$10,000 to \$20,000."
- "Stakeholders noted that the complex and changing offset rules act as a disincentive for potential offset providers to commit to setting up offset sites."

Since the review the Department has taken steps to address some of these issues. For example, they have moved away from a like for like requirement on all offsets to allow general offsets for general clearing. The Department have also created a high level calculator so potential sellers can better understand the likely value of their site.

Source: Department of Environment, Land, Water and Planning (2016), Review of the native vegetation clearing regulations: consultation paper

Relevance to a biodiversity platform

- Instead of an emphasis on like for like transactions, it may be more efficient to encourage greater use of offset payments, where developers are able to pay a prescribed amount into a government fund. The fund can then be used to purchase public good biodiversity outcomes on behalf of the community, a process that facilitates the strategic use of scarce conservation resources, while potentially lowering transaction costs for market participants.
- Mechanisms to simplify the market and reduce transactions costs are likely to maximise participation.
- There is a tension between simplifying the market arrangements to maximise participation, and providing the measurement and verification arrangements required to ensure market integrity.

6.2 Government tender: Queensland Land Restoration Fund

Market overview

The Queensland Land Restoration Fund was established relatively recently, with the first round of participants recently being contracted by the Queensland Government. The Land Restoration Fund facilitates landholders participating in the Emissions Reduction Fund by recognising and paying for additional co-benefits. The Land Restoration Fund contracts participants through a



tender process and purchases ACCUs at a rate higher than market price to account for the additional co-benefits. Co-benefits currently recognised by the LRF funding rounds include:

- First Nation co-benefits: including outcomes on indigenous land or for indigenous employment.
- Environmental co-benefits: including soil health, native vegetation, threatened species and ecosystems, wetlands and Great Barrier Reef outcomes.
- Social co-benefits: such as employment, community resilience and environmental connectivity, diversity and human rights outcomes.

Key lessons

Initial learnings from the first round of the Queensland Land Restoration Fund include:

- **Integrity of monitoring and evaluation is a key driver of prices in the market.** As discussed in Section 4, the integrity of monitoring is often the only mechanism available for buyers to observe quality differences in biodiversity sites. The premiums offered under the Land Restoration Fund are much higher (approximately 100% more) than similar ACCUs on the voluntary market which informally offer co-benefits (such as Savannah Burning). This is likely due to confidence in the integrity of validating and monitoring outcomes under the Land Restoration Fund. Participation in the Land Restoration Fund uses third party verification where there is not a direct link between the project type and the claimed co-benefit. These co-benefit verification requirements are in addition to the measurement, reporting and verification requirements under the Emissions Reduction Fund.⁴⁸ This additional integrity provides greater transparency and assurance on the quality of outcomes. With this said, greater integrity comes at a cost for landholders and may not be the most appropriate option in all cases.
- **A key driver of participation for landholders is the opportunity cost of land.** As noted in Section 4.1.5, the supply of biodiversity services often requires permanence of biodiversity outcomes, effectively writing off land from productive use. For landholders, the decision to supply biodiversity services requires the returns from biodiversity services to at least cover the opportunity cost of using this land, reflected in the value of the land written off when the site is established. Under the Land Restoration Fund, participation has occurred in more productive areas (such as coastal regions with higher rainfall) compared to the Emission Reduction Fund reflecting the characteristics of the scheme and that the price premiums for co-benefits are sufficient to cover the higher opportunity costs of land. This indicates that, for participation to occur in more productive areas (where biodiversity investment is often most needed), a higher price is needed for it to be economic to offer biodiversity services in these places.
- **The service industry plays an important role in facilitating the supply of biodiversity services.** The majority of participants in the first funding round of the Land Restoration Fund had some role for service providers such as consultants, brokers and investment partners.

⁴⁸ Proponents can also elect to use proponent driven assurance, which is expected to command a lower price on the market



Participants included smaller landholders in partnership with service providers, conservation trusts, First Nation providers and service providers as the primary participants.

Relevance to a biodiversity platform

- There is capacity to staple the delivery of carbon and biodiversity services.
- There is a broader question around the costs of engaging the service industry and the broader trade-off between ensuring integrity of biodiversity services and having overly onerous requirements which limit supply.
- There may be an ongoing role for service providers in facilitating participation in biodiversity markets.

6.3 Compliance market: UK offset markets

Market overview

The UK offset markets is largely driven by local planning authorities. Whilst attempts have been taken to standardise measurement under one framework⁴⁹, offset requirements and measures still differ significantly between jurisdictions. Given the variety of offset measurements and requirements across the UK, there is no consistency for landholders to access these schemes efficiently.

This has given rise to sophisticated brokers and service providers to match developers and landholders. One such example is Environment Bank, which helps match developers with landholders, calculate obligations for developers and overseeing development of offset sites.

Key lessons

- **There are incentives for service providers to maximise participation.** Service providers such as brokers have commercial incentives to maximise participation in the market. This in turn provides incentives to minimise transaction costs between the developer and landholder providing biodiversity credits. In the UK where biodiversity offset brokers are more developed and competitive than in Australia, brokers have additional incentives to provide the best value offering to clients.
- **There is merit to learn from the private sector to maximise participation.** Given the incentives of service providers to maximise participation, there are learnings we can take from their approaches to reduce transaction costs. One approach from the Environment Bank is how they maximise participation from landholders.⁵⁰ Landholders submit an expression of interest to the Environment Bank. If a developer approaches the Environment Bank with an offset requirement, the Environment Bank contacts potential landholders of the opportunity and matches the developer to a potential site. This is in contrast to offset schemes in Australia in two ways:

⁴⁹ For example, DEFRA biodiversity metrics, Available at: <https://consult.defra.gov.uk/natural-england/the-biodiversity-metric-2-0/>

⁵⁰ The Environment Bank, Landowners, How does it work?, Available at: <https://www.environmentbank.com/landowners/>



- The upfront burden for landholders to express interest in the market is reduced into a number of smaller steps
- It reduces risks for landholders as investments into the biodiversity site are only made once matched with demand

Relevance to a biodiversity platform

- There can and will be a role for service providers in the market to overcome transaction costs. Having a market that promotes competition from these service providers can benefit all participants
- The platform can look to service providers in Australia and internationally to inform features that assist in matching and reducing transaction costs for both landholders and those who demand biodiversity services.

6.4 Carbon and renewables markets in Australia

6.4.1 Renewables power purchase agreements

Market overview

The renewables power purchase agreement market in Australia is a subset of the electricity market. Buyers who need to buy electricity to meet their needs choose to do this by entering into agreements with renewable generators, rather than buying electricity from non-renewable generators. Buyers including corporates voluntarily enter into 5-15 year power purchase agreements with renewable electricity generators to buy renewable electricity, often at a premium to the market price.

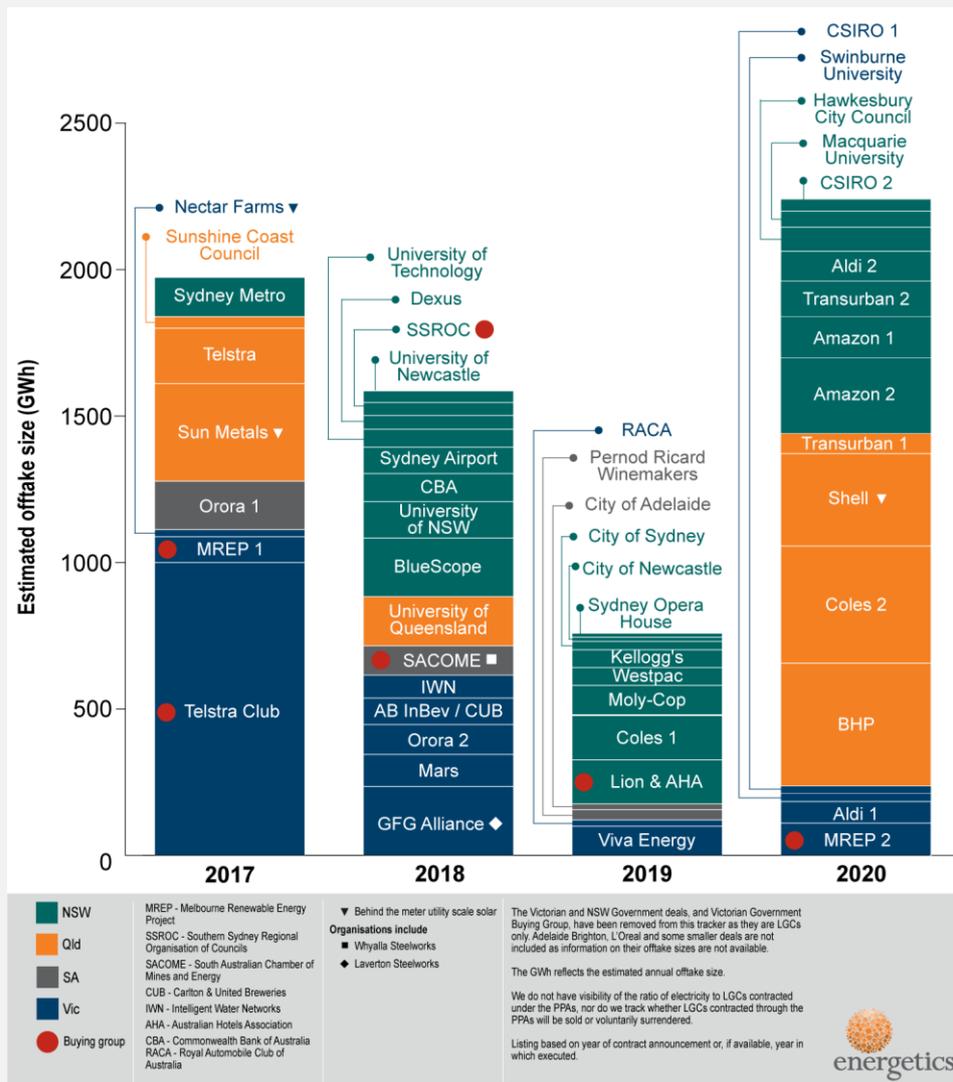
In the first phase up to 2015, when renewable energy was considerably more expensive than other electricity, electricity retailers accounted for most buyers, largely to meet mandatory compliance obligations (see **Box 9**). More recently from 2016, renewable energy has become more cost competitive as the capital cost of renewable technologies has fallen, with more corporates directly contracting in renewables power purchase agreements. The premium for renewables is now very small, with renewables at a very similar cost to black energy.



