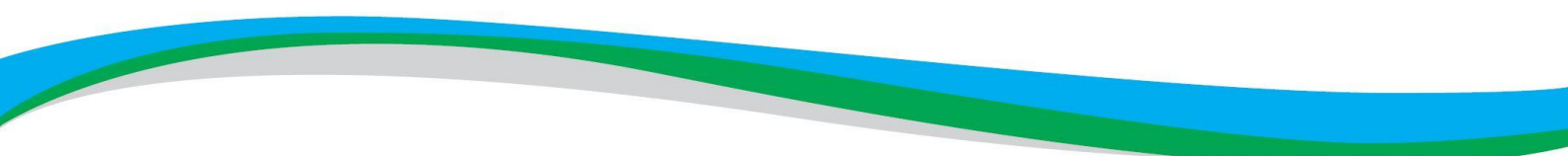


# Assessing South Australian carbon offset supply and policy for co-beneficial offsets: Policy context

Patrick O'Connor, David Summers, Jeff Connor, Erinne Stirling and Timothy Cavagnaro



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Enquires should be addressed to: Goyder Institute for Water Research  
Level 4, 33 King William Street  
Adelaide, SA 5000  
tel: 08 8236 5200  
e-mail: [enquiries@goyderinstitute.org](mailto:enquiries@goyderinstitute.org)

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## Executive summary

South Australia is well positioned to increase its contribution to carbon abatement through land-based sequestration to offset carbon emissions from Australia and overseas. International markets are rapidly adopting carbon prices in business planning and through a burgeoning suite of carbon pricing mechanisms being developed at national, sub-national and industry specific scales. Carbon prices remain extremely variable and are often low in the early stages of developing carbon markets, however, policy drivers at jurisdictional level are stimulating forecasts of increased prices, and institutional risk management and investor expectations are converging to raise price expectations as a response to international pressure to honour Paris Agreement commitments. The institutional arrangements are quickly developing for international trade in carbon credits and standards for offsets in both the fully regulated and voluntary markets. These markets have developed to the stage where very high volumes of offsets are already being credited, with and without co-benefit recognition. Despite the positive outlook, many barriers remain for South Australia's land-based carbon sequestration industry to overcome before the potential benefits of increased activity in land-based carbon sequestration can be realised. This report examines the policy context, driving demand and supply of carbon credits, that impacts on the feasibility of abatement projects developing in South Australia.

Current South Australian involvement in carbon abatement projects is small, with fewer than 1% of carbon credits issued through the Australian Government's Emissions Reduction Fund (ERF) auctions coming from projects in the State. The reasons for this low level of participation are primarily due to the low carbon price posted by the ERF, a price substantially driven by the types of projects being funded in New South Wales, Queensland and Western Australia. At prices of around \$12 tCO<sub>2</sub>-e<sup>-1</sup> from the ERF, South Australian projects appear to be uneconomic because supply would not be economically viable across South Australia's agricultural zone below \$50 tCO<sub>2</sub>-e<sup>-1</sup>. Trading in the voluntary market offers a higher price premium of \$15-\$25 tCO<sub>2</sub>-e<sup>-1</sup> for carbon with co-benefits of various types. While the gap between the price being offered by the regulated and voluntary markets and the supply side appears significant, there are many reasons to believe that it can and will be narrowed.

Prices posted by the ERF appear to reflect a suite of conditions which cannot prevail in a future of higher demand for carbon credits. The ERF price is greatly influenced by the design of the initiative; specifically, the list of approved sequestration methods and the current requirements for additionality, permanence and leakage. The data from the ERF indicate that at the reserve price being offered, the supply of cheap credits is lessening. While the policy environment around carbon markets is uncertain in Australia and in some other countries, the ever-growing number of carbon pricing initiatives are pricing carbon as high as AUD\$32–53 tCO<sub>2</sub>-e<sup>-1</sup>, and businesses representing a very significant portion of global turnover are factoring a carbon price of AUD\$32–53 tCO<sub>2</sub>-e<sup>-1</sup> by 2020, and higher prices beyond that. Furthermore, there is optimism for prices resulting from the possibilities for international trade in carbon credits being stimulated by the Article 6 of the Paris Agreement.

For South Australian carbon abatement programs to capitalise on opportunities arising from global movements to decarbonise the economy, local policy settings need to be oriented correctly. This report outlines the many policy issues that are currently impeding the development of a larger land-based carbon sequestration industry in South Australia. Current projects are limited by price, information availability and policy settings to a set of abatement products for 'niche' segments of the market. Intangible public good type social and ecological co-benefits associated with carbon abatement through revegetation are not being sufficiently captured but could be better incorporated to ensure opportunities in carbon abatement benefit the South Australian economy.

A thorough analysis of the policy context for land-based carbon abatement in South Australia reveals a suite of actions that could contribute to the development of a viable industry of carbon offsets with co-benefits. Key among the options is the need to proactively engage with the generation of carbon abatement projects where they are currently economic, are near to economic, or can reasonably be forecast to be economic should carbon prices rise in line with reasonable scenarios for demand and trading opportunities. This 'portfolio' strategy has a downside as prices may not rise in reasonable timeframes; however, early stimulation of a modest number of projects could be undertaken with full accounting for the up and downside uncertainty around price. The costs and risks of this stimulation could be offset by incorporation of well-designed co-benefit production, supplying public benefits of desirable type and location. An example of such a co-benefit shown to be economic in this project is the buffer strip reforestation of stream banks in Mount Lofty Ranges water catchments.

Another option is further work on assisting industries interested in supplying carbon credits to assess and manage financial and supply risk for carbon abatement. Market access for new participants could also be enhanced by facilitating access to market, including through improving access to brokerage services. The economics of co-benefit types should be examined (e.g. biodiversity and 'blue carbon') in preparation for appropriate method development for crediting. Further developing and promoting sequestration methods which better fit the South Australian context, and calibrating methods for realistic sequestration dynamics, could increase the supply of economic credits.

# 1 Introduction

The policy landscape associated with carbon offset supply and demand and policy for co-beneficial offsets is complex and dynamic. Understanding the national and international context and how it is changing is essential if South Australia (SA) is going to meet its own carbon offset requirements; capitalise on international needs for offsetting; and manage risks of changing international policies around carbon abatement and emissions reduction. This report examines the policy context into which South Australian carbon abatement projects fit. The project is part of the Goyder Institute for Water Research project, *Assessing South Australian carbon offset supply and policy for co-beneficial offsets*. The project seeks to understand the biophysical potential for carbon sequestration across SA, the opportunities ahead and the economic and policy constraints to overcome.

Many individuals, (public and private) organisations and agencies are involved, or are seeking to become involved, in carbon sequestration activities. These stakeholders include, but are not limited to, individual landholders, aggregators, investment funds, Non-Governmental Organisations (NGOs), large multinationals, and governments (municipal, state, federal and multinational). These stakeholders operate at different scales. Moreover, the sequestration of carbon is a complex issue; spanning the complexity of the biophysical environment, diverse sectors of the economy and is relevant on time scales from the very short term (e.g. avoided land clearance) to the decadal and beyond (e.g. 'blue carbon', rangeland revegetation, soil amendment). This complexity of stakeholders, scales and mechanisms creates a complex policy space. The policy context is extremely dynamic and requires synthesis across many domains of interest and attention to drivers that cross jurisdictions, geopolitical boundaries, and contexts. As such the joint activities of decarbonisation and carbon sequestration represent one of the great policy challenges of our time.

In this review we seek to explore some of this complexity by working down from international to national drivers to an emphasis on the South Australian context. Understanding of these drivers will help understand how policies at multiple levels of government could be modified to entice offset projects with co-benefits that meet other social needs. The rationale is to highlight policy and incentive possibilities to encourage recognition and funding for offsets in ways that can enhance net benefits. The work aspires to complement ongoing Australian Climate Authority activities in this space to increase policy impact in Australia. Ultimately, our objective is to support the Government of South Australia with strategic information on benefits and risks in carbon offset projects and strategies to manage risks. While not the sole focus of this work, we highlight issues relevant to the South Australian context (e.g. 'bBlue carbon', agricultural co-benefits from restoration and sequestration through rangeland revegetation, etc.) where appropriate. This information will also help inform the Government of South Australia's objective of achieving a carbon neutral Adelaide.

To address this complexity in the context of the project, we have undertaken two activities, namely:

- A review of the policy context for carbon abatement with co-benefits (this report). The desktop review covers the global and Australian contexts (such as the Kyoto Protocol; relevant national initiatives) and considers the South Australian specific policy requirements and policy operating context.
- An assessment of local policy issues and impediments to carbon offset supply and demand by O'Connor *et al.* (2019). This component is based on interviews with Government agency policy officers, representatives working in the carbon offset industry, and not-for-profit and industry providers of carbon offset projects with and without co-benefits. The synthesis includes an

examination of factors that do and could limit or encourage offsets and co-benefits for land sector abatement in SA, and some commentary on potential solutions.

This report on policy context should be read in conjunction with other outputs from the project on:

The estimation of carbon supply in South Australia:	Settre, C., Cavagnaro, T., and Regan, C. (2019) <i>Technical estimation of carbon supply data and methodology report</i> . Goyder Institute for Water Research Technical Report Series No. 19/04, Adelaide, South Australia.
The estimation of the economics of carbon supply in South Australia:	Regan, C., Connor, J., Settre, C., Summers, D.M. and Cavagnaro, T. (2019) <i>Assessing South Australian carbon offset supply and cost</i> . Goyder Institute for Water Research Technical Report Series No. 19/03, Adelaide, South Australia.
	Regan, C., and Connor, J. (2019) <i>Economic methods for assessing carbon supply costs</i> . Goyder Institute for Water Research Technical Report Series No. 19/05, Adelaide, South Australia.
The potential for economic supply of carbon with three types of co-benefit:	Connor, J., Summers, D.M., Regan, C., Abbott, H., Frizenschaf, J. and van der Linden, L. (2019) <i>The economics of riparian plantings for carbon and water quality benefit in the Mount Lofty Ranges</i> . Goyder Institute for Water Research Technical Report Series No. 19/06, Adelaide, South Australia.
	Summers, D.M., Regan, C., Connor, J., O'Connor, P., Lowe, A. and Cavagnaro, T. (2019) <i>Assessing South Australian carbon offset supply and policy for co-beneficial offsets: Pollination service supply in lucerne seed production</i> . Goyder Institute for Water Research Technical Report Series No. 19/07, Adelaide, South Australia.
	Summers, D.M., Regan, C., Connor, J. and Cavagnaro, T. (2019) <i>Assessing South Australian carbon offset supply and policy for co-beneficial offsets: shelter belts for lamb mortality reduction</i> . Goyder Institute for Water Research Technical Report Series No. 19/08, Adelaide, South Australia.
Policy context	O'Connor, P.J., Summers, D.M., Connor, J., Cavagnaro, T. (2019) <i>Assessing South Australian carbon offset supply and policy for co-beneficial offsets: barriers to supply</i> . Goyder Institute for Water Research Technical Report Series No. 19/09.



## 2 Global, national, and subnational initiatives creating demand for carbon offsets and trade

### 2.1 United Nations framework convention on climate change

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty adopted at the 1992 United Nations Conference on Environment and Development (also known as ‘Earth Summit’) in Rio de Janeiro, Brazil (United Nations 1992). The UNFCCC came into effect in 1994, after a sufficient number of parties had ratified it; as of 2018, there are 197 parties that have ratified the treaty (United Nations 2018c). The overall goal of the treaty is to provide a framework for international negotiations (nominally ‘protocols’ and ‘agreements’) to achieve:

*...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.*

(United Nations 1992)

The purpose of the UNFCCC was not to commit parties to emissions limits or to be an enforcement mechanism for international agreements; rather, the to provide guiding principles and recommendations for international negotiations. For developed countries, for example, the one overarching aim was to return or stabilise anthropogenic greenhouse gas emissions to their 1990 levels (United Nations 1992). The policy provides the basis for national and sub-national policies relevant to this project.

#### 2.1.1 THE KYOTO PROTOCOL

The first international agreement under the UNFCCC was the Kyoto Protocol in 1997. The purpose of the Kyoto Protocol was to commit its signatories to internationally binding emissions reduction targets (United Nations 1998). Parties that committed to the Kyoto Protocol were subject to different levels of commitment based on their economic development (United Nations 2018b):

- Annex I: industrialised countries (members of the Organisation for Economic Co-operation and Development (OECD), including Australia) and economies in transition;
- Annex II: the OECD members of Annex I; and
- Non-Annex I: developing countries.

There are also a further 49 countries classified as ‘least developed countries’ which are given special consideration under the convention due to their limited capacity to respond and adapt to climate change. Under the Kyoto Protocol, Annex I parties were legally committed to reduce or maintain their

emissions as a percentage of their base year or period; Australia, for example, had an emission limitation of 108% of 1990 emissions (United Nations 1998).

The Kyoto Protocol allowed two ‘flexibility mechanisms’ that could be used by Annex I parties to meet their commitments: the Clean Development Mechanism (CDM) and International Emissions Trading (IET) (United Nations 1998). The CDM allows countries that have made a commitment to reach their targets by implementing emission reduction projects in developing countries. The IET allowed countries that exceed their commitment targets to ‘sell’ their emissions reductions to countries unable to make the reductions within their own efforts (United Nations 2018a). This mechanism is the major global initiative driving demand for global offsets and trade. The most recent agreement, the ‘Paris Agreement’ (see below), expands on the IET mechanism of the Kyoto Protocol and acts as a framework for a global carbon market (United Nations 2015).

