

Optimising Carbon in the Australian Landscape

How to guide the terrestrial carbon market to deliver multiple economic and environmental benefits

WENTWORTH GROUP OF CONCERNED SCIENTISTS

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Summary

The focus in climate change policy has centred on reducing greenhouse gas emissions from energy generation, manufacturing and transport, because this is fundamental to any solution to climate change.

The science now tells us that it will be next to impossible for nations to achieve the scale of reductions required in sufficient time to avoid dangerous climate change unless we also remove carbon from the atmosphere and store it in vegetation and soils.

Terrestrial carbon includes carbon stored in forests, woodlands, swamps, grasslands, farmland, soils, and derivatives of these carbon stores, including biochar and biofuels.

The power of terrestrial carbon to contribute to the climate change solution is profound.

At a global scale, a 15% increase in the world's terrestrial carbon stock would remove the equivalent of all the carbon pollution emitted from fossil fuels since the beginning of the industrial revolution.

The multiple public policy benefits for Australia in adopting full terrestrial carbon offsets are enormous, but there are also significant risks of an unregulated terrestrial carbon market to other areas of public policy.

In a report recently commissioned by the Queensland government, *Analysis of Greenhouse Gas Mitigation and Carbon Biosequestration Opportunities from Rural Land Use*, CSIRO estimate that the Australian landscape has the biophysical potential to store an additional 1,000 million tonnes of CO₂e in soils and vegetation for each year of the next 40 years.

If Australia were to capture just 15% of this biophysical capacity, it would offset the equivalent of 25% of Australia's current annual greenhouse emissions for the next 40 years.

This represents a gross investment potential of terrestrial carbon in Australia of between \$3.0 billion and \$6.5 billion per annum.

It is good news for Australia. It lowers the economic cost of achieving Australia's emissions reductions, and makes it possible for Australia and the world to adopt deeper emission cuts.

If Australia commits to reducing our greenhouse gas emissions by 25% by 2020, and carbon forestry offsets are included, ABARE estimate that the majority of these forests will be permanent environmental plantings rather than harvested plantations.

If we plan wisely, terrestrial carbon presents an economic opportunity of unparalleled scale to address a range of other great environmental challenges confronting Australia: repairing degraded landscapes, restoring river corridors, improving the condition of our agricultural soils, and conserving Australia's biodiversity.

It also poses significant risks. Without complementary land use controls and water use accounting arrangements in place, there is a risk that carbon forests will take over large areas of agricultural land, causing adverse impacts on food and fibre production, and impacting on regional jobs that are dependent on these industries.

ABARE has estimated that if Australia commits to reducing greenhouse gas emissions by 25% by 2020, over 40 million hectares (an area equivalent to 40% of the entire Murray Darling Basin) would be economically suitable for carbon forestry.

In some locations, newly established carbon forests could also cause a reduction in runoff into rivers and worsen existing over-allocation problems.

The challenge for Australia is to optimise this new terrestrial carbon economy to drive investments towards improving the health of our agricultural soils, protecting areas of high conservation significance and repairing degraded landscapes, and away from damaging native vegetation and prime agricultural land.

It is also counterproductive to create economic incentives to revegetate overcleared landscapes without introducing complementary measures to reduce broadscale land clearing. Clearing of native vegetation still contributes 13% of Australia's greenhouse gas emissions.

Australia needs to plan where we want trees, where we produce food and where we might do both.

It is the role of Australia's governments (Commonwealth, State, Territory and Local) to build the institutional structures to create these opportunities and manage these risks by:

1. Designing a Carbon Pollution Reduction Scheme that captures the full potential of terrestrial carbon in vegetation and soils, providing land managers across Australia the opportunity to optimise their contribution to the climate change solution;
2. Regulating the terrestrial carbon market so that multiple economic and environmental benefits can be realised, whilst avoiding unintended consequences for fresh water resources, biodiversity and agricultural land;
3. Assisting communities prepare regional *Climate Change Adaptation Plans* to manage the impacts of climate change on the Australian landscape and guide the development of policies to optimise future investments in terrestrial carbon;

4. Underwriting climate change adaptation policies and terrestrial carbon investments by building a system of regionally based, *National Environmental Accounts*, to monitor the health and change in the condition of our natural resource assets;
5. Establishing a *Climate Change Adaptation Fund*, by applying a 1% levy on the sale of emission permits to monitor, plan and invest in actions to minimise the impact of climate change on Australia's biodiversity, coasts, and land and water resources; and
6. Strengthening international efforts to protect and restore terrestrial carbon in tropical forest landscapes that will promote new international rules to provide the opportunity for developing countries to capture this potential.

These reforms will mean that a price on carbon stored in the landscape can make a substantial contribution to Australia's efforts to combat climate change.

They can also help Australia adapt as climate change imposes its footprint across the Australian landscape, and they can be a catalyst for driving a new generation of economic reforms to improve the health of our farmlands and the protection and restoration of Australia's biodiversity.

The Science of Climate Change

The world's climate scientists believe that even stabilizing greenhouse gas concentrations at around 450 ppm of CO₂e is likely (best-estimate) to result in global average temperature increases of between 2.0° and 2.4°C (above pre-industrial levels) by 2050.¹

Achieving a '450 ppm' stabilisation scenario requires global CO₂ emissions to peak no later than 6 years from now, and for net global emissions to be reduced by between 50 and 85% by 2050 (relative to 2000).² Even then, there is more than a 50% likelihood that global temperature increases will exceed 2°C, and there is a 5% likelihood that temperature increases will exceed 4°C.³

Australia's landscapes have not seen increases of global temperatures by 2°C for about 10,000 years.⁴ The world has not experienced temperature increases exceeding 4°C for over 40 million years.⁵

Achieving stabilisation at '450 ppm' will require developed countries such as Australia, the United States and Europe to reduce emissions by between 25% to 40% in 2020 (relative to 1990 levels) and by 80% to 95% in 2050,⁶ and for developing industrial economies to change the way they generate and use energy.

This is a staggeringly difficult political, institutional and technological challenge.

The Power of Terrestrial Carbon

The focus of climate change policy has centred on reducing greenhouse gas emissions from energy generation, manufacturing and transport, because this is fundamental to any solution to climate change.

The science now tells us that it will be next to impossible for nations to achieve the scale of reductions required in sufficient time to avoid dangerous climate change, unless we also remove carbon from the atmosphere and store it in vegetation and soils. The level of long-

lived greenhouse gases in the atmosphere in 2005 was 455 ppm CO₂e, already exceeding the long-term stabilization target needed to minimise the risk of dangerous climate change.²

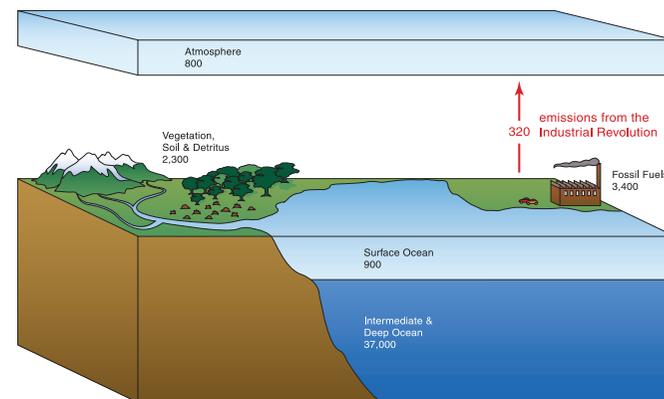
Terrestrial carbon emissions (primarily from clearing of tropical rainforests) are responsible for 20% of annual global emissions.⁷

Terrestrial carbon includes carbon stored in forests, woodlands, swamps, grasslands, farmland, soils and derivatives of these carbon stores, including biochar and biofuels.