Box 9 : Corporate PPAs in Australia’s electricity market

Corporate power purchase agreements (PPAs) first appeared in Australia’s electricity market in 2010. Corporates paid a significant premium at this time to voluntarily enter into corporate PPAs to purchase renewable energy in the pursuit of strategic objectives. These were mostly government bodies and regulated businesses.

The number of corporate PPAs increased substantially from 2017. This reflected very high wholesale energy and LGC prices at the time, together with the large number of new renewables projects coming into the market as technology prices fell. Purchasers of corporate PPAs include universities, governments, not-for-profits and large corporates.



Source: Frontier Economics and energetics

Key lessons

- **Compliance driven demand has been important in supporting investment required to deliver supply.** Many renewables projects sign for part of a project with Government or electricity retailers seeking to compliance requirements. This Government and compliance



demand provides support and financial credibility to the renewables project. The renewables project can then sell the remainder of its capacity to corporates in the voluntary market.

- **There is a successful market in renewables power purchase agreement without a facilitated market.** Renewables power purchase agreements are negotiated bilaterally between buyers and sellers. There is limited market transparency around prices and contract terms and conditions.
- **There is some corporate demand for a premium product**, in this case clean energy (similar to corporates buying ACCU's delivering biodiversity). However, this demand is relatively limited compared to the total demand for electricity and the renewable premium is relatively small as renewable costs have become increasingly competitive.

Relevance to a biodiversity platform

- While there is some corporate demand for a premium product electricity is a product required by many corporates (whereas biodiversity is not), and electricity represents a relatively small proportion of total costs for renewable power purchase agreement corporate buyers.
- The wholesale electricity market provides integrity to the renewable power purchase agreement market. However, renewable energy is relatively straightforward compared to biodiversity – it is homogenous and there are no issues of permanence or additionality.
- It is not necessary to have a trading platform to have a successful market. All corporate renewable power purchase agreements are entered into via bilateral negotiation (sometimes involving buyer groups) as opposed to a central trading platform.

6.4.2 Carbon offsets in Australia

Market overview

Individuals and companies can offset their carbon footprint by purchasing **carbon offsets** for emissions avoided or stored by a project. Offsets are usually project specific and each unit reflects a reduction in emissions (known as a carbon credit) relative to a hypothetical baseline. There are various standards of verification of offsets. Voluntary offsets (a credit for reducing emissions) differ from mandatory carbon trading schemes where units must be acquitted for every tonne of emissions (an allowance to emit, which is reflected as a charge, penalty or tax).

In Australia, participation in the carbon offset supply market is voluntary and facilitated through the Emissions Reduction Fund (ERF). This is a fund for the Australian Government to buy abatement from eligible projects. Certificates for emissions reductions are known as Australian Carbon Credit Units (ACCU's). ACCU's are issued by the Clean Energy Regulator. Eligible activities can come from a broad range of sectors in the economy, although, to date, most projects have been from the land, agriculture and waste sectors.

The sources of demand to buy ACCU's include:

- **Emissions Reduction Fund** auctions: The Federal Government allocates a budget for purchasing abatement credits at regular auctions.
 - Project proponents submit confidential bids to the **Clean Energy Regulator**, offering to supply a quantity of ACCU's for a nominated price



- The regulator will accept the lowest 80 per cent of bids below a 'benchmark price', which will not be disclosed to participants
- There have been 11 auctions so far, with an average clearing price of \$12.19/tCO₂.
- A **Safeguard Mechanism** applies baselines to high emitters (above 100 kilotonnesCO₂) and requires ACCU to be surrendered for emissions above the safeguard. This ensures that emissions offsets purchased through ERF projects are not cancelled out by significant increases in emissions in other sectors/industries. This is mandatory for liable parties that exceed their baseline.
 - Currently the baselines are relatively weak, which means low demand for mandatory permits. However, this obligation could be strengthened to potentially reducing the baselines, which would require much more mandatory abatement purchases from large emitters.
- **State and Territory Governments** can buy and surrender ACCUs.
- **Voluntary purchases** to offset emissions.

Table 6 shows the ACCU demand by type (million ACCUs): almost all is contracted through the ERF, though voluntary demand is growing. Government demand from outside the ERF, including from government owned corporations, is an important component of voluntary demand.

Table 6: ACCU demand (millions)

			2016–17	2017–18	2018-19
ERF contract deliveries			13.29	10.92	10.17
Safeguard mechanism*	0.38	0.15	0.06		
Voluntary demand (including non-ERF government purchases)			0.14	0.36	0.38

* Safeguard Mechanism ACCU surrenders are reported in the financial year in which the surrender obligation arose. The surrenders do not include 'deemed surrenders'.

Source: Frontier Economics, using data from the Clean Energy Regulator.

Average prices of ACCUs in the voluntary market (outside of ERF auctions) are typically around \$15-16/tCO₂. This reflects a small premium on ERF auction prices.

Companies can also purchase international and private offset products. To be carbon neutral certified, these must comply with the **Climate Active Carbon Neutral Standard** (previously known as the National Carbon Offset Standard). Eligible units must all be later than 2012.

Options include:

- ACCUs (above).



- Certified Emissions Reductions (CERs) issued as per the Kyoto Protocol from Clean Development Mechanism projects. These are project based credits in developing countries. There are some exclusions for those associated with nuclear or large scale hydro.⁵¹
- Removal Units (RMUs) issued by a Kyoto Protocol country on the basis of land use, land-use change and forestry activities under Article 3.3 or Article 3.4 of the Kyoto Protocol.
- Verified Emissions Reductions (VERs) issued by the Gold Standard.
- Verified Carbon Units (VCUs) issued by the Verified Carbon Standard (VCS).

The recognised international and private offsets are generally between priced at USD0.2-5/tCO₂, which is cheaper than ACCUs. Currently, CERs are trading at around EUR0.3/tCO₂. However, some companies prefer to buy higher priced ACCUs due to either a higher perceived quality or due to a preference to support domestic industry.

Key lessons

- **Prices vary to reflect the certainty and method of abatement.** There are a wide range of international credits and allowances. Each scheme has different eligible activities and verification standards which means a difference in perceived quality: it is important that emissions reductions are accurately measured, additional (i.e. a reduction in emissions that would not otherwise have happened) and permanent (e.g. a forest remains in place store carbon). Some third party voluntary verifiers have higher standards to ensure abatement is legitimate and permanent, which usually means these credits have a higher value.
- **There is voluntary demand for environmental products, although this is a relatively limited proportion of demand.** Many corporates choose to offset their carbon footprint using offsets. Although international offsets are cheaper, many companies often prefer to buy domestic offsets due to either a higher perceived quality (of verification) or a preference or requirement to support local industry.
- **Although there is a common unit, prices vary to reflect the type.** Although there is a common unit traded – carbon – there is still significant price variation to reflect the perceived quality of the carbon unit. Buyers are willing to pay a premium for carbon products which deliver co-benefits including biodiversity benefits.

Relevance to a biodiversity platform

- Voluntary buyers are willing to pay a premium for products with robust accreditation and verification processes.
- Methodologies can be developed to establish measurement and verification arrangements for environmental products.

⁵¹ For a full list see: <https://www.environment.gov.au/climate-change/government/carbon-neutral/publications/ncos-appendixa>



6.5 Matching platforms

6.5.1 eBay

Market overview

eBay is a matching platform that matches buyers and sellers of consumer goods.⁵² Originally, this was predominantly via auctions, although most trades now occur at fixed prices. Trades on eBay match buyers and sellers of a wide range of products, but these are usually well known consumer items.

Key lessons

The major challenge which eBay had to overcome to become a successful marketplace matching millions of buyers and sellers was platform trust and reliability:

- Many sellers were not “brick and mortar” stores with established reputations. Buyers would only buy from them if they could be trusted to deliver the products in good order and on time.
- In turn, sellers wanted assurance and fast payment from buyers.

eBay used two important mechanisms to increase trust and reliability:

- To facilitate trust in payments, eBay acquired PayPal, which acted as an intermediary to guarantee payments. (In its early days most payments were made by cheque or money order).⁵³
- To facilitate trust in purchasing, eBay created a ratings system by which sellers and buyers rated each other based on past transactions.⁵⁴ This has undergone significant evolutions over time as users have adapted behaviours to reduce the information content of ratings.⁵⁵

A further interesting feature of eBay is the evolution of its market from predominantly auctions to predominantly fixed prices. According to Roth (2015), this is due to the speed advantages of fixed price sales. Auctions can be efficient, but they involve delay and search costs on the part of the buyer (for example, if the item is not acquired the first time).

Relevance to a biodiversity platform

- Getting both sides on board means creating trust and keeping transactions costs low.
- Auctions may be efficient, but increase transactions costs and delay compared to “buy now” markets at fixed prices.

⁵² www.ebay.com.au

⁵³ <https://www.cnet.com/news/ebay-picks-up-paypal-for-1-5-billion/>

⁵⁴ Alvin Roth, Who gets what - and why, 2015, pp. 104-105, pp. 117-119.

⁵⁵ For example, eBay initially allowed ratings from any user, but this was later restricted to only the supplier and buyer to increase integrity.



6.5.2 Dating platforms

Market overview

Dating platforms using apps or websites⁵⁶ seek to match couples based on information revealed in a user profile. A dating platform is a pure matching platform, in the sense that there are no priced transactions between buyers and sellers. Users send messages to other users to interact, and platforms charge for the ability to contact other users and for other value-added features (such as access to photos).

Dating platforms are somewhat different from transaction-based exchanges (such as a share exchange). Dating platforms do not offer a transaction to either side as its product. Instead the product that it offers to both sides is the opportunity to find a match (and hence to transact off-platform), so these platforms use access (membership) fees.⁵⁷

Key lessons

Like other exchange platforms, platform operators face challenges about how to attract buyers and sellers, due to cross-network effects (more sellers is good for buyers).

A strategy of dating sites is to make participation low cost. For example, eHarmony allows users to sign up, receive matches and view profiles at no charge. Paid membership is required to make contact and view photos of compatibility matches. RSVP offers free basic services and sells memberships and “stamps” that are required to make contact with other users.

A second feature of dating platforms is the use of matching algorithms that make successful matches more likely. Once these platforms are well established, choices for users becoming overwhelming, and many matches will be incompatible. Platforms use combinations of simple filters (e.g. location based), preferences (e.g. hair colour) and more complex filters (e.g. user profiles) to generate more suitable matches.