### 2.1.2 THE PARIS AGREEMENT

Rather than stabilising emissions at a particular level as per the Kyoto Protocol, the Paris Agreement’s central aim is to keep global temperature rise to less than 2°C (and preferably less than 1.5°C) above pre-industrial levels (United Nations 2015). This agreement allows parties to nominate their Nationally Determined Contributions (NDC) as outlined in Article 3:

*...all Parties are to undertake and communicate ambitious efforts... with the view to achieving the purpose of this Agreement... The efforts of all Parties will represent a progression over time, while recognizing the need to support developing country Parties...*

(United Nations 2015)

Australia’s NDC is set as an “economy-wide target to reduce greenhouse gas emissions by 26 to 28 per cent below 2005 levels by 2030” (Commonwealth of Australia 2015). Unlike the Kyoto Protocol, the Paris Agreement allows for voluntary and nationally determined targets that are politically encouraged rather than legally binding under international law. The Agreement also extends beyond the Kyoto Protocol by progressing market based mechanisms through the framework that is outlined in Article 6 of the Agreement (United Nations 2015).

The framework outlined in Article 6 of the Paris Agreement is a global driver of carbon offsets and trade by supporting the international trade of carbon offsets without restricting trade to specific types of approved units. Units are only specified as needing to meet common standards and accounting practices (for example, they cannot be double counted) (United Nations 2015). The framework also encourages bilateral agreements to transfer units internationally while encouraging the mitigation of greenhouse gasses through support of sustainable development of under-developed countries (United Nations 2015).

## 2.2 International and national carbon agreements

The international framework outlined by the UNFCCC and the Paris Agreement encourage the formation of international and national carbon agreements. Three levels of agreement will be

discussed in this section: international agreements between countries (Section 2.2.1), international agreements between sub-national entities (Section 2.2.2), and emission reductions systems within a single nation that is scheduled for international integration at a later date (Section 2.2.3).

### **2.2.1 SWITZERLAND (SWISS) – EUROPEAN UNION BILATERAL AGREEMENT ON EMISSIONS TRADING**

The Swiss emissions trading scheme (ETS) started in 2008 as a voluntary emissions reduction mechanism that entities could use to replace their taxation under the Swiss CO<sub>2</sub> levy; it later became mandatory for large industries (which accounted for approximately 10% of Swiss emissions) in 2013 (ICAP 2018). The bilateral agreement with the European Union Emissions Trading Scheme (EU ETS) came into effect in 2017. The agreement was relatively simple as the Swiss ETS had been designed to EU ETS standards, with allocations determined via a similar methodology for the two entities (ICAP 2018). The aim of the Swiss ETS is to reduce emissions to 50% of 1990 levels by 2050. Free allocations were initially 80%, reducing to 30% by 2020; excess or insufficient allowances are then sold and bought in the shared Swiss/EU carbon market 2-3 times per year (ICAP 2018).

### **2.2.2 CALIFORNIA CAP AND TRADE PROGRAM**

International carbon agreements can be initiated at the State/Province level: for example, the California cap and trade program. Cap and trade systems are mechanisms for controlling carbon emissions, and other forms of atmospheric pollution, by which an upper limit is set on the amount a given organisation may produce but which allows further capacity to be bought from other organisations that have not used their full allowance. The Californian program was initiated in 2012 and came into force in 2013; it is the fourth largest ETS in the world and covers the industries responsible for 85% of the state's emissions (C2ES 2018). The aim of the program is to achieve a 3% per annum decrease in emissions until 2021, after which the target emissions reduction will be adjusted as appropriate. The program is a blend of policies from the Regional Greenhouse Gas Initiative (RGGI) and the EU ETS, with additional policies as designed by the State of California (C2ES 2018). The program is linked with similar programs in the Canadian provinces of Ontario and Quebec, which allows international trade between the three entities. California's cap and trade program also has a Memorandum of Understanding with the states of Chiapas, Mexico and Acre in Brazil that allows offsets via reduced emissions from deforestation and land degradation (C2ES 2018).

The California cap and trade program is a legislated market based emissions reduction mechanism that assigns a state-wide emissions cap that industries must remain under either by reducing their own emissions or by purchasing reductions from other industries (C2ES 2018). Emissions allowances are first distributed by free allocation (determined by facility efficiency relative to industry benchmarks) and then by quarterly auctions. Auctions have both a price floor and ceiling; if the ceiling price is reached then additional allowances become available (C2ES 2018). Criticism of the program (e.g. Balmes 2018) includes a concern that industries with high emissions will simply buy large allowances rather than investing in emissions reductions, and that these industries are likely to be situated in low socio-economic areas; with limited improvements in emissions and air quality in poorer communities (Balmes 2018). This concern was addressed in 2016 by the decree that, of the funds received from the cap and trade program, "at least 25 percent of funds go to projects within and benefitting

disadvantaged communities and at least an additional 10 percent is for low-income households or communities” (CalEPA 2018).

### **2.2.3 CHINA’S NATIONAL EMISSIONS TRADING SCHEME**

As with the two previous examples, China’s national emissions trading scheme is a cap and trade market mechanism to reduce greenhouse gas emissions. The ETS was initiated in 2017 and is now the world’s largest carbon market (ICAP 2018). China’s long term goal is to reduce CO<sub>2</sub> emissions per unit GDP by 60-65% by 2030 as part of its commitment to the Paris Agreement (Weng and Xu 2018). Unlike the previous two examples, the only industry covered by the China national ETS as it currently stands is the power sector, however, further industries will be included in the future (ICAP 2018). The price of carbon in the Chinese market does not appear to have a floor or ceiling: in the pilot emission trading schemes the price per tonne of CO<sub>2</sub>-e ranged from ¥1-123 RMB with a mean price of ¥32 RMB (approximately \$6.50 AUD) (Yang et al. 2018).

## **2.3 Carbon trading: limitations in the current environment**

### **2.3.1 INTERNATIONAL TRADING**

Although a handful of countries are currently in bilateral negotiations for international carbon trading (ICAP 2018), very few countries are currently accepting international offsets to meet mandatory compliance obligations (Palmer and Cook 2017). The China national ETS, for example, does not currently support international trade (Section 2.2.3). Countries that are accepting international equivalent allowances have substantial restrictions on the certification, project type, and quantity of emissions which can be surrendered, in particular on the sector of origin of the emissions reduction (Palmer and Cook 2017). For example, the EU ETS is unlikely to accept international offsets after 2020 and no land-based offsets are permitted. International carbon markets are highly sensitive to political and practical difficulties – the price of carbon in the EU ETS, for example, has been highly volatile in response to policy change (Palmer and Cook 2017). In addition to the normal challenges an international market faces, two flexible mechanisms that are outlined in the Kyoto Protocol (CDM and Joint Initiatives; Section 2.1.1) may no longer be valid under the Paris agreement (Section 2.1.2), leading to further volatility and uncertainty in the global carbon market.

### **2.3.2 DOMESTIC TRADING**

The two main commonly cited limitations to carbon trading within the Australian market are policy uncertainty (Evans 2018) and the low carbon price (Palmer and Cook 2017). This could, however, be defined as one limitation as the policy uncertainty appears to be one of the major causes of the low carbon price. The frequent changes in climate policy in Australia are a major barrier to entities entering into and investing in the Australian carbon market (Evans 2018). For large emitters, the lack of certainty about the timing, extent, and funding of government initiatives such as the ERF and the Safeguard Mechanism (See Section 2.4) has led to a reluctance to invest in emission reduction programs, thus decreasing the price of carbon in the Australian system (Palmer and Cook 2017). Furthermore, a lack of trusted information on the provision of co-benefits (e.g. biodiversity

conservation, water quality, pollination) from emissions reduction activities also acts as a barrier to entry into carbon trading (Evans 2018).

## 2.4 Australian emissions reduction fund

### 2.4.1 POLICY FRAMEWORK

Although Australia does not currently operate a carbon cap and trade scheme, there is a framework for emissions reduction in the Emissions Reduction Fund (ERF) (See Section 4 for more detailed information) (Clean Energy Regulator 2018a). This voluntary scheme and its associated legislation and policies are the primary mechanism for climate change mitigation currently supported by the Australian Government. Although participation is voluntary, there are incentives included to encourage participation by a range of stakeholders, including individuals and organisations. The ERF is enacted through:

- *The Carbon Credits (Carbon Farming Initiative) Act 2011*;
- The Carbon Credits (Carbon Farming Initiative) Regulations 2011; and
- The Carbon Credits (Carbon Farming Initiative) Rule 2015.

The ERF contains three elements: crediting, purchasing, and safeguarding emissions reductions (Department of Environment and Energy 2018). It covers activities, including the adoption of new practices and technologies, that result in an emissions reduction. Participants in the ERF earn an Australian carbon credit unit (ACCU) for every tonne of carbon dioxide equivalent (tCO<sub>2</sub>-e) that is stored or avoided from release (Clean Energy Regulator 2018a). These credits can be sold domestically to the Australian Government, or on the international carbon market. Although ACCUs may be sold internationally, there are no specific international agreements in place for this purpose; therefore, all international sales must be specifically sought out by ERF participants.

In addition to crediting and purchasing of units, the ERF includes a safeguarding mechanism to ensure that emissions reductions are not negated by emission increases elsewhere in the economy. This mechanism acts somewhat like a carbon 'cap' where covered facilities are required to keep their emissions at or below a baseline set by the Clean Energy Regulator (Clean Energy Regulator 2018a). The facilities that are covered by the safeguard mechanism include those with direct emissions (such as electricity generation, mining, oil and gas, manufacturing, transport, construction and waste) of more than 100,000 tCO<sub>2</sub>-e per year (Clean Energy Regulator 2018d).

Participation in the ERF is via participation in a 'project', of which there are various types, each of which is referred to as a 'method'. Each method is underpinned by a methodology that describes the appropriate way in which a project can be undertaken, and also how the resulting reductions in emissions can be measured for reporting purposes. Methods include (Clean Energy Regulator 2018b):

- Emissions reductions at facilities reporting under the National Greenhouse and Energy Reporting Scheme;
- Capture and destruction of coal mine fugitive emissions;
- Reductions in emissions-intensity of transport;

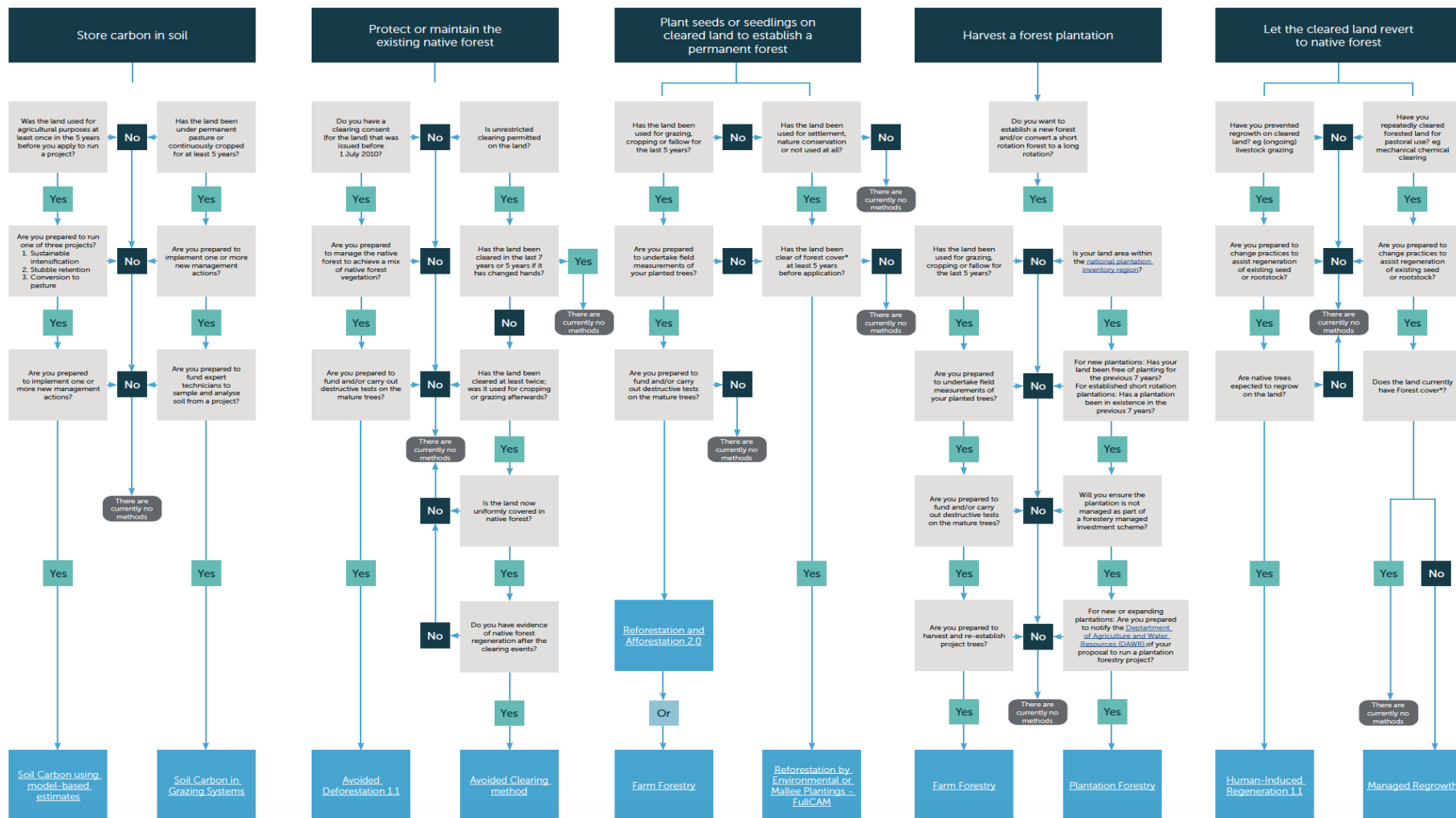
- Commercial, industrial, and aggregated energy efficiency;
- Capture and combustion of landfill gas and agricultural waste;
- Alternative treatment of organic waste;
- Capture and combustion of biogas from wastewater; and
- Methods for the land sector, including increasing soil carbon, reducing livestock emissions, expanding opportunities for environmental and carbon sink plantings, and reforestation (including assisted natural revegetation (ANR) .