The power of terrestrial carbon emissions to contribute to the climate change solution is profound. At a global scale, the total stock of carbon in the world's terrestrial landscapes (stored in vegetation and soil) is approximately 2,300 billion tonnes (Gt), about three times more than in the atmosphere.⁸

A 15% increase in the world's terrestrial carbon stock would remove the equivalent of all the carbon pollution emitted from fossil fuels since the beginning of the industrial revolution.

FIGURE 1: GLOBAL CARBON STOCKS



Figures are in billion tonnes of carbon (GtC).

Adapted from Figure 7.3, IPCC 2007.

Terrestrial Carbon in Australia

The total stock of carbon in the Australian landscape is approximately 28 billion tonnes, half of which is found in native forests and woodlands, and half in Australia's extensive grasslands and crop land (TABLE 1).⁹

FIGURE 2: TERRESTRIAL CARBON IN AUSTRALIAN LANDSCAPES¹⁰

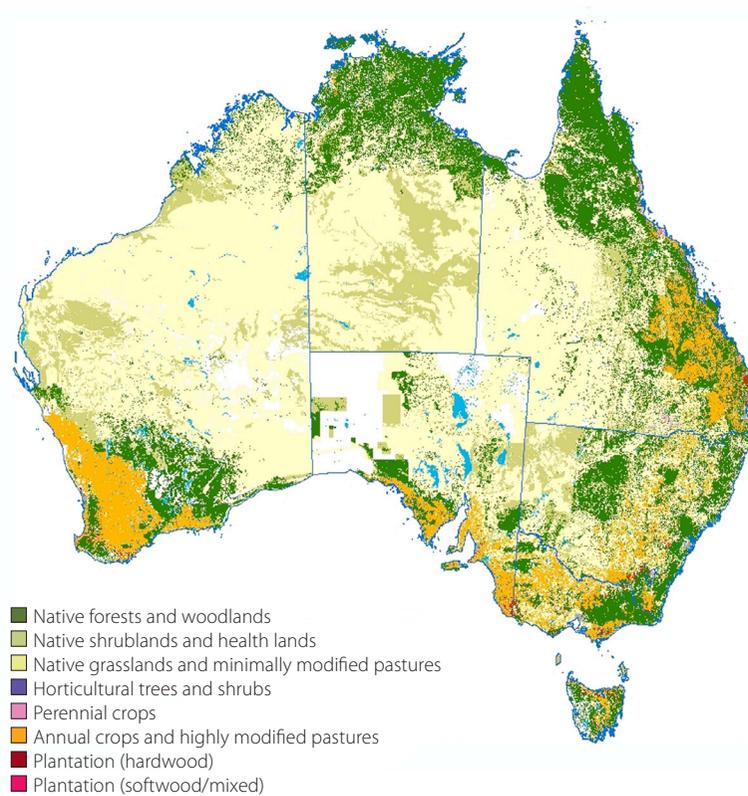


TABLE 1: CARBON IN AUSTRALIAN LANDSCAPES

	Total GtC	Total C %	Total CO ₂ e Gt CO ₂ e
Forest – living biomass	6.6		24.3
Forest - debris	2.7		10.1
Forest - soil	5.5		20.2
<i>Sub-total Forest</i>	<i>14.9</i>	<i>52.5</i>	<i>54.7</i>
Grassland - grass	0.1		0.4
Grassland – sparse woody vegetation	0.2		0.8
Cropland - crops	0.3		1.0
Grassland and cropland - soil	13.1		48.1
<i>Sub-total Grassland and Cropland</i>	<i>13.5</i>	<i>47.5</i>	<i>49.3</i>
Total	28.3	100.0	103.9

(1 tonne of carbon [C] = 3.67 tonnes of carbon dioxide equivalent [CO₂e]).

Terrestrial carbon emissions (primarily from land clearing) are responsible for 14% of Australia's annual greenhouse gas emissions.¹¹

In a report recently commissioned by the Queensland government, *Analysis of Greenhouse Gas Mitigation and Carbon Biosequestration Opportunities from Rural Land Use*¹², CSIRO estimate that the Australian landscape has the biophysical potential to store an additional 1,000 million tonnes (Mt) of CO₂e in soils and vegetation each year for the next 40 to 50 years.

If we could capture just 15% of this biophysical capacity, it would offset the equivalent of 25% of Australia's current annual greenhouse emissions for the next 40 years (15% of 1,017 Mt = 153 Mt).

TABLE 2: BIOPHYSICAL POTENTIAL OF AUSTRALIAN LANDSCAPES TO SEQUESTER CARBON 2010 - 2050¹³

Action	Potential (Mt CO ₂ -e /yr)
Agriculture	
Grazing land management (incl. soil carbon)	100
Livestock emissions (mainly methane)	26
Crop land management (incl. CO ₂ and N ₂ O emissions)	25
Savannah Fire Management	13
<i>Sub-total Agriculture</i>	<i>164</i>
Forestry	
Carbon forestry (biodiversity plantings - 350; plantations - 400)	750
Land clearing and regrowth	56
Eucalypt forest management	47
<i>Sub-total Forestry</i>	<i>853</i>
Bioenergy¹⁴	
Biofuels	not avail
Biochar	not avail
Total	1,017
Australia's total net annual greenhouse gas emissions (2007)	597

This is good news for Australia and the world:

- it lowers the economic cost of achieving Australia's emission reduction targets;
- it paves the way for Australia and the world to adopt deeper emission cuts;
- it provides a new source of income for Australian agriculture and other land managers to manage our landscapes more sustainably; and
- it helps Australia adapt to climate change by improving the health of our natural assets.