Relevance to a biodiversity platform

- Keep participation and other transactions costs low to increase liquidity and benefit from network effects
- Algorithms to increase the frequency of possible matches may be required to reduce transactions costs.

6.5.3 Share exchanges

Market overview

Share exchanges were developed as an efficient means to (physically) bring together buyers and sellers of equity in companies. Exchanges have traditionally operated as continuous open auction systems - with options to buy and sell. Exchange trades occur on a “first come, first” served basis.

Key lessons

Share exchanges offer many relevant lessons about market design. Three pertinent ones are:

⁵⁶ The two largest in Australia are e-Harmony and RSVP.

⁵⁷ OECD, Rethinking Antitrust Tools for Multi-Sided Platforms 2018, p.13.



- Share exchanges tend to have complex rules around trading to maximise market thickness. Share exchanges are highly efficient when they are thick - where there are lots of buyers and sellers offering market liquidity. Liquidity here refers to the ease of trade without a price impact. This requires depth in volume and bid/offer prices.

Key rules that maximise thickness include designated trading hours and limitations around trading off-exchange, as well as disclosure rules. Disclosure rules maximise thickness because they ensure the flow of information. For example, listed firms are subject to continuous disclosure rules (to provide confidence to buyers that they are not only trading with sellers better informed than they are) and all trades must be reported to the exchange to ensure prices are not 'stale'.

- Traders can be motivated to not trade off the exchange if there is insufficient liquidity. This can harm the usefulness of the main exchange if not managed appropriately. For example:
 - Over the counter markets: not prominent in Australia, but widely used for illiquid shares in the United States. Traders (market makers) provide liquidity by taking positions on their own account. These trades tend to have worse terms of trade than exchange trades, which is a cost of illiquidity. OTC traders are usually subject to information disclosure requirements and "best execution" requirements to ensure they act in the interests of buyers/sellers⁵⁸.
 - Dark pools: side-markets have developed for anonymous trades of large share blocks to reduce price effects that can be associated with such trades. Buyers and sellers use "dark pools" (so called due to their limited transparency) which act like a bulletin board at which buyers and sellers can express interest in transactions, and then enter individual negotiations. Notably, these transactions can lessen the information value of prices on the main exchange.⁵⁹
- Exchange trading rules continuously evolve. Opportunities for profit mean that rules are exploited by traders, and to promote the interests of all users market rules need to adapt.⁶⁰

Relevance to a biodiversity platform

- If the platform is to be useful, capturing liquidity is critical. This will require attention to the specific rules of trading, including what and when trades can occur.
- If the platform is not liquid, other means of trading may emerge. These trading methods tend to have downsides. If such trades are allowed, rules will be needed to manage these downsides, such as information disclosure.

⁵⁸ See <https://www.otcmarkets.com/learn/market-101/regulation> and <https://www.otcmarkets.com/learn/finra-sec-rules>.

⁵⁹ Exchanges have now started offering such products. For example, the ASX offers 'Centre Point', which offers "Australia's only dark pool matching system which can offer this true integration with the lit market. It's this access which sees around 8% of on-market trading being directed through ASX Centre Point." See <https://www.asx.com.au/services/trading-services/>

⁶⁰ Roth (2015) provides the example of high speed algorithmic trading. As electronic order books on US exchanges priorities orders by time, and then by price, returns can be earned from being first to trade on news. But trading on the basis of speed to market instead of price offered is inefficient and wastes resources in "being first". Rules to change how trading occurs (e.g. to limit trading to once a second, and priorities orders by price) could increase liquidity and market efficiency. See Roth, op. cit. pp. 82-89.



6.5.4 Real estate platforms

Market overview

In the last 20 years, online real estate platforms have changed the nature of search for real estate. Websites such as realestate.com.au and domain.com.au allow buyers and sellers to browse and list real estate, and offer customisable searching options to reduce search costs to defined geographic regions and types of properties.

No or very few trades are undertaken on such platforms. While real estate has long been seen as ripe for disintermediation by platforms, none has had large scale success in doing so. Real estate agents (brokers) are still relied on for market transactions.

Key lessons

Real estate is an interesting platform model because it has only been partially disrupted by digital technologies:

- Internet-based platforms are widely used for searching and listing of real estate
- Brokers (real estate agents) are widely used by sellers of real estate to arrange transactions with buyers, even though this involves commissions (transactions costs for sellers) of 2-5% of sale value.

Product complexity and value help to explain this market structure. Internet platforms have markedly reduced search costs for buyers. But complexity means that it is not feasible to run simple auctions of multiple quantities at set times as for products like shares; rather, each property is sold separately as each has unique characteristics. There is a role for a skilled broker to bring together buyers and the seller in such a way as to maximise buyer competition, which benefits the seller. The broker may use multiple mechanisms to produce that competition e.g. open auctions, sealed bid tenders, closed auctions, etc.

Relevance to a biodiversity platform

- Real estate is a market with high value and differentiated products. Real estate markets are reasonably efficient, even though use of brokers (real estate agents) is widespread. Brokers tend to be active in such markets because the transactions costs of engaging with informed brokers is relatively low (in comparison with the size of the average transaction). This may not be true for biodiversity markets, which are differentiated and complex but relatively lower value.
- Online platforms are restricted to identifying buyers and sellers, and use algorithms and filters to help buyers identify possible matches with sellers. The platforms themselves do not host trades and so the liquidity produced by these markets is for the efficient searching (and for which platforms receive fees from sellers). This may be relevant to a biodiversity market platform; it need not host trades but may have value as a mechanism to assist matches organised by brokers.

6.6 What can we learn from other markets?

Figure 11 summarises the lessons from other markets, which are discussed in more detail below.



Figure 11: Lessons from other markets



Source: Frontier Economics

There are many types of platforms – and not all host transactions

There are a wide range of platforms. Some platforms host transactions, but this is not necessary for successful market outcomes. Large platforms have many sides linked by common data, for example user data. This can provide the basis for other services and transactions. Platforms can use algorithms and filters to help buyers identify possible matches with sellers. This can reduce search costs without hosting trade.

Promoting liquidity will be particularly important for biodiversity services

Liquidity offers market participants good trading terms. But complexity creates search and transactions costs that hinder market liquidity. Arrangements that can maximise liquidity will be therefore be important to a functioning biodiversity platform. For example:

- Mechanisms to simplify the market and reduce transactions costs are likely to maximise participation
- Attracting users to the platform through functionality or government support
- Creating trust in the platform through supporting arrangements or government participation
- Allowing some flexibility in biodiversity trading, for example like for better transactions.

Verification, measurement and reporting arrangements are important for market integrity, but add complexity

There is a tension between simplifying the market arrangements to maximise participation, and providing the verification, measurement and reporting arrangements required to ensure market integrity. There is evidence of demand for a wide range of biodiversity services – including ACCUs delivering co-benefits and specific biodiversity services within defined geographic regions.

Achieving harmonisation across jurisdictions will be difficult

The jurisdictions have well-developed offset schemes and arrangements for purchasing biodiversity services, including the Queensland Land Restoration Fund and NSW Biodiversity Conservation Trust. There are significant differences in the coverage, eligibility requirements, administration arrangements, trading and recording systems and verification, monitoring and



reporting requirements. Achieving harmonisation across the offset schemes and purchasing arrangements is likely to be very difficult in practice. The jurisdictions have invested in bespoke arrangements and are unlikely to be willing to harmonise without incentives to participate. Precedents from other industries, including energy and water, suggests achieving harmonisation across jurisdiction to support a coherent national platform is likely to be costly and time consuming.

There is likely to be an ongoing role for service providers in the biodiversity services market

The likely continuation of fragmented jurisdictional arrangements raises the likelihood the biodiversity services market will remain fragmented and complex moving forward. The complexity of the biodiversity services markets means service providers are likely to play an ongoing role in the market. Service providers facilitate the participation of market participants in many other markets, using expertise to navigate complexity and aggregating products and services.

Voluntary demand is likely to remain uncertain

The experience of renewable power purchase agreements suggests there is scope for voluntary demand. However, electricity is a product required by most corporates and represents a relatively small proportion of total costs.



7 Options for a biodiversity platform

This section sets out three options for a biodiversity platform. These options have been developed using our understanding of the problem and opportunity, insights from other markets and drawing on our expertise on markets and platforms.

In the following sections 7.1-7.3 we describe three key platform options (see **Figure 12**) ranging from a simple information portal to a highly developed trading exchange. The lessons from other markets demonstrate it is not necessary to have an exchange to improve market outcomes. We therefore consider options that involve increased information provision, without hosting trade. The nature of biodiversity services means spatial information can be used, which is likely to be attractive to both buyers and sellers, and provides a strong basis for innovation. We therefore also consider an option that uses a spatial registry. Finally, we explore an option that involves using an exchange to improve trading opportunities for biodiversity services. Option 1 and to a greater extent Option 2 are consistent with an innovation platform, while Option 3 is more consistent with a transaction platform.

Figure 12: Options for a trading platform



Source: Frontier Economics

In section 7.4, we consider how a biodiversity platform fits within the broader set of measures needed to address the problems we have identified.

7.1 Option 1: Information portal

The information portal will provide a single source of information for buyers and sellers

This option involves the development of an information portal. The information portal will provide a single source of information for buyers and sellers across all biodiversity services markets in Australia (both compliance and voluntary). The aim of the portal will be to reduce search and transactions costs for both buyers and sellers by providing greater transparency on the current markets for biodiversity services.



The information portal would have limited functionality

The information portal will include information for current and potential participants in biodiversity services markets in Australia. These participants may include buyers, sellers and service providers.

The information portal would not attempt to harmonise the many definitions of biodiversity services and the range of accreditation, monitoring and enforcement arrangements. Systems could be developed – for example star ratings – to promote trust, enabling users to compare the potential cost and quality of compliance regimes.

The information portal would not have the functionality to execute trades. Buyers and sellers can post bids and offers, or expressions of interest, associated with proposed terms and conditions. Trades can take place off-line through existing mechanisms including direct transactions, government tenders and offset schemes.

The information portal could provide a platform for additional functionality to be added over time. The platform could act as an innovation platform, although this may be limited by the functionality of the platform.

