3 Coverage of an ETS

Key points

- While an Emissions Trading Scheme (ETS) should have broad coverage to provide maximum scope to take up low-cost abatement opportunities, maximising coverage should not be an end in itself.
  - The objective should be to include sectors where this will lower the total cost of meeting a given emissions target.
  - Furthermore, mitigation policy should be focused on achieving reductions in greenhouse gases (GHGs) that will be counted towards Australia's international commitments.
- It is likely that the ETS will include all energy, industrial and fugitive emissions. Sectors that may initially be excluded include land use, forestry, agriculture and waste.
- There are possibilities for partial coverage of land use, land use change, forestry and agriculture sectors within an ETS — New Zealand's proposed ETS provides one model of this.
- Eventual inclusion of uncovered sectors within the ETS should be assessed alongside a range of alternative policy options, both transitional mechanisms and longer term alternatives, including leaving them unregulated.
  - This assessment should take into account the least-cost abatement objective and the acceptability of the response in international protocols.
- An offset scheme is one alternative policy option, but such schemes can have significant disadvantages.
  - The need to reduce emissions below a hypothetical level can necessitate complex and costly compliance processes with risks of inaccuracy.
  - If a large number of credits are issued that are not backed by genuine emission reductions, this can compromise the credibility of an ETS linked to the offset scheme.
- Options that do not involve any linkages with an ETS can be pursued. These include agreements to reduce deforestation in developing countries, incorporating a carbon price into the management of public forests, and extension programs to promote privately cost-effective activities that reduce GHGs in agriculture.

3.1 Deciding on coverage

Broad coverage in an Emissions Trading Scheme (ETS) is generally desirable to achieve given greenhouse gas (GHG) emissions targets at least cost. In some circumstances, however, inclusion of a sector in an ETS may increase costs beyond the benefits of abatement achieved or lead to reduced credibility of the scheme. Australia's ETS is likely to include all energy, industrial and fugitive emissions, but may exclude some forestry and agriculture emissions (box 3.1).

Where a sector is not included in an ETS, there is a strong rationale for examining whether there are supplementary policies that can be used to access relatively low-cost abatement opportunities in the sector. Such policies may be linked to the ETS or be independent of it.

Box 3.1 Coverage of Australia's ETS

The Minister for Climate Change and Water has announced that Australia's ETS 'will have maximal coverage of GHGs and sectors, to the extent that this is practical' and that 'there is wide agreement that over 70 per cent of our national emissions can be practically covered by emissions trading' (Wong 2008). This appears to broadly support the proposal by the Task Group on Emissions Trading, which recommended that the ETS include all energy, industrial and fugitive emissions.

The Government is proposing to consult with the agriculture and forestry sectors about their inclusion in the ETS (Wong 2008). The Task Group on Emissions Trading proposed that energy use in the agriculture and land use, land use change[1] and forestry (LULUCF) sectors be included, but that all other sectoral emissions be excluded because of measurement uncertainties and high compliance costs. Inclusion of the waste sector is also to be determined this year.

Such an arrangement would incorporate a broader range of sectors in the ETS than the National Emissions Trading Task Force proposal (NETT 2006), which posited initial coverage of electricity generators (above a given threshold), with offsets from excluded sectors, and inclusion of other stationary combustion of gas, coal, oil and other fossil fuels five years later. However, in mid 2007, the NETT broadened its terms of reference and proposed to investigate the potential for an ETS to cover other sectors beyond the stationary energy sector.

Australia's treatment of 'bunker fuels' (aviation and shipping fuels) used in international transport is yet to be determined. Currently, emissions from international aviation and shipping do not count towards Australia's Kyoto Protocol target.

1 Where land use change refers to the emissions resulting from the conversion of land from one type of land use to another.

Why broad coverage is desirable

Where an ETS does not include all GHG emitting sectors of the economy, and there are no other mitigation policies in these sectors, the cost of achieving a given emissions target is likely to be higher than otherwise (box 3.2). The extent to which abatement costs will be higher depends on the quantity of relatively low-cost abatement opportunities in the excluded sectors, and the policy-related costs of obtaining them. For example, while there may be low-cost ways of reducing emissions in a sector, total abatement costs may be high because of high costs of measuring and verifying emissions.

Where an ETS does not have full coverage, there is a cost imposed on activities that emit GHGs in the covered sectors, but no cost to certain GHG emitting activities in the uncovered sectors. This can lead to adverse outcomes such as 'leakage', where emissions are reduced in a covered sector, and there is a corresponding increase in an uncovered sector. An example of this could be energy generators using biomass from deforestation to generate lower-emissions energy where land use change is not included in an ETS. While this may result in a decrease in emissions from energy generation (the covered sector), emissions from land use change (the uncovered sector) could increase, with the possibility of an overall increase in emissions. Introducing supplementary abatement policies may reduce this problem.

Exclusion of sectors from an ETS can also make the achievement of GHG emissions targets less certain. If Australia were to take on emissions targets through an international agreement, accounting against these targets would include net emissions from all sectors in the economy. Under these circumstances, the cap for the ETS will need to be set taking into account likely emissions from excluded sectors of the economy. If emissions in the excluded sectors are higher than expected (due to leakage or other factors) this could put achievement of the targets at risk. Furthermore, exclusion of significant sectors from the ETS may make it difficult for Australia to meet stringent targets. As in the case of leakage, introducing supplementary abatement policies in uncovered sectors may reduce these problems.