Managing Terrestrial Carbon

If Australia was to capture 15% of the biophysical capacity identified in the CSIRO report, the gross investment potential of terrestrial carbon in Australia would be between \$3.0 billion and \$6.5 billion per annum.¹⁵

TABLE 3: THE ECONOMIC POWER OF TERRESTRIAL CARBON IN AUSTRALIA

Sector	Biophysical Potential Mt CO ₂ e per/yr	Gross Economic Potential (15% of biophysical potential, \$ per annum)		
		CPRS -5 @ \$20 t CO ₂ e	CPRS -15 @ \$28 t CO ₂ e	Garnaut -25 @ \$43 t CO ₂ e
Agriculture	164	\$492 m	\$689 m	\$1,058 m
Forestry	853	\$2,559 m	\$3,583 m	\$5,502 m
Bioenergy	not avail	-	-	
Total	1,017	\$3,051 m	\$4,271 m	\$6,560 m

Earlier ABARE modelling suggests investments of similar magnitude.¹⁶

Whilst there will be many issues affecting whether this potential is converted into reality, the implications are that a price on carbon presents an economic opportunity to use the new carbon economy to address the range of other great environmental challenges confronting Australia: repairing degraded landscapes, restoring river corridors, improving the condition of agricultural soils, and conserving Australia's biodiversity.

An Economic Opportunity to Revolutionise Landscape Conservation

Because forests and restored river basins store vast quantities of carbon, carbon economics of the 21st century presents our generation with the opportunity to improve the health of our landscapes and conserve the world's biodiversity, at scales that would have been unimaginable even a few years ago.

ABARE modelling suggests that such an outcome is feasible, because the higher the carbon price the greater proportion of terrestrial carbon investments that are likely to be directed into environmental plantings.¹⁹ ABARE define environmental plantings as carbon forests that are not harvested for their timber.

With a 25% 2020 target, ABARE estimate that the majority of the land dedicated to carbon forestry will be in the form of permanent plantings, rather than harvested plantations.

TABLE 4: BIODIVERSITY CONSERVATION POTENTIAL 2010 TO 2050 (Kyoto Compliant Forests Only)

2020 Target	Timber Plantations 2010-2050 Million Ha	Environmental Plantings 2010-2050 Million Ha	Total Afforestation 2010-2050 Million Ha	% Environmental Plantings
CPRS -5	3.0	2.7	5.8	47%
CPRS -15	4.5	21.8	26.3	83%
Garnaut -25	5.0	34.0	39.0	87%

This does not guarantee that a terrestrial carbon market alone will produce plantings that also optimise biodiversity outcomes, because the economic driver is to maximise carbon.¹⁸

A major factor dictating the economics of harvested plantations is that harvesting and transport costs represent a large proportion (in the order of 40%) of total growing costs. In contrast, environmental plantings can be established anywhere in the landscape with suitable climatic conditions.

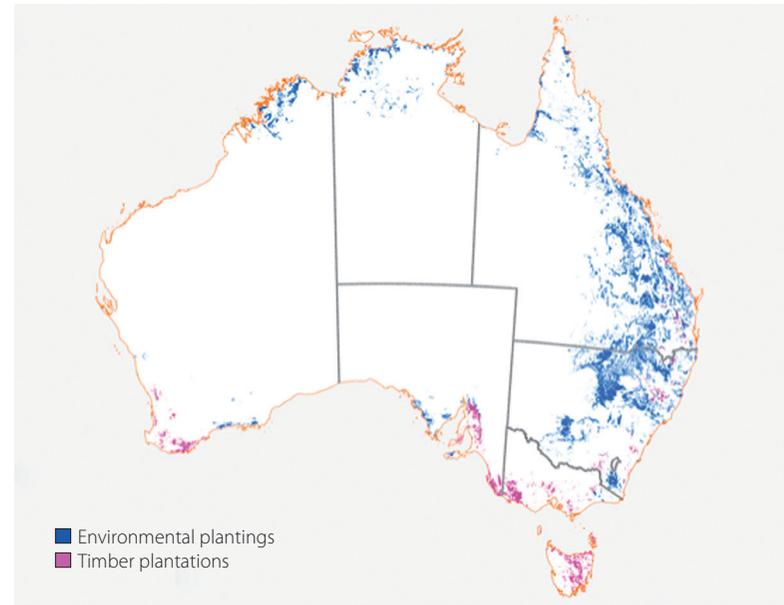
On the other hand, the Carbon Pollution Reduction Scheme will also increase the cost of producing emissions intensive products such as cement and steel, making wood products relatively more attractive.¹⁹ This is likely to increase the profitability of harvested plantations relative to permanent carbon forests.

Biodiversity plantings do, however, have a natural competitive advantage over plantation forests. The carbon stock of native forests is higher on average than the carbon stock of plantations.²⁰ Biodiversity plantings are also self regenerating and are therefore more resistant to climate variability.

ABARE suggests that most of the environmental (permanent) plantings are likely to be established in eastern Australia, primarily in northern NSW and Queensland.

The policy challenge for many parts of Australia may simply be how to guide the terrestrial carbon market to those areas in the landscape in ways that deliver multiple economic and environmental benefits.

FIGURE 3: POTENTIAL LAND USE CONVERSION TO AFFORESTATION



Source: ABARE CPRS -15 scenario.

The Co-Benefits of Soil Carbon

Agricultural practices over the past century have mined Australian soils of their carbon stores. Nearly 40% of carbon stocks have been lost from Australia's cropping soils.

The loss of soil carbon is a primary cause of land and water degradation, acidification and the destruction of soil structure.²¹

This reveals the great co-benefit of improving soil carbon. Soil carbon sequesters carbon from the atmosphere which also improves soil health and as a consequence, agricultural production.

CSIRO have identified the significant biosequestration potential of the Australian landscape to absorb carbon. The paradox in their analysis is that whilst nearly 50% of terrestrial carbon in the Australian landscape occurs in grasslands and croplands, less than 20% of the estimated potential of the Australian landscape to store carbon occurs in these landscapes. This is because without changes to existing agricultural practices, any increase in carbon will come at the cost of agricultural production.

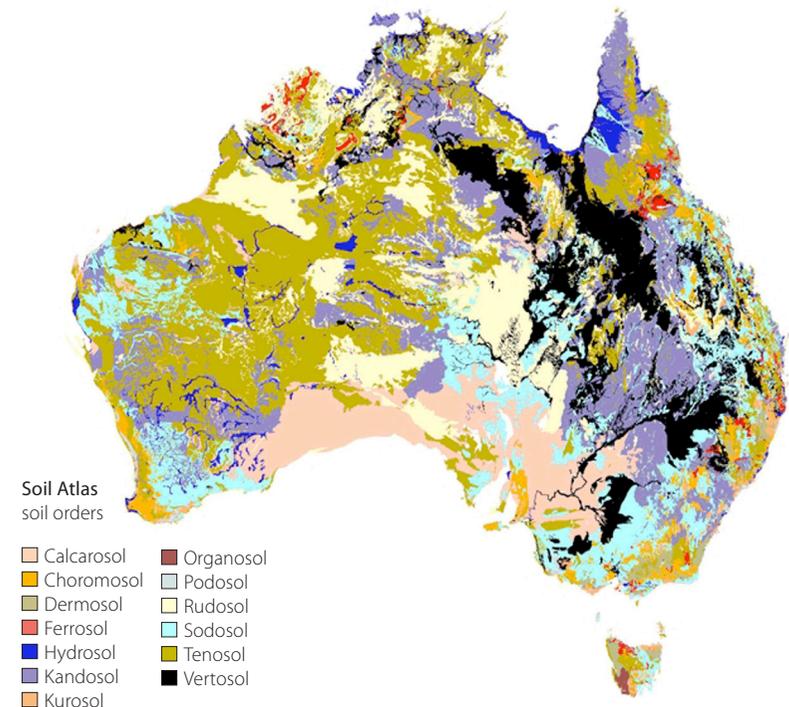
It is estimated that Australia's grasslands and croplands store an estimated 48,000 million tonnes of CO₂e in their soils (TABLE 1).