The information portal will signpost existing compliance and voluntary markets

The key elements of the portal from a user perspective could involve:

- Signposting to existing schemes, including for example:
 - Details about and links to biodiversity offset schemes like the NSW Biodiversity Offset Scheme
 - Details about and links to government tenders for biodiversity services and other land based environmental services like the Emissions Reduction Fund
 - Case studies on voluntary market participation.
- Tools and guidance to facilitate market participation, including:
 - An introduction to trading biodiversity services for new participants
 - Information about eligibility, accreditation, verification and monitoring arrangements, including a comparison of different regimes and information about the potential cost of complying with these arrangements
 - Standardised agreements
 - Revenue estimators.
- A bulletin board for buyers, sellers and service providers to provide bids and offers (or expressions of interest) for biodiversity services with defined characteristics. These characteristics could include land area, activity (protection or restoration), type (flora, fauna, etc), geographic location and quality (based on a description of land or a more systematic assessment using an established methodology).

The information portal would be public information able to be accessed by any interested parties. However, a verification process could be used to screen bulletin board posts to ensure genuine participants.



There are few additional information requirements for this option

The information portal does not have any specific information requirements. This option is focused on consolidating existing and future information about biodiversity services. There is likely to be benefit from preparing additional material, for example introduction to the market guides, to assist new market participants navigate the biodiversity services market.

Some additional resources are required to develop this option

Funding and support will be required to clarify user requirements, prepare a specification and develop the information portal. Consultation and promotion may be required to develop support for the portal and increase awareness of the portal to maximise participation and the associated benefits. Ongoing support will be required to ensure the platform is up to date and verify and monitor bulletin board participants.

This option could add to rather than reduce complexity

Care will need to be taken to increase transparency and reduce search and transaction costs, rather than increase information and complexity. The lack of standardisation of existing markets including terminology, measurement, accreditation, monitoring and enforcement may confuse and deter potential participants. There is a risk the information portal could become out-of-date and lose integrity if information is not updated appropriately. The fragmented nature of the market, the lack of consistency between jurisdictional compliance markets and other barriers to participation may limit the value in transparency.

Government or an independent entity could develop and support the information portal

Governance arrangements will be important to ensure the portal has integrity. However, given the limited role of the portal extensive governance arrangements are not required. The information portal could be developed and supported by government or an independent entity (provided that conflicts of interest could be avoided). A Government-run platform may add legitimacy, but is not necessary.

7.2 Option 2: Spatial information portal

The spatial information portal supports government trade and uses digital technology to add a geo-spatial registry

Like Option 1 this option involves the development of an information portal providing a single source of information for buyers and sellers across all biodiversity services markets in Australia (both compliance and voluntary) with the aim of increasing transparency. This option involves expanding on the information portal (Option 1) so that the portal includes a spatial registry which records trades and facilitates searching for suppliers of biodiversity services. It is also assumed the Commonwealth Government would use the bulletin board and spatial registry for its own biodiversity services programs. This would add integrity to the portal.

The spatial registry expands the functionality of the spatial information portal

The spatial information portal will include information for current and potential participants in biodiversity services markets in Australia, in the same way as the information portal. It would not have the functionality to execute trades, which would continue to take place outside the portal. Like the information portal the spatial information portal could provide a platform for additional functionality to be added over time.



The functionality of the portal will be expanded by a spatial registry. The spatial registry will build on existing geospatial information relating to biodiversity to:

- provide a record of sites which have been sold for biodiversity services to support the integrity of the markets
- map and model flora, fauna and ecosystems (and potentially also carbon) across Australia to allow identification of potential supply of biodiversity services.

The registry could make it easier for sellers to identify the services they could provide and for buyers and service providers to identify potential sellers of biodiversity services. For example, government or voluntary buyers could identify gaps in locations for biodiversity services and undertake targeted purchasing to develop biodiversity corridors. This capacity to group biodiversity service delivery spatially has the capacity to amplify the biodiversity outcomes achieved. This will enable better use to be made of government, voluntary and philanthropic resources. Similarly, sellers of biodiversity services could screen opportunities by location. This would enable a farmer in the Darling Downs to identify potential opportunities without needing to investigate each scheme in turn.

[The spatial information portal will signpost existing markets, support government purchasing and be underpinned by a registry](#)

From a user perspective, the spatial information portal will:

- Signpost to existing schemes, including for example:
 - Details about and links to biodiversity offset schemes
 - Case studies on voluntary market participation.
- Provide other tools and guidance to facilitate market participation, including mapping and modelling tools and information about eligibility, accreditation, verification and monitoring arrangements.
- Include a bulletin board for buyers, sellers and service providers to provide bids and offers for biodiversity services with defined characteristics.
- Provide a portal to access Commonwealth Government purchases of biodiversity services. This could be via the bulletin board.
- Be supported by a registry that records transactions and facilitates searches.

As for the information portal this option would be able to be accessed by any interested parties, including searching the registry. A verification process could be used to screen bulletin board posts to ensure genuine participants.

[Appropriate technology and systems are needed to ensure the integrity of registry data](#)

This option can build on existing information, including geospatial mapping and modelling of flora, fauna and ecological communities, to support a registry. The registry will record:

- Baseline data for location, land area and quality
- Any pre-existing accreditations of locations
- Biodiversity trades tied to location, land area and quality



- Delivery of biodiversity services at each location based on verification.

The registry could also include data from the National Carbon Accounting System and Emissions Reduction Fund to facilitate the uptake of carbon projects and integration of the carbon and biodiversity markets.

A process will need to be developed to facilitate the collection of information for the registry and ensure the integrity of registry data. Managing privacy while promoting transparency will be another key consideration.

A spatial information platform provides a strong basis for innovation

A spatial information platform provides a good basis for a multi-sided innovation platform, provided it is an open system and the pricing policies accommodate user access and development of new solutions. The geospatial data provides valuable support for the development of complementary trading systems. This could include the development of transaction based services by other parties, including other jurisdictions.

Interoperability issues could be a barrier to the development of a registry

The intent is for the spatial information portal to act as a single information portal for publishing biodiversity market and trade information, without executing trades. Interoperability with other platforms, including state based arrangements and other information portals (including for example Marketplace for Nature and the Emissions Reduction Fund), will be key. Achieving interoperability may be difficult depending on the nature of the technology supporting private and state based arrangements, and the willingness of jurisdictions to cooperate in the development of the spatial information portal and registry.

The participation of the Commonwealth Government is a key enabler for the spatial information portal

A structured and ongoing approach to participation of Commonwealth agencies as active users of the bulletin board and spatial capabilities will be critical to the success of the portal. Commonwealth Government support can be expected to:

- Provide legitimacy to the platform
- Attract participation to the platform
- Facilitate the ongoing development of the platform in response to feedback from stakeholders on functionality and the user experience.

Participation from other jurisdictions will further boost the success of the information portal.

A more structured approach to governance is required to support the registry

A more comprehensive governance approach will be required for the spatial information portal to:

- Ensure the integrity of the information in the registry and protect the privacy of participants
- Ensure the integration of relevant federal, state, regional and local datasets
- Ensure the integrity of the spatial information portal to ensure it is appropriate to support Commonwealth Government biodiversity purchasers.



It may be possible to set up separate governance arrangements for the registry which could then be accessed by the spatial information portal and competing portals.

7.3 Option 3: Exchange

[This option provides a single clearing market for defined biodiversity services](#)

This option involves the development of a clearing market for defined biodiversity services. This option would retain the information portal and registration functionality of option 2, in addition to operating a clearing market. The market would cover the entire market for biodiversity services, including government purchasing, compliance and the voluntary market.

The success of this option would be contingent on capturing sufficient liquidity to ensure the biodiversity services market is able to operate efficiently. This is likely to require the participation of large stakeholders, including governments purchasing biodiversity services and compliance demand. The platform could also support the purchase of any land management services, including for example salinity management, rather than being limited to biodiversity. State governments could also use the platform to support their offset schemes and magnify their environmental expenditure.

Other market participants that enter into agreements outside the exchange could be encouraged or required to notify the exchange of trading information. This information is necessary for the bids and offers on the exchange to be fully reflective of supply and demand conditions.

[The exchange would match bids and offers, set market clearing prices and settle trades](#)

The exchange would enable buyers and sellers of biodiversity services to place bids and offers for specified biodiversity products in defined trading periods. The platform will match supply and demand given bids to buy and offers to sell biodiversity services and establish a market clearing price or set of prices for biodiversity services. Market participants would be able to make bids/offers for specific biodiversity services or specify a budget constraint over a series of biodiversity products.

To maximise liquidity, we envisage that trading would be held in sessions rather than continuously. Each trading session would include multiple rounds with the opportunity for participants to adjust their bid/offer price to facilitate market clearing. If necessary a market maker may intervene in the market to facilitate clearing (for example by buying more valuable alternatives to the products demanded).

The exchange will register and settle all trades. This may include for example accepting lump sum payment from buyers and making annual payments to suppliers dependent on verification that services have been delivered.

In addition to this market clearing functionality the exchange will provide an information portal and a spatial registry as per Option 2.

[The exchange platform will have advanced capabilities to capture and share real time information](#)

In addition to providing information about biodiversity services and including a registry of trades and opportunities this option involves an exchange similar to a share market. Sellers can enter offers to sell for a defined product or set of product. Sellers are able to set a floor price for a defined product or a minimum payment across a set of products. Buyers are able to set a bid



price and quantity sought. Both sides can see historic data from previous trading sessions, including product definitions, volumes and prices.

There are significant information and governance requirements for this option, which will add to complexity

Implementing the exchange requires a range of infrastructure including:

- Eligibility and accreditation arrangements
- Verification of the quality and quantity of the biodiversity service product being offered for sale and ongoing monitoring. The work currently being undertaken by the Department under the Agricultural Stewardship Scheme provides a potential mechanism to support this.
- Market systems and algorithms to enable bids and offers to be submitted and the market cleared
- Settlement information and arrangements.

The enabling infrastructure required to support the exchange will be significant

There is significant work required to design and establish the systems and processes for an exchange. Time will be required to establish arrangements for the registration of buyers and sellers, develop the methodologies for measuring for biodiversity services, establish the accreditation and verification arrangements, develop the spatial registry, design and implement an auditable trading system and robust settlement system and establish and operate compliance and audit systems for monitoring sites which have been sold. Independent governance arrangements will need to be developed to ensure the integrity of the exchange. Legislative change may be required to introduce these arrangements.