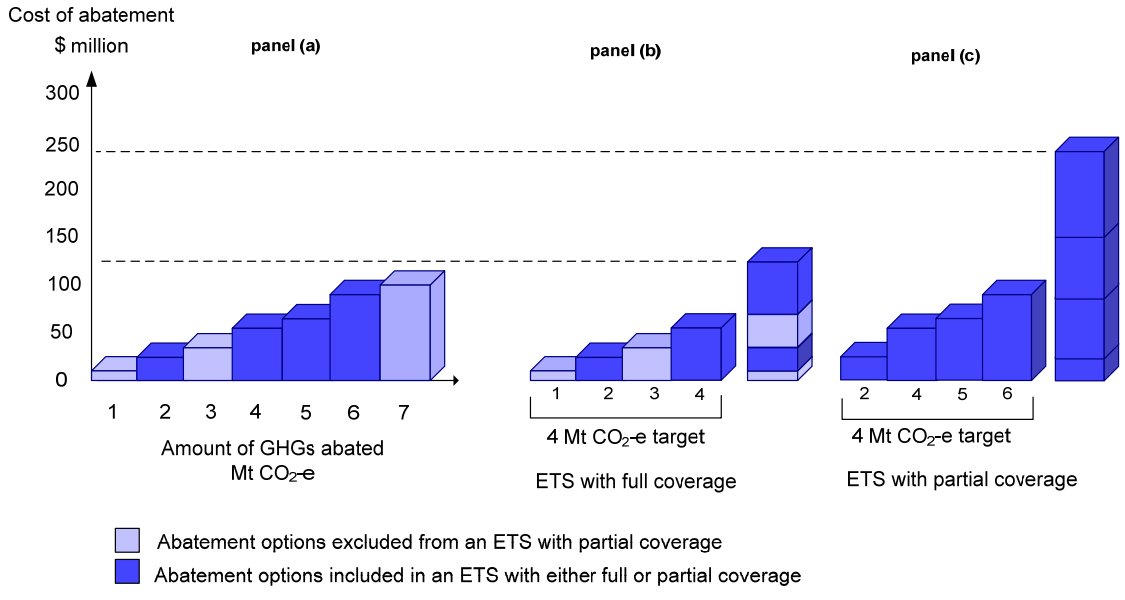
While broad coverage is desirable, in practice, some factors can make a sector unsuitable for inclusion in an ETS. By introducing an ETS, the Australian Government will be creating a market for the right to emit GHGs. Market creation is a policy approach that is best suited to situations where a number of criteria are met (table 3.1).

Box 3.2 The costs of achieving a GHG target with partial vs full coverage: an illustration

Panel (a) below shows a hypothetical GHG abatement cost curve for Australia using all possible abatement opportunities at different costs. Each abatement opportunity reduces emissions by one million tonnes of carbon dioxide equivalents (1 Mt CO_2-e). For example, the first abatement option, which might be improving forest management, reduces 1 Mt CO_2-e at a cost of $10 million dollars. The second option could be improving residential water heating, where 1 Mt CO_2-e of abatement can be achieved for $25 million dollars. And so on.

Where a 4 Mt CO_2-e target can be achieved through an ETS using abatement from all sectors in the economy (full coverage), the total cost is $125 million (panel (b)). Where the target must be met through an ETS which does not include all emitting sectors in the economy (partial coverage), the total cost of achieving this abatement in this illustrative example is $240 million (panel (c)).

The full coverage ETS achieves the 4 Mt CO_2-e target at a considerably lower cost as the cheapest forms of abatement (options 1 to 4) are used until the target is met, irrespective of the sector in which they occur.



Where these criteria can not be met in a sector, its inclusion in an ETS may not be desirable. For example, administration and compliance costs will be increased where there are difficulties verifying the quantity of GHG emissions that have occurred. High costs can be avoided by applying low standards for verification but this can reduce the credibility and environmental effectiveness of the ETS.

Table 3.1 **Desirable property right characteristics for creating markets**

	Property right characteristic	*Description*
1	Clearly defined	Nature and extent of the property right is unambiguous
2	Verifiable	Use of the property right can be measured at reasonable cost
3	Enforceable	Ownership of the property right can be enforced at reasonable cost
4	Valuable	There are parties who are willing to purchase the property right
5	Transferable	Ownership of the property right can be transferred to another party at reasonable cost
6	Low scientific uncertainty [a]	Use of the property right has a clear relationship with ecosystem services
7	Low sovereign risk [a]	Future government decisions are unlikely to significantly reduce the property right's value

[a] Low in the sense that it does not prevent a market from forming. Moderate levels of risk and uncertainty are not necessarily insurmountable barriers to the operation of a market.

Source: Murtough, Aretino and Matysek (2002).

It is important, therefore, that decisions on whether to include sectors are made after assessing all the costs and benefits of inclusion, and after establishing whether inclusion will lead to lower total costs of meeting a given emissions target. It may be necessary to re-assess such decisions over time, as future inclusion may become viable if measurement technologies improve and/or permit prices increase.

While coverage of a sector in an ETS is one option, it may not be the best option. Evaluation against other policy options (such as baseline-and-credit arrangements, subsidies and doing nothing) is necessary and the policy approach which yields the highest net social benefits should be chosen. This approach may conclude that, for the initial period of the ETS, no action is taken in a sector because the factors that make it costly or difficult to include it in an ETS also hinder the use of alternative policy instruments.