As a consequence of the loss of soil carbon in agricultural systems, many Australian soils now have a significant capacity to store additional carbon.

Australian soils are complex and their potential to store carbon varies significantly. Three soil types (Kandosol, Sodosol and Vertosol) which occupy 50% of the continent have the biophysical potential to sequester 80% of the soil carbon (TABLE 9).

In Australia, livestock grazing and cropping land occupies over 400 million hectares – nearly 60% of the Australian continent. Even small increases in soil carbon can produce significant offsets in greenhouse gas emissions.

FIGURE 4: AUSTRALIAN SOILS ATLAS²³



Changing farming practices, such as *Carbon Grazing*²³, have the potential to reduce emissions of greenhouse gases while simultaneously increasing productivity, reducing input costs and producing wider natural resource management benefits.

Experts believe that it is technically feasible for Australian agricultural landscapes to increase soil carbon levels by 2% per year. This would result in the storage of an additional 900 Mt of CO₂e per annum.²⁴

TABLE 5: SOIL CARBON STORAGE POTENTIAL IN AUSTRALIA

Estimated areas of each soil type within the >200mm average annual rainfall zone.²⁵

Soil Type	Area (Million ha)	Carbon Increase (tonnes per annum per ha)	Biosequestration Potential (Mt CO ₂ e)
Calcarosol	42	0.12	18
Chromosol	16	0.74	43
Dermosol	7	0.74	19
Ferrosol	4	1.23	18
Kandosol	90	0.51	168
Kurosol	3	0.74	8
Rudosol	42	0.12	18
Sodosol	69	0.74	187
Tenosol	89	0.12	39
Vertosol	75	1.48	407
Total	437		927

If changed grazing and cropping practices resulted in the capture of just 15% of this potential, carbon stores in Australia's agricultural soils would offset 140 Mt CO₂e of Australia's emissions each year.

Without planting a single tree, it would improve the health of our farmlands and Australian agriculture would become carbon neutral.

Food Security

The terrestrial carbon economy provides an historic opportunity to repair our degraded river systems and estuaries, restore habitat for threatened species, and build economic drivers into agriculture that pays farmers to improve the health of our soils. But if 100% of the CSIRO estimate of the biophysical potential of the Australian landscape was committed to carbon, then we would most likely see vast tracts of agricultural land converted to carbon forests.

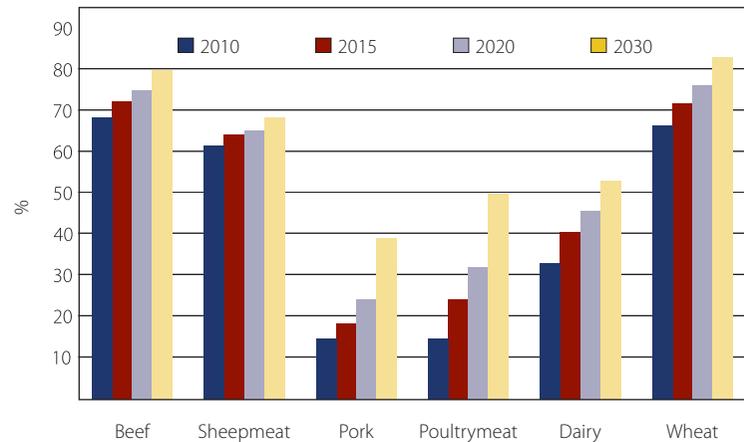
One of the challenges facing humanity is increasing food production (increasing current demand by 70% according to some estimates²⁶) to satisfy the needs of an expected 9 billion people. This is against a background of a dwindling global natural resource base, whose biophysical productivity is being undermined by pollution and land and water degradation.²⁷

The world's population has doubled in the past 40 years, from 3 billion people in 1969 to over 6 billion people today. It is projected that the world's population will exceed 9 billion in the next 40 years.²⁸ Australia is expected to add another 15 million people in the next 40 years, to reach a population of about 35 million by 2050.²⁹

Historically the answer to world population growth has been found in the green revolution, where high input systems have been sustained by a suite of new seed varieties, pesticides and fertilisers, and by bringing more land under cultivation.³⁰

Australia is an important producer and exporter of food. Australian agriculture exports over 60% of our beef, sheep and wheat products and this proportion is expected to grow to 80% within the next 20 years.³¹

FIGURE 5: EXPORT SHARE OF SELECTED AUSTRALIAN COMMODITIES³³



Source: RIRDC, 2009 using CIE GMI, Dairy and Grain model projections.

Food and fibre production provides the backbone to many regional economies, as well as the resource base for the valued-added industries that support regional jobs.

If the new terrestrial carbon economy takes large areas of agricultural land out of production, as has happened recently in the United States, when corn was turned into biofuel, or when the European Union set biofuel targets but didn't ban the clearing of tropical rainforests to produce it, then we risk creating more problems for Australia and the world than we solve.

ABARE has estimated that if Australia commits to reducing greenhouse gas emissions by 25% by 2020, over 40 million hectares – an area equivalent to 40% of the entire Murray Darling Basin - could be economically suitable for Kyoto compliant carbon forestry.³²

TABLE 6: ECONOMIC POTENTIAL OF AFFORESTATION 2010 TO 2050

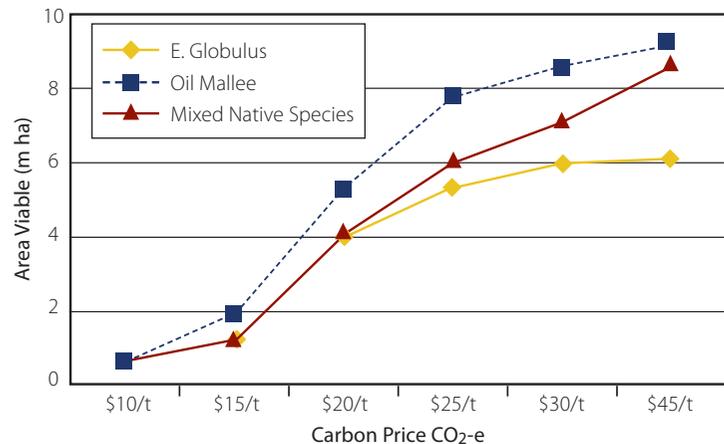
Target	Total Afforestation Area 2010-2050 Million ha	Total Carbon Sequestered 2010-2050 Mt CO ₂ e
CPRS -5	5.8	1,082
CPRS -15	26.3	3,245
Garnaut -25	39.0	4,107

* Based on Australia Treasury 2008 carbon price assumptions.