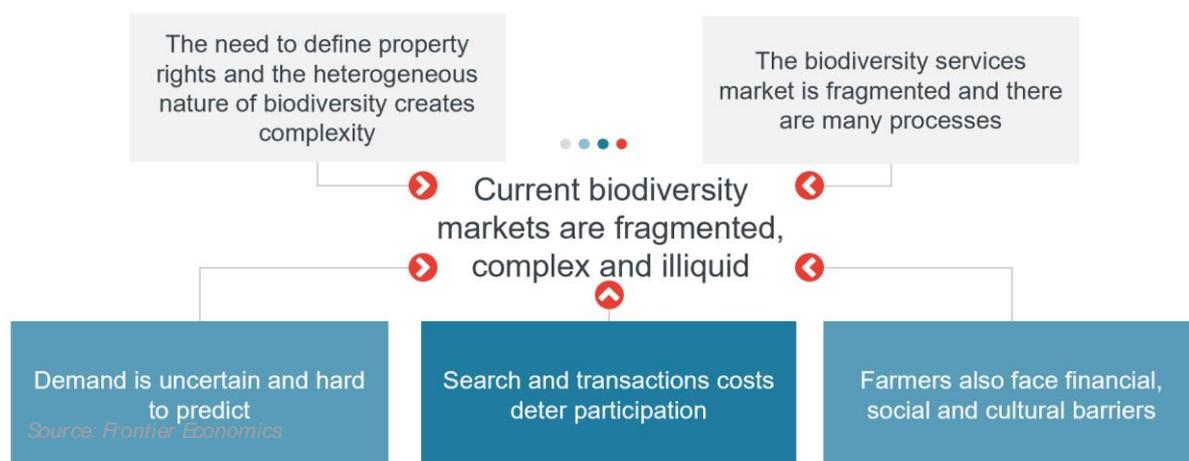


7.4 Where a biodiversity platform fits

7.4.1 A platform could address some, but not all, issues with the current arrangements

Figure 13 summarises a number of challenges with the current arrangements that were discussed in section 4. Many of these challenges relate to the heterogeneous nature of biodiversity and the multiplicity of processes that exist.

Figure 13: Challenges in current markets for biodiversity



Platforms of the kind we have discussed can address some of these challenges, however, at least some challenges are likely to require complementary measures.

7.4.1 A platform can't address heterogeneity or fragmentation

A biodiversity platform can't address the underlying issues with property rights and heterogeneity. Other workstreams underway under the Agricultural Stewardship Package seek to provide a framework for defining property rights and establishing the monitoring, verification and reporting arrangements required to ensure the biodiversity services provided are credible. However, the nature of biodiversity means it is difficult to simplify classification and monitoring while maintaining integrity.

A platform won't address the sub-markets in biodiversity services, including the inconsistency between federal, state, regional and local government arrangements. Achieving harmonisation across biodiversity schemes, together with private sector and philanthropic investment is likely to be costly, complex and time consuming. This is a significant risk for a transaction platform like Option 3.

A well-designed innovation platform like Option 2 can assist in dealing with the heterogeneity issue as it can support many schemes and provides a key geospatial data link. However, care will need to be taken in the design and implementation of Options 1 and 2 to ensure the platform does not add to the complexity which characterises the current arrangements.

7.4.2 A platform can reduce search costs that deter participation

A platform can reduce the search costs for both buyers and sellers of biodiversity services that can deter participation. It can do this by becoming the entry point for buyers, sellers and service providers seeking information about biodiversity activities. Collating and organising the information on biodiversity services in an accessible and structured way may reduce search costs for buyers and sellers. However, the monitoring, verification and reporting arrangements required to support participation in the biodiversity services market are still material. These transaction costs may continue to deter participation.

7.4.3 A platform could attract demand which may reduce uncertainty

A platform can't address the uncertainty and unpredictability of demand. But if the platform is successful in reducing search costs and establishing confidence in the trade of biodiversity services it may be effective in attracting demand. Additional demand, for example from philanthropic investors and increasingly corporate investors as the desire for ESG compliance grows, may help to offset some of the uncertainty and unpredictability. The platform could also be used to report key trade characteristics including price, quantity and attributes, which may go some way to addressing price uncertainty.

Stabilising demand depends critically on attracting users to the platform and keeping them engaged. This requires current information which is updated regularly to ensure it remains current. It also highlights the importance of engagement with potential users around functionality and user experience. In practice government use of the website is likely to be critical to attracting demand. By using the platform to procure biodiversity services and other land management services the government can provide confidence to other buyers that the platform is credible and has integrity.

7.4.4 A platform can meet some needs of farmers, but not others

Farmers face a range of financial, social and cultural barriers to the delivery of biodiversity services. A platform cannot address the issues around opportunity cost, additionality and permanency that deter the participation from many farmers. A credible platform may assist in reducing social and cultural barriers to farmer participation by increasing familiarity with, and understanding of, biodiversity markets.

7.4.5 The potential role of a government standing offer in a platform

Although the specific features of a platform vary, it would fundamentally be designed to improve the ability of buyers and sellers to come together and explore mutually beneficial biodiversity trading opportunities. This may address current problems of lack of participation.

Nonetheless, problems of lack of participation in biodiversity markets can be attributed to several market features. In our view, a platform will be of limited value if it is not also able to generate information on services and prices transacted (price discovery). In our view, it may be necessary for a platform be introduced in conjunction with other measures to increase market liquidity and so price discovery.

As an example, one option would be to have governments standing as a buyer of biodiversity services of specific kinds, effectively making "take it or leave it" offers. This would require clearer definitions of desired biodiversity services. Prices could be adjusted over time to match desired quantities purchased. The amount expended through these offers would also be capped to limit the budget exposure.

The main benefit of establishing a government fixed priced offer process is it would provide

landholders with a higher degree of certainty about demand and prices, thereby reducing one of the most significant obstacles to farmer participation in biodiversity markets. The process would also produce price and service information that would be relevant for decision makers (e.g. farmers) that is currently lacking due to illiquidity.

It is further possible that a platform may arise organically from the government's purchases without any further intervention. For example, philanthropic purchasers would have a much clearer benchmark for prices for certain biodiversity services. There could then be additional value in private participants facilitating those transactions through a platform, potentially with some participation from brokers.

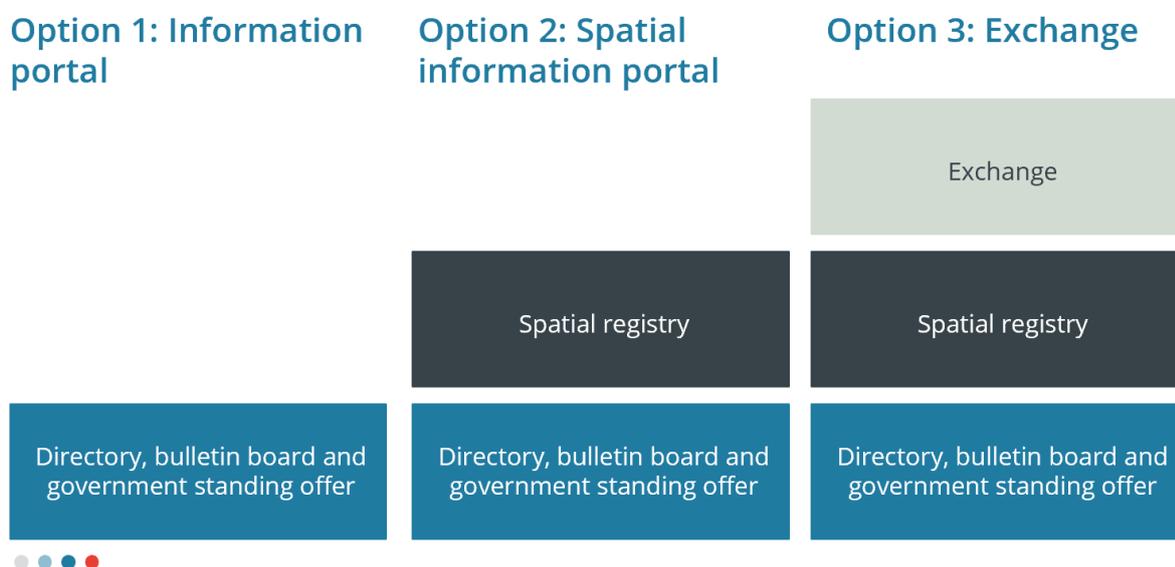
8 Implementation and operational considerations

This section presents a range of implementation and operational considerations relating to a biodiversity platform.

8.1 What is the relationship between the platform options?

The three key options we have presented could be considered as alternatives. However, the options could also be developed in sequence, since each option includes the functionality of the previous option (see **Figure 14**). This provides the opportunity for Option 1 to be developed and implemented relatively quickly, while work progresses to enable the development of Option 2. The design of market arrangements to facilitate an exchange is likely to take some time. This work could progress in parallel to the development and implementation of Option 2. Importantly, progressing the options sequentially represents a ‘no regrets’ pathway. There is no requirement to progress to an exchange if Option 2 is working effectively and/or the harmonisation required to support the development of an exchange proves difficult or costly.

Figure 14: Relationship between the options



Source: Frontier Economics

8.2 What technology can be used to implement the options?

While each option has different levels of functionality, the most appropriate underlying technology to deliver these services for all three options would be a secure digital registry accessible through an open platform. A digital registry is an inventory of information stored digitally. The registry could



be as simple as a place that buyers and sellers could record what they have to offer, and any negotiations or enquiries are not recorded in the system (e.g. Facebook Marketplace).

If the correct underlying technology is used, this registry concept can then be scaled up relatively easily to include more structured detail of offers to improve searchability, documents pertinent to those offers, contractual arrangements and commitments or even execute contracts of sale (e.g. the Property Development Transaction Platform (PDT-P) for Service NSW or the ASX share trading underpinned by share registries). The functionality included in the platform should be driven through user engagement.

While a public interface will be necessary for general access, the platform should be built using open-platform standards to allow stakeholders to interact with the platform with their own business systems. This will provide a pathway that all existing schemes and systems who participate in this market can be exposed to a wider audience. Open source is a key attribute to encourage innovation.

The functional requirements increase for each suggested option moving from the Information Portal to the Exchange options, but with much overlap (see **Figure 14**). This allows an agile approach to development and deployment to balance participant needs and expectations, and to involve traders to guide the needs of the system as it evolves.