3.2 Land use, land use change and forestry

The Intergovernmental Panel on Climate Change (IPCC) specifies six broad catagories of land use (for example, forest land, grassland and cropland), where land is converted into another type of land use this is catagorised as 'land use change' (IPCC 2003). Land-based emissions as a result of agricultural practices, such as nitrous oxide emissions from soil due to fertiliser use, are reported separately under agricultural emissions.

As trees grow they absorb carbon dioxide and store the carbon in wood and other plant tissue. Where an activity withdraws carbon dioxide from the atmosphere (such as growing a forest) it is called a *sink*. When forests are destroyed by fire, cleared or harvested, some

stored carbon is released as carbon dioxide, though some may remain sequestered (for example in wood products) for extended periods.

A key issue when considering emission withdrawals by sinks is the longevity of any sequestration. When an electricity generator reduces its emissions by one tonne, this is an enduring reduction of carbon dioxide in the atmosphere. Sequestration, on the other hand, only removes carbon dioxide from the atmosphere for the duration of sequestration. If the duration of sequestration equates to the residence time that emissions have in the atmosphere, then they cancel each other out, but this is rarely the case.

Overall, forests are generally viewed as being able to play a positive role in reducing GHG emissions. However, not all countries take this stance. In announcing its decision to exclude sinks as eligible offsets in the EU ETS, the European Commission stated that carbon sinks 'do not bring technology transfer, they are inherently temporary and reversible, and uncertainty remains about the effects of emission removal by carbon sinks' (European Commission 2003, p. 2).

Abatement potential

Australia's net emissions for 2005 from the LULUCF sector (using Kyoto Protocol accounting provisions) were 34 million tonnes of carbon dioxide equivalent (Mt CO_2-e) out of total national emissions of 560 Mt CO_2-e (AGO 2007). This includes sequestration of 20 Mt CO_2-e from afforestation and reforestation, and emissions of 53 Mt CO_2-e from deforestation (box 3.3). Decreases in land clearing since 1990 have reduced emissions from this sector, with emissions from deforestation declining by 76 per cent (AGO 2007). This has made a significant contribution toward meeting Australia's Kyoto Protocol commitment. In addition, withdrawals of emissions by sinks have also increased through reforestation and afforestation.

Land use shifts from agriculture to forestry, and vice versa, for commercial and other reasons. This can result in considerable changes in net carbon dioxide emissions. Even quite modest emission prices (or other mitigation incentives) could be expected to influence these decisions at the margin.

A recent report by McKinsey identifies a large quantity of low-cost abatement opportunities in the LULUCF sector (McKinsey 2008). It posits 100 Mt CO_2-e of abatement is possible by 2020, and 170 Mt CO_2-e by 2030, at an average price of $40 per tonne CO_2-e through avoided deforestation, replanting and improved forest management. However, it appears that the policy-related costs of achieving this

Box 3.3 **Emissions accounting in the LULUCF sector**

As a party to the United Nations Framework Convention on Climate Change (UNFCCC) Australia is required to publish a national inventory of anthropogenic emissions by sources and removals by sinks of all GHGs using methodologies agreed upon by the Conference of the Parties. Australia has produced national inventories since its ratification of the Convention in 1992.

Australia has also ratified the Kyoto Protocol which requires it to meet a target of 108 per cent of 1990 emissions over the period 2008 to 2012.

Australia's GHG emissions are not usually monitored directly, but are generally estimated through the application of models and methodologies that link emissions to data on observable activities. Australian methodology for estimating GHG emissions and sinks uses a combination of country-specific and Intergovernmental Panel on Climate Change methodologies and emission factors (DCC 2008b).

Reporting requirements under the Kyoto Protocol and the UNFCCC are not identical. The principal source of difference is the treatment of emissions from sources and sinks in the LULUCF sector. UNFCCC guidelines promote a more comprehensive approach to emissions accounting and require the inclusion of all sources and sinks where there is adequate data. In contrast, the Kyoto Protocol restricts allowed emissions and withdrawals to a more limited set of sources and sinks from land use and forestry activities.

The Kyoto Protocol requires reporting in three areas:

- Afforestation: direct, human-induced conversion of land, that has not been forested for a period of at least 50 years, to forested land.
- Reforestation: direct, human-induced conversion of non-forested land (that had once been forested) to forest. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.
- Deforestation: direct, human-induced conversion of forested land to non-forested land.

Additionally, under Article 3.4 of the Kyoto Protocol, parties may elect additional human-induced activities related to LULUCF (specifically forest management, cropland management, grazing land management and revegetation) to be included in their accounting of GHG emissions and removals for the first commitment period. Australia has not elected to account for any activities under Article 3.4.

Sources: DCC (2008b, 2008d); UNFCCC (2001).

abatement (such as government costs for administration and verification, and forest-owner costs of measurement and reporting) are not considered in these estimates (McKinsey 2008). These costs could be substantial and could have a large influence on the potential for low-cost abatement. In addition, a considerable number of profitable abatement

opportunities were identified. If such opportunities are not currently being taken up this suggests there may be additional barriers to their adoption.

Abatement potential in the LULUCF sector depends very much on accounting rules for emissions. For example, emission removals from forests that are not subject to harvest are currently counted as zero under both UNFCCC and Kyoto Protocol provisions (table 3.2).

Policy issues

Accounting rules

Australian policy should focus on achieving emission reductions that will assist Australia meet national commitments under future international agreements. However, uncertainty over what emissions and sequestration might count under such an agreement makes this difficult. A conservative approach could be to defer introducing policy in areas of uncertainty until the rules are clarified. Within the current context this would entail LULUCF policy recognising emissions and sequestration currently counted under the Kyoto Protocol with flexibility for other types of sequestration and emissions to be included once the post-Kyoto framework is decided.