The emphasis in this literature review is on the final bullet point above: on opportunities for the land sector to participate in the ERF. Participation of the land sector in the ERF is *via* storing carbon (e.g. in woody biomass or in the soil) or avoiding emissions (e.g. avoided land clearance) from agricultural activities. Examples of such activities include, but are not limited to: reforestation, revegetation, restoring rangelands, and protecting native forest or vegetation that is at imminent risk of clearing. With the diverse types of projects available, the ERF has produced a decision tree to help stakeholders in their decision to participate in the ERF, and the types of activities they may be eligible for. As it is not the intention to list all possible project opportunities in this review, the decision tree is provided here (Figure 1), and with the recommendation that further details be sought from the ERF webpage (Clean Energy Regulator 2018a).

# Sequestration Decision Tree

What would you like to do on your land to store, or sequester, carbon and be issued with Australian carbon credit units for that activity?

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Version: 2017

Figure 1: Clean Energy Regulator – Sequestration Decision Tree.

(source: <http://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/Sequestration%20decision%20tree.pdf>)

### **2.4.2 LIMITATIONS: POLICY UNCERTAINTY, SCALE, AND PRICE**

An important limitation of the ERF is policy uncertainty; this is a particular issue with climate policy in Australia which has been characterised by frequent changes. As discussed previously (Section 2.3.2) policy uncertainty reduces the incentive for participants to commit to emissions reduction. Uncertainty over future government policy decisions and the market prices for carbon and other commodities have been identified as primary barriers to participation in the Carbon Farming Initiative, the ERF, and the establishment of reliable supply of future carbon credits (Evans 2018, Kragt et al. 2017). Addressing this limitation requires the reduction of uncertainty surrounding financial exchanges involved in emission reduction mechanisms (Evans 2018).

Scale of operation and the exclusion of co-benefits from project accounting are also substantial barriers to participation. Limiting the scale of operation to at least 2,000 tCO<sub>2</sub>-e per annum prevents small scale participants with highly economical projects from participating and although small-scale projects can be aggregated into a single project, the administrative burden can be prohibitive (Burke 2016). The scale limitation and administrative burden mean some relatively easy to perform but difficult to document emissions reduction activities cannot be included in the current policy environment.

Carbon price (see also Section 4) and the difficulty of accounting for co-benefits are a barrier to meaningful participation in emissions reduction via the ERF. This is particularly the case in projects under the land sector methodologies, where the lack of co-benefit accounting means projects with the best carbon benefit may not be the projects with the best net benefit. For example, although planting a fast growing monoculture plantation may yield the best carbon sequestration, it is likely to have no net benefit on biodiversity or other co-benefits, such as pollinator habitat (Evans 2018); an environmental planting (a planting with a diversity of native trees and shrubs) may be more expensive to implement with less carbon sequestration but with a large number of co-benefits. Encouraging landholders to participate in complex reforestation is therefore unlikely under the current policy environment and it is likely that this variety of project will require a biodiversity 'premium', or similar, to encourage uptake (Evans 2018, Rooney and Paul 2017).

### **2.4.3 LIMITATIONS: INFORMATION, FINANCIAL, AND TIME BURDENS**

Further limitations to the ERF include information, financial, and time burdens when designing, implementing, and reporting on projects. Information burdens include effort spent understanding the requirements of ERF methods and obtaining information about the specific implementation of a potential project under local conditions (Burke 2016). The administrative burden can have significant financial and time costs for both the government and the participant: the government in administering the mechanism and the participant in monitoring and reporting on their project (Burke 2016). These costs can be avoided or mitigated where there is a functioning market for Carbon Service Providers (CSP - brokers).

### **2.4.4 LIMITATIONS: ADDITIONALITY AND 'ANYWAY' PROJECTS**

The issue of additionality and 'anyway' projects will be briefly discussed here; for more information see Section 5.5. There is the risk with projects funded by emissions reduction mechanisms that the project



has no net emissions reduction, or that the commitments in the project were going to happen ‘anyway’. For example, using funds from emissions reduction on one property to clear forest on another property (no additionality), or a project that is funded to prevent clearing on a site where there was no intention of clearing (Burke 2016, Evans 2018). Such ‘anyway’ projects are likely to proceed with or without funding from the ERF; reforestation of a site unsuitable for agriculture, for example (Evans 2018). These projects may appear low cost for high benefit, and are therefore likely to be selected for funding even though they would proceed without intervention (Evans 2018). The misalignment of national carbon policy with State-level legislation allows projects to be eligible in one jurisdiction where they would not be in another jurisdiction. e.g. legislation allowing wholesale clearance of native vegetation in Queensland results in projects for carbon offsets being eligible there which would not be eligible under legislation in South Australia.

## 2.5 State initiatives within Australia

There are a small selection of State based emissions reductions mechanisms in a number of Australia’s States; however, no State has implemented emissions reduction strategies to the scale of the ERF. Current commitments to action are different for each jurisdiction and include strategies such as voluntary pledges to reduce emissions (Victoria), funding opportunities to improve energy efficiency (Tasmania), and promotion of ‘green industries’ (South Australia). The Victorian program ‘TAKE2’, aims to reduce emissions and build capacity in order to achieve the State’s goal of net zero emissions by 2050 (DELWP 2016). This program is supported by a small number of granting schemes to assist volunteer businesses and community groups (DELWP 2016). The ‘Tasmanian Energy Efficiency Loan Scheme’ provides interest free loans (36 months) for small business purchases of up to the \$40,000 and home purchases of up to \$10,000 to update existing equipment to improve energy efficiency (DPAC 2018). The South Australian ‘Green Industries’ program provides funding opportunities and support for industries and groups in SA with an aim of keeping SA at the forefront of green innovation (Green Industries SA 2018). Additionally, the South Australia's *Climate Change and Greenhouse Emissions Reduction Act 2007* provides renewable energy and emissions reduction targets to ‘reduce by 31 December 2050 greenhouse gas emissions within the State by at least 60% to an amount that is equal to or less than 40% of 1990 levels’ as part of a national and international response to climate change (Water 2007). The Carbon Neutral Adelaide policy statements (Adelaide City Council 2015) will also require large quantities of offsets (with preference for locally sourced offsets) to be sourced if the goals are to be met.

### 2.5.1 CASE STUDY: GREENHOUSE GAS REDUCTION SCHEME (GGAS) (NSW 2003-2012)

Although there are no current State based cap and trade ETSS, New South Wales previously ran the world’s first mandatory cap and trade carbon ETS (IPART 2013). This scheme started in 2003 and ended in 2012; it was ended to prevent duplication with the Commonwealth Carbon Tax (IIED 2013). This ETS was unusual as it used CO<sub>2</sub>-e per capita as the benchmark unit of emissions reduction. It was also unusual in that Australia was not under any commitment to decrease emissions under the Kyoto Protocol (IIED 2013). The scheme was considered largely successful, with high levels of compliance and the mitigation of

approximately 144 million tonnes of emissions over the scheme's life (IIED 2013). The scheme achieved a cost of approximately \$15 to \$40 per tonne of CO<sub>2</sub>-e reduction (IPART 2013).

### **Strengths, weaknesses, and lessons from the GGAS**

This section on strengths, weaknesses, and lessons from the GGAS has been distilled from the New South Wales Independent Pricing and Regulatory Tribunal's report on the NSW Greenhouse Reduction Scheme; please see that report for more detailed information (IPART 2013).

The most important strength of the GGAS was its design as a market-based mechanism that was based on the economic principles of supply and demand. In particular, it benefitted from being a product (albeit intangible) with readily identifiable sellers and buyers. The clarity of this scheme allowed businesses to focus on meeting the specific requirements of the GGAS rather than expending energy on meeting a large administrative burden before project approval. The structure of the GGAS encouraged best net financial benefit, and it encouraged high compliance through effective auditing at a low administrative cost. A benefit that it had compared to the ERF is the capability to easily include small projects as provisions were made within the scheme to reduce the transaction costs of small individual energy efficiency measures.

Weaknesses of the GGAS included issues with emissions targets, trading with external schemes, and financial additionality. The use of tCO<sub>2</sub>-e per capita made calculating industry obligations to surrender abatement certificates difficult, while issues with the scheme's baseline emissions increasing over time meant the scheme was not as effective as it might have been. The GGAS allowed a proportion of certificate surrenders to be Renewable Energy Certificates (REC) from the Renewable Energy Target scheme to be used rather than certificates from the GGAS. This allowance was considered to negatively affect demand (and therefore price) of the GGAS certificates. Finally, the GGAS suffered from issues surrounding financial additionality. That is, projects did not have to prove financial additionality and therefore projects that would have proceeded 'anyway' due to the fact that financial pressures could still be counted as projects for emissions reductions.

Lessons from the GGAS highlight the importance of the following:

- Setting targets
  - Creating a transparent mechanism to set challenging but achievable targets; and
  - Developing a mechanism for updating targets while maintaining market confidence.
- Penalties
  - Ensuring sufficient penalties and compliance mechanisms to deter non-compliance at low administrative cost.
- Flexibility
  - Including shortfall allowances as a means of ensuring compliance and managing risks of potential supply shortfalls;
  - Allowing small shortfalls without financial penalty; and
  - Creating mechanisms where unexpected behaviour can be addressed in a timely manner. i.e. the ability to make small changes to the scheme without a legislative burden.
- Risk and Uncertainty
  - Minimising the risks and uncertainties inherent in regulatory markets; and
  - Managing uncertainty by effective consultation and communication before enacting changes.

- Confidence
  - Establishing confidence in certificates or abatement units as a valuable and tradable commodity;
  - Regulating the scheme in such a way as to ensure the scheme's integrity; and
  - Limiting the ability to surrender certificates from unrelated or non-certifiable schemes.

## 3 Global supply and demand

### 3.1 Global pricing variability

The emergence of global supply and demand for carbon offsets is driven by the clear market signal created by more than 179 parties ratifying the Paris Agreement (World Resources Institute 2018) on climate change. The parties now joined in the Paris Agreement represent 89% of global emissions. In line with commitments under the Paris Agreement, Australia has committed to reduce emission by 26-29% from 2005 levels by 2030 (Commonwealth of Australia 2015), a level that is expected to be inadequate by some to contribute sufficiently towards global climate mitigation efforts (Climate Action Tracker 2018). Many other countries are similarly committed to what are considered insufficient targets and the combined current commitments are viewed as a 'floor' or starting point which can be increased to meet required goals. The high levels of commitment to targets, even if considered to be low targets, provides the beginning of confidence for markets to begin to incorporate carbon offsets into business-as-usual.

The threatened withdrawal from the Paris Agreement by the United States of America (USA; July 2017) is in direct contrast to the resolve of many other world leaders and US business leaders, and the requirements for the Paris Agreement to remain in force (agreement from at least 55 countries representing more than 55% of global emissions) are not threatened. However, the already complex task of developing market mechanisms (taxes or ETS) have not been aided by this political uncertainty and what is considered by many to be an under commitment to global targets for effective action on climate change. Add to this the speed at which regulatory frameworks can be developed within countries and the pace of uptake by business, and it can be considered that current arrangements for carbon pricing in many countries provide great promise but from a low and volatile base.

An additional challenge for price certainty for carbon abatement projects in a jurisdiction like SA is that while provisions exist under the Paris Agreement to enable international trades of carbon units (Article 6 of the Paris Agreement; carbon units for trading are referred to as Internationally Transferred Mitigation Outcomes or ITMOs), trading is not yet up and running. The benefits of international trading of ITMOs is that prices for carbon units can better reflect global initiatives to curb atmospheric carbon concentrations. With international trading, a jurisdiction like SA may become a seller on the international market and attract investment to South Australian carbon abatement projects. The anticipated arrangements for international carbon trading open possibilities for Australian carbon abatement projects to be sold into other markets. e.g. China which will have the largest domestic carbon market in the world.