Whilst these estimates should be interpreted as conditional projections and not forecasts, the results suggest that the introduction of a carbon price can substantially influence land use change in Australia.

In an economic analysis of the impact of a carbon price on agricultural land in South Australia, CSIRO estimate that over 5 million hectares (half the study area) would be economically viable to reforest if the carbon price was above \$20 tonne CO₂e. At \$45 per tonne (the price Australian Treasury estimates for a -25%, 2020 target), the area estimated to be economically viable for conversion to forestry could increase to over 8 million hectares.³³

FIGURE 6: AFFORESTATION POTENTIAL IN SOUTH AUSTRALIA



All things being equal, individual farmers are likely to keep productive areas in food and fibre production and look for less profitable parts of the farm to provide an additional income stream from carbon forestry.³⁴ This would be a good outcome for everyone.

However, in the highly distorted global agricultural markets, an unregulated carbon market of this scale has a significant potential, in the short term at least, to destabilise many agricultural regions across Australia, as investors move to take agricultural land out of production to grow carbon instead.

It is the role of our governments (Commonwealth, State, Territory and Local), to capture the opportunities presented by the new terrestrial carbon economy. It is also their responsibility to manage the risks.

Water Resources

Unregulated carbon forestry poses risks to Australia's fresh water resources, particularly in high rainfall zones above 700mm where large scale forestry is most viable, because it can reduce the amount of runoff into rivers, groundwater and dams.³⁵

The risks from large-scale forestry on Australia's fresh water resources were recognised in the historic National Water Initiative, agreed by the Council of Australian Governments in 2004: "... a number of land use change activities have potential to intercept significant volumes of surface and/or ground water ... if these activities are not subject to some form of planning and regulation, they present a risk to the future integrity of water access entitlements and the achievement of environmental objectives for water systems."³⁶

The solution is for the Commonwealth to require carbon forest offsets to hold a water access entitlement in areas where forestry is likely to affect runoff into rivers, groundwater or dams, and for these entitlements to be surrendered equivalent to their environmental impact.³⁷

This requires State and Territory governments to honour their obligations under the National Water Initiative "to implement ... no later than 2011, ... in water systems that are fully allocated, overallocated, or approaching full allocation, ... (that) any proposals for additional interception activities above an agreed threshold size, will require a water access entitlement."

Land Clearing and Native Forest Management

It is counterproductive for Australia to create economic incentives to revegetate overcleared landscapes, without introducing complementary measures to further reduce broadscale land clearing.

Clearing of native vegetation is the prime cause of land degradation and biodiversity loss in Australia and contributes significantly to Australia's greenhouse gas emissions.

Despite significant reductions in land clearing in Australia in recent years, land clearing still releases an estimated 77 Mt CO₂e each year, contributing 13% of Australia's greenhouse emissions.³⁸

If Australia was to buy back the clearing of regrowth, CSIRO estimate that action alone would save 11 Mt CO₂e per year.³⁹

Emissions reductions from improved management of native forests also has potential to make an important economic contribution to Australia's greenhouse gas reduction targets. CSIRO estimates of the benefits that could be achieved from improved forest management are in the order of 47 Mt CO₂e per year.⁴⁰

Optimising Carbon in the Landscape

The introduction of a Carbon Pollution Reduction Scheme in Australia which provides for terrestrial carbon offset credits, will require a suite of institutional responses by Commonwealth, State, Territory and Local governments, if we are to optimise this new terrestrial carbon economy across the Australian landscape.

Many have direct implications on the design of Australia's Carbon Pollution Reduction Scheme and some require international agreement at the UNFCCC Conference in Copenhagen in December this year.

State, Territory and Local government also have an important role to play in guiding investments and regulating land use. These need to be in place before the Carbon Pollution Reduction Scheme becomes operational in 2011.

Australia's immediate policy response for managing the terrestrial carbon economy should focus on six priority actions:

1. Designing a Carbon Pollution Reduction Scheme that captures the full potential of terrestrial carbon in vegetation and soils, providing land managers across Australia the opportunity to optimise their contribution to the climate change solution;
2. Regulating the terrestrial carbon market so that multiple economic and environmental benefits can be realised, whilst avoiding unintended consequences for fresh water resources, biodiversity and agricultural land;
3. Assisting communities prepare regional *Climate Change Adaptation Plans* to manage the impacts of climate change on the Australian landscape and guide the development of policies to optimise future investments in terrestrial carbon;

4. Underwriting climate change adaptation policies and terrestrial carbon investments by building a system of regionally based, *National Environmental Accounts*, to monitor the health and change in the condition of our natural resource assets;
5. Establishing a *Climate Change Adaptation Fund*, by applying a 1% levy on the sale of emission permits to monitor, plan and invest in actions to minimise the impact of climate change on Australia's biodiversity, coasts, and land and water resources; and
6. Strengthen international efforts to protect and restore terrestrial carbon in tropical forest landscapes that will promote new international rules to provide the opportunity for developing countries to capture this potential.

1. Capture the Full Potential of Terrestrial Carbon

It is in Australia's self interest to adopt full terrestrial carbon accounting:

1. It lowers the economic cost of Australia's greenhouse reduction targets for at least 40 years and paves the way for Australia and the world to adopt deeper emission cuts;
2. It provides a new source of income to help Australian agriculture and other landholders create more sustainable farming systems;
3. It has the potential for almost unlimited possibilities for repairing degraded river systems and financing the conservation of Australia's biodiversity; and
4. It provides a capital base to help us adapt to the impacts of climate change on our natural resource assets.

According to CSIRO, approximately 75% of the biophysical potential of the Australian landscape is already built into the rules adopted by Australia under the Kyoto protocol, primarily through forestry.⁴¹

TABLE 7: RESTRICTIONS ON AUSTRALIA'S BIOSEQUESTRATION POTENTIAL

Legal Status	Activity	Biophysical Potential
Benefits captured in CPRS Bill	Carbon forestry Biofuels (displacing fossil fuels)	73%
Not in CPRS but emissions counted under Kyoto rules	Emissions from Livestock Savannah burning Land clearing and re-growth	10%
Not counted under Kyoto rules because Australia has not elected to include in our national carbon accounts	Grazing land management Native Forest management Crop land management	17%
Ineligible under Kyoto rules	Biochar	unknown
Total		100%

The Carbon Pollution Reduction Scheme Bill creates credits for reforestation on land that is 'Kyoto compliant', and potentially through the displacement of fossil fuels with biofuel.

The current bill does not however reward carbon sequestration in grazing land, cropping land and forest management, primarily because the international rules require Australia to account for natural as well as human induced changes in carbon stocks.

Such rules constrain the potential for terrestrial carbon to contribute to lowering the cost of meeting mitigation targets. They also create an economic distortion in agricultural markets where tree planting is given a competitive advantage over soil carbon stored in agricultural soils.