On the other hand, developing policy approaches that demonstrate that more comprehensive emissions accounting is practical may strengthen Australia's efforts to influence post-Kyoto rules for LULUCF accounting in its favour. There is, however, a possibility that this will be a 'dead end' if the attempt to influence the rules is unsuccessful. These issues need to be thought through carefully when developing policy for the sector.

A related issue is the rules applying to emissions trading schemes developed in other countries or regions that could potentially be linked with Australia's ETS. It is unlikely that countries with restrictive rules in their ETS will find it acceptable to link with a scheme that accepts a greater range of emissions and sequestration possibilities. For example, where Australia's ETS takes an inclusive approach to LULUCF (either through full inclusion in an ETS or with an offset scheme linked to the ETS) this may create an obstacle to linking with the EU ETS which does not allow forestry offsets (Betz 2008).

Table 3.2 **Australia's LULUCF GHG emissions under Kyoto Protocol and UNFCCC accounting rules**

Land use, land use change and forestry emission sources	*Emission levels*	*Kyoto Protocol*	*UNFCCC*
	Mt CO2-e (2005)[a]	yes included / no not included /partially included	
Afforestation and reforestation			
Land converted to forest	-21.9	partial[b]	yes
Plantations	2.3	partial[b]	yes
Deforestation			
Land converted to cropland	-4.5	yes	yes
Land converted to grassland	57.8	yes	yes
Other			
Managed native forests[c]	-43.5	no	yes
Fuel wood consumed	10.4	no	yes
Biomass burning	1.3	no	partial[d]
Land remaining cropland	- [e]	no[f]	yes
Land remaining grassland	- [e]	no	yes
Harvested wood products	-5.0	no	yes
Unmanaged native forests[g]	na	no	no
Total net LULUCF emissions in 2005		**33.6**	**-3.2**

[a] Negative figures indicate a net sink. [b] Plantations and land converted to forest after 1 January 1990 are included in the Kyoto Protocol as reforestation. Plantations and land converted to forest prior to 31 December 1989 are not included. [c] Where managed forests are subject to harvest and regrowth from prior harvest (DCC 2008b). [d] The IPCC Good Practice Guidelines (2003) states that it is good practice to incorporate the impact of fire in national inventories for all GHGs (except where fire occurs in unmanaged forests and does not result in land use change). Currently, Australian methodology for the National Greenhouse Gas Inventory does not account for *carbon dioxide* emissions from fire, both in terms of emissions as a result of fire and withdrawals of GHGs by regrowth after a fire (but does account for all other GHGs emitted through fire). This is in accordance with the IPCC (2003), which states that where methods are applied that do not capture removals by regrowth after natural disturbances, then it is not necessary to report the carbon dioxide emissions associated with natural disturbance events. [e] These figures do not include non-CO_2 emissions which are reported in Australia's agriculture emissions accounts. [f] Under Article 3.4 of the Kyoto Protocol, parties may elect to account for forest management, cropland management, grazing land management and revegetation in their national accounts. However, Australia has not elected to account for any of these activities. [g] Where unmanaged forests are not harvested (DCC 2008b). **na**: Not available.

Source: DCC (2008a, 2008b), IPCC (2003).

Other externalities

There are other externalities associated with forests besides GHG sequestration. Other positive externalities may include soil and water quality protection, while reduced run-off to rivers and streams as a result of increased water use by forests can be a negative externality. The extent and significance of these externalities vary enormously from place to place.

Introducing policy that internalises the externality of GHGs while other externalities remain may result in land use changes that are not in the community's interests. For example, inclusion of forestry in an ETS would encourage the development of forest plantation on agricultural land. While this would have a GHG mitigation benefit it may also have a cost in terms reduced run-off. The opportunity cost of reduced run-off can be substantial (Young and McColl 2008). In some locations this cost may exceed the value of the abatement achieved.

Policy options

Options to encourage a reduction in net emissions from the LULUCF sector include coverage of the sector under an ETS, offset arrangements that link to the ETS, or approaches that are completely independent of the ETS (such as financial incentives for new plantations).

Inclusion of LULUCF in an ETS

Under this option, inclusion could be either mandatory or voluntary. Participating LULUCF businesses would receive permits for any net sink activities and be liable for any GHG emissions. LULUCF businesses would need to report periodically on their emissions and withdrawals of GHGs.

The challenges of including LULUCF in an ETS have been grouped with those of agriculture, with a focus on measurement difficulties and the large number of small sources that would have obligations (PMTGET 2007b). However, the costs of inclusion of the LULUCF sector in an ETS appear likely to be lower than that for the agriculture sector. One reason is that the task of measuring carbon in standing trees is inherently easier than measuring the diffuse and ephemeral emissions that occur in agriculture. Measurement of wood volume made as part of normal business operations can be used to determine the amount of carbon sequestered (IFA 2008). Another reason, is that there is likely to be fewer obligated parties per unit of emissions/sequestration than for agriculture (A3P 2008).

Australia's National Carbon Accounting System (NCAS) accounts for GHG emissions from land-based sectors through an integrated system that combines remotely-sensed land cover change, land use and management data, climate and soil data, GHG accounting tools, and spatial and temporal ecosystem modelling (DCC 2008b). The NCAS currently meets national and international reporting requirements, and can be utilised at a project level through Full Carbon Accounting Model (FullCAM). Many large commercial forest growers are already utilising

FullCAM and estimating the total stock and annual changes of carbon in their forests (NAFI 2007).[2]

There are clear incentives for forest managers to be involved in an ETS in order to claim the value of carbon sequestered, although the extent of credits to be claimed will depend on methods used to estimate sequestration entitlements and the treatment of carbon stored in wood products. Credit for carbon stored in wood products would need to take into account the life of the wood product, the resulting emissions once in landfill, and the fact that the receiver of the credit will have no control over the product's use or eventual disposal.

