available at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/ecolecon

ANALYSIS

Economy and ecology of emerging markets and credits for bio-sequestered carbon on private land in tropical Australia

Colin Hunt[*,1]

Environmental Policy and Socio-economics Faculty, Centre For Rainforest Studies, School for Field Studies (Head Office Salem, Mass.), Yungaburra, North Queensland, Australia

ARTICLE INFO

Article history:
Received 1 April 2007
Received in revised form
17 August 2007
Accepted 11 September 2007
Avaiable online 24 October 2007

Keywords:
Sequestration economics
Reforestation
Biodiversity
Carbon credits
Carbon costs
Australia

ABSTRACT

A central question addressed is whether emerging carbon markets have the potential to provide an economic incentive for private landholders to reforest without recourse to subsidy. A second question is whether bio-sequestration in the Wet Tropics of Queensland is cost-competitive with southern Australia. A third, given that plantations of monocultures also provide carbon sinks, is: are the goals of carbon sequestration and biodiversity mutually exclusive or complementary? Australia intends to meet its Kyoto greenhouse gas emissions target even though it has not ratified the Protocol. While a national system of carbon emission cap and trade does not exist, unilateral action by some states to mandate industry caps has generated a demand for offsets. However, it is the voluntary market for offsets, stimulated by demand by companies and government departments that is most active. The favourable climate and soils of the Wet Tropics Region of north Queensland have enabled the evolution of unique ecosystems. Deforestation of these has been greatly reduced by World Heritage listing of the Wet Tropics. Nevertheless much of the landscape remains fragmented. An official priority is the encouragement of rainforest plantations on private land with the aim of augmenting endangered ecosystems and the habitat of iconic species, but reforestation is heavily subsidised by the Australian government. Using methodology that allows the comparison of uneven streams of costs and benefits, it is found that – at present prices – payments for sequestered carbon defray only a small proportion of costs, providing a level of incentive insufficient to stimulate restoration. Comparative analysis shows that monocultures sequester carbon at a much lower price per tonne. However, despite the relatively high growth rates of monocultures in the region, their cost per tonne of carbon are greater than costs in southern Australia. A decreasing supply of suitable land for bio-sequestration offsets in southern Australia may well force brokers to look to the Wet Tropics. In this event – the economic analysis suggests – land in areas that carried endangered or threatened ecosystems will be devoted to monocultures rather than restored rainforest. The paper highlights the asymmetry between the availability of credits for carbon and of credits for biodiversity and the need for public investment in conservation and restoration. Requiring further investigation is the potential demand for carbon offsets with high biodiversity benefits – so called "boutique abatements" – that could readily be supplied in the Queensland Wet Tropics.

* Colin Hunt, 4 Oak Street, Yungaburra, Queensland 4884, Australia. Tel.: +61 7 40952523.
E-mail address: colinhunt@bigpond.com.
[1] Author's address: c/o SFS, PO Box 141 Yungaburra, Queensland 4884, Australia.

0921-8009/$ – see front matter © 2007 Elsevier B.V. All rights reserved.
doi:10.1016/j.ecolecon.2007.09.012

1. Introduction

Australia, like the US, has not ratified the Kyoto Protocol and is therefore excluded from international emissions trading and joint implementation which would stimulate in-country capture of carbon in forest sinks (bio-sequestration). Nevertheless, Australia still intends to meet its Kyoto target, and has adopted Protocol accounting rules that specify that carbon stock changes between 2008 and 2012 are to be included in the country's accounts (Australian Greenhouse Office, 2006).

Given the high rate of increase of emissions from the power generation and transport sectors the Australian government is encouraging *bona fide* bio-sequestration projects (under Article 3.3 of the Protocol) that can contribute to a reduction in the country's emissions. There is no Australia-wide cap and trade system governing emissions. Nevertheless, voluntary corporate activity and unilateral action by states in the Australian federation to cap emissions has stimulated the emergence of markets for carbon. Some of the largest Australia-based multinational companies, public corporations and state government departments have entered into offset contracts with providers of, or brokers in, bio-sequestered carbon (Ribón and Scott, 2007).

The economics of halting biodiversity loss and preserving ecosystems has been developed in response to the failure of cost-benefit analysis to adequately account for the benefits of flows of environmental services or the costs of their irreversible loss. The precautionary principle states that, where there is a significant reduction or loss of biological diversity, the lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat. The principle is central to the Convention on Biological Diversity.

A tool that incorporates the precautionary principle is the safe minimum standard (SMS), advocated by Ciriacy-Wantrup (1968) and refined by Bishop (1978). The SMS draws a distinction between the private benefits that can result from exploitation and the public benefits that are a function of preservation, and it attempts to achieve the social optimum. The application of the SMS avoids a situation where the physical condition of an area is prevented from declining to a stage where deterioration is inevitable or is uneconomical to stop. The opportunity costs incurred in such an intervention may have been unnecessary to avert irreversible depletion. Nevertheless, delay confers an option value on preserved areas (Arrow and Fischer, 1974). The SMS concept is widely adopted and was applied when some 900,000 ha of the Wet Tropics of Queensland was inscribed on the World Heritage List in 1988. However, in the Wet Tropics region (See Fig. 1), much biodiversity lies outside the World Heritage area in fragmented forests on private land. The fragmentation is a result market failure, in that landowners were not obliged to include public costs and benefits in their decisions to log and then clear the rainforest for livestock farming and agriculture.

A prime example of an endangered ecosystem in the Wet Tropics is the complex notophyll vine (Mabi) forest listed as "endangered" by the Queensland government and "critically endangered" by the Australian government. The habitat lies mainly on private land with agriculturally productive basaltic soils. This type of forest has been reduced to a mere four per cent of its original extent (Environmental Protection Agency, 2007; Department of Environment and Water, 2007a).

The Mabi forest harbours the nationally threatened Large-eared Horseshoe Bat (*Rhinolophus philippinensis*) and Spectacled Flying-fox (*Pteropus conspicillatus*) together with the "rare" Lumholz Tree-kangaroo (*Dendrolagus lumholtzi*), Green Ringtail Possum (*Pseudocheirops archeri*) and Herbert River Ringtail Possum (*Pseudochirulus hebertensis*) (as classified under Queensland's *Nature Conservation Act, 1992*). The Musky Rat-kangaroo (*Hypsiprymnodon moschatus*) and the nationally endangered Southern Cassowary (*Casuarius casuarius johnsonii*) once occurred in Mabi Forest. However, the remaining patches of Mabi Forest are too small for animals' survival and the Musky Rat-kangaroo and Southern Cassowary have become locally extinct (Mabi Forest Working Group, 2001; Department of Environment and Water, 2007b).

The complex mesophyll vine forest (Hypsi) is less threatened. Nevertheless, less than 30% remains unaffected by weed

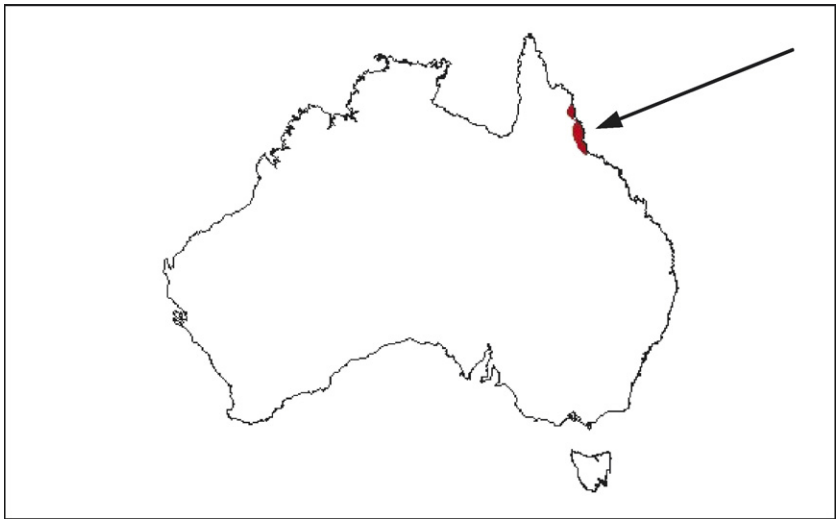

Fig. 1 – Wet Tropics of Queensland, Australia.