Green Institute Working Paper 3

Biocarbon, biodiversity and climate change. A *REDD Plus* scheme for Australia

Margaret Blakers, Green Institute, July 2008[1]

Much attention has been given to examining the impact of climate change on biodiversity, but there is a second question that should also be asked. That is: what is the impact of biodiversity on climate change?

Living systems store carbon ('biocarbon'). Unlike fossil carbon, these stores occupy the earth's surface and they accumulate over time. The quantities of carbon stored are massive in total, and can reach extraordinary densities in intact ecosystems.[2] Biocarbon is lost to the atmosphere through clearing, logging, burning, soil disturbance and other forms of degradation. It is recaptured as vegetation regrows, but for forests this may take decades or centuries. Existing dense carbon stores in mature natural ecosystems are irreplaceable in any relevant time scale, except by competing with agriculture for scarce water and land areas large enough to replant in compensation.

To reduce atmospheric concentrations of greenhouse gases, biocarbon emissions have to be reduced and biocarbon stores protected and enhanced. Biodiversity confers permanance and resilience, making the preservation of existing native vegetation a central priority. Protected areas, including national parks and other publicly-owned reserves, Indigenous Protected Areas and covenanted private land are performing, literally, an invaluable service. These carbon stores have a high probability of ecological permanence provided the ecosystems are maintained in a healthy condition. They also have the best probability of legal permanence through legislative protection.

Internationally, negotiations are in train to reduce deforestation and degradation in tropical rainforests (REDD). Australia needs its own *REDD Plus* scheme, focusing primarily on existing natural ecosystems. The first step is to reduce and eliminate emissions from deforestation and degradation (*REDD*); the second step is to secure permanent protection, ecologically and legally, with properly funded management (*Plus*). Part of the scheme should be a very large *REDD Plus* fund managed by a government-auspiced expert body (att. 1).

The impact of biodiversity on climate change is large and its protection and enhancement is a key and exciting part of the solution.

---

[1] This working paper was written to clarify the framework for policy and action on biocarbon. Comments are welcome and should be sent to Margaret Blakers, margaret.blakers@bigpond.com

[2] Prof Brendan Mackey et al (ANU) have recorded densities over 9000 t CO_2 per hectare in intact eucalypt forests in south eastern Australia in a study of green carbon, shortly to be published.

General propositions

1. Biocarbon – the carbon associated with living systems – differs fundamentally from fossil carbon and should be treated separately for accounting, policy and practical purposes (see att. 4). This discussion is limited to terrestrial biocarbon in natural and production ecosystems; it focuses on Australia although the international implications are obvious.

2. Biocarbon emissions are large. Clearing (deforestation), logging and other forms of 'degradation' of natural ecosystems account for 15--25% of emissions globally and 15—20% of Australia's emissions.[3] Avoidable emissions (not net emissions) from clearing and logging native forests in Australia exceed those from transport (91 Mt CO_2-e in 2006 compared with 79 Mt CO_2-e for transport). Such large emission sources need policy attention, resources and funding commensurate with their significance.

3. Options for dedicated, permanent storage of biocarbon are limited by the availability of land, water and time. Biocarbon storage competes with food production for access to land and water. Stores of biocarbon take time to accumulate; if destroyed or degraded they cannot be replaced in any relevant time scale when the global imperative is to turn the corner on emissions within a decade.

4. The priority, therefore, must be to protect permanently all existing dense stores of biocarbon. These, generally speaking, are tracts of native vegetation, especially forests, which have accumulated and stored carbon in biomass and soil over decades or centuries.

5. Biodiversity is essential for permanent storage of biocarbon. Natural ecosystems are self-regenerating, adaptive and resilient and, in the case of eucalypt forests, are known to continue to accumulate and store additional carbon for up to 475 years.

6. Growing plantations to offset emissions is slow and inefficient. Between 1990 and 2006, uptake by new plantations recovered only a fraction of the emissions from clearing and native forest logging (uptake 225 Mt CO_2-e; emissions 1875 Mt CO_2-e).[4] The 800 000 hectare plantation expansion has largely been driven by tax schemes costing over $2 billion, and is competing for land and water against other forms of agriculture.