**The possibilities of greater demand for carbon units are discussed below, however, the current situation is that prices are low and volatile.** *NOTE: Nominal prices on April, 01 2018. Prices are not necessarily comparable between carbon pricing initiatives because of differences in the number of sectors covered and allocation methods applied, specific exemptions, and different compensation methods. Some initiatives use a two-price system where prices are different for different tCO<sub>2</sub>-e contributions or industries (source: The World Bank Carbon Pricing Dashboard [https://carbonpricingdashboard.worldbank.org/map\\_data](https://carbonpricingdashboard.worldbank.org/map_data))*

**Figure 2 illustrates the many international jurisdictions in which an ETS or carbon tax is operating. Amongst the many initiatives, ETSs hold more than 2.5 times the value of carbon tax initiatives; prices are extremely variable; and approximately half the initiatives currently have prices above the average for Australian ERF auctions (The**

**World Bank 2018). The range of prices currently on offer is <US\$1 to US\$139 tCO<sub>2</sub>-e<sup>-1</sup>** (NOTE: Nominal prices on April, 01 2018. Prices are not necessarily comparable between carbon pricing initiatives because of differences in the number of sectors covered and allocation methods applied, specific exemptions, and different compensation methods. Some initiatives use a two-price system where prices are different for different tCO<sub>2</sub>-e contributions or industries (source: The World Bank Carbon Pricing Dashboard [https://carbonpricingdashboard.worldbank.org/map\\_data](https://carbonpricingdashboard.worldbank.org/map_data))

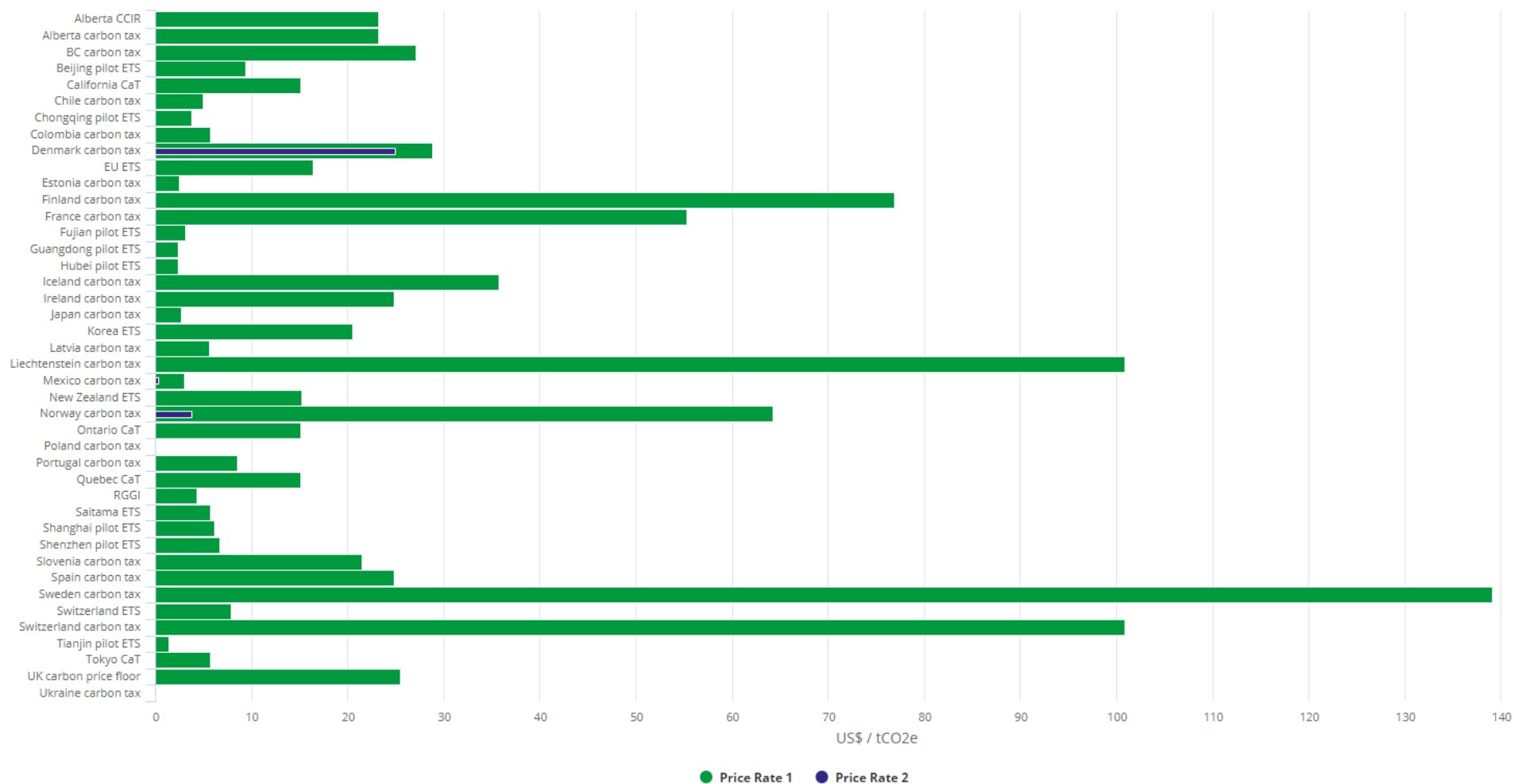
Figure 2). In the voluntary market, prices have been tracked for sale within the last year at between \$0.5 tCO<sub>2</sub>-e<sup>-1</sup> and more than \$50 tCO<sub>2</sub>-e<sup>-1</sup> (Hamrick and Gallant 2017).

Trading into international initiatives with high prices is only possible in a few situations as the few countries accepting international permits have restrictions on the project type, certification standard, data of project and quantity of permits which can be traded, and the sector of origin of the credits (Palmer and Cook 2017). ACCUs from land-based sequestration projects in Australia would not currently meet eligibility requirements for any of the schemes accepting permits in other countries (Energetics 2017). International prices have been highly volatile in response to policy change (Palmer and Cook 2017) and future prices are no more predictable. Estimates of future prices depend on the arrangements setting offset demand in different international jurisdictions (Energetics 2017) but can range widely from US\$3 tCO<sub>2</sub>-e<sup>-1</sup> in Japan 2030 (Ministry of the Environment Japan 2017) to US\$28 tCO<sub>2</sub>-e<sup>-1</sup> in the European Union 2030 (Inside Financial and Risk 2014). Other projections for carbon prices are even more optimistic, taking the line that prices need to rise to AU\$50-\$105 tCO<sub>2</sub>-e<sup>-1</sup> by 2020 and AU\$65-\$130 tCO<sub>2</sub>-e<sup>-1</sup> by 2030 if signatories are going to meet Paris Agreement commitments (Twidale 2017).

Internal carbon pricing continues to develop as businesses and governments use it as a tool in decision making on climate-related opportunities and risks and opportunities. Internal carbon pricing by businesses is driven by business risk and opportunity assessment, statutory reporting requirements or investor needs. Prices are included across a wide range and some businesses will use multiple levels of price in scenario planning, particularly for risk and opportunity assessment. Over 1,300 companies with collective annual revenues of about US\$7 trillion disclosed that they currently use or are intending to use (within two years) an internal price on carbon (CDP 2016).

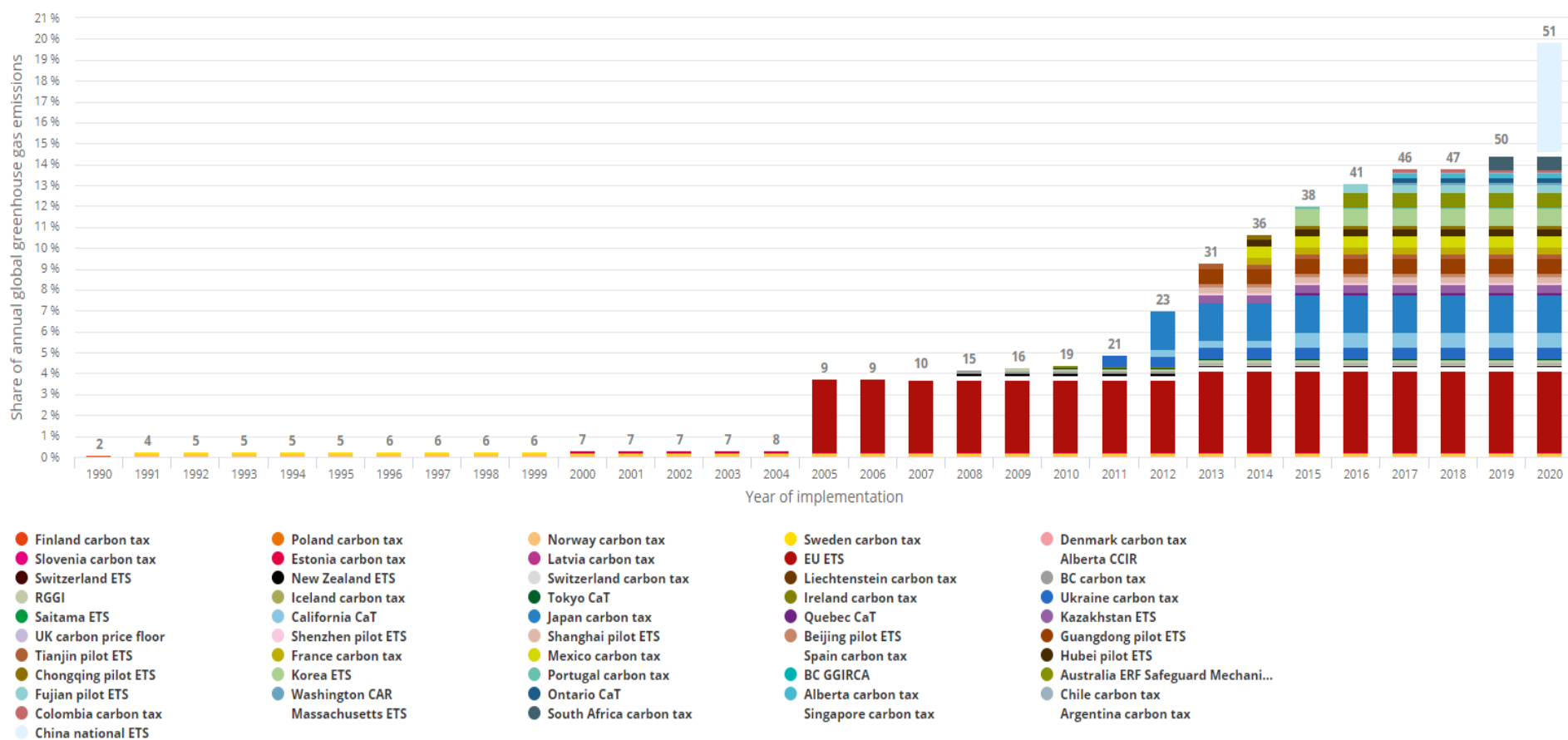
In the power sector, there is an initiative (TCFD 2018) to factor in the costs of carbon as part of decarbonising the sector towards meeting the Paris Agreement goal of a 2°C or below global warming scenario. The results indicate that carbon prices are being factored into power sector considerations in the range AUD\$32–53 tCO<sub>2</sub>-e<sup>-1</sup> by 2020 and AUD\$40–135 tCO<sub>2</sub>-e<sup>-1</sup> 2030 (CPD 2017).

Overall, past experience of prices and price volatility alone may not create confidence for development of carbon abatement projects in SA. However, the high number of signatories to the Paris Agreement, the rapid expansion of ETS and carbon tax initiatives around the world, and the development of arrangements for international trade in carbon permits all suggest that the future will be characterised by higher carbon permit prices than are currently available for most abatement projects in Australia. The large number of businesses now incorporating carbon prices into their forward planning, and the level of those prices, also provides confidence that demand is likely to increase as policy frameworks tighten around the Paris Agreement commitments.



*NOTE: Nominal prices on April, 01 2018. Prices are not necessarily comparable between carbon pricing initiatives because of differences in the number of sectors covered and allocation methods applied, specific exemptions, and different compensation methods. Some initiatives use a two-price system where prices are different for different tCO<sub>2</sub>-e contributions or industries (source: The World Bank Carbon Pricing Dashboard [https://carbonpricingdashboard.worldbank.org/map\\_data](https://carbonpricingdashboard.worldbank.org/map_data))*

**Figure 2. Prices in implemented carbon price initiatives from around the world.**



NOTE: Emissions are given as a share of global greenhouse gas emissions in 2012. Annual changes in global, regional, national, and subnational greenhouse gas emissions are not shown in the graph. The information on the China national ETS represents early unofficial estimates. (Source: The World Bank Carbon Pricing Dashboard [https://carbonpricingdashboard.worldbank.org/map\\_data](https://carbonpricingdashboard.worldbank.org/map_data))

Figure 3: Regional, national and sub-national carbon pricing initiatives: share of global greenhouse gas emissions covered.

## 3.2 Market complexity

A challenge for increasing the supply of land-based carbon credits from SA to markets, both Australian and international, is the variety of different standards and requirements for credits in different markets. As discussed above, Australia is not yet party to any carbon trading clubs with other countries which would make international trades in ACCUs easier. However, Australia does operate in the voluntary market for carbon offsets and contributed to the demand of approximately 1.5 MtCO<sub>2</sub>-e in Oceania in 2016 (Hamrick and Gallant 2017). Eighty-six percent or approximately 15 MtCO<sub>2</sub>-e of demand for voluntary offsets in 2016 came from Europe and the USA (Hamrick and Gallant 2017).

The key complexities of the voluntary markets are that they are fragmented, highly differentiated, prone to change, and somewhat occluded (i.e. often transactions between individual businesses). Trading is through a selection of standards, depending on the buyers' needs and desire for auditability. The main standards in international use in the voluntary market in 2016 were the Verified Carbon Standard (VCS): 21.4 MtCO<sub>2</sub>-e, the Gold Standard: 7.1 MtCO<sub>2</sub>-e, and the Climate Action Reserve (CAR): 4.9 MtCO<sub>2</sub>-e. Additional standards in popular use were the American Carbon Registry (ACR), and Plan Vivo (Hamrick and Gallant 2017).