Inclusion in an ETS would mean that forest owners would face liabilities where events, such as fire or harvest, reduce the carbon stocks in their forests. If it is assumed that all carbon is released at the point of harvesting, plantation owners would gain credits during the period of their plantation's growth, but be required to acquit equivalent permits to cover all carbon released at harvest. Where carbon stored in wood products is included as sequestration, this liability could be significantly reduced.

Options for modes of inclusion of the LULUCF sector in an ETS are presented in table 3.3. Although inclusion of the LULUCF sector in an ETS seems feasible, it is yet to be determined whether inclusion is the best option and, if so, how and when it should be done. Among other things, further work is required to:

- estimate transaction costs
- assess whether inclusion would be likely to undermine the credibility of the ETS by introducing a new source of uncertainty as to the quantity of low-cost abatement that meets the schemes' requirements
- determine the extent, and implications, of interactions between the incentives that would be provided by the ETS and other externalities (such as increased water interception by plantations).

Offset arrangements

The offset arrangements considered here are a type of baseline-and-credit scheme in which credits are issued for activities that are accepted as decreasing emissions below what they would have been in the absence of the scheme (box 3.4). An offset scheme operating in the LULUCF sector could be linked to the ETS by allowing the

2 There are divergent views on whether NCAS is appropriate for use at the project level (New Forests 2008)

Table 3.3 **Possible approaches to include the LULUCF sector in an ETS**

Approach	*Description*	*Comment*
Voluntary inclusion	All forest owners choose whether to participate in the scheme. Once included, forest owners are liable for all emissions and can receive credit for all withdrawals of GHGs.	
Mandatory inclusion	All forest owners that exceed a certain size threshold are liable for emissions and receive credit for withdrawals of GHGs.	
Combination of mandatory and voluntary inclusion	Owners of Kyoto compliant forests[a] can choose whether to participate in the scheme. Once included, Kyoto compliant forest owners are liable for all emissions and receive credit for all withdrawals of GHGs. Owners of non-Kyoto compliant forests are automatically liable for deforestation and do not receive credits for sequestration.	This is the approach proposed in NZ. Furthermore, in the NZ scheme a rule has been applied such that the liabilities of Kyoto compliant forest owners can never exceed their credits[b]. With this rule, Kyoto compliant forest owners would be expected to stay out of the scheme only where the transaction costs exceed the net value of the credits they expect to receive.

a The Kyoto Protocol makes a distinction between forests planted after 1 January 1990 ('Kyoto compliant forests') and forests planted before 31 December 1989 (non-Kyoto compliant forests). In the Kyoto Protocol, all deforestation is counted as an increase in emissions, and only sequestration in forests planted after 1 January 1990 is eligible as sequestration. **b** This rule aims to prevent participants being penalised for increasing carbon stocks prior to the commencement of the ETS. That is, where carbon stocks of Kyoto compliant forests are increased prior to the commencement of the ETS no credit for this sequestration is received. Once the ETS is in place and the forest is harvested the forest owner will be liable for all carbon stocks lost, but this liability will exceed credits received for sequestration. The rule addresses this by capping forest owners liabilities to the amount of credits received.

offset credits to be sold and used as substitutes for permits by firms that have liabilities under the ETS.[3]

An offset scheme has been, and is being, considered to supplement Australia's ETS. For example, one of the design features of the ETS proposed by the Task Group on Emissions Trading (2007b p. 101) was 'recognition of a wide range of credible carbon offset regimes, domestically and internationally'. In a subsequent paper concerning incentives for early abatement, the Task Group on Emissions Trading (2007a) provided further information regarding the proposal for the ETS to include an offset scheme, including a discussion of possible initial administrative arrangements and a proposal for a national offset registry.

3 Such offset schemes are distinct from those that currently operate in Australia; for example, those that allow people to offset their emissions from air travel. The key difference is that the 'air travel' type schemes are not linked to an ETS (that is, the offsets can not be used to substitute for ETS permits).

Box 3.4 **Baseline-and-credit schemes**

Baseline-and-credit schemes require emission reductions below business-as-usual levels (the baseline) to be achieved. Participants can achieve their own emission reductions and/or purchase credits from others who have made eligible emission reductions. Cap-and-trade schemes, such as the ETS, on the other hand, operate under a fixed overall emissions limit with emissions permits allocated, and traded, between parties.

Baseline-and-credit schemes can stand alone or be incorporated into cap-and-trade schemes (for example, using forestry offsets).

Measuring emissions is more straightforward than measuring emission reductions. As measurement and verification procedures in baseline-and-credit schemes require proof that emissions have been reduced below a hypothetical level, a complex and costly process is required. This process embodies a high risk of inaccuracy and overestimation of emission reductions, as at its essence it is trying to quantify something that is indefinite.

Where there are deficiencies in verification, credits can be created that are not backed by genuine emission reductions which undermines the integrity and effectiveness of the scheme. Where this occurs for a high proportion of credits there is said to be low additionality.