7. Biocarbon products, like wood or biofuels, cannot be carbon-free.[5] At best they can be carbon-neutral, which implies a time frame to achieve neutrality . The time frame has to be made explicit when testing claims of 'neutrality' such as from the forestry industry – neutrality over centuries or even decades is not acceptable given the immediacy of the climate crisis.

8. Schemes that rely on growing then processing biocarbon for storage or use elsewhere, such as biofuels or biochar, are unlikely to be as greenhouse effective as growing and storing carbon in situ in a natural ecosystem; the onus is on the proponent to prove otherwise. [6]

---

[3] Emissions (Mt CO_2-e) derived from the 2006 Australian Greenhouse Emissions Information System (www.greenhouse.gov.au). Native vegetation clearing: 63 (a net figure); fuelwood burning: 7.3; native forest logging slash: 10.8 (severe underestimate); native forest logs: 10.1; total 91 Mt CO_2-e. Total (net) emissions, UNFCCC accounting: 550 CO_2-e.

[4] Calculated from AEGIS data www.greenhouse.gov.au. All figures Mt CO2-e, 1990 –2006. Native vegetation clearing: 1325 (a net figure); fuelwood burning: 162; native forest logging slash + logs: 387 (severe underestimate); total 1874 Mt CO_2-e. Uptake of 225 Mt CO_2-e by plantations established since 1990 is net of logging emissions, but relatively little logging would have commenced by 2006.

[5] Products that compete with wood, like steel, could in the future be carbon-free if produced with renewable energy.

[6] The basic problem for biomass and bioenergy is that plants grow rather slowly. Photosynthesis is not nearly as efficient as modern technologies in converting solar energy into usable forms.

9. Current greenhouse gas accounting systems have major deficiencies in their treatment of biocarbon which is responsible for some of the misperceptions about its importance (att. 3).

Policy frameworks for biocarbon

10. Both Garnaut and the government's Green Paper fail to address biocarbon properly and are setting a framework that ignores emissions from native forest logging and the potential for uptake through forest restoration, while encouraging unlimited expansion of plantations (already assisted through tax incentives). The Green Paper also leaves land clearing outside the emissions trading scheme to be dealt with through incentives and 'avoided deforestation' credits (att. 2).

11. Emissions trading is unlikely to be an effective mechanism for biocarbon precisely because it focuses on fluxes not storage and therefore provides no income stream for permanently protected stores. If introduced under Kyoto accounting, without additional measures to address native forest logging, it will result in massive leakage of emissions as logging of post-1990 plantations is deferred and transferred to native forests. If introduced under UNFCCC accounting, which does include native forest logging, the accounting systems need major upgrading and the targets would need to be adjusted to compensate, both of which would take considerable time and result in unacceptable delay (att. 2).

13. Emissions from clearing and native forest logging are largely avoidable. The most efficient way to reduce them is through nationally coordinated regulation accompanied by a negotiated transition package for affected workers and industries.

14. Plantations should be grown for wood production, driven by wood market realities, not tax incentives or carbon credits. Expansion of biocarbon stores should focus on permanent natural revegetation, or in specific cases cultural and amenity planting.

15. Sectors not currently included in the national greenhouse gas accounts, especially soil carbon and non-forest ecosystems, may generate significant emissions and have large opportunities for sequestration. Reliable full carbon accounting is essential.

Recommendations

Establish a biocarbon working group, or persuade the government to do so, with a view to establishing a clear framework for policy, accounting and action on biocarbon emissions and storage and designing a *REDD Plus* scheme for Australia.

Move quickly to full carbon accounting and a systematic, transparent and scientific approach to measuring and reporting stocks and flows of biocarbon. Biocarbon should be treated separately from fossil carbon, and biocarbon in natural ecosystems (green carbon) should be differentiated from that in production systems.

Attachments

1. A *REDD Plus* scheme for Australia
2. Emissions trading, Garnaut and the Green Paper
3. Greenhouse gas accounting
4. Biocarbon compared with fossil carbon (terrestrial systems only)

Green Institute
www.greeninstitute.com.au, margaret.blakers@bigpond.com
GPO Box 927, Hobart, Tas 7001

Attachment 1. A REDD Plus scheme for Australia

REDD is an international scheme under negotiation for *Reducing Emissions from Deforestation and Degradation* of tropical rainforests in developing countries. This is precisely the framework that should be applied in Australia. It should aim to reduce and eliminate emissions from deforestation and degradation of natural ecosystems (*REDD*); and secure their permanent protection, legally and ecologically (*Plus*). As well as avoiding emissions, this will result in considerable additional sequestration over time as degraded forests and other protected ecosystems regrow to their full carbon carrying capacity.[7]

The government's *Carbon Pollution Reduction Scheme* allows for the possibility of measures other than emissions trading, such as a *REDD Plus* scheme. The critical point is that all sectors should contribute to the emissions reduction task from day one.