Many offsets in the voluntary market come with co-benefits as 35% of buyers seek co-benefits, primarily community benefits, biodiversity and adaptation co-benefits. Of the offsets retired under VCS in 2016, 17% had co-benefit certification and most came from energy, forestry and land use projects in Africa and Southeast Asia (Hamrick and Gallant 2017). The purchase of offsets with co-benefits is driven by a number of factors and is often tied to purchasers' objectives for marketing and corporate social responsibility. Hamrick and Gallant (2017) indicate that many buyers have preferences for buying offsets from projects near to the buyer's operations and/or buyer's headquarters.

The complexity of voluntary markets means that brokers play an important role in developing projects and linking buyers and sellers. Brokers are needed for the generation of offset credits through projects but also along the chain of purchases which can exist before eventual retirement of an offset. An offset is retired when an end buyer purchases the offset with the intent to claim the emissions reductions as their own. Project developers and their brokers most commonly issue offsets and then sell some of those offsets to an end user, an intermediary or hold them for later sale. This means that the supply and demand for offsets in the voluntary market may not be easy to track as brokers and intermediary offset buyers hold offsets looking for buyers or higher prices.

## 3.3 Global demand projections

Previous sections have discussed the predominantly low prices and high price volatility for carbon permits internationally. This section seeks to look ahead to future demand and how it might increase the price and therefore the potential supply of carbon offsets from SA.

*NOTE: Emissions are given as a share of global greenhouse gas emissions in 2012. Annual changes in global, regional, national, and subnational greenhouse gas emissions are not shown in the graph. The information on the China national ETS represents early unofficial estimates. (Source: The World Bank Carbon Pricing Dashboard [https://carbonpricingdashboard.worldbank.org/map\\_data](https://carbonpricingdashboard.worldbank.org/map_data))*

Figure 3 shows the rapid increase in the number carbon pricing initiatives around the world and the share of global carbon emissions covered by these initiatives. The ten years, 2010 – 2020, will see a rise from 15 carbon pricing initiatives covering 4% of global emissions to 51 initiatives covering 20% of global emissions. This rapid growth still does not include national initiatives from some major economies (e.g. USA). As markets become more established, business and government policy will have interest in well linked international markets, to stabilise both supply and price as well as ensure they can meet commitments under corporate



social responsibility goals or Paris Agreement commitments, respectively. Australian projects are in a good position to supply increasing demand as ACCUs are considered a high standard offset type and are likely to meet the accreditation requirements of emerging and linking markets. The requirements for quality ACCUs are related to measurement, additionality, permanence and leakage; all of which are discussed later in this report.

Even in the absence of international trading of carbon offsets through joint national markets, voluntary demand is expected to grow. Voluntary offsets are used by businesses, governments and other entities for compliance and branding and reputational purposes. There are strong drivers for sustainable development in value chains for products traded all around the world and increasing risks for businesses not addressing sustainability in their value chains.

An example of increased demand from the voluntary market is the upcoming Carbon Offsetting and Reduction Scheme of International Aviation (CORSIA). The CORSIA is an agreement with the aviation industry that participating business will offset their emission from passenger transport when they exceed 2020 levels. The initiative begins on 1<sup>st</sup> January 2019, after which time all operators will have to report emissions for all international flights. Projections are that the aviation industry will have to offset 2.6 billion tonnes of CO<sub>2</sub> between 2021 and 2035, more than the total volume of offsets ever issued under the Clean Development Mechanism or traded in the voluntary carbon market (IATA 2018). There is every prospect that other industries will follow suit.

Global demand looks set to increase and prices are set to increase along with demand. Different markets for both compliance and voluntary product, domestically and internationally are still developing to service the demand but several elements appear to be firming as important. These include:

- Carbon offsets need to be a high standard;
- Co-benefits are desirable and there is interest in aligning offset projects with United Nations Sustainable Development Goals (Energetics 2017);
- There are opportunities for financial gains in trading credits and reputable brokers will be needed;
- The current arrangements in Australia are set to be reviewed as the initial funding for the ERF is exhausted, and this may come at a time when opportunities arise for Australia to participate in carbon trading clubs with other countries; and
- Cheap offsets from assisted natural revegetation (ANR) and avoided deforestation may be drying up as indicated by the price and volume information for ERF auctions shown in the next section.

## 4 Emissions reduction fund outcomes

ERF auctions have resulted in considerable contracted carbon abatement across the country, particularly resulting from vegetation methods.

There have been seven ERF auctions (Table 1, Figure 4), with the latest taking place in June 2018. Through the auctions, 429 contracts have been awarded across 461 projects. These contracts are set to provide a total of 192 Mt of carbon abatement with \$1.9 billion committed at an average price of \$11.97 per tonne of CO<sub>2</sub>-e. Across the seven auctions, 65% of abatement has been secured through vegetation methods (125.5 Mt CO<sub>2</sub>-e) while 9% (18.1 Mt CO<sub>2</sub>-e) was secured through agriculture (Figure 4).

The most recent auction awarded 32 projects across 32 contracts and resulted in the purchase of 6.67 Mt of carbon abatement for a cost of \$90 million (Table 1). This is the lowest amount of carbon abatement purchased across all the auctions so far. Carbon abatement purchased in the last three auctions was significantly less than the amount purchased in the first four. The first four auctions resulted in 87% of the carbon abatement purchased to date.

Auction data released does not include information about the number and price of unsuccessful bids in the auction or the volume of carbon abatement not purchased based on price considerations. The Clean Energy Regulator has set a confidential benchmark price for each of the auctions, essentially setting a ceiling on prices which will be paid for abatement. The literature supporting the ERF indicates that the benchmark price will be unique to each auction (i.e. set ahead of each auction) and that any bid higher than the benchmark price for that auction will automatically be excluded from consideration. However, reporting on auctions 3-7 indicates that some contracts have been awarded above the benchmark price (Table 1). The data released is insufficient for full interrogation; however, the declining volume of abatement purchased and the purchase of abatement above benchmark prices, suggests that either: 1) the total volume of abatement offered is declining and the offered prices have rising since early auctions; or 2) volumes of abatement offered are much higher than the purchase data indicates but that relatively few projects are available for purchase below the benchmark price. The latter would be consistent with purchases above the benchmark to ensure volumes are sufficient to advertise that the market remains viable for purchasing at or below politically acceptable prices.

A recent review of vegetation projects awarded through the ERF found that, of the three broad vegetation methods (tree planting, ANR, and avoided deforestation) tree planting is the least likely to be awarded (Evans 2018). Ninety-eight percent of registered avoided deforestation projects were awarded and 70% of registered ANR projects were awarded compared with just 23% for tree planting (Evans 2018) (these figures predate the seventh ERF auction). With the higher costs involved in tree planting, these projects are likely to be too expensive to be competitive against the cheaper options of ANR and avoided deforestation (Burke 2016).

Registered vegetation projects are also concentrated in a limited number of geographical areas (Evans 2018). Most projects are located in two broad regions (Figure 5). ANR projects are the most frequently adopted, accounting for 65% of registered vegetation projects and covering the most area; they are mostly found in a region that straddles the New South Wales and Queensland border (Figure 5). Avoided deforestation methods are mostly in western New South Wales and largely protect primary and previously cleared native vegetation (Figure 5). Tree planting methods have mostly been adopted in Western Australia in highly modified cropping areas and semi-arid grazing lands (Figure 5) (Evans 2018).

By undertaking abatement activities proponents can be issued ACCUs. Each ACCU represents one tonne of CO<sub>2</sub>-e stored or avoided by a project. ERF contracts have resulted in the issuing of 50,668,204 ACCUs

nationally. In ERF contracts to date, abatement via the vegetation method accounts for majority of contracted ACCUs issued at 58% of all ACCUs (26,518,909) (

Table 2). On the other hand, agricultural abatement methods make up just 5% (418,729) of the ERF contracted ACCUs that have been issued. New South Wales (201 contracts) and Queensland (156 contracts) have been issued 78% of ERF contracts resulting in 79% of the ACCUs issued; 26,710,902 and 10,252,518 respectively.

Despite the contracted abatement projects and awarded ACCUs, particularly in vegetation, deforestation in Australia is currently greater than reforestation (DEE 2017). This raises numerous concerns about the permanence of revegetation projects (Evans 2018), and also highlights the importance of broader government policy and economic factors in achieving real emissions reductions and revegetation goals (Evans 2016).

**Table 1: Summary of total carbon abatement contracts awarded through the ERF.**

Auction	Date of Auction	Abatement purchased (Mt CO <sub>2</sub> e)	Average price per tonne (\$)	Contracts awarded	Number of projects	Total value of contracts awarded (\$ million)	Largest single contract (Mt CO <sub>2</sub> e)	Smallest single contract (t CO <sub>2</sub> e)	Volume of abatement below benchmark price (%) *
1	15-16 April 2015	47.33	13.95	107	144	660	3.5	12,000	100.0
2	4-5 November 2015	45.45	12.25	129	131	556	2.5	15,333	100.0
3	27-28 April 2016	50.47	10.23	73	73	516	15.0	5,383	77.0
4	16-17 November 2016	34.36	10.69	47	49	367	2.5	20,000	98.6
5	5-6 April 2017	11.25	11.82	31	38	133	4.0	10,000	84.1
6	6-7 December 2017	7.95	13.08	26	26	104	1.7	5,000	94.6
7	5-6 June 2018	6.67	13.52	32	32	90	0.8	51,959	83.0

*\*Volume of abatement below benchmark price was not reported in the first two auction rounds and is assumed to be 100%.*

*Data source: <http://www.cleanenergyregulator.gov.au/ERF/Auctions-results>.*

# Emissions Reduction Fund contract portfolio

Released 15 June 2018

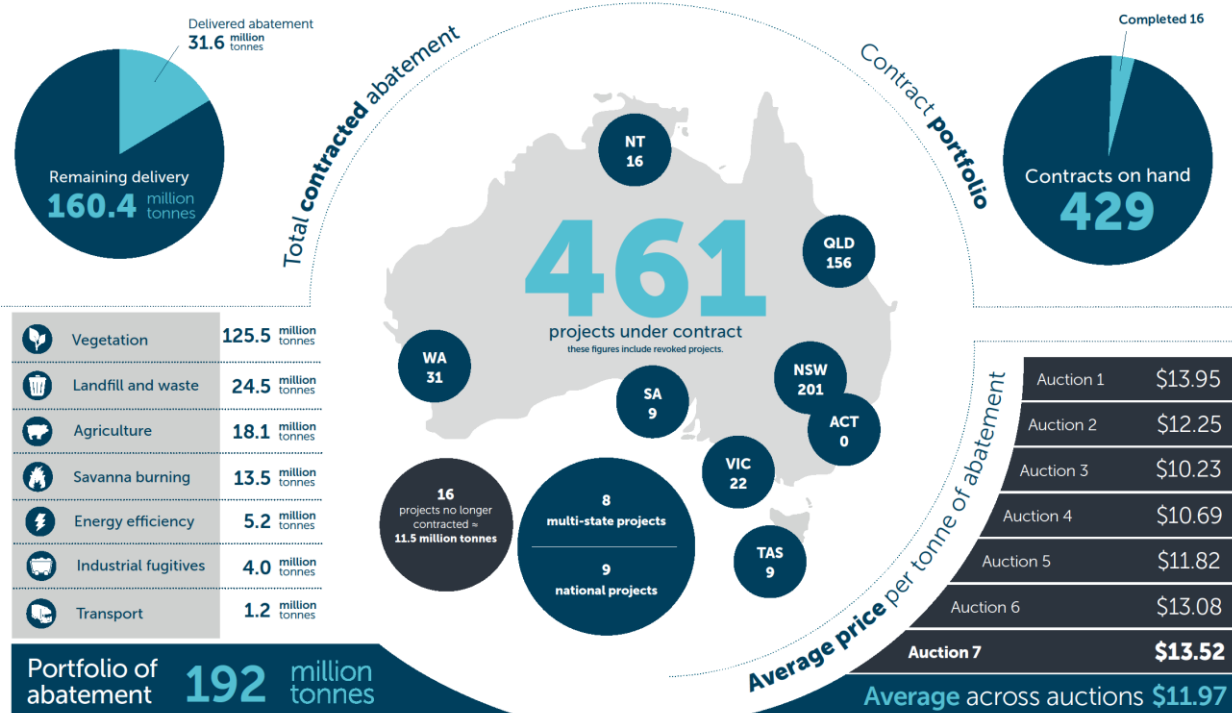
The Clean Energy Regulator is not responsible for the accuracy or completeness of the information in this document. The information is provided for general information only and should not be relied upon for any specific purpose.