The United States House of Representatives has passed legislation which allows full terrestrial carbon offsets, including soil carbon offsets.⁴²

The new Copenhagen framework should mirror these reforms and rectify the flaws in the current international accounting rules to allow Australia and other nations to incorporate the benefits of full terrestrial carbon accounting.

Biochar is another carbon sequestration technology which has potential to both remove carbon from the atmosphere and increase plant production by reducing soil acidity, lowering fertiliser use, and increasing water holding capacity.⁴³ Biochar is a form of fine-grain charcoal which is created by converting organic matter (such as wood, leaves, food wastes and manure), though heating in a low or zero oxygen environment.⁴⁴ This opportunity should also be recognised in the new Copenhagen framework.

Australia should take the lead with these reforms, and extend the Carbon Pollution Reduction Scheme Bill to allow for the inclusion of carbon offset credits from all terrestrial carbon sources once the international rules are in place, and definitional and measurement standards are agreed.

This will provide a signal to the market that there will be a level playing field in terrestrial carbon, and this market signal will create an economic driver that rewards innovation to develop cost effective methods for addressing the measurement and monitoring issues.

Where there is confidence in current measurement and verification systems, these activities can be included immediately (eg. biodiverse revegetation, forestry and avoided deforestation). Other activities such as grazing land management and biochar would be included once reliable and cost-effective measurement systems are in place.

Australia should also introduce complementary measures to reduce broadscale land clearing. To do otherwise will result in more damage to Australia's biodiversity and water resources and impose higher costs on the rest of the Australian economy in meeting our national emissions targets.

Recommendation 1:

1. Australia promote at the UNFCCC Conference in Copenhagen, new international rules for including full terrestrial carbon accounting, by removing the requirement to count natural as well as human induced sources of emissions and sinks in cropland, grazing land and forest management, and include biochar as a new carbon capture technology that is eligible to receive emission credits.
2. The Commonwealth extend the Carbon Pollution Reduction Scheme Bill to enable carbon offset credits to be generated from all sources of terrestrial carbon, including soil carbon and forest management, so that when these new international rules and definitional and measurement standards are agreed, all sectors can compete on a level playing field with carbon forestry.
3. State and Territory governments extend existing (and where necessary introduce) laws to end the broadscale clearing of remnant native vegetation (both urban and rural) unless it maintains or improves environmental outcomes (including for carbon sequestration).
4. The Commonwealth amend the Carbon Pollution Reduction Scheme Bill to require the effects of broadscale clearing of native vegetation on greenhouse gas emissions to be offset, either by the planting of native vegetation elsewhere or the purchase and surrender of an emissions permit.
5. The Commonwealth establish a public fund from which regional natural resource management bodies offer incentives to landholders to reduce clearing, particularly in areas of high conservation significance.

2. Regulate the Terrestrial Carbon Market

The introduction of an emission trading scheme in Australia that allows offset credits for carbon forestry requires complementary regulatory arrangements to ensure the protection of high value agricultural land for food production, protection of fresh water resources, and the promotion of environmental co-benefits (such as restoring river corridors, biodiversity plantings and regrowth of native vegetation over monoculture plantings).

Whilst ABARE and other modelling suggests that a large proportion of terrestrial carbon investments are likely to be directed into permanent plantings, this does not guarantee that a terrestrial carbon market alone will produce plantings that optimise biodiversity, water quality and other environmental outcomes.⁴⁵

Governments can use a combination of economic incentives and existing land use planning schemes to direct terrestrial carbon investments to optimise these outcomes across the Australian landscape.

One option is for the Commonwealth to establish a *National Carbon Bank*⁴⁶ - a large public fund, managed by Australia's existing regional natural resource management bodies. This fund would invest in biodiversity plantings which produce a double environmental dividend. It would use a price on carbon to help Australia meet its greenhouse gas emission targets in a way that also restores the native vegetation along the nation's river systems, restores habitat for threatened species, improves water quality, and secures landscape health in the face of climate change.

The Wet Tropics NRM Group in north Queensland⁴⁷ has a pilot scheme in place now which uses their existing accredited regional natural resource management plan as the framework for creating a carbon market enterprise to deliver complementary biodiversity, sustainable agriculture, water quality and community benefits.

There are other economic vehicles, such as targeting existing environmental programs to compensate for the difference between biodiversity and monocultures on sites of high conservation value but where carbon economics favours monocultures.

Another option is to provide taxation incentives to landholders who are engaged in 'accredited' biodiversity carbon projects.

An effective regulatory tool for optimising terrestrial carbon is for State, Territory and Local governments to improve the quality of existing regional natural resource management plans and link these plans with their existing land use planning schemes to zone land according to its acceptability for carbon forestry.

These land use planning schemes can then guide terrestrial carbon into areas of highest benefit and away from areas of risk, without significantly undermining the terrestrial carbon market.

The Commonwealth has recently gazetted guidelines for the establishment of trees for carbon sequestration under the *Income Tax Assessment Act 1997*.⁴⁸ These guidelines require carbon sink forests to be based on best practice for land and water environmental benefits and to be guided by regional natural resource management plans and water sharing plans. These provisions should also apply to all carbon offset credits generated by the Carbon Pollution Reduction Scheme.

Recommendation 2:

1. The Commonwealth amend the Carbon Pollution Reduction Scheme Bill to require that terrestrial carbon credits are only available where they meet national environmental and natural resource management standards consistent with the existing Income Tax Guidelines.

This creates the legal authority to link the carbon forestry offsets created by the Commonwealth legislation with State, Territory and Local government powers to designate land as suitable or otherwise under regional natural resource management plans, water sharing plans and regional land use plans.
2. The Commonwealth amend the Carbon Pollution Reduction Scheme Bill to require that carbon forestry offset entitlements are only issued if they hold a water access entitlement in areas where forestry is likely to affect runoff into rivers, groundwater or dams, and to ensure these operations surrender entitlements equivalent to their environmental impact.
3. In areas of Australia where carbon forestry is likely to cause other adverse economic, social or environmental impacts, State, Territory and Local governments amend their land use planning schemes to zone land according to its suitability for carbon forestry:
 - Green light for areas identified by regional natural resource management plans and/or regional land use strategies, as suitable for biodiversity plantings could be zoned "permitted use", subject to compliance with environmental guidelines with regard to location and species type;

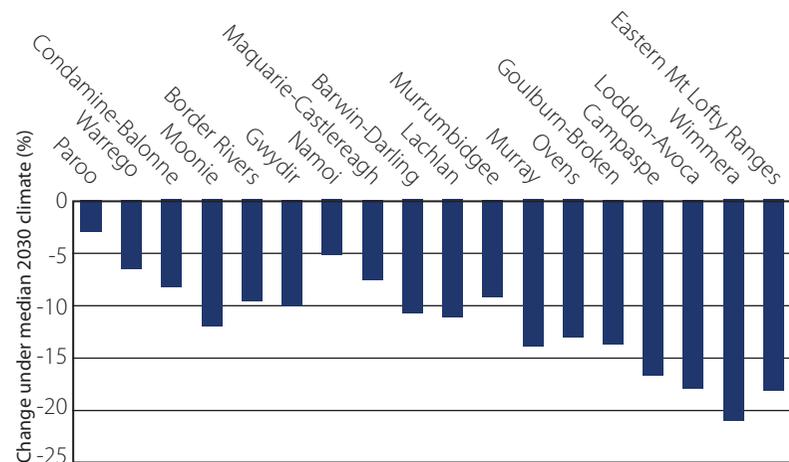
- Red light for areas of high value arable land deemed unsuitable for carbon forestry because of its long-term impact on food production, jobs and regional economic development; and
 - Amber light for areas not in the two categories above, when carbon forestry developments would be subjected to a formal development application or environmental impact assessment processes.
4. The Commonwealth establish, as a complimentary measure alongside the Carbon Pollution Reduction Scheme, a *National Carbon Bank* - a large public fund for Australia's regional natural resource management bodies to invest in biodiversity plantings which produce a double environmental dividend.