For example, concerns have been raised about the NSW Greenhouse Gas Reduction Scheme, which does not formally address additionality (MacGill et al 2005). The scheme enables forestry offsets for Kyoto compliant afforestation and reforestation activities. A zero baseline is applied which means that all carbon stock changes that occur in the project area are assumed to be below business-as-usual and are credited.

Some examples of baseline-and-credit schemes include:

- the Kyoto Protocol's Clean Development Mechanism
- offset scheme proposed for forestry and agriculture sectors by the Task Group on Emissions Trading (PMTGET 2007a)
- Victorian Energy Efficiency Target planned for introduction in 2009 (chapter 2)
- Greenhouse Gas Reduction Scheme (GGAS) (NSW and ACT Governments).

The main reason why an offset arrangement might be considered to be preferable to inclusion of the LULUCF sector in the ETS is that measurement and verification activities are confined to a self-selected subset of actors that are actively engaged in emission reducing activities. Offset arrangements are sometimes seen to be appropriate as a transitional measure with eventual inclusion as the desired end point. It is argued that experience can be gained in measurement and reporting that may make later inclusion in the ETS more feasible.

However, as outlined in table 3.1, government-created markets work best where the nature and extent of the property right is unambiguous, verifiable and can be measured at reasonable cost. In general, cap-and-trade schemes rate much better against these criteria. Baseline-and-credit schemes rely on measuring emission reductions below hypothetical business-as-usual levels which is difficult, often costly and potentially open to gaming. Because of this there is potential for offset schemes to have high transaction costs and/or credit emission reductions that would have occurred without the scheme (that is, credit emission reductions that were not 'additional').

A further difficulty with forestry offset schemes is that they must include arrangements for dealing with the uncertain longevity of sequestration. Most existing schemes do this by including a requirement that projects be maintained for a minimum time period, with penalties applied where carbon stocks do not remain at credited levels. For example, the Australian Government's Greenhouse Friendly program has legal requirements that carbon remains sequestered for at least 70 years. The Task Group on Emissions Trading has suggested that the same requirements could be incorporated into an offset scheme that linked with the ETS (PMTGET 2007a).

Such requirements may have a positive aspect in reducing the potential for additionality problems. For example, it is uncommon for commercial forest plantations in Australia to be older than about 40 years. Accordingly, anyone committing to establishing and maintaining a forest for 70 years might reasonably be assumed not to be contemplating doing this anyway as a commercial activity (they may, however, have been contemplating it for other reasons).

On the other hand, such requirements could result in much of the low-cost abatement potential of the sector not being realised by the scheme. For example, plantation growers who might have responded to inclusion of the sector in an ETS by establishing more forests and/or managing forest on a longer rotation would probably view a scheme with a 70 year requirement as irrelevant to their commercial interests.

In summary, while no definitive judgement on the merits of offset schemes for the LULUCF sector is intended, there do appear to be significant disadvantages to their adoption. These include:

- the possibility that a high proportion of the credited abatement would have occurred anyway (low additionality), lowering effectiveness of the ETS
- future difficulties when transitioning from offsets to full coverage in an ETS (such as resistance to a change where participants who used to receive credits subsequently face liabilities)
- high transaction costs, including those associated with monitoring obligations for many decades

- the creation of incomplete incentives for abatement, such that much of the low-cost abatement potential of the sector might not be realised.

Other policy options

There is a range of abatement policies for the LULUCF sector that could operate independently of the ETS.

Regulate 'undesirable' activities and / or reward 'desirable' ones

Regulation can restrict activities that tend to increase emissions. For example, land clearing regulations have been effective in this regard in Australia already. However, in its report on the impacts of native vegetation and biodiversity regulations the Commission found that these regulations have imposed substantial costs on many landholders (PC 2004). It also found that, due to a focus on prevention of native vegetation removal, rather than the promotion of desirable environmental outcomes, the regulations were not always effective in achieving environmental goals. In some cases, the regulations led to perverse environmental impacts such as premature clearing of regrowth and increased soil degradation due to more intensive rotation of paddocks.

Another option is to provide incentives for engaging in activities that tend to lower net emissions (for example, financial incentives for new plantations). These incentives are not generally efficient as they do not directly target the environmental outcome desired, although they can have low transaction costs.

Manage public forests for sequestration

The great majority of Australia's 164 million hectares of forests are government owned native forests (BRS 2006). These forests are managed for a range of values including conservation, recreation, and wood and water production. One option is for governments to agree to instruct their forest management agencies to factor in a value for sequestration (equivalent to emissions prices under the ETS) in managing these forests. This could have a similar outcome to including these forests in the ETS, but would not actually require inclusion, nor the level of reporting needed for an ETS. It would also not risk compromising the credibility of the ETS through the prospect of an influx of sink credits.

The merits of this option depends very much on the rules that might apply under future international climate change agreements. For example, it would not achieve emission reductions under current Kyoto Protocol rules, as sequestration in forests planted before 1990 does not count under this agreement. More inclusive rules, such as those under the UNFCCC, would make the option viable.

Promote forest retention in developing countries

Preventing deforestation in developing countries with dense tropical forests is a particularly effective way of reducing global GHG emissions (Stern 2007). The bulk of deforestation in developing countries occurs when forested land is converted for agricultural purposes. Australia could play a role through influencing international rules about how avoided deforestation is treated and/or assisting developing countries to reduce deforestation. Both of these options can be pursued independently of domestically focused policy.

Australia is advocating the inclusion of a broader range of LULUCF emissions and 'maintains that the international community can reach a workable framework to support reductions in emissions from deforestation in developing countries' (UNFCCC 2007 p. 8). In addition, Australia has committed $200 million over five years to the International Forest Carbon Initiative to facilitate reductions in GHG emissions in developing countries through promoting reforestation and sustainable forest management.