Examples of the types of system functionality that are either required or can be provided at various levels of trading involvement are set out below.

All options require a base level of functionality

- Access available relevant information about schemes and requirements to participate in the market.
- Stakeholders can easily register to interact with the registry, and then can submit their offer to enable the mutual discovery of sellers and buyers.

Information is available to support Option 2: Spatial Information Portal

- Where data is recorded spatially, more detail can be provided by the platform about the qualities of the land on offer or being sought through locality-based searches on data contained in core natural resource datasets such as vegetation, landform, soils, satellite imagery and citizen science data on species occurrence. These datasets currently reside on a mix of platforms managed by state and federal agencies (e.g. <https://data.gov.au/>, <https://www.environment.nsw.gov.au/eSpade2WebApp>, <https://portal.spatial.nsw.gov.au/>, <https://qldglobe.information.qld.gov.au/>). Access to the core natural resource data can be facilitated by ANZLIC—the Spatial Information Council is the peak intergovernmental organisation providing leadership in the collection, management and use of spatial information in Australia and New Zealand. They sponsor and facilitate the Foundation Spatial Data Framework (FSDF), which aims to provide a national coverage of the best available, most current, authoritative source of foundation spatial data which is standardised and quality controlled
- Satellite imagery can be used to monitor the extent and quality of vegetation through time (both history and into the future) – tree cover is routinely monitored at both state and national levels (<https://data.gov.au/data/dataset/national-forest-and-sparse-woody-vegetation-data-version-3-2018-release>), and a number of service providers now use 10mx10m resolution Sentinel data to produce land/vegetation condition reports, typically based on changes in



NDVI (Normalised Difference Vegetation Index) over time (e.g. <https://www.cibolabs.com.au/services>).

- Reports and documentation about projects and sites that either qualify the proposal or are part of the contractual process (e.g. ecology reports) can be stored and accessed, including the full version history.
- Integrity checks to ensure, for example, that the proposed biodiversity projects are not already covered by other contracts
- Price and conditions of biodiversity transactions can be recorded and reported on to provide market transparency and facilitate market price expectations.

More comprehensive systems and information are required to support Option 3: Exchange

- Sales can to be conducted through the portal if that is considered worthwhile, potentially even facilitating the contractual process through smart contracts that can guide a participant through the process using business rules reacting to the information supplied (e.g. Property Development Transaction Platform (PDT-P) for Service NSW).
- Other markets such as carbon credits can be incorporated to provide a complete overview of the projects undertaken on a property and to facilitate project stacking where appropriate to maximise returns to the landholder.

While the technical aspects and functionality of the platforms required to support these options are relatively straightforward to define, custodianship and institutional arrangements between federal, state and local regulatory bodies may require negotiation, especially where existing registry information is not held in a structured manner such as a database.

Importantly, the use of technology to support a platform addresses many of the concerns raised in the context of the EPBC Act review and the ACCC's Murray Darling Basin Water Market review (see **Box 10**). We understand work to standardise and harmonise spatial information required for Option 2 is underway at the Commonwealth level in the context of the EPBC Act review.

**Box 10:** Technology in water markets

The Samuels review of the EBPC Act suggests that effective environment protection and biodiversity conservation requires precise, quantitative standards underpinned by quality data and information. These learnings will be important to consider for potential biodiversity market platforms that are designed to encourage participation and integrity.

However, it was found that the systems used by the Department are insufficient to deliver its regulatory functions efficiently. For effective participation and integrity in the Act, the Review suggested that the systems be overhauled to provide a modern interfaces and services for participants.

Similar concerns and learnings can be drawn from the ACCC Interim Report of Water Markets in the Murray Darling Basin. The ACCC takes the view that key services supporting water trade are fragmented, inconsistent and opaque, and create challenges for smaller participants. A lack of harmonisation impedes participants from accessing the data and information they need for trading and investment decisions.

This complexity acts as a significant barrier for effective water markets. The complex nature of the Basin's market services also means that sophisticated participants such as investors have the resources to identifying opportunities in ways that other participants, such as farmers, cannot. This further contributes to mistrust in market integrity and a limited direct engagement from smaller participants.

The ACCC considers that more transparency in the water-rights markets, such as providing more-accessible information, will help farmers and other water users understand how to interact with the market. This would help them make more informed decisions, reduce search and transaction costs, and help them be at less of a disadvantage to well-resourced parties. The ACCC made a number of potential suggestions for increasing market transparency and integrity:

- Enhance interoperability between registers and service platforms between Basin states, brokers and other intermediaries
- A single information portal and/or register for publishing water availability and trade information, which collates data from multiple sources, but does not facilitate trade
- Exchange platforms, similar to the National Electricity Market or ASX
- For all options, the potential to leverage innovation and technology (such as Distributed Ledger Technology) more effectively.

Broadly speaking, the ACCC's view is that reform to centralise and streamline trade services could make trade services and information flows more efficient and also facilitate improved oversight of trading activity. However, the ACCC note that while governance and participation remains distributed between jurisdictions, efforts to harmonise and coordinate will be more suitable than options which deliver centralisation.

Source: ACCC, Murray-Darling Basin water markets inquiry, Interim Report, 30 July 2020.



8.3 What is the role of government in delivering a platform?

There are existing private and government platforms

There are a number of information portals similar to Option 1 in place or currently being developed. The Option 1 Information Portal is similar in concept to the Marketplace for Nature concept being developed by the Biodiversity Markets Working Group (see **Box 13**). The Biodiversity Markets Working Group is an informal network of nature conservation and indigenous-focused organisations seeking to explore the role of nature credits in safeguarding Australia's ecosystems. It may be possible to influence and support this initiative rather than developing a competing information portal.

Box 11: Marketplace for Nature

A working group of organisations – 10 Deserts Project, Australian Government Indigenous Land and Sea Corporation, The Nature Conservancy, Pollination and Trust for Nature – came together to address the need for increased investment in environmental services. Their proposal is for a Marketplace for Nature. This marketplace looks to bring together buyers and sellers for products and projects offering environmental, social, cultural and economic outcomes.

The proposed Marketplace for Nature would be an online platform for both existing products (including biodiversity offsets and Australian carbon credit units) and new products or projects. The Marketplace would place an emphasis on transparency. That is to say, making it clearer what the environmental services market looks like rather than the current fragmented and siloed approach. The marketplace would not look to provide quality assurance or enforce compliance, rather the emphasis would be on building a network of buyers and sellers.

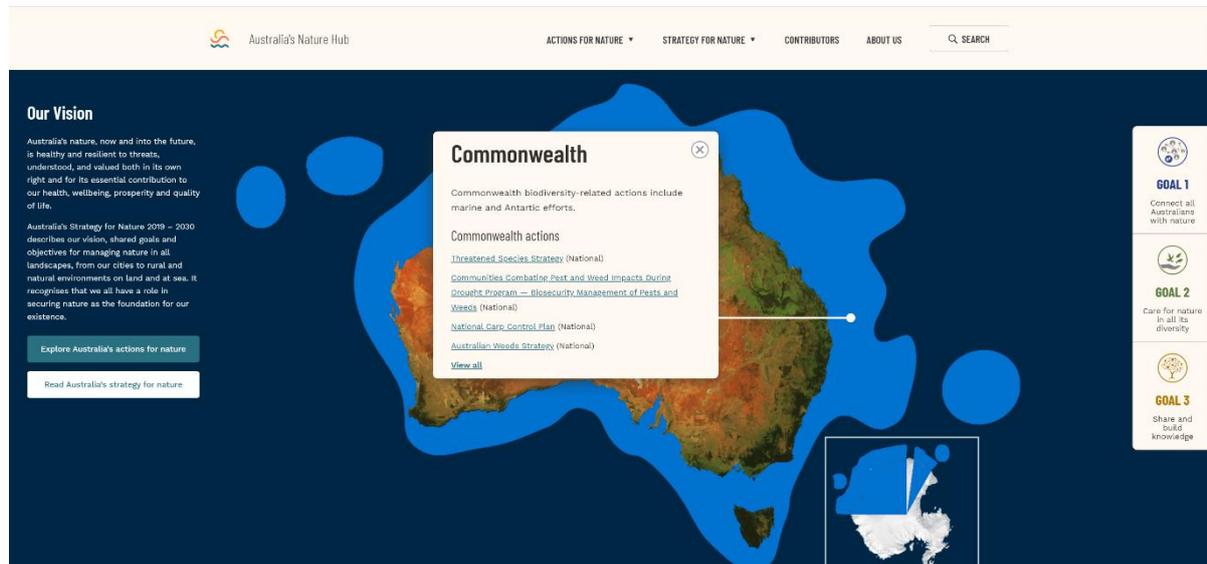
The Marketplace for Nature is still a concept with aspirations to move towards prototyping and release. They are currently seeking funding to hire a project manager, undertake an audit of potential participants, engage with stakeholders and design a virtual marketplace.

Source: The Nature Conservancy

The government website Australia's Nature Hub (**Figure 15**) provides an interactive platform linking to all biodiversity related government action underway across Australia. The platform was developed by the Biodiversity Working Group, made up of officials from environment departments across Australia. This hub could also provide a starting point for a platform for Option 1.



Figure 15: Australia's Nature Hub



Source: <https://www.australiasnaturehub.gov.au/>

Ongoing participation by government is important, and allows others to develop further uses

A key challenge for government will be ensuring the platform remains current and therefore attractive to users. If the information on the platform is not up-to-date it is likely to undermine the confidence of users. This would mean the platform would be unlikely to be effective. Ongoing government participation is critical to the success of the platform.

The rapid development of the Bushfire.io platform by demonstrates the relatively short time frame required to compile a comprehensive platform. Bushfire.io was developed over four weeks in January and February 2020 to improve access to information required for decision making around bushfires. The aim was to provide one national view of the information. The platform was developed as a social enterprise. Many of the datasets that are used in this platform would also be important in biodiversity (vegetation, landform, land ownership, up to date satellite imagery).

Making information available through the spatial registry provides the opportunity for businesses and NGOs to access the registry to offer alternative uses. For example, many competing weather apps have been developed drawing on Bureau of Meteorology information (see **Box 12**).