1. Reducing emissions. Emissions from clearing native vegetation and native forest logging are in principle almost entirely avoidable. Land clearing (totalling 6 million hectares since 1990) has multiple disbenefits. Native forest logging produces mostly woodchip exports, heavily subsidised, almost entirely substitutable by plantation-grown wood, and damaging to other values including biodiversity, water and amenity. The most efficient way to secure rapid reduction of emissions from clearing and native forest logging is through regulation, accompanied by a negotiated transition package for affected workers and industries. Australia has considerable experience in implementing such schemes.

2. Funding. *REDD Plus* should incorporate a very large fund to pay for the maintenance, in perpetuity, of biocarbon stores:

- sources of income could include existing government land management programs; setting aside a tranche of funds from the emissions trading system either directly or by adjusting the target to create a space for industry to buy credits from the government which then go into the fund; taxing currently untaxed emissions such as aircraft fuel (which could link into an international scheme); voluntary contributions from industry and private donors;
- funds should be allocated by a government-auspiced expert body primarily on the basis of the management needs of the ecosystem; this avoids having to measure carbon densities or fluxes precisely and limits the potential for perverse outcomes if ecosystems were to be managed to maximise short-term carbon uptake or storage rather than for resilience and permanence;
- expansion of biocarbon stores should give priority to revegetation that enhances the resilience and permanence of existing stores (such as by improving connectivity), or in specific circumstances to cultural and amenity planting;
- a significant amount of funding should be allocated to research and development, ecological, economic and social.

[7] Presumably however, even if all existing native vegetation was protected and re-grew over the coming decades, and storage in production systems was increased, it would not be sufficient to re-absorb previously emitted biocarbon. It cannot therefore be regarded as 'offsetting' fossil fuel emissions. Biocarbon emissions have to be reduced in their own right.

3. In production systems:

- the *REDD Plus* fund could provide incentives for improving the carbon carrying capacity of agricultural soils;
- plantations should be grown for wood not carbon; they could participate in an emissions trading system on the basis of net emissions in any given year, but taxes may be a better way to go for agricultural emissions generally including wood growing and animal farming;
- under a REDD scheme, native forests would not be logged but currently native forest logging emissions are offset in the accounts against regrowth created by historical logging and disturbance (enabling the industry to claim 'carbon neutrality'); the apportionment of such credits is a community decision, not an accounting decision.

4. International application:

- circumstances differ from country to country but it would be worth exploring how an 'expanding protection' approach could work (with a permanent income stream to maintain the stores) instead of or alongside the current 'reduce deforestation and degradation' model;
- a common protocol under the Climate Convention and Biodiversity Convention would be a useful mechanism through which to recognise the vital role of natural ecosystems in storing biocarbon and set up enforceable mechanisms to avoid damage and fund protection.

Attachment 2. Emissions trading, Garnaut and the Green Paper

The draft Garnaut report and the government's Green Paper are giving the first indications of how biocarbon will be treated in Australia's response to climate change. They have failed to apply the resources and policy detail commensurate with tackling 20% of Australia's emissions.

1. Both Garnaut and the Green Paper:

- adopt Kyoto accounting, which excludes emissions from native forest logging, uptake by regrowing native forests (including in conservation reserves); emissions and uptake by plantations established before 1990 (primarily softwoods); soil carbon fluxes; and carbon fluxes in non-forest native vegetation.
- propose unlimited access to offsets (Garnaut) or credits (Green Paper) for 'Kyoto' forests, primarily short-rotation hardwood pulplog plantations, established on land cleared prior to 1990.[8]

2. Garnaut has not yet dealt with biocarbon but intends to do so in his final report. He has not expressed a position on how to deal with land clearing and native forest degradation except generally to say that emissions trading should cover the broadest possible range of emission sources.