**\$2.55 billion** scheme funding

\$396 million paid

\$1.9 billion currently committed

Total remaining \$249 million



Data source:

<http://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/Seventh%20auction%20contract%20portfolio%20June%202018.pdf>

**Figure 4: Emissions reduction fund contract portfolio following the seventh ERF auction.**

**Table 2: Australian and South Australian ERF contracted projects and ACCUs issued broken down by ERF methods (Clean Energy Regulator 2018c)**

	National		South Australia	
	Projects	ACCUs issued	Projects	ACCUs issued
Vegetation	262	26,518,909	2	97,266
Landfill and waste	102	15,399,204	4	310,808
Agriculture	22	418,729	2	0
Savannah burning	45	4,216,217	0	0
Energy efficiency	12	317,768	1	0
Transport	2	0	0	0
Industrial fugitives	9	0	0	0
Facilities	0	0	0	0
Total	*454	46,870,827	9	408,074

\* We note a disparity between total number of projects in Figure 4 and Table 1. We believe that this is due to the inclusion of 'rejected projects' in the Figure 4 numbers.

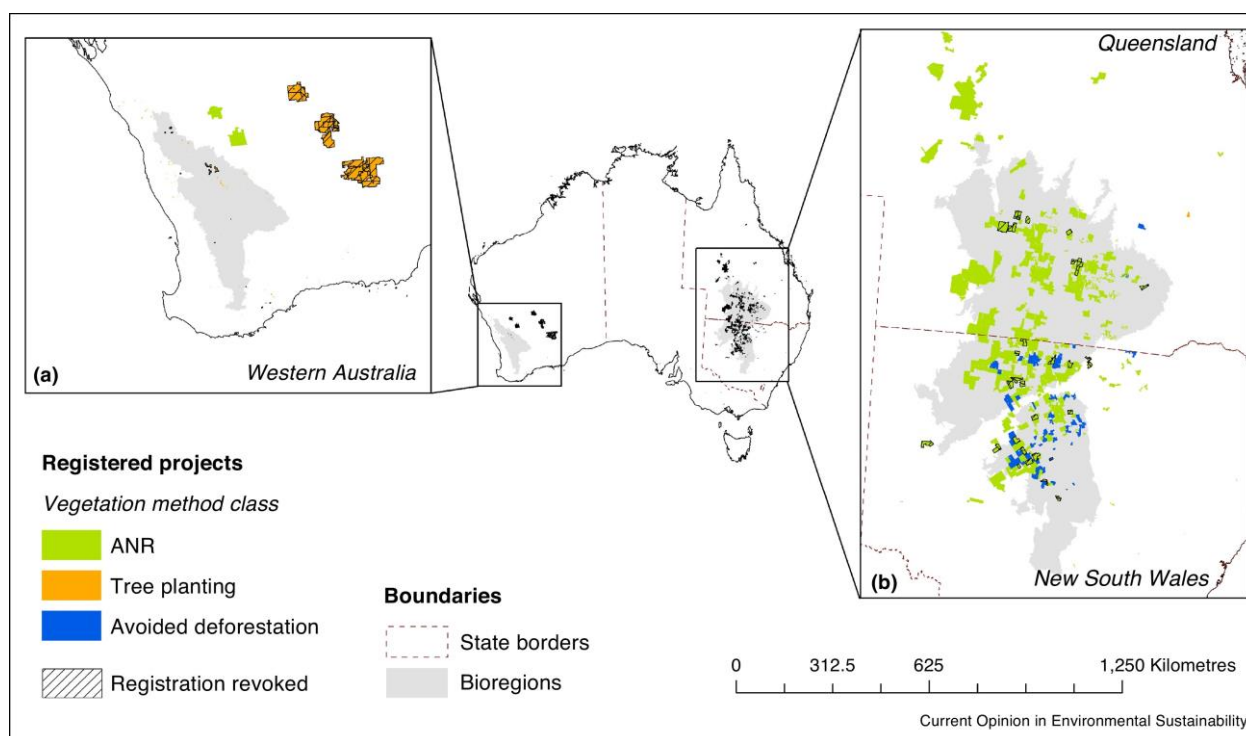


Figure 5: Distribution of vegetation projects by method class (Evans 2018).

## 4.1 South Australia

South Australia has been awarded nine contracts across the seven ERF auctions, accounting for 2% of the national total (

Table 2). South Australian contracts account for 408,074 of the ACCUs issued, just 0.9 % of the national total with 24% (97,266 ACCUs) in vegetation and 76% (310,808 ACCUs) in landfill and waste. ACCUs have not been issued within SA across other ERF methods.

Much of the South Australian landscape is under agricultural or rangeland management. While there are opportunities to change current practices and/or land use to sequester carbon or avoid emissions, uptake has been limited. South Australia faces a landscape of rapid, disruptive low carbon economy innovation and increasing international and business pressure to consider climate and carbon risks in planning. Land use and land management change can play an important role. Nonetheless, few ERF projects have been funded in SA (Figure 4,

Table 2) reflecting the limited ERF-consistent opportunities for natural regeneration of cleared lands or avoided deforestation (Settre et al. 2018).

The two contracted vegetation projects in SA both use ANR methodologies. One on the Eyre Peninsula uses *human induced regeneration* and has been awarded 97,266 ACCUs. The other project in the South East of South Australia establishes permanent native forest through assisted regeneration from *in-situ* seed sources. This is carried out on land that has been cleared of vegetation and where regrowth has been suppressed for at least 10 years. It is not clear whether this project has been issued any ACCUs at this time.

The nature of these two contracts is consistent with observations of National funding trends that low input ANR projects are more likely to be funded. This further re-enforces the assertion that high input revegetation methodologies that require planting trees are too expensive to be funded through the ERF.

Other potential methodologies such as 'blue carbon' and soil modification not currently eligible to be projects under the ERF but may present more opportunities for SA. These methodologies are likely to face lower opportunity costs compared with high input revegetation methodologies and may increase the scope for economic carbon sequestration. However, more work is required to understand these opportunities and explore the potential challenges. Nonetheless, this is an area where SA could lead development in methods and create new pathways for South Australia to increase its share of ACCUs and is currently being investigated through Goyder Institute for Water Research projects.

## 5 Market development and efficiency

Opportunities for South Australian projects to participate in the regulated Australian carbon market depend on the governance arrangements of that market and the risks, real and perceived, of accessibility and participation. The ERF has been recently reviewed by the Australian Government's Climate Change Authority and a number of areas of improvement in market design and delivery have been recommended (CCA 2017). In the sections below, we examine three of the design issues where changes in the ERF are increasing, or could increase, the viability of South Australian land-based sequestration projects participating in the ERF.

### 5.1 Safeguard mechanism

The safeguard mechanism was established in the *National Greenhouse and Energy Reporting Act* to ensure emissions reductions purchased by the Government are not offset by significant increases above business as usual levels elsewhere in the economy. Facilities that emit over 100,000 t CO<sub>2</sub>-e a year in regulated sectors (the electricity generation, mining, oil, gas, manufacturing, transport, construction and waste sectors) are provided with baselines or regulatory limits that they should adhere to each year (or within a multi-year compliance plan). These facilities are able to purchase ACCUs to offset emissions above their baseline or they can reduce their emissions through other means (*National Greenhouse and Energy Reporting Act 2007* (Cth)).

The introduction and development of the safeguard mechanism provides a potential opportunity for carbon offset projects as facilities covered by the mechanism can choose to meet their prescribed emissions baselines by purchasing ACCUs on the secondary market or on international voluntary markets. While it remains unclear what demand the mechanism will create (CCA 2017), the introduction of the safeguard mechanism has the potential to drive the development of a secondary market for ACCUs (i.e. outside ACCUs purchased by the ERF auctions). Stimulating the secondary market through this mechanism has two important elements: 1) it provides a requirement for business to avoid, reduce or offset their emissions where they exceed a baseline and 2) it initiates the development of a business-to-business market for ACCUs credited under ERF methodologies. These are discussed further in the next section.

In addition to the safeguard mechanism, there is the potential for ACCUs to be needed for business-to-business transfer for the purpose of making good on project shortfalls in contracts with the ERF or other parties. With the implementation and maturing of sequestration projects, CSP will need to manage their contracted and expected abatement volumes (e.g. due to project delays or less than anticipated carbon growth from reforestation in low rainfall periods). The size of this demand is also not known, however, an efficient secondary market stimulated by the safeguard mechanism will make untied ACCUs easier to access and reduce sequestration project risks.

### 5.2 Secondary markets

The primary markets for carbon abatement projects in Australia are the ERF auctions and demand from voluntary carbon offsetting (both for ACCUs and other voluntary offsets). Of the 43 million ACCUs credited in the ERF by November 2017, more than 4.5 million ACCUs are being held or traded by companies outside the ERF auctions (CCA 2017). These 'surplus' ACCUs may be being traded to cover shortfalls in ERF contracts, to meet demand in the voluntary sector, or may be being held for speculation on the offset market in future (which might be justified if traders believe the ERF auctions have temporarily kept the price of ACCUs artificially low at the expense of purchase volumes). Any trading of these ACCUs is necessarily achieved

through an unstructured secondary market which has emerged to facilitate sale and purchase of ACCUs outside of contracts with the Australian Government.

The Climate Change Authority examined the current operations of the secondary market for ACCUs and reported that the market is unstructured and presents a barrier to the liquidity and depth of trading (CCA 2017). In submissions to the Authority's review, stakeholders reported that there was a lack of transparency of both volume and price of supply on the secondary market for ACCUs and that most trades are bilateral (between pairs of CSP) for the purpose of managing portfolios. This transparency barrier was reported as making it difficult for smaller providers to supply to this market. The potential demand for transparency and liquidity in the secondary market may lead to institutionalisation of the secondary market to allow it to meet the requirements for risk management of portfolios. This is the safeguard mechanism for greater use of ACCUs for meeting corporate social responsibility targets, especially if the set of approved methodologies for the ERF are expanded to include more approaches which produce co-benefits. The secondary market could be improved relatively easily and profitably if the opportunity is presented to the private sector through increased transparency on ACCU holdings and contract delivery schedules. There are signs that the Clean Energy Regulator intends to provide more market information on supply and demand for ACCUs in line with the recommendation of the Climate Change Authority (Footprint 2018).

Examples of the development of efficient environmental offset markets for business-to-business transactions are relatively few and rare in Australia. One example is the BushBroker biodiversity offset program operating in Victoria (DELWP 2018). The BushBroker program was established by the Victorian Government in 2008 and biodiversity credits were generated investing to create a credit bank to speed the implementation of business-to-business trading in a thin market (O'Connor 2009). Businesses seeking biodiversity offset credits are able to use the BushBroker exchange to find appropriate credits and negotiate prices. The evolution of a secondary market for ACCUs, particularly under drivers from the safeguard mechanism, may result in more business-to-business ACCU trading; an outcome likely to lead to revelation of prices for more differentiated sequestration projects and eventually to efforts to avoid and reduce carbon emissions as prices for ACCUs rise.

### **5.2.1 VOLUNTARY MARKET FOR ACCUS**

The discussion above primarily relates to the regulated market for ACCUs purchased through ERF auctions and under the safeguard mechanism on the secondary market. There is also a voluntary market for ACCUs and other credits servicing organisations seeking to offset their emissions directly. In an analysis for the Climate Change Authority's review of the ERF, it was revealed that the Carbon Neutral Program had assisted the offset of around 9 Mt of CO<sub>2</sub>-e between 2010-11 and 2015-16, with approximately 2% of the credits used for this purpose in 2015-16 being ACCUs (CCA 2017). The voluntary market may create demand for credits to meet corporate social responsibility targets even where they are not required to act under the safeguard mechanism. Credits on the voluntary market may not be certified ACCUs as the purchasers of these credits may wish to recognise co-benefits in a way that is not easily achieved with ACCUs. Carbon Neutral's submission to the review of the ERF (CCA 2017) indicated that they certified part of their revegetation projects under the international Gold Standard (Section 3.2), partially to aid recognition of co-benefits and allow some upfront crediting. Carbon Neutral reported that buyers of credits in the voluntary market were 'paying a premium price of \$12-\$25 per t CO<sub>2</sub>-e (CCA 2017), presumably because the option for co-benefit recognition is important for these buyers and the current arrangements for ACCUs do not certify co-benefits.



## 5.3 Brokerage

A key issue for stimulating supply and efficient trading of carbon offset credits is the availability and effectiveness of brokers. Brokers (or Carbon Service Providers (CSPs)) have emerged to service the ERF auctions by developing ERF projects; providing advice on project registration; implementation and management; aggregating projects or contracts; or acting as designated agents on behalf of scheme participants. The barriers to entry to the carbon market is relatively low for CSPs, primarily due to an understanding of the requirements of carbon offset standards and the ERF auctions. The growth of firms offering services as CSPs has been relatively rapid in Australia (see a list of prominent CSPs in Table 3). While CSPs have been involved in ERF projects accounting for nearly three quarters of the contracted abatement, and just two firms accounted for 55% of contracted abatement (CCA 2017), the Clean Energy Regulator has limited oversight of their role as participants and agents. Relative to the significant role CSPs play and the risks presented by having such a high concentration of abatement volume managed by so few brokers, the role of CSPs has had very little examination. In an emerging market there is a real risk that the price, performance and development of the ERF is influenced by a few commercial operators with superior access to information (Blakers and Considine 2016).

Asymmetric information on the price of carbon abatement projects could undermine the efficiency of the ERF. The two firms that dominated the contracted abatement volumes funded under the first six ERF auctions were primarily operating in a relatively small geographic area (the Mulga Lands and Cobar Peneplain straddling the western regions of either side of the New South Wales-Queensland border) and the majority of projects are large avoided clearing or regeneration projects; only 13% of projects were for planting (Blakers and Considine 2016). The consequence for development of carbon abatement projects in SA is that the dominant CSPs are developing expertise in systems which differ from the South Australian context and in sequestration methods which are not likely to be available for significant abatement. The dominance of only a few operators may also hinder the development of a secondary market if they are influential in the way the scheme evolves.