**Box 12** : Bureau of Meteorology (BoM) data platform

The BoM provide a range of weather forecasts, warnings and information services for use by third parties. This service – called ‘Public Access Services’ – provides public, agricultural and marine weather services. Public Access Services comprises real time data that is provided free of charge and anonymously. The latter means that the BoM cannot track all users of the data. However, they do offer support to registered users which provides an incentive for users to waive their anonymity.

Several weather forecast websites and apps are based on BoM data. For example, the mobile app “AUS weather” is solely based on the data from the BoM. More interesting are services which build on BoM data with additional data. For example Weatherzone sell weather forecasting services to businesses in sectors including agriculture, aviation, energy and insurance. Weatherzone state that:

“Weatherzone’s Opticast forecast system utilises realtime observations from the Bureau of Meteorology, our client’s weather stations, Weatherzone’s own weather station network and from weather agencies across the globe for both improvements in accuracy and realtime adjustments of forecast in rapidly changing situations.”

One area where Weatherzone provide services which go beyond the BoM is storm detection. In this area, Weatherzone provide services where they augment BoM data to provide more detailed heavy rainfall detection. In addition, Weatherzone have a lightning detection network which is based on their own network of sensors.

This is an instructive example of a Government agency providing open access and allowing the private sector to innovate over the top of this data.

Source: BoM. Weatherzone including <https://business.weatherzone.com.au/science-and-technology/information-sources/>

The Aboriginal Carbon Foundation has recently commissioned the development of a platform to sell community credits and farmer credits, delivering ACCUs with environmental, social and cultural co-benefits (see **Box 15**). The Aboriginal Carbon Foundation platform will sell the peer to peer credits provided by the Aboriginal Carbon Foundation, rather than a range of services of different types proposed for Option 1.

A number of the state and territory biodiversity schemes also include basic registries of market information, with the intent of increasing transparency and helping to link sellers and buyers. For example, as noted in section 3.2.2, the New South Wales Biodiversity Offset Scheme is supported by a credit supply register, credit demand register (which details of credits wanted to meet obligations) and a transactions register. There are also registers of biodiversity stewardship agreements, conservation agreements and wildlife refuge agreements. Similar registers are maintained in Victoria, including a public register of traded native vegetation credits. The information and spatial information portals presented here would build on these existing systems, harmonising information and providing a single site that participants can utilise to obtain market information.

**Box 13:** Aboriginal Carbon Foundation farmer credits

The Aboriginal Carbon Foundation (AbCF) is an organisation that supports Indigenous groups and farmers access carbon markets. Their focus is to provide carbon credits (ACCUs) to the voluntary corporate and Government markets, offering price premiums on the credits to reflect verified social and environmental co-benefits.

The AbCF offers two types of carbon credits:

- **Community credits** – offering ACCUs that support indigenous land management, indigenous employment and engagement, and supports the protection of sacred sites.
- **Farmer credits** – supports regional economies, employment and stewardship of land and water.

In addition to the verification requirements to register activities for ACCU credits, the AbCF has verification processes for community and environmental co-benefits. The methodologies to verify and monitor co-benefits for community credits have also been adopted for the Queensland Land Restoration Fund.

The credits are typically sold to voluntary corporate demand through direct transactions between the AbCF and partners. Direct transactions ensures that the AbCF can negotiate price premiums on the ACCUs to reflect the co-benefits. For example, the Commonwealth Bank are directly supporting the Kowanyama Carbon Project in Queensland. The AbCF has recently engaged with Griffith University to develop a platform to sell these credits to the voluntary market.

Source: <https://www.abcfoundation.org.au/>

Given there are alternative options does government need to get involved? Would it be more efficient for government to contribute funding to the existing options? It is likely there are other platforms being considered and developed which could provide a starting point for Option 1. A more comprehensive stakeholder consultation and market scan exercise could be undertaken to uncover existing and proposed platforms and consider their suitability and the risk of a government led platform crowding out other initiatives.

8.4 What steps are required to develop the options?

Section 5 identified the characteristics of a well-functioning market, and the challenges for biodiversity in this context. We have drawn on this discussion to identify the steps required to develop each platform. These steps include:

- **Developing the platform** concept through further analysis, market testing and stakeholder consultation, specifying this concept for delivery, commissioning delivery of the platform and delivering the platform, including prototyping, commissioning and testing. It may be the appropriate platform for the exchange is an existing exchange platform.
- Developing the **enabling and supporting arrangements** for the platform, including:
 - **Defining products** required to clarify property rights to support trade in biodiversity services. It is possible to rely on existing product or service definitions for Option 1 and 2,



although refinement and harmonisation of existing products is likely to be beneficial in improving outcomes and reducing complexity.

- **Developing the enabling systems and processes** required to ensure the market is credible and participants trust each other and information is collected, protected and shared as required. This includes developing eligibility requirements and monitoring, reporting and verification arrangements and information sharing protocols.
- **Confirming government participation** in the platform as a buyer of biodiversity services. This will involve confirming government expenditure and associated arrangements, including for example a Nature Fund, supported by a standing offer.
- **Developing governance arrangements** required to support the platform, and associated systems and processes.
- **Developing cost recovery arrangements.** Arrangements for recovering the cost of platform require consideration to maximise participation.

A summary of the actions required for each platform Option is presented in **Table 7**.

The specification and development of the technology required to support each platform is not complex. The majority of cost and timing associated with the development of the options is likely to be associated with developing the enabling systems and processes. As discussed in Section 7.4 we expect achieving agreement on the preferred approach and harmonisation of the arrangements required for Options 2 and to a greater extent for Option 3 to be costly and time consuming to achieve. It is possible to sequence the key steps to enable this work to take place in parallel with the development of Option 1.

It is important to remember the design and delivery of the platform is likely to be iterative. For example, Bushfire.io was updated over 100 times over the four weeks of its development. We expect the biodiversity platform, and the associated enabling arrangements, will be developed over time as features are tested and refined in response to experience and feedback.

**Table 7:** Steps to developing a platform

Requirement	Option 1: Information portal	Option 2: Spatial information portal	Option 3: Exchange
Develop and deliver platform concept	<ul style="list-style-type: none"> Market testing and stakeholder consultation Platform specification Platform development and delivery 	<ul style="list-style-type: none"> As for Option 1 	<ul style="list-style-type: none"> As for Option 2
Develop and define products	<ul style="list-style-type: none"> Existing processes can be used Additional benefits likely to arise from improved MVR arrangements 	<ul style="list-style-type: none"> As for Option 1 	<ul style="list-style-type: none"> Harmonisation of existing processes to define biodiversity services is most likely to promote liquidity
Develop enabling systems and processes	<ul style="list-style-type: none"> Screening of eligible participants Quality biodiversity products Monitoring and reporting Enforcement of obligations Information collection and dissemination 	<ul style="list-style-type: none"> As for Option 1 Review of federal, state and private organisation systems to understand the scope to integrate with these systems and methods to do this Arrangements to ensure integrity of spatial registry, including timely updating of information 	<ul style="list-style-type: none"> As for Option 2 Develop market systems and protocols including bid and offer arrangements, settlement systems, etc
Confirming government participation	<ul style="list-style-type: none"> Allocate funding Establish standing offer 	<ul style="list-style-type: none"> As for Option 1 	<ul style="list-style-type: none"> As for Option 1
Develop governance arrangements	<ul style="list-style-type: none"> Establish governance arrangements for platform, systems and processes 	<ul style="list-style-type: none"> As for Option 1 	<ul style="list-style-type: none"> As for Option 1
Develop cost recovery arrangements	<ul style="list-style-type: none"> Develop and impose cost recovery arrangements 	<ul style="list-style-type: none"> As for Option 1 	<ul style="list-style-type: none"> As for Option 1

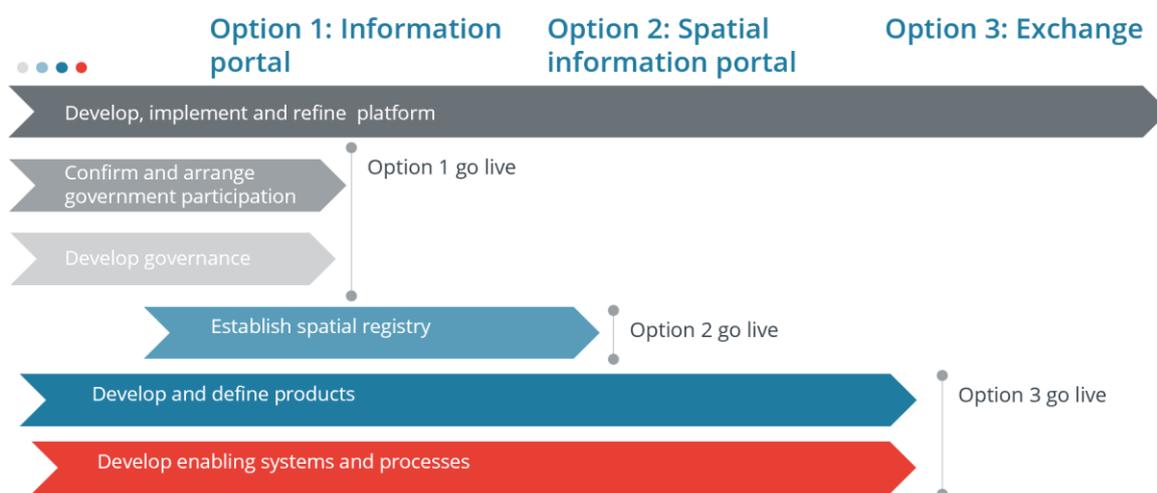
Source: Frontier Economics



There is significant scope to sequence the development of the options (see **Figure 16**). This could involve:

- First progressing the development of Option 1:
 - An initial platform being specified, developed and commissioned
 - Arrangements for government participation on the platform being confirmed and established
 - Developing governance arrangements for the platform
 - Launching the platform.
- Meanwhile working on the arrangements for Option 2 by:
 - Developing the functionality of the platform
 - Working with states and ANZLIC to define and establish a consolidated spatial registry
 - Launching the platform.
- Simultaneously progressing the arrangements for Option 3:
 - Core parts of these arrangements could be introduced into Option 2 to improve its functionality while Option 3 is being developed:
 - ┆ Developing and defining products
 - ┆ Developing monitoring, verification and reporting arrangements
 - Other parts of the arrangements can be developed and introduced for Option 3:
 - ┆ Developing the functionality of the platform
 - ┆ Trading and settlement arrangements
 - ┆ Governance arrangements.