Conclusions

Inclusion of the LULUCF sector in the ETS appears to be feasible, and participation of LULUCF organisations could be either mandatory or voluntary. However, full inclusion of all sectors in the ETS should not be the ultimate aim. Inclusion of the LULUCF sector should only occur where it will reduce the total cost of meeting Australia's emissions target. Evaluation against other policy options is necessary, such as subsidies and managing public forests for enhanced sequestration.

When assessing mitigation policies for the LULUCF sector, consideration should be given to what will be counted towards Australia's international commitments. Offset arrangements could be introduced for the LULUCF sector, but they have significant disadvantages either as a transitional or long-term option.

3.3 Agriculture

The agriculture sector was responsible for 16 per cent of Australia's GHG emissions in 2005 (AGO 2007).[4] This is a higher proportion than in most other developed countries, although New Zealand is an exception as agriculture accounts for nearly 49 per cent of emissions in that country (New Zealand Ministry for the Environment and The Treasury 2007).[5]

Agricultural emissions in Australia are primarily from the digestive processes of livestock (67 per cent of the sector's emissions in 2005), fertiliser use (19 per cent), prescribed burning of savannahs (10 per cent) and manure management (4 per cent) (AGO 2007). Agriculture differs from most other sectors in that methane and nitrous oxide, rather than carbon dioxide, are the main GHGs. Agriculture can also be a sink for GHGs, through vegetation management, increasing carbon stored in soils and woodlots (small scale plantations).

Abatement potential

While there are significant knowledge gaps regarding abatement opportunities in the agriculture sector, it is known that emissions can be reduced by:

- changing fertiliser management practices, including applying nitrogen inhibitors to the soil to reduce nitrous oxide emissions
- improving livestock management to reduce enteric fermentation
- using no-till cropping and stubble retention in place of conventional tilling, to increase soil carbon levels (Wang and Dalal 2008)
- switching from higher to lower GHG emission forms of agriculture and/or changing land use from agriculture to forestry.

The ability of these techniques to reduce GHG emissions, however, can vary widely across locations and in ways that are not well understood.

Although the techniques themselves may achieve abatement at relatively low cost, measuring GHG emissions in the agriculture sector is difficult. In many cases, proxies are used to keep costs manageable. For example, measurement of emissions from the digestive processes of animals is calculated using formulas that take into account animal numbers, types and feed (pasture or feedlot) (DCC 2007). This means that some

4 This does not include emissions from energy use in the sector. The vast majority of energy-related emissions across all sectors are likely to be covered by the ETS.

5 This refers to pastoral and arable farming as well as horticulture and excludes agricultural energy use.

changes to farming practices that reduce *emissions* may not influence *measured emissions*. In assessing the potential to use policy to encourage abatement in the sector the costs of the measurement and verification systems that would be required need to be considered. Given the diffuse and poorly understood nature of agricultural emissions and the fact that Australia has over 130 000 farms, these costs could be considerable.

Consideration also needs to be given to what actually counts as GHG emissions under international rules as applied to Australia. For example, Australia has elected not to count carbon dioxide emissions and withdrawals from carbon in soils under the Kyoto Protocol (DCC 2008d) and such emissions are assumed to be zero in Australia's National Greenhouse Gas Inventory (DCC 2008b)[6].

Another consideration is whether the Kyoto Protocol rule that treats one tonne of methane emissions as equivalent to 21 tonnes of carbon dioxide emissions will continue to apply. Some analysts have suggested that much less emphasis should be given to controlling methane emissions over the next few decades as they reside in the atmosphere for only about ten years (Schelling 2007).

To assist the development of policy to mitigate GHGs in this sector, further research and development into methodologies to verify emissions and the impact of different abatement techniques is required.

Policy options

Inclusion in an ETS

Initial inclusion of agriculture in the ETS in a way that covers all emissions sources and sinks would have substantial costs. One way to reduce these costs is to cover only those emissions that are relatively easy to measure (directly or by reliable proxies). This is the approach proposed for New Zealand (box 3.5).

Another feature of the proposed New Zealand model is that individual agricultural producers will not have obligations under the scheme. Instead, liabilities will be placed at different points in the supply chain so as to greatly reduce the number of parties that are

6 Nitrogen and methane emissions from soil are accounted for in Australia's National Greenhouse Gas Inventory under agricultural emissions. Carbon from soil on the other hand is accounted for under LULUCF according to the IPCC Good Practice Guide (2003). According to the DCC (2008a) carbon stocks and carbon emissions from soil are assumed to be zero, as studies have shown that the biomass of annual crops is generally consistent year to year. The Kyoto Protocol enables a country to count these emissions where it elects to cover cropland management under article 3.4.

required to acquit permits and be monitored. For example, instead of farmers being liable for emissions from livestock, meat processers will be responsible for reporting and acquitting permits for these emissions.

Through restricting liability to specific sources of emissions and limiting the number of liable parties, the approach aims to decrease transaction costs and problems with monitoring and compliance. Coverage of emissions from livestock, manure management and soil (due to synthetic fertiliser use) would draw around 90 per cent of Australia's emissions in this sector under the ETS cap.

Box 3.5 Agriculture in the New Zealand Emissions Trading Scheme

In 2007, the New Zealand Government announced it will introduce a domestic ETS. It aims to include all sectors by 2013.