Currently, CSPs are not regulated by the Australian Securities and Investment Commission (ASIC) in the way that financial advisors are. In 2017, ASIC began to implement reforms under the *Corporations Amendment (Professional Standards of Financial Advisers) Act 2017* to raise the education, training and ethical standards of financial advisers providing personal advice to retail clients on more complex financial products. In contrast, CSPs do not need to meet the Fit and Proper Person requirements of the ERF if they are acting only as brokers (not participants) and are only now working towards an industry-led code of conduct (CCA 2017). These issues related to standards of professional service and training for brokers adds to the risk that inexperienced or financially unstable operators enter and exit the market within the lifetime of contracts (i.e. 25 years). A situation which becomes more likely where there is uncertainty around the continuation and change of design of the ERF.

There is also no requirement for reporting to the Clean Energy Regulator (CER) to be informed about who has provided advice to scheme participants. This reduces the train of accountability in situations of non-compliance and results in the CER not having data on, and supervision over, participants in the market. Without information on the entities providing advice and services to the market, the CER cannot adaptively develop appropriate compliance, monitoring and enforcement approaches to support the delivery of a confident and robust market and Australia's carbon abatement targets.

The development and behaviour of brokerage for the carbon sequestration market remains relatively unexamined. The way the first seven ERF auctions have allocated funds has resulted in the concentration of contracts to, or through, a relatively small number of CSPs. These CSPs have superior information on the

supply side costs, particularly for abatement under methodologies for avoided clearing or regeneration projects. Conversely, the brokerage of projects for land-based sequestration through revegetation or soil modification remains a relatively small part of the market. Understanding brokerage for revegetation projects is particularly important in the context of producing co-benefits because revegetation can be located where carbon sequestration and co-benefits are spatially optimised. e.g. where water quality, biodiversity or pollination benefits are economic co-drivers of investment.

**Table 3: Prominent CSP operating in Australia (compiled from Endscarbon offsets<sup>1</sup> and Blakers and Considine ( 2016).**

Provider name	Provider type
<b>AGL</b>	Project developer, Retailer, Consultant
<b>Australian Carbon Traders</b>	Trader and/or broker, Retailer, Consultant
<b>Balance Carbon</b>	Retailer, Consultant
<b>Bendigo Bank</b>	Retailer, Consultant
<b>Breathe Easy Now</b>	Retailer, Consultant
<b>Canopy</b>	Project developer, Retailer
<b>Carbon Neutral</b>	Project developer, Retailer, Consultant
<b>Carbon Planet</b>	Trader and/or broker, Retailer, Consultant
<b>Carbon Pool</b>	Project developer, Consultant
<b>Carbon Reduction Institute</b>	Retailer, Consultant
<b>Carbonza</b>	Retailer, Consultant
<b>Cleaner Climate</b>	Project developer, Retailer, Consultant
<b>Climate Friendly</b>	Retailer, Consultant
<b>CO2 Australia</b>	Project developer, Retailer
<b>Corporate Carbon Solutions</b>	Project developer, Retailer, Consultant
<b>Devine Agribusiness Carbon</b>	Project developer, Retailer, Consultant
<b>Enviro Friendly</b>	Project developer, Retailer
<b>Goldfields Carbon Group</b>	Project developer, Retailer, Consultant
<b>Greencollar</b>	Project developer, Retailer, Consultant
<b>Green Pass</b>	Retailer, Consultant
<b>Greenfleet</b>	Project developer, Retailer
<b>Greenhouse Balanced</b>	Retailer
<b>LandcareCarbonSMART</b>	Project developer, Retailer
<b>LMS Generation</b>	Project developer, Trader and/or broker
<b>My Clean Sky</b>	Project developer, Retailer
<b>Neco</b>	Retailer
<b>New Forests</b>	Project developer, Trader and/or broker, Consultant
<b>One Dollar Carbon Credits</b>	Retailer

## 5.4 Leakage

Leakage is a term used to express how emissions reductions or offset policy may simply result in shifting emission elsewhere outside of the boundaries of where the policy applies (Newell et al. 2014). In the

<sup>1</sup><https://www.endscarbonoffsets.com/directory/>

academic literature leakage across international borders involving industrial emission is most discussed. In this context leakage can be defined as additional emissions in countries with weak or no climate policy that result from strong policy in other countries. Essentially, strong policy in one country that increases the costs of high emissions industries creates an incentive for such industries to migrate to countries where emissions are less costly, rather than to take up higher cost, lower emissions technologies (Arroyo-Currás et al. 2015).

The concept also applies to offsets from land use change (Ostwald and Henders 2014). In an Australian ERF context, leakage could occur if an owner of multiple properties contracted one property into the ERF and agreed to remove stock and allow natural regeneration and simultaneously cleared forest and introduced stock on another property. This would be what is referred to as direct leakage where activity from one area is moved to another. Leakage can also be indirect or “tele-coupled”, where land use change in one area creates an indirect market incentive for change elsewhere. An example would be decreased livestock supply from destocking to allow forest regrowth and sequestering of carbon at one location creating economic incentive (higher meat prices) to clear more distant land for grazing in another region or country.

Whilst there has been not specific analysis of the extent to which land use change to sequester carbon in SA or under the ERF may lead to leakage, there have been a number of studies estimating likely leakage from forest conservation, and afforestation from other countries. National scale assessments for Bolivia (Sohnngen and Brown 2004) and the USA (Murray et al. 2004) and regional scale assessment for the Philippines (Lasco et al. 2007) estimate indirect market incentive leakage from afforestation programs at between 5-42%, 18-42%, and 19-41% respectively.

The key implication is that at a scale beyond the increased sequestration on individual properties resulting from carbon offsets, there is likely to be some counteracting increased emissions from land use change elsewhere. For SA specifically, where land clearing laws are relatively stringent, it may be the case that leakage can primarily be expected beyond State borders (Marcos-Martinez et al. 2018).

## 5.5 Additionality

Issues with additionality around revegetation projects are a source of concern (Burke 2016; Evans 2018). For emission reduction schemes to be successful they need to achieve legitimate additional carbon offsets. Carbon abatement actions that would have taken place anyway, without a carbon payment, all else being equal, are not considered to have provided additional carbon sequestration (Ruseva et al. 2017). Examples include scenarios where land holders are subsidised for allowing forest to regenerate where the farming was not profitable and regeneration would likely have happened anyway, or subsidising land holders for not clearing forest. Funding carbon abatement projects without additionality is an issue for achieving genuine emissions abatement, but also provides poor value for money (Tahvonen and Rautiainen 2017). Ensuring additionality is a fundamental component of ERF goals.

Criticisms of the requirement for additionality assert that it can add complexity that acts as a disincentive and that it can disadvantage good land managers that already use best practice and are unlikely to find much opportunity to increase carbon storage and invite ERF funding (Cook and Ma 2014). For example, ongoing conservation practices (e.g. minimum/no-till) can store significant amounts of carbon but may not meet additionality standards and therefore be ineligible for ERF funding (de Steiguer et al. 2008; Schuman et al. 2002). Conversely, others maintain that the methods used to define baselines to establish and measure additionality are too flexible and can be manipulated to achieve favourable outcomes by proponents (Burke 2016).

The high proportion of ANR and avoided deforestation funded projects in the ERF raises questions about the extent of additionality achieved under funded projects. Methodologies that do not require extensive tree planting are cheaper and offer more flexibility (Macintosh and Waugh 2012). However, if the carbon abatement is not additional these projects run the risk of undermining the effectiveness and integrity of the scheme.

A recent review (CCA 2017) of the ERF by the Climate Change Authority examined claims of non-additionality across a range of ERF methods. While the review found no evidence of widespread abuse of the additionality requirement in vegetation methods, citing the decline in forest clearing in areas dominated by avoided reforestation ERF projects, they did not consider other factors that may also restrict vegetation clearing such as commodity prices, terms of trade or other policy factors. Other research has previously found that these other factors do affect clearing rates (Evans 2016).

## 5.6 Permanence

The essential idea of an offset is that it creates a unit (e.g. tonne CO<sub>2</sub>-e) of carbon sink of value equivalent to a unit reduction in emissions. Once a unit of is not emitted the concentration of atmospheric CO<sub>2</sub> is permanently less than it would have been had the unit been emitted. The impact of an offset in contrast may not be permanent. This can be the case when a land use change is reversed. For example, if a forest planted for carbon sequestration is again cleared, the emissions reduction equivalent effect will also be reversed. Permanence in offset schemes like the ERF is treated by requiring that land use changes implemented as ERF projects stay in place for a permanency period. Land holders have the option to choose either a 100 or a 25 year permanency period on entering an ERF agreement. Prior to the end of this period a landholder can opt out by purchasing and surrendering enough permits to offset the offsetting that would not occur as a result. However, this implies that at the end the permanency interval, the land holder is free to clear the land again without requirement to mitigate any carbon impact (Thamo and Pannell 2016). A key implication is that offsets are not equivalent to emissions reductions in the long run. True equivalence would require permanent and not time bound land use change and simply require the land owner to relinquish permits to revert land use change regardless of when this occurs.

A key implication in the context of an entity (such as the Government of South Australia) wishing to achieve an emissions reduction target (such as carbon neutrality) is that offsets may be less cost effectively per unit CO<sub>2</sub>-e than emissions reduction (Gramig 2011, van Kooten 2009). This is because, on release of carbon after a permanency period expires the entity would be required to provide new emissions reductions or offsets. Some entities such as the Government of Alberta address this risk by scaling down the value of credits for offsets relative to the value of emissions reductions. In the case of Alberta, the scaling down is by 7.5 to 12.5% (Government of Alberta 2012).

## 6 Potential for co-beneficial offsets

The co-benefits concept refers to ‘the positive effects that a policy or measure aimed at one objective might have on other objectives’ (IPCC 2015). In climate change policy and economics research co-benefits are the social, environment and economic outcomes associated with an offset project (carbon sequestration) that are additional to the emissions avoided or the carbon stored (Net Balance Foundation 2014). Co-benefits are also not priced in the value of the offset itself, but rather exist in a separate valuation or market. As such they offer the opportunity to create additional value for project stakeholders, while also pursuing social and other environmental outcomes. In situations where the carbon price is lower than might be required for landholders to undertake a carbon sequestration project, payments for co-benefits may help make the proposition more economically viable. As is evident from other work undertaken as part of this project, this may indeed be the case for many regions of SA (O'Connor et al. 2019, Summers et al. 2019). Moreover, even where change in land management to sequester carbon is economically viable (e.g. water quality (Connor et al. 2019)), co-benefits may further incentivise land use change.

### 6.1 Biophysical opportunities

The most evaluated case in climate policy and economics research is where policy to reduce emissions also reduces costly damages from other air pollutants (Mayrhofer and Gupta 2016). A review of studies valuing co-benefits of this type found that estimates of the value of such co-benefits equalled between 7% and nearly 700% of the estimated value of the primary climate mitigation benefit (Pearce 2000). This finding leads to the conclusion that other pollutant reduction co-benefit value could rival primary global warming mitigation benefits for emissions reductions.

In many cases, co-benefits from afforestation, reforestation, and avoided forest clearing may similarly exceed the primary benefit that they produce in schemes focused on carbon sequestration. However, there has not been a similar analysis to Pearce (2000) that documents the scale of co-benefits relative to primary benefits from carbon forests. What does exist is a large and disparate literature from Australia and internationally that documents many benefits in addition to carbon that reforestation, afforestation and avoided forest clearance can provide. Benefits in addition to carbon sequestration cited in this literature include: regulation of the quality and quantity of water; provision of residential and recreational amenities; protection of endangered species and biodiversity; and avoided erosion and salinisation of soil. Examples of these are detailed below.

A global review of the estimated values of forests found that, in addition to carbon sequestration, the most commonly valued benefits are the conservation of soil, water shed protection (water quality maintenance) and the recreation and amenity that forest provide (Ninan and Inoue 2013). In Australia, many studies have evaluated carbon sequestration from reforestation and the trade-offs between carbon benefits and reduced water surface water runoff and groundwater recharge (Bryan and Crossman 2013; Connor et al. 2015). This literature concludes that careful targeting of locations for additional carbon forestry is required to obtain net benefit when both carbon and water yields are considered. In terms of water quality benefits, salinity is perhaps the most commonly evaluated aspect in Australia, and is of particular relevance to the South Australian context. Connor (2008) demonstrated that targeted revegetation along the River Murray corridor can avoid salt loading to the river in a way that is more cost effective than capital and energy intensive additional salt interception pumping infrastructure as way to meet river salinity targets. In another study Bryan et al. (2014) demonstrate that strategic revegetation and stock exclusion can achieve reduced *Cryptosporidium* risks in the Myponga catchment (South Australia) at lower cost than additional capital

intensive water treatment infrastructure. Studies have also examined the potential to achieve biodiversity benefits from different types of revegetation, finding that the configuration and composition of plantings is an important consideration (Collard et al. 2013; Crossman et al. 2011; Cunningham et al. 2015; Imai et al. 2009; Mukul et al. 2016). Replanting in riparian zones may also offer the additional benefit of shading streams and reducing water temperature, which may improve the adaptive capacity of systems (i.e. biodiversity co-benefit) in the face of a warming climate. A similar case could be made for the planting of vegetated buffer strips/carbon plantings to reduce the impact(s) of runoff from terrestrial (e.g. agricultural/urban/industrial areas) into marine (tidal marshes/mangroves) systems and pesticide/herbicide drift into native vegetation. Finally, forests provide additional residential and recreational amenity value but the value cultural ecosystem services add to marketable carbon may be affected by their size and composition (Bryan et al. 2018).