3. The Green Paper proposes (in addition to the points in 1 above):

- to exclude land clearing from emissions trading and rely on the clearing controls introduced in NSW and Queensland in 2004-5 to bring Australia's total emissions within reach of the Kyoto target;
- to further reduce land clearing emissions using incentives and 'avoided deforestation' offsets;
- to treat biofuels, and presumably biomass feedstocks, from any source as 'carbon neutral' (that means Gunns proposed pulpmill, generating upwards of 10 Mt CO_2-e per annum in emissions, would have no carbon emissions liability if it used native forest wood as a feedstock and to generate electricity).

4. Drawbacks of emissions trading for biocarbon –

- emissions trading by definition focuses on fluxes, not storage and therefore provides no permanent income stream for the vital task of maintaining existing stores of biocarbon;
- under emissions trading, CO_2 emissions are as treated as a uniform commodity, whereas carbon in natural ecosystems should be recognised as having much higher value than carbon in plantations or other production systems; the value comes from being permanently stored, having accumulated over long periods of time, and having important roles in protecting biodiversity and water conservation;
- if introduced under Kyoto accounting, there will be massive leakage of emissions to native forests and pre-1990 plantations (these sources not being accounted for) while post-1990 plantations are grown on to accrue credits (the impending glut of hardwood pulplogs, with

[8] The Green Paper uses the term 'forestry' to mean different things in different places. When proposing to include 'forestry' in the Carbon Pollution Reduction Scheme, it means 'Kyoto forests, established post-1990, primarily eucalypt pulplog plantations; elsewhere it refers to 'forestry' as an industry sector including native forests and older sawlog plantations.

supply rising from 4 to 14 million m^3 per annum within two years, will accelerate pressure to defer logging);

- if introduced under UNFCCC accounting, the data for natural ecosystems and soils will need major upgrading in order to adjust the targets before emissions trading could be introduced (resulting in unacceptable delay);
- there are significant measurement issues for all forms of biocarbon and the level of uncertainty is higher than for fossil carbon emissions, posing a risk to the integrity of the scheme for fossil carbon;
- if the targets are not adjusted, the quantity of potential abatement from plantations, avoided deforestation and future biocarbon offsets (e.g. soil carbon) will undermine the integrity and effectiveness of the ETS in reducing fossil carbon emissions;
- funding for carbon credits or offsets will be directed predominantly to fast growing plantations on highly productive land, assisted by tax deductions through Managed Investment Schemes and the new tax measures for 'carbon sink' planting (as distinct from natural regeneration); there will be acute competition for land and water;
- as carbon prices rise, plantations may become too expensive to log for wood production, locking up land in uses that are neither productive nor a permanent carbon store;
- access to 'avoided deforestation' offsets, as proposed in the Green Paper, will give landholders an incentive to bring forward an 'intention to clear' to gain access to funding; this will be an expensive and inefficient way of controlling clearing. There is an additional risk that non-forest vegetation will also be included in carbon accounting within the next few years, and also have to be paid for hectare by hectare once the precedent is established;
- if forestry and agriculture are included the number of ETS participants will be very large;
- agriculture and forestry are excluded from comparable schemes overseas (noting that NZ includes forestry on an opt-in basis, but this is restricted to plantations because native forest logging is banned).

Attachment 3. Greenhouse gas accounting

Australia's greenhouse gas accounting system has multiple shortcomings that lead to mis-perceptions and mis-information about the importance of biocarbon emissions. There are two reporting frameworks: (a) the Kyoto accounts which are linked to Australia's targets under the Kyoto Protocol and include only emissions and uptake related to changes in land-use from forest to non-forest or vice versa. (b) the UNFCCC accounts which are more comprehensive but still omit major sources of emissions and uptake.

1. Coverage: Australia's Kyoto accounts do not include CO_2 emissions from native forest logging, uptake by native forests, emissions from logging pre-1990 plantations, soil carbon, and non-forest ecosystems. UNFCCC accounts are closer to a full carbon accounting system but still exclude soil carbon, non-forest ecosystems, uptake by forests used for purposes other than logging (e.g. conservation reserves); exported wood, primarily from native forests, is also omitted.

2. Emissions not net emissions: a key difference between biocarbon and fossil carbon is that biocarbon is both accumulated and emitted. Almost all figures relating to biocarbon are reported as net emissions. This is fundamentally misleading when the policy objective is to reduce emissions, not net emissions. For example, in the Kyoto accounts emissions from land clearing are netted off against regrowth; in the UNFCCC accounts, emissions from currrent native forest logging are offset against uptake by native forests regrowing after decades-old logging and degradation.

3. Data: non-Kyoto sectors are seriously deficient. ANU will shortly release a study showing that intact eucalypt forests in south-eastern Australia store up to 2500 t C per hectare (9000 t CO_2), many times the amount currently assumed. While not all released by logging and clearing, reported emissions from such forests are likely seriously under-estimated. Measurement of the CO_2 uptake rate by native forests is even worse -- the assumed constant rate of 57.3 Mt CO_2 per annum is incorporated into all reports and projections.

4. Time: Australia's greenhouse gas accounts are annual and lack a systematic treatment of longer time periods. Time is a crucial parameter for biocarbon because it accumulates and decays over years to centuries. For forestry and wood products, the IPCC recommends a time-neutral approach by accounting for all emissions at the time of harvest. The Australian government and industry instead incorporate decay time by partitioning logging and wood product emissions into different decay paths and reporting emissions in the future year when they occur. On the other side of the ledger, there is no attempt to reflect the very much longer accumulation time of biocarbon stores – decades or centuries for mature and old growth forests. In a time constrained environment, it is vital to know how long it will take to recapture carbon lost by logging.

5. Quality: The greenhouse gas accounts treat CO_2 as a commodity, undifferentiated irrespective of its source. Healthy biodiverse forests offer the best prospect of permanently storing carbon, compared with monoculture plantations. Biocarbon emissions should be differentiated according to their source with a premium for emissions from high biodiversity value, effectively irreplaceable, stores.

6. Methodology: Methodological information about the greenhouse gas accounts is opaque to say the least. These are matters of national and international significance and should be public, transparent and fully peer-reviewed.

Attachment 4. Biocarbon compared with fossil carbon (terrestrial systems only)

	Biocarbon		**Fossil carbon**
	Green carbon **Natural ecosystems**	**Agricultural carbon** **Production systems**	
Intrinsic characteristics of stores	Ecologically functional – intimately linked to ecological processes such as water and nutrient cycling	Ecologically functional	Ecologically inert
	Highly differentiated according to age and ecological/biodiversity value	Relatively undifferentiated	Relatively undifferentiated
	Occupies a large part of the earth's surface, competing with and linked to other 'economic' uses of land and water	Competes with green carbon for land and water	Largely underground
	Difficult to create or restore	Readily created	Non-renewable
	Stores with high ecological/biodiversity value are resilient and permanent	Transient, depending on management regime. Risk of crop failure (especially in monocultures)	
	High ecological/biodiversity value stores require few inputs and relatively little management effort	May require significant inputs (e.g. fertiliser, water, management effort)	
Economic characteristics of stores	Not fungible	Fungible	Fungible
	Not valued. Land/water with which it is associated may be valued	Valued according to economic use	Valued according to downstream economic use
	No functional alternatives: ecological (and cultural) functions are irreplaceable	Multiple functional alternatives: e.g. organic farming, different crop selection	Multiple functional alternatives: e.g. efficiency, renewables

Global emissions (Stern Review)	18% (deforestation, not including degradation)	14%	68%
	Derived partly from direct economic use of green carbon (logging) and mostly from competing uses (clearing and degradation for agriculture and other development)	Derived from choice of production system (e.g. organic, no-till v. conventional; extent of animal husbandry)	Derived entirely derived from direct economic use of brown carbon
	Hard to measure reliably	Hard to measure reliably	Relatively easy to measure
	CO2 is differentiated according to the age and ecological value of the green carbon from which it is derived	CO2 is a commodity	CO2 is a commodity. It gains differential value according to its downstream economic use
Eliminating emissions and protecting stores	Primary aim is to protect existing stores in perpetuity, starting by reducing or eliminating emissions Secondary aim is to increase permanent carbon storage consistent with maintaining enough food and fibre production capacity (protection of existing stores that have been logged or degraded will automatically increase sequestration)	The aim is to protect and increase stored carbon	The aim is to eliminate emissions by moving from a fossil carbon dependent economic system to one based on renewable energy
	Requires permanent income stream to maintain the stores	May require a permanent income stream to maintain the stores	One-off payment secures a permanent reduction in emissions
CO2 uptake potential	Very large	Very large	None (except possibility of geosequestration)