

Editorial

An Inconvenient Truth about Accounting

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Abstract

The Kyoto Protocol is the first step towards stabilising global emissions of carbon dioxide (CO₂). But what is carbon trading and is the accounting profession ready to provide the decision information required to limit the enhanced greenhouse effect?

This paper considers the impact of the Kyoto protocol on countries, business entities and individuals, and if the accounting profession is ready to meet the challenges brought about as countries enact carbon trading legislation. An inconvenient truth is that the measurement, reporting and assurance frameworks developed in financial accounting and auditing actually hinders the role the profession can play in reducing global warming. Management accounting reporting has no such constraints.

Keywords

**Global Warming
Carbon Emissions
Carbon Financial Accounting
Carbon Auditing
Carbon Auditing and Assurance
Carbon Financial Reporting
Kyoto Protocol
Accounting for Greenhouse Effect**

Introduction

The Greenhouse Effect

The Earth and all life that occupies it, require the gases– water vapour (the main greenhouse gas), methane, ozone, carbon monoxide, nitrous oxide and carbon dioxide (CO₂) – generated via the greenhouse effect. This occurs when heat energy from the sun passes unimpeded through the atmosphere and warms up the Earth. In turn, the Earth radiates this energy back towards space. The greenhouse gases absorb some of this energy and emit it in all directions, including back towards Earth. The Earth's surface is about 34°C warmer as a result.

The Earth manages to regulate concentrations of greenhouse gases through a system of *sources* and *sinks*. In nature, carbon (in the form of CO₂ and methane) is sourced or *emitted* by burning and rotting of vegetation and other organic matter. Conversely, CO₂ is *absorbed* (or sequestered), by trees (their roots, branches, trunks and leaves are about 50 per cent CO₂), plankton, soils and water bodies, which are termed ‘Carbon Sinks’. Increases in CO₂ emissions are a result of either nature (e.g. volcanic eruptions) or the actions of mankind (e.g. the burning of fossil fuels such as coal, oil and natural gas), and thus could be ‘mopped up’ only by the increased capacity of sinks, via growth of forests, or increases in water bodies (and the plankton within) in which CO₂ could be stored or dissolved.

In recent times the burning of fossil fuels like oil– in which CO₂ has been stored for millions of years – has led to unprecedented levels of greenhouse gas emissions in the atmosphere which, according to most scientific studies, the current CO₂ sinks just cannot keep up with. This is more so when combined with the accelerated land clearance and urbanisation taking place worldwide to house an ever increasing population.

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Thus concentrations of greenhouse gases in the atmosphere have risen dramatically leading to an out-of-balance greenhouse effect that most scientists believe will continue to cause a very rapid warming of the world's climate. The effects of such warming have been modelled, and the resultant outcome possibilities range from dire to mild; i.e. from widespread ecological changes in agricultural production and rising sea levels, to moderate changes in regional climates.

Whatever the model predictions, the possibility of costly disruption from rapid climate change either globally or locally, calls for greater attention and precautionary measures to be put in place. Governments, business entities and consumers would be impacted by the extent to which such precautionary measures are incorporated in their decision making process.

Governments need to consider 'carbon regulation' issues such as rationing or taxing of net- CO₂ emitting entities (such as business organisations and individuals) and providing credit allowances or tax-breaks for net- CO₂ absorbing entities.

Business entities need to consider issues such as trading in carbon allowances (or permits)¹, investment in low- CO₂ emission technologies, counting the costs of carbon regularity compliance and passing on the increased cost of carbon regulation to consumers through higher prices.

Consumers need to consider if, given a choice, they are willing to pay a higher price for CO₂ neutral products and services so as to play their part in reducing CO₂ emissions.²

¹ What is traded in 'carbon trading' is not actual carbon, but the right to emit CO₂. The basic unit is one metric tonne of CO₂ per year.

² In Australia, Intrepid Travel, a tour operator, has added a compulsory fee in order to purchase carbon offsets, ranging from A\$60 for a return ticket between Melbourne and Bangkok to A\$ 180 for a return ticket between Melbourne and Paris. The company says that customer reaction has been mixed amongst different demographic groups, with non-business customers between 20-60 largely accepting the levy (Peter Hannam, *The Age*, March 26, 2007, Business page 2).