Figure 16: Sequencing the development of the options



Source: Frontier Economics



Sequencing the development of the options in this way enables an adaptive management approach to be adopted. Resources and effort can be refocused as required over time as the platform and broader market develop.



9 Comparing the options

This section considers the scope for a platform to address the underlying issues, and sets out a framework for moving forward.

9.1 How can you compare the options?

It is important to have a set of evaluation criteria to enable the options to be systematically compared and assessed. **Figure 17** presents a set of evaluation criteria that can be used to identify the preferred option. The evaluation criteria consider the extent to which the option is effective in addressing the primary concern that has motivated the scoping study – the capacity for farmers to monetise the provision of biodiversity services through their environmental stewardship. It is critical the options facilitate the efficient operation of the biodiversity services market – including promoting efficient investment, delivery and use – to maximise welfare. Achieving efficiency in biodiversity services is also important for promoting efficiency and therefore maximising welfare in related markets. Encouraging innovation is another important consideration, since innovative and multi-sided solutions are likely to be most effective in addressing the heterogeneity and inter-jurisdictional issues. The cost and time required for implementation is another key evaluation criterion. Finally, we consider the barriers and risks that will need to be addressed to ensure the options can be implemented effectively. We use these criteria to undertake a high level review of the options in the next section.

Figure 17: Evaluation criteria

Effectiveness	Does the option make it easier for farmers to monetise biodiversity services?
Efficiency	Is the option likely to promote efficient investment in and delivery and use of biodiversity services?
Innovation	Is the option likely to encourage innovation?
Implementation	How costly and time consuming will it be to implement and operate the option?
Enablers and risks	What are the key enablers required to implement this option? What are the key risks?

Source: Frontier Economics

In practice the option that delivers the greatest net benefit to the community should be preferred. Identifying this option requires an assessment of the benefit of the option (primarily related to the benefits of improved efficiency) compare to the costs of the option (primarily the implementation and operating costs of the platform), recognising the risks of implementation. For example, a well-functioning exchange (Option 3) is likely to deliver significant efficiency benefits, but there are material risks associated with achieving the harmonisation of service



definition and monitoring, verification and reporting arrangements to ensure this option achieves desired liquidity objectives.

9.2 A high level comparison of options

Table 8 presents a high level comparison of the options.

All of the options are likely to be somewhat **effective** in enabling farmers to monetise biodiversity services. Option 1 does this by providing a portal to assist farmers navigate the complex biodiversity services market. Option 2 builds on option 1, using a spatial registry which will enable farmers to filter interest from government and other buyers. The spatial registry will also enable buyers of biodiversity services to search for potential sellers. We expect government demand will continue to dominate – channelling government investment in biodiversity through the spatial information portal will make it easier for farmers to navigate this market. The capacity to search the spatial registry may also attract additional corporate and philanthropic demand. Option 3 provides a comprehensive exchange to facilitate the trade of biodiversity services. However, the arrangements required to support the exchange may make it even more complex for farmers to navigate biodiversity services and monetise an additional source of revenue.

The implications of each option for economic **efficiency** varies. Option 1 may facilitate trade by reducing search costs, improving efficiency. The additional functionality of Option 2 may increase the potential efficiency benefits, by further reducing search costs. Option 2 also promotes efficiency by enabling more informed buying of biodiversity services, drawing on the spatial registry. Option 3 has the capacity to deliver significant improvements in efficiency, if the exchange is able to achieve the characteristics of a well-functioning market.

The scope for the platforms to support **innovation** differs. Option 1 has some capacity to support innovation if an open source approach is adopted. Option 2 has significant scope to encourage innovation drawing on key geospatial data and incorporating many schemes. The data provides valuable support for the development of transaction based services by other parties, including jurisdictions. Option 3 is more consistent with a transaction platform, rather than an innovation platform.

The **implementation and operation costs** increases with the complexity of the options. Option 1 will be relatively straightforward to implement and deliver. By way of comparison The Marketplace for Nature is undertaking an initial fundraising of \$400,000 to support the design of a platform, including initial stakeholder engagement. Option 2 will be more costly and time consuming, recognising the need to design a registry and combine information from a range of state and federal government sources. Option 3 is likely to be most costly and time consuming to implement and operate. The scope to sequence the development of the platforms means investment on Option 1 can be used as a foundation to support Option 2. Development work can also be sequenced, so that work to define products and harmonise arrangements for Option 3 could commence while Options 1 and 2 are being developed and operated. In each case the administration, stakeholder engagement and change management tasks are likely to be more time consuming than the specification, development, testing and commissioning of the technology.

The **barriers and risks** increase with the complexity of the option. The key risks for Option 1 relate to the relationship with other platforms, and the need to ensure the platform remains current. These risks can be managed by a comprehensive audit of potential users and their requirements, the development of resources and communication material to minimise confusion



and funding and governance arrangements to ensure the platform is appropriately resourced. The lack of participation from the states has a relatively low impact for Option 1.

The barriers and risks for Option 2, in addition to those outlined for Option 1, relate to the harmonisation required to develop the spatial registry and the failure to secure Commonwealth government use of the platform. These risks can be managed with appropriate resourcing and Commonwealth support at the highest level. There is a risk the spatial information associated with Option 2 could expose farmers in biodiversity hotspots to unwanted attention. It may also enable landowners in strategic locations to exercise market power in the sale of biodiversity services. Careful attention to information management and release is required to manage these risks.

There are significant risks for Option 3, associated with the establishment of a liquid market. Delivering the benefits of this option requires a liquid market. This in turn requires a clear product definition, contractual arrangements a comprehensive set of measurement, verification and reporting arrangements, settlement arrangements and governance arrangements. Achieving agreement across the wide range of potential market participants about the optimal arrangements is likely to be difficult in practice. This introduces uncertainty relating to implementation cost and timing.



Table 8: Comparing the options

Criteria	Option 1: Information portal	Option 2: Spatial information portal	Option 3: Exchange
Effectiveness	May make it easier for farmers to navigate the biodiversity services market	Likely to make it easier for buyers and sellers to navigate the biodiversity services market	May make it more complex for buyers and sellers to navigate the biodiversity services market
Efficiency	Scope to reduce search costs to a small extent, which may improve efficiency	Scope to reduce search costs to a larger extent, which is likely to improve efficiency. Information enables more informed buying, further improving efficiency	Scope to significantly reduce search and transaction costs, improving efficiency. But this depends on achieving liquidity. Information enables more informed buying, further improving efficiency
Innovation	Some scope to support innovation	Significant scope to support innovation, adopting open source and drawing on geospatial information	Some scope to support innovation
Implementation	Relatively simple to implement and operate. A platform could be developed in 3-12 months at a cost of \$0.5-1.5 million. Ongoing operating costs likely to be limited	More complex to implement and operate. A platform and spatial registry could be developed in 6-18 months at a cost of \$1-5 million. Ongoing operating costs likely to be more material	Relatively complex to implement. An exchange and the associated MVR and settlement requirements is likely to take more than 2 years to implement at a cost of more than \$10 million. Ongoing operating costs likely to be significant



Criteria	Option 1: Information portal	Option 2: Spatial information portal	Option 3: Exchange
Barriers and risks	<p>Barriers and risks exist:</p> <ul style="list-style-type: none"> • Confusion with other platforms for buyers and sellers • May compete with or crowd out other platforms • Failure to ensure the platform remains current undermining credibility • Low impact of lack of participation from states 	<p>Material barriers and risks exist:</p> <ul style="list-style-type: none"> • Achieving harmonisation required to develop spatial registry • State cooperation • Failure to secure Commonwealth government use of platform • Failure to ensure the platform remains current undermining credibility • Privacy and market power issues 	<p>Significant barriers and risks exist:</p> <ul style="list-style-type: none"> • Establishing MVR requirements • State cooperation • Failing to attract sufficient participation to achieve liquidity • Failure to secure Commonwealth government use of platform • Difficulty developing governance and regulatory arrangements • Cost and implementation risk
Summary	<p>A relatively low cost and low risk option that may improve outcomes for farmers</p>	<p>A more costly and risky option that is likely to improve outcomes for farmers and the community and promote adjacent markets and products</p>	<p>A relatively costly and risky option that requires significant investment and may not improve outcomes for farmers</p>



9.3 Next steps

Our analysis demonstrates a well-functioning biodiversity exchange is likely to be hyper efficient, delivering maximum benefit to the community. However, there are significant risks to achieving sufficient liquidity. In particular, the cooperation of the states required to harmonise arrangements and secure liquidity is likely to be difficult to achieve in practice.

A platform in and of itself will not resolve the most significant issues with the current arrangements. There is work to be done to develop the product definition and monitoring, verification and reporting arrangements to ensure farmers are better positioned to participate in the market. However, the nature of biodiversity means this market is necessary complex. Harmonising government expenditure on biodiversity and allocating it through the platform will make demand more predictable, encouraging farmer participation. Government participation in the biodiversity market via the platform is a critical enabler for success, by attracting buyers and sellers.

Developing the IT to enable a platform is a relatively straightforward exercise. More work needs to be done to confirm there is a role for government in this context. It may be more appropriate for the government to concentrate on developing the enabling and supporting arrangements, including product definition, monitoring, verification and reporting and establishing information systems, required to instil confidence in the platform.

The relationship between the options suggests there is significant scope to start with a relatively simple platform, while arrangements are developed for more complex arrangements.

We suggest the Department consider the following steps to guide its thinking and analysis on the potential benefit of a biodiversity platform:

- A comprehensive stakeholder consultation and market scan exercise with a wide range of stakeholders including farmers and other potential suppliers, governments and private participants as buyers to:
 - Discuss the desired functionality of the platform
 - Uncover existing and proposed platforms and consider their suitability as a basis for a platform.
- Confirm commitment for government support of a platform, including:
 - Combining programs to identifying and commit funding
 - Developing standing offer arrangements
 - Harmonising Commonwealth, state and local government arrangements.
- Progress supporting and enabling arrangements, including:
 - Developing product definition
 - Developing monitoring, verification and reporting arrangements
- Data investigation and harmonisation, including:
 - Confirming data availability and data linkages
 - Harmonising data to develop a comprehensive and robust spatial registry



- Consideration of platform attributes, including:
 - Scope to sequence development of a platform to make progress while supporting and enabling arrangements are developed
 - Key attributes of an innovation platform to take advantage of data availability and linkages
 - Key requirements to support innovation platform, including for example open source.

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