## 6.2 Market opportunities and challenges

There is increasing recognition around the world that co-benefits have the potential to augment the economics of climate change mitigation actions and also achieve additional social, environmental and economic outcomes (Asian Development Bank 2017). Emissions trading scheme frameworks that already acknowledge or address the importance of co-benefits include: The Clean Development Mechanism (Section 2.1.1), the Gold Standard, the Californian Cap and Trade System (Section 2.2.2) and the European Emissions Trading Scheme (Section 2.2.1) (Net Balance Foundation 2014). Furthermore, there is an increasing trend for these frameworks to include co-benefits directed at achieving sustainable development goals (Carbon Market Institute 2018).

The existence of international standards and guidelines provide a valuable platform for the integration of co-benefits into the Australian domestic market and provide the potential for stakeholders (public and private) to achieve multiple social and environmental outcomes (Net Balance Foundation 2014).

Despite the potential advantages of including a co-benefit within emissions trading schemes, there are barriers and challenges to adoption. These include challenges such as the:

- Perceived or real uncertainty and risk associated with co-benefits and potential markets;
- Difficulties quantifying and measuring across social, environmental and economic sectors;
- Potential increases to monitoring, reporting and verification burdens;
- Potential increase in project development and delivery time due to additional monitoring, reporting and verification (MRV) requirements;
- Additional project and compliance costs, such as transaction and administration costs associated with co-benefits that may outweigh (perceived or otherwise) the price premium potential; and
- Increased complexity making it difficult to articulate the business case adequately (Net Balance Foundation 2014).

A further challenge relates to how co-benefits are paid for. For example, with increasingly diverse markets around the world, it is likely that co-benefits will be of interest to funding agencies from jurisdictions separate to that paying for the carbon sequestration. Indeed, there may be different agencies interested in different co-benefits from the same project. Even at its simplest level these complexities will present challenges. Reliable and practical methods for assessing and quantifying co-benefits will be essential. Furthermore, the associated transaction costs associated with accruing and managing co-benefits will need to be as streamlined as possible.

Under the ERF it is unlikely that projects in SA are will attract payments that will drive a widespread shift in land use from current activities to carbon sequestration (Regan et al. 2019). The valuation of, and payment for, co-benefits associated with carbon sequestration activities may help to overcome this challenge. For

example, as discussed in more detailed in Connor et al. (2019), an economically viable case can (under current conditions) be made for undertaking carbon sequestration activities wherever quality co-benefits are taken into account. There are however numerous challenges to realising these opportunities. Many of these challenges lie at the intersection of complex policy, and are discussed in the other sections of this review.



## 7 Conclusions

### 7.1 Opportunities within South Australia at current emission reduction fund prices

Opportunities for offsetting carbon emissions in SA through land-based sequestration projects are limited at the price levels being paid in ERF auctions. Review of ERF outcomes show that at ERF prices, purchases of carbon offset in SA contributed only 2% of national carbon abatement projects and less than 1% of the ACCUs issued. In the voluntary market, carbon credits are selling for relatively small premiums above ERF carbon prices when they provide co-benefits that are valued by firms who require them. Prices in the ERF auctions have consistently averaged below \$14 tCO<sub>2</sub>-e<sup>-1</sup> and across the seven ERF auctions have averaged below \$12 tCO<sub>2</sub>-e<sup>-1</sup>. Prices in the voluntary market include co-benefits and are in the order of \$15-\$25 tCO<sub>2</sub>-e<sup>-1</sup>, although the co-benefit type(s) may not be quantified against widely accepted standards and may not be fully auditable.

Previous research has found extensive capacity for carbon sequestration through revegetation across SA (Bryan et al. 2014). The current research project calculates that the carbon supply would not be economically viable across South Australia's agricultural zone below \$50 tCO<sub>2</sub>-e<sup>-1</sup>, but Bryan et al. (2014) suggest that land-based sequestration would grow rapidly if the price paid for sequestered carbon rose and confidence in the market increases. In other words, for farmers to make money 'growing' carbon they would need to make more than \$50 tCO<sub>2</sub>-e<sup>-1</sup> before they would be better off than if they maintained traditional, business-as-usual agricultural practices. Based on this evidence and the evidence in the case studies on co-benefits from revegetation for pollination (O'Connor et al. 2019) and stock protection (Summers et al. 2019), there is an obvious disparity between the payments available to landholders for carbon abatement activities and the amount required to provide an economic incentive to change land use to carbon abatement even when there are co-benefits. Carbon sequestration may be economic in situations where co-benefits provide valuable economic returns, such as in the case study on the economics of riparian plantings for carbon and water quality benefits in the Mount Lofty Ranges (Connor et al. 2019).

Overall, this indicates that opportunities for land-based carbon abatement within SA are currently only available for a limited set of abatement products for 'niche' segments of the market. Intangible public good type social and ecological co-benefits associated with carbon abatement through revegetation is potentially quite valuable in a number of specific contexts (e.g. Bryan et al. 2014; Crossman et al. 2011; Paul et al. 2013). However, capitalising on the opportunities that could represent social benefit well in excess of the cost involved is fundamentally challenging unless it is publicly subsidised. Many benefits, such as avoided dust storm damage, avoided salinisation and biodiversity conservation accrue far away in time and space from the revegetation that would create such benefits. Fundamentally, the price for land-based activities that create carbon sequestration credits is low (there is a low subsidy for revegetation compared to the social and ecological value that it creates). One explanation is that there are missing markets for many of the services that are produced as co-benefits and creating such markets is challenging. Even well-designed carbon sequestration through revegetation payment schemes such as the ERF don't account for key co-benefits. There are not well developed, liquid or transparent markets for biodiversity co-benefits from revegetation. Even where investors do exist for these co-benefits, designing transactions mechanisms that could coordinate demands from multiple sources that may separately value different types of co-benefits would involve high transactions cost that may be difficult to justify.

An additional barrier to increasing carbon offset projects in SA is policy uncertainty. This is intimately linked with price in the sense that high uncertainty in price acts to lower effectively perceived price by those who could offer land use change-based carbon sequestration projects. The changes in commitment to international action, Australian policy focus, and Australian carbon abatement instruments and instrument design and evolution, have added to uncertainty around investments in carbon abatement. This is also the case for the State government policy and programs such as Carbon Neutral Adelaide (Australia 2018). While Australian domestic policy shifts remain difficult to predict, Australia's high exposure to international trade requirements and Australia's commitments to the Paris Agreement, result in a greater likelihood that carbon credit prices will increase. A result could be that more South Australian carbon abatement projects will become economically viable. The introduction of Article 6 in the latest global carbon agreement that is designed to create greater global linkage and comparability in offsets across countries. This may well increase opportunities for South Australian projects (which are viewed globally as high-quality verifiable credits) to play a greater role in meeting the growing demand that is arising from greater and more interlinked emissions reduction demand coverage and carbon price mechanisms around the world. In the context of increasing opportunities, SA has much to gain from further supporting the development and readiness of near-economic carbon abatement projects.

## 8 Recommendations and opportunities

The growth and scope of carbon pricing schemes around the world may well drive a higher price for carbon sequestration than is being revealed within the current limits of the Australian ERF auctions. Businesses around the world are factoring international prices for carbon abatement into their planning in the order of AUD\$32–53 tCO<sub>2</sub>-e<sup>-1</sup> by 2020 and AUD\$40–135 tCO<sub>2</sub>-e<sup>-1</sup> by 2030; more than two and a half times the prices paid across the ERF auctions. At the prices emerging from the business sector and an increasing number of national pricing initiatives, a large number of carbon offset projects in SA will become economically feasible. Projects will become feasible more rapidly where appropriate arrangements have been made to recognise, measure and allow investment in co-benefits. The barriers to establishing an efficient trading arrangement for carbon sequestered in SA to achieve realistic prices on national and international markets remain high but can be improved by preparing for future demand and reducing local obstacles to supply.

The following recommendations are made to encourage steps to be taken ahead of the approaching opportunities for SA:

- A portfolio strategy is recommended where some projects are undertaken now even if they are sub-economic in the short-term, because there is some probability that by the time they are yielding significant numbers of credits they will be profitable. In essence this can be viewed as a strategy to capitalise on “upside” uncertainty, though it clearly also carries a downside risk, should high carbon prices not materialise. To the extent that projects can be identified that also provide valuable but not easily marketed co-benefits they may be justifiable even if anticipated higher carbon price never materialise.
- An evaluation strategy for offsets should be adopted that assesses financial and carbon accounting risks. The issue is that project proponents can be left holding liabilities if the full sequestration committed to in an agreement, such as an ERF agreement, don’t materialise. For example, full sequestration may be prevented or delayed as a result of climate change or wildfire. Transparent methods to evaluate and communicate such risks can aid realistic and informed transactions and improved understanding of the role of brokers in managing risks is required.
- Governance of carbon offset service providers (brokers) should be considered to build confidence in the market for different methods of carbon offsets, to provide potential project proponents low-cost and fairly-priced services, and to manage risks that projects provide real and effective sequestration (minimise risks around additionality, permanence and leakage).
- Further scrutiny of the size of the voluntary market for carbon with co-benefits in SA is justified, particularly if the primary and secondary regulated markets are slow to develop liquidity and transparency. Most current transactions in voluntary markets are firm to firm transactions and do not always use well documented or highly creditable (verifiable) standards, but they do sometimes allow recognition of co-benefits in ways that the larger and more regulated ERF does not.
- The economics of additional co-benefit types should be examined for potential opportunities (e.g. ‘blue carbon’, biodiversity) and for emerging carbon sequestration methods under the ERF (e.g. woodland restoration). This should include further economic analysis of the direct measurement methods that may allow recognition of opportunities where actual carbon sequestration is likely to be significantly greater than levels that are conservatively estimated by convenient and lower transactions cost ERF default methods like FullCAM.

- Carbon abatement projects which are near to economically feasible based on current carbon prices should be prioritised for co-investment by the South Australian Government where they provide significant co-benefits. The South Australian Government would in effect act as a ‘bundler’ of benefits, some of which could be on-sold to other markets (e.g. carbon into the ERF or voluntary markets). This strategy could be particularly applicable where co-benefits are aligned with other natural resource management objectives that are high priority for the South Australian Government. e.g. landscape restoration projects where aggregation of bundled benefits is essential.

In addition to the recommendations above there are a number of opportunities identified through this assessment that should be considered. These are:

- There is a small but developing market for land-based sequestration in SA that could be developed with increases in the efficiency of project brokerage.
- Proposing or supporting sequestration methods which fit the South Australian context would increase the scope for economic carbon sequestration in the State. Opportunities may exist for significant projects in SA from ‘blue carbon’ sequestration projects and these should be explored using methods reported on in this project to assess the economics of supply. This would allow provision of comprehensive advice on feasibility of ‘blue carbon’ projects. A similar case could be made for soil modification in the South Australian context.
- Current carbon accounting methods are not well calibrated to the true spatial heterogeneity and sequestration dynamics of different South Australian land and seascapes. Carbon accounting for more specific-scaled measures for terrestrial carbon sequestration in the Mount Lofty Ranges, ‘blue carbon’, restoration of rangelands systems and soil carbon may have potential to be economic under current carbon prices but would require direct measurement of tree growth and involve higher monitoring cost than ERF default (FullCAM) methods.
- Supporting efforts to assess carbon offsets opportunities in a portfolio management framework could help to understand how the Government of South Australia or others in the State with potentially significant carbon liabilities balance potential risks of continued low prices with “upsides” of investing now to realise benefits from higher future carbon credit prices should they arise. To some extent, poor recognition of upside potential may be currently preventing the uptake of offset projects.
- Additional effort could be made to determine where other processes are already resulting in projects that can be economical given carbon sequestration and co-benefit value. One such opportunity identified through this project involves buffer strip reforestation along stream banks in Mount Lofty Ranges’ water catchments. A range of additional co-beneficial reforestation projects deserve further consideration such as: revegetation to stop salinisation; revegetation to add recreational and amenity value to landscapes; and opportunities to inundate floodplains or coastal mangroves to stimulate vegetation growth for carbon with co-benefits.

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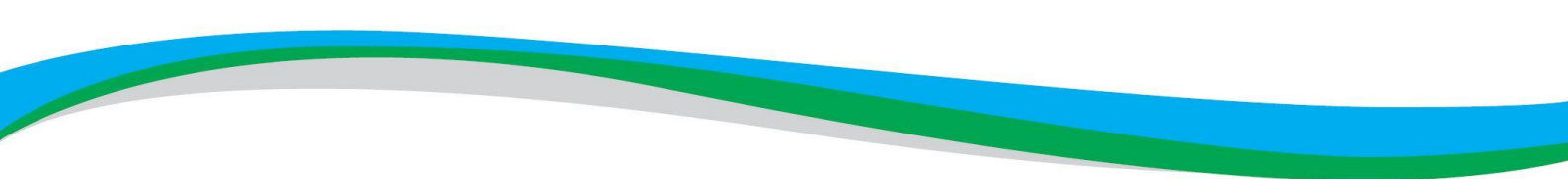
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