It is proposed to include the agriculture sector in the ETS by 1 January 2013. The intention is to focus on nitrous oxide emissions from synthetic fertiliser use and methane and nitrous oxide emissions from manure management and enteric fermentation. Other agricultural emissions will not be covered.

The Government's preferred option is for agriculture to be brought into the ETS through a mixture of downstream and upstream liabilities for agricultural emissions. This would mean that individual agricultural producers would not have obligations under the scheme. Responsibility for agricultural emissions would be given to groups at different points in the supply chain in a way that limits the number of obligated parties. The preferred option is that:

- meat processors be liable for emissions from livestock (downstream targeting)
- importers and producers of nitrogen fertiliser be liable for nitrogen emissions from fertiliser sold to farmers (upstream targeting).

Source: New Zealand Ministry for the Environment and Treasury (2007).

There are, however, trade-offs. One drawback to the New Zealand approach is that downstream targeting of emissions does not provide direct price signals to farmers regarding their GHG emissions. For example, where a downstream processor must pay for emissions from livestock (for example, using a formula that calculates emissions depending on factors such as type of animal, age, weight and whether fed on pasture or in feedlot), some actions that a farmer may take to reduce emissions on-farm, such as improving animal health, will not be taken into account in the calculation of emissions. Therefore, there will be little incentive under the ETS for a farmer to undertake such actions.

A general issue concerning the inclusion of the agriculture sector in an ETS is the risk of leakage of emissions overseas. An example of this would be where farmers reduce

livestock numbers in response to the lower price they receive for their livestock (due to a carbon price being levied on the meat processer), global demand has not changed and production of livestock increases in another country where there is no cost to GHG emissions.

In summary, none of the ways in which the agriculture sector could be covered by an ETS seem to be very satisfactory. The trade-off appears to be between having high transaction costs and approximately the right incentives to abate, or having lower transaction costs but muted incentives. Emissions leakage is a potential problem regardless of the approach taken. That New Zealand is pushing ahead with inclusion may reflect the fact that almost half of its emissions are from agriculture. Excluding agriculture would, therefore, greatly limit the scope for New Zealand to reduce emissions and/or require very high (and expensive) levels of abatement in other sectors. As noted, Australia is in a different situation. Inclusion of agriculture in an ETS should only occur if it can be shown that it will reduce the total cost of meeting Australia's emissions target and that it is superior to other policy options.

Offset arrangements

The problems associated with using offset arrangements were outlined in section 3.2. In general, these apply equally to agriculture, with some exceptions. For example, the greater level of uncertainty regarding agricultural emissions may exacerbate problems of determining baselines and emission reductions. Another example, is a greater potential for moral hazard where farmers who are using best practice farming methods (in relation to reducing GHGs) go unrecognised and those who are not at best practice are rewarded. Conversely, duration of sequestration is potentially less of a concern for agriculture (except in the case of agricultural soils). Any proposal to use offset arrangements should be subject to rigorous evaluation.

Other policy options

There are other options that could be pursued for the agriculture sector that, while generally providing more limited incentives for abatement, may also have lower transaction costs. These options include:

- extension services to promote practices that reduce GHG emissions and are cost-effective for farmers
- subsidies to farmers for adopting specific agricultural practices that are known to reduce GHG emissions.

Conclusions

There is a paucity of understanding of abatement opportunities and emissions measurement in the agriculture sector. These uncertainties will pose challenges to developing most types of mitigation policies in this area. Consequently, it seems unlikely that this sector will be able to make a major contribution to abatement in the short to medium term. As such, a focus on research and development appears to be warranted to develop understanding of emissions measurement and abatement.

3.4 Other sectors

Waste

Emissions from the waste sector, predominantly methane emissions, were 17 Mt CO_2-e in 2005, which represents 3 per cent of total national emissions (AGO 2007). Emissions occur due to anaerobic decomposition of organic matter in landfills and sewerage facilities.

Abatement opportunities in the waste sector include diversion of solid waste from landfills, for example through recycling, composting organic materials and diverting waste for energy. Another option is the recovery of methane released from landfills which is then burned as fuel or flared. Rates of methane recovery from solid waste have increased substantially since 1990, increasing from a negligible amount to 3 Mt CO_2-e in 2005 (AGO 2007).

Waste will be considered for inclusion during the development period of the ETS.

Aviation and maritime fuels

The Kyoto Protocol includes domestic emissions for aviation and shipping but not international emissions associated with these activities. International aviation and shipping emissions are monitored, but not counted towards countries' targets. The Kyoto Protocol states that the responsibility for limiting or reducing GHG emissions from aviation and marine bunker fuels shall fall to the Annex I Parties (parties with fixed emissions targets under the Kyoto Protocol), working through the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO) respectively.

In recent talks in Bangkok, a range of options were put forward for the treatment of shipping and aviation fuels. While consensus was reached that 'the current treatment of greenhouse gases, sectors and sources in the context of further commitments should

continue, without introducing any major changes', there was no agreement on the specific treatment for aviation and shipping (UNFCCC 2008).

While the EU has signalled that it will incorporate emissions from international aviation within its ETS[7], it is not clear that any future international agreement will follow suit. As such, there appears to be little rationale for immediate inclusion of international bunker fuels in an Australian ETS. There may be a rationale for supplementary policies in these sectors, for example working with the ICAO and IMO. However, mitigation efforts should be focused on reducing emissions where it will count towards Australia's GHG emissions target.

7 The EU has announced that from the start of 2011, all emissions from domestic and international flights between EU airports will be included, and emissions from all international flights that arrive at or depart from an EU airport will be covered from 2012.