Responses to Global Warming – Use of Allowable Carbon Sinks

The United Nations Framework Convention on Climate Change (UNFCCC) was first agreed in 1992 by most developed countries and was designed to impose limits on greenhouse gas emissions and thus minimise the adverse effects of climate change. The third session of the Conference of the Parties to the UNFCCC took place in Kyoto, Japan in December 1997, resulting in the *Kyoto Protocol*. This working agreement of the signatories commits developed countries to reduce their collective emissions of six greenhouse gases by at least 5 per cent of 1990 levels by 2012. The Kyoto agreement became legally binding on 16 February 2005 when 132 signatory countries (169 by 2006) agreed to strive to decrease CO₂ emissions accounting for an estimated 55 percent of global greenhouse gas emissions (Dunn, 2007). The USA and Australia are among the group of countries that have not, as yet, ratified the Kyoto Protocol. Some developing countries, such as India and China, have ratified the protocol but are not required to reduce CO₂ emissions under the present agreement, despite their large populations. Australia, which relies heavily on coal for its power supplies, issued a separate policy response.³

The main response to removing CO₂ from the atmosphere and thereby reducing the impact of global warming is to grow more forests, or not cut down trees that we might otherwise have. While recognising that it is only a partial solution⁴, negotiations conducted by all the countries that have

³ Australia began addressing the enhanced greenhouse effect and its consequences in a formal way through the National Greenhouse Response Strategy, which was endorsed in 1992. The National Greenhouse Response Strategy was replaced in late 1996 by the National Greenhouse Strategy. It is the primary mechanism through which its international commitments will be met.

⁴ Critics see it as a tactic to delay the time when countries have to deal with the issue of burning fossil fuels – by which time the problem may be much worse.

signed the UNFCCC Kyoto Protocol are paving the way for this possibility.

Under the Kyoto Protocol, developed countries are required to limit their greenhouse gas emissions according to the following formula:

Actual emissions must be less than or equal to the assigned amount +/- carbon sinks and carbon emissions.

This means that a country can emit more CO₂ than its assigned amount (which, is defined as being 8 per cent above its emissions in 1990) only if it can simultaneously sequester the equivalent amount in 'allowable' carbon sinks.

Under the Kyoto Protocol, allowable carbon sinks include *afforestation* and *reforestation* activities undertaken since 1990.⁵

Geosequestration is another option being investigated for CO₂ to be stored in countries with suitable geology, i.e. use the earth as a CO₂ sink.

The Implications for the Accounting Profession

Traditionally, the monetary basis on which the various stakeholders of business entities make their investment and other commercial decisions, and evaluate the results of those decisions has been through the framework of financial accounting. Further, to ensure the numbers reported can be relied upon, the profession has an auditing and assurance framework which gives a 'true and fair' assessment of such reports.

However, in terms of financial reporting, the current financial accounting framework appears to be ill-equipped to provide the information required by companies to meet the challenge of global warming. This is mainly because accounting information

systems based on the accounting equation⁶ are not designed to cope with non-monetary measures such as CO₂ sources and sinks. Even if it is possible to reflect these in monetary terms, the question arises if they should be classified as 'liabilities' or 'assets'? To a profession struggling to account for intangible assets and liabilities such as intellectual capital, brand values and reputation, accounting for carbon emissions appears to be a hurdle to big to jump over. Further, even if they are considered as assets, can an entity depreciate or amortise the revenue or expenses generated by these assets amongst its products and services? Would these revenue or expense streams be taxable or allowable against tax? These and other questions will be explored further in this paper.

Literature Review

There is now a significant body of literature in the academic journals in the area of *corporate social responsibility* (CSR) (see Lantos, 2001; Matten and Crane, 2005; Shank, et.al. 2005; Ratnatunga, et.al. 2005; PJCCFS, 2006); *sustainability reporting* (see European Commission, 2001; Global Reporters, 2004; Amalric and Hauser, 2005; De Bakker, et. al. 2005;; KPMG, 2005; Ratnatunga, et.al. 2005; Salzmann, et.al. 2005; GRI, 2005; DEH, 2005; CPA Australia, 2005; FEE, 2006; NIVRA, 2007, Mock, et. