Introduction

A range of techniques is employed in teasing out the role of forestry in tackling climate change. Socioeconomic analysis complements the technical data, and in most chapters leads to a policy position being taken. The introduction gives a flavor of the book and summarizes what are considered the major issues surrounding forestry’s role.

Global warming is the greatest known challenge facing the world. While future armed conflicts or global pandemics could possibly be more sudden in their devastation, human-induced climate change is already a reality, and we know that, unchecked, it will visit dire consequences on future generations (Parry et al., 2007). We only have a few years in which to act to keep the rise in concentration of greenhouse gases within the limits that will avoid dangerous climate change (den Elzen and Meinshausen, 2007).

In economic theory, and in practice, substitutes for depleted resources are readily available. If we run out of potable water supplies because climate change has affected rainfall patterns we can substitute recycled waste-water or desalinated sea water. When agricultural land becomes scarce we substitute fertilizers and pesticides for land, and so increase crop yields. However, there is no substitute for the capacity of the atmosphere, the oceans and the forests to act as sinks and absorb our gaseous wastes, and we are far exceeding that capacity. Unless these wastes can be channeled into caverns and deep into the oceans, a solution that seems unlikely in the time available, we have little choice but to cut our reliance on fossil fuels and bring the output of greenhouse gases into balance with the absorptive capacity of the planet.

Trees in forests take in carbon dioxide, the main greenhouse gas, and store it as carbon in their leaves, branches, trunks and roots. A tonne of carbon in trees is the result of the removal of 3.67 tonnes of carbon dioxide from the atmosphere. The world’s forest ‘sink’ already holds more carbon than is in the atmosphere (Prentice et al., 2001), but part of that sink is being reduced rapidly by the cutting of forests in tropical developing countries, contributing some 17 percent to global greenhouse gas emissions.

Forestry, which includes the maintenance of existing forests as well as increasing forest area, can make a very important contribution to the mitigation of global climate change, but only a small proportion of this potential is being realized (Nabuurs et al., 2007; Capoor and Ambrosi, 2007).
INCENTIVES AND MARKETS

William Nordhaus (2007: 20) provides salutary advice: ‘[I]t is unrealistic to hope that major reductions in emissions can be achieved by hope, trust, responsible citizenship, environmental ethics, or guilt alone.’ Climate change mitigation requires finance: just reducing deforestation will cost billions of dollars every year for the foreseeable future. Who is going to put up this kind of money? The solution that has most promise is to harness the market. Creating a demand for allowances to emit greenhouse gas reduction and allowing their trade is the approach adopted by the United Nations Framework Convention on Climate Change in its Kyoto Protocol. Most rich countries have accepted emission allowances that are less than 1990 levels. To comply with their caps, countries are bound to adopt domestic policies that restrict greenhouse gas emissions. The cost of compliance is reduced by the ability of countries to trade emission allowances. If the price of allowances is above the cost of abatement, there is an incentive for the country to cut to below its cap and sell surplus allowances to countries with costs of abatement above the price of allowances, and the overarching cap is still achieved.

The policy instruments available to countries to reduce emissions within their borders boil down to two main types: a tax on greenhouse gas emissions, and this can easily be applied to the use of fossil fuels depending on their carbon content; or a cap on emissions by industries and businesses, and making the emission allowances tradable. These policies can be complemented by subsidies for research and development and adoption of new technology that makes targets cheaper to achieve.

If greenhouse emissions are taxed, industries and businesses can either avoid the tax if the cost of abatement is lower than the tax, or pay the tax if this is cheaper than abatement. Governments with greenhouse gas taxes can give a role to reforestation by paying subsidies for, or by applying tax rebates to, the carbon dioxide removed by plantations from the atmosphere.

In the alternative policy of cap and trade, so far the preferred option of several countries, reforestation can be given a role by treating a tonne of carbon dioxide removed from the atmosphere as equivalent to a tradable emission allowance. Developers of plantations can then sell the allowances generated by the carbon captured in the forestry sink. Moreover, capped industries and businesses may be allowed to offset their emissions by importing allowances generated by forestry projects elsewhere. Whatever the means, the greenhouse gas reductions achieved are entered into the national accounts, which all participating governments are required to maintain.
Thus the answer to the question ‘who pays?’ in the case of growing new forests as carbon sinks, is that industry and business will pay. Money can be made by selling emission allowances generated, or money can be saved by buying offsets rather than by abating. The effectiveness of both cap and trade and tax systems in stimulating forestry investment is dependent on the price of carbon; this in turn depends on the deepness in the cuts in greenhouse emissions or the size of the tax.

**IS A TONNE OF CO₂e A TONNE OF CO₂e?**

Emission allowances to countries, and to emitters within countries, are in terms of carbon dioxide (CO₂) equivalent. The major greenhouse gases are rated for their global warming potential and converted to CO₂e, which is the commodity traded in the world’s carbon markets. The workings of the markets for emission allowances and the role and potential for forestry in those markets are analyzed in Chapter 1. In assessing the potential role and importance of forestry the chapter finds that there is great range in forecasts in the literature, prompting attempts at clarification in later chapters.

The question that heads this section needs to be asked because the potential market is for billions of tonnes CO₂e, withdrawn or withheld from the atmosphere and stored as carbon in forests’ biomass. Markets can work well if the commodity being traded is divisible, uniform and capable of accurate description. However, every forest differs and every tree in it, and so does the amount of atmospheric CO₂e a tree extracts, and is expected to extract, over time. Another complicating factor when we come to estimating the carbon in forests, and hence how much CO₂e has been removed, is the amount of carbon in soils and how this changes when we establish plantations. Chapter 5 discusses the sophisticated measurement techniques that need to be deployed in estimating the carbon in tracts of native forests, something that is crucial if payments are to be made for the conservation of forest carbon in the tropical zone. The chapter also emphasizes the importance of ground-truthing these estimates; a case study shows how the amount of carbon in forests can be confirmed by physical measurement.

It is known with accuracy how much CO₂e is released by burning a gallon of gasoline. However, buyers may not have such confidence in the amount of CO₂e removed by a forest in a reforestation or a tropical forest, even after the carbon in the trees is measured. Buyers’ confidence may be eroded by the knowledge that there is a risk that a proportion of the forest’s carbon may be released any time back into the atmosphere as CO₂e,
as a result of fire, disease, accidental clearing or climate change. In these circumstances, potential investors in forest carbon have every right to discount its value. A recurrent theme in the book is how markets cope, or fail to cope, with the idiosyncratic nature of forest carbon sinks.

Chapter 2 focuses on the role of forestry in international markets created under the Kyoto Protocol, including those that give flexibility to the developed nations by allowing them to mount forestry projects in other developed and in developing countries. Questions are raised about the architecture of the existing schemes and whether the market is able to deliver the volume of projects that will allow forestry to make a telling contribution to tackling climate change. A conclusion is that the rules governing forestry in the Kyoto Protocol should be changed only at the margin to eliminate inconsistencies. If the global price of carbon rises, for example as a result of deeper global cuts in global emissions agreed at the Copenhagen conference in December 2009, the interest in afforestation and reforestation will increase from its present low level. However, it is argued that the inherent nature of forestry (as reflected in unfavorable prices, costs and risks) means that afforestation and reforestation under the Protocol is likely to remain less attractive to private investors than other types of offsets.

The informal markets are developing quite outside the formal architecture of the Kyoto Protocol and official domestic climate change policies of countries. These so-called ‘voluntary’ markets allow investors anywhere, large and small, to buy into projects that are conserving carbon in new forests or that are protecting forests. By doing so they offset a quantity of their own emissions. These types of investors can be distinguished from the corporates responding to taxes or caps on emissions in that their motivation for investing is pure altruism, desire to create a favorable image, reduce guilt, or a combination of all three. Chapter 3 reports on research that delves into the rather chaotic voluntary market and finds that most voluntary forestry offsets are sold before they have been verified as existing, that is before the trees have had a chance to grow; that is they are offsets not only in space but also in time. In fact these offsets are commonly sold on the basis that they will be still sequestering carbon in 100 years’ time, so that the question ‘Is a tonne of CO₂e sequestered in a forestry offset a tonne of CO₂e?’ is a very relevant one. While progress is being made in the forestry offset market in defining its product, there are still improvements to be made in the verification that carbon has actually been sequestered. This would increase the confidence of buyers of forestry offsets.

The protection of the world’s remaining biodiversity in the face of the rapid clearing of forests could be said to be one of the greatest challenges of our time. Yet there is no integrated international effort backed
by finance to curb it. Chapter 4 asks the question whether the markets for forestry offsets and the accompanying rapid increase in afforestation and reforestation will benefit biodiversity, given that the market rewards carbon sequestered but not biodiversity conserved. It does this through case studies of projects in both developed and developing countries.

Liquid biofuels will increasingly replace fossil fuels in transport. The use of biofuels derived from cellulose, including from wood, is a technique that delivers impressive greenhouse gas savings per gallon compared to the level of emission savings from crops, as detailed in Chapter 6. The commercialization of such ‘second generation’ processes will take time, however, and the price of carbon, or subsidies, will need to be high for them to fulfill their promise.

POLICY ANALYSIS AND PROPOSALS

Having reviewed how measurement, markets and money enable forestry to join the fight against global warming, the actual policies being followed by some developed countries are investigated. Countries that are advanced in their policies, or that have announced their policies, are chosen for this exercise in Chapter 7. Forestry has no role in the EU Emission Trading Scheme. In contrast, in the US, Australia and New Zealand, afforestation and reforestation is likely to emerge as a very important instrument in mitigation and in reducing compliance costs. In practice, the significance of the contribution of forestry will depend on the price of emission allowances, which will depend in turn on the deepness of emission cuts. Domestic policies governing the acceptance of emissions allowances from forestry projects and constraints applied to the use of forestry offsets will also determine the importance of forestry’s role.

The impact on global food prices of the subsidization of biofuels mainly derived from annual crops in the United States and the European Union is an issue that surfaced in 2008. These subsidies were found to be perverse incentives in that they had the indirect effect of increasing emissions from tropical forests in Brazil and south-east Asia. Large-scale diversions of land from food crops to carbon-capturing plantations will be likely to cause food prices to rise, with consequences for the poor. It is argued that the type of socioeconomic impact analysis that has been done for biofuels needs to be extended to include the impact of the future establishment of extensive forests for their carbon.

Deforestation is rapid and is being driven by powerful forces, yet there is no global market for emissions abated by avoiding deforestation and degradation. Now there is a renewed interest in saving the tropical
Carbon sinks and climate change

forests, not just because this promises immediate and major reductions in greenhouse gas emissions but also because of the rich biodiversity and the other unpriced services they deliver. Innovative mechanisms are now being trialed and introduced, outside the Kyoto Protocol, to reward the retention of standing forests.

Devising schemes for prevention of deforestation in tropical developing countries raises the same set of marketing problems as afforestation and reforestation, that is defining the product and permanence of the forest. There is also a new set of complications that needs to be dealt with before the market will channel funds to prevent the main cause of deforestation, which is the conversion of land to agriculture. The process of conversion has been going on for millennia, enabling an increasing world population to be fed (Williams, 2003). But in the case of preventing deforestation in tropical countries, the buyer of carbon needs to be sure that the avoidance of deforestation being paid for would not have happened anyway. Even when the investor is satisfied that a forest has genuinely been saved from clearing, a doubt may remain about whether the deforestation avoided has not simply been transferred to another location.

There are many beneficiaries of tropical deforestation and conversion to agriculture from humble growers to industrial giants and illegal loggers. Governments are also large beneficiaries through taxes on logs and on agricultural commodities. The burning question addressed in the last chapter is: given the social, economic and political implications of reducing deforestation (not to mention technical requirements), can markets be harnessed to make it an effective climate change strategy and, if not, what are the alternatives?

REFERENCES