3. Regional Climate Change Adaptation Plans

Even with concerted action, projected temperature increases of 2.9°C (above pre-industrial levels) over the next 40 years, are likely to have profound impacts on Australian agriculture, water security, coastal systems, icons like Kakadu and the Great Barrier Reef, and biodiversity.

Irrigated and dryland agriculture in southern Australia is facing a bleak future. CSIRO (median) modelling suggest reductions in average annual rainfall of 5% in the south of the Murray Darling Basin within the next 20 years, which could translate to reductions in average annual runoff of 15% or more in many southern catchments.⁴⁹

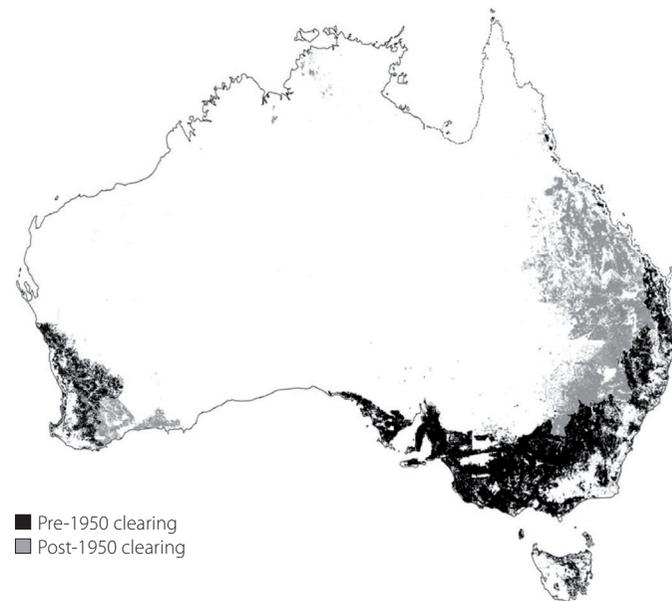
FIGURE 7: CLIMATE CHANGE IMPACT ON WATER AVAILABILITY IN THE MURRAY DARLING BASIN



Source: CSIRO 2008 *Water availability in the Murray-Darling Basin. A report to the Australian Government from the CSIRO Murray Darling Basin Sustainable Yields Project* CSIRO, Australia. 67pp.

In many parts of Australia where native vegetation has been fragmented into small patches by urban development and agriculture, climate shifts will almost certainly lead to a wave of regional extinctions of native plants and animals, because the remaining islands of native vegetation will no longer provide the habitat needs for many native species.⁵⁰

FIGURE 8: LAND CLEARING IN AUSTRALIA⁵¹



Australia needs to equip our existing regional natural resource management institutions to prepare *Regional Climate Change Adaptation Plans* to:

- identify the risks posed to our natural resource base from climate change;
- build greater alignment between Commonwealth, State, Territory and Local government policies and natural resource management and landscape adaptation investments; and
- offer communities opportunities to assess their options for improving land use management under new climate conditions.

These plans would identify areas and set investment targets for:

- restoring native vegetation along the nation's rivers, wetlands and estuaries, which would improve water quality and re-connect native vegetation across our vast, fragmented landscapes;
- expanding habitat to create viable populations of threatened species, which is a foundation stone for their long-term survival;
- identify opportunities in agricultural landscapes for improving soil carbon, which helps address both climate change and improve the condition of our agricultural soils; and
- in coastal areas, allow for the expansion of ecosystems that help protect low-lying land from inundation and erosion.

Recommendation 3

1. Commonwealth, State and Territory governments agree, preferably through their existing Regional Natural Resource Management and land use planning bodies, to develop *Regional Climate Change Adaptation* plans to:
 - identify the risks posed to our natural resource base from climate change;
 - build greater alignment between Commonwealth, State, Territory and Local government policies and natural resource management and landscape adaptation investments; and
 - offer communities opportunities to assess their options for improving land use management under new climate conditions.

4. Regional Scale, National Environmental Accounts

It is not possible to effectively manage our landscape to adapt to climate change, nor is it possible to optimise investments in terrestrial carbon, unless this new generation of regional land use planning is underwritten by a system of environmental accounts.

It would be like trying to manage the global economic crisis without access to economic accounts.

The scale and speed of the change and the uncertainty of the science demands that we equip our natural resource management institutions with the capacity and technology to monitor changes in real time. The next generation of climate models will have a finer resolution, but are never going to be enough.

If we are to have any hope of adapting to climate change and addressing the other great environmental challenges of the 21st century, we need to apply the same level of discipline to environmental decision making that we apply to managing other complex issues in our society.

One model put forward last year for building the *National Environmental Accounts of Australia*, proposes a regionally based system across Australia for monitoring the health of key environmental assets and the change in condition of these assets over time.⁵²

The power of this model is that it creates a common set of accounts – an environmental currency - across the country for all environmental assets, at all scales. In doing so, this allows a single accounting system to be used to guide a range of investments, from a range of sources, both public and private, at a range of scales, into activities that produce the most cost-effective environmental benefits.

A regional reporting system is necessary because each region has unique environmental characteristics which need to be managed to cater for the specific pressures on these landscapes and environmental assets.

National Environmental Accounts have application beyond climate change policy and have the potential to be one of the great transforming investments of our generation. They present an opportunity for Australia to influence global environmental reform into the 21st century.

They will guide the new terrestrial carbon economy. They will also change the design of our town and cities, how and where we produce our food and fibre, and they will deliver far better environmental outcomes for the \$8 billion of other public investments in environmental programs across Australia.

TABLE 8: INVESTMENTS IN ENVIRONMENTAL MANAGEMENT IN AUSTRALIA

Program	Annual Investment
Caring for Our Country program	\$400 million
other Commonwealth Environment programs	\$3,600 million
State and Local Government programs	\$4,000 million
<i>Sub-total</i>	<i>\$8,000 million</i>
Terrestrial Carbon (150 Mt/y @ \$30 tonne)	\$4,500 million and rising ⁵³
Total	\$12.5 billion (1.3% GDP)

Recommendation 4:

1. The Council of Australian Governments establish a system of regionally based, *National Environmental Accounts*, to underpin climate change adaptation policies, guide public and private sector terrestrial carbon investments, urban and regional planning, and other public investments in environmental management across Australia.

5. Climate Change Adaptation Fund

One way of financing the regional system of *National Environmental Accounts* and resourcing the development and implementation of *Regional Climate Change Adaptation Plans*, is to apply a levy on the sale of emission permits under the Carbon Pollution Reduction Scheme and investing this revenue into an *Australian Climate Change Adaptation Fund*.

If Australia adopted a 25% emission reduction target for 2020, a 1% levy would raise approximately \$250 million per annum.⁵⁴

This would resource the planning of investments arising from the *Regional Climate Change Adaptation Plans*, guide other investments

arising from the terrestrial carbon market created by the Carbon Pollution Reduction Scheme, and finance the management, data gathering and reporting costs associated with the regional scale, *National Environmental Accounts*.

Recommendation 5:

1. The Commonwealth amend the Carbon Pollution Reduction Scheme Bill to apply a 1% levy on the sale of emission permits and invest this revenue into an *Australian Climate Change Adaptation Fund* to:
 - monitor, plan and invest in actions to minimise the impact of climate change on Australia’s biodiversity, coasts, and land and water resources;
 - guide other investments arising from the terrestrial carbon market created by the Carbon Pollution Reduction Scheme; and
 - fund the monitoring and reporting costs associated with the establishment of a system of regionally based *National Environmental Accounts*.

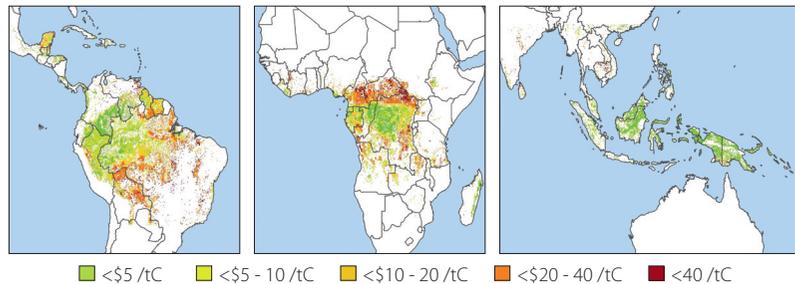
6. Support the Conservation of Tropical Forests

Australia, through its \$200 million *International Forest Carbon Initiative*,⁵⁵ has been playing a leadership role in creating the opportunity for developing countries to contribute to the global climate change solution, by promoting economic and technical solutions to assist them reduce the clearing of the world’s tropical rainforests.

The tropical forests in the developing countries of Asia, Oceania, Africa, and South and Central America, are estimated to contain 538 billion tonnes of carbon.

If the current rate of deforestation (an estimated 12.5 million hectares per annum) remained constant over the next 40 years, approximately 24% of this carbon stock would be lost.⁵⁶ This would release over 8,000 million tonnes of CO₂e, 25% of existing global emissions, each year.

FIGURE 9: CARBON PRICES TO AVOID DEFORESTATION⁵⁷



The world is now negotiating to include reduction of greenhouse gas emissions from deforestation in developing nations in the post 2012 international climate framework.⁵⁸

To harness the potential of tropical forests in developing countries to contribute to the climate change solution in a way that balances the competing demands for food and fibre, it is necessary to create an economic framework that values terrestrial carbon in these developing countries, so that it can compete with other land uses.

One model, put forward by the *Terrestrial Carbon Group*⁵⁹ uses international carbon markets to create economic incentives to maintain existing terrestrial carbon and create new terrestrial carbon in tropical forest landscapes, whilst avoiding perverse economic and environmental outcomes.

This model shows that it is possible to create an international framework that allows international trading (whether bilateral, multilateral, or global) of carbon credits based on the maintenance and creation of terrestrial carbon, in a way that guarantees that action under the system will contribute to long-term climate change mitigation.

Designing the rules in this way means that terrestrial carbon does not restrict the economic use of land in developing countries, but it does open up a new economic development option – generating and selling terrestrial carbon credits.

The benefits for Australia and other developed countries is that it provides access to a large source of abatement opportunities and as such, establishes a financially viable means for developing countries to contribute to global climate change mitigation.

Creating an international market for terrestrial carbon also presents an opportunity for Australian enterprises to market the potential of the Australian landscape to store carbon.

Recommendation 6:

1. Australia promote at the UNFCCC Conference in Copenhagen, new international rules for the creation of a legally binding, but voluntary terrestrial carbon market in developing countries.

This international framework should be built on robust design principles that are in the self-interest for participating nations, guarantee the permanence of the carbon stores, and address global leakage and additionality issues as proposed for example by the Terrestrial Carbon Group.

2. Provide Australian industry access to buy and sell terrestrial carbon credits, through the Carbon Pollution Reduction Scheme.

Conclusion

The Wentworth Group is encouraged by Australia's commitment to reduce greenhouse gas emissions by 25% of 2000 levels by 2020 if the world agrees to stabilise levels of CO₂e in the atmosphere at 450 parts per million.

This is an important first step on the path to a carbon pollution free economy.

Achieving a '450 ppm' stabilisation scenario requires global CO₂ emissions to peak no later than 6 years from now, and net global emissions to be reduced by between 50 and 85% by 2050 (relative to 2000).

This is a staggeringly difficult political, institutional and technological challenge.

The use of terrestrial carbon is an essential ingredient to help meet these emissions targets, because it is next to impossible for Australia and the world to achieve such targets without harnessing the full power of terrestrial carbon.

Terrestrial carbon presents our generation with an opportunity to not only help stabilise the world's climate system, but to also create an economic system that will improve the health of our farms and conserve the world's biodiversity, at a scale that would have been unimaginable even a few years ago.

CSIRO analysis shows that if we could capture just 15% of the biophysical capacity of the Australian landscape to store carbon, it would offset the equivalent of 25% of Australia's current annual greenhouse emissions for the next 40 years.

This will allow Australia to adopt deeper emission targets and it would make Australian agriculture carbon neutral.

With a 25% 2020 target, ABARE estimate that the majority of carbon forestry will be environmental plantings. This presents an economic opportunity to use the new carbon economy to address the range of other great environmental challenges confronting Australia: repairing degraded landscapes, restoring river corridors, and conserving Australia's biodiversity.

Left unregulated however terrestrial carbon also poses significant risks. If Australia commits to reducing greenhouse gas emissions by 25% by 2020, over 40 million hectares - an area equivalent to 40% of the entire Murray Darling Basin - would be economically suitable for Kyoto compliant carbon forestry.

These carbon forest offsets have the potential to take over large areas of prime agricultural lands, impacting on food and fibre production, regional jobs and the security of Australia's fresh water resources.

It is the role of government to create these opportunities and manage these risks.

The challenge for Australia is to optimise this new terrestrial carbon to drive investments towards improving the health of our agricultural soils, protecting areas of high conservation significance and repairing degraded landscapes and away from damaging native vegetation and prime agricultural land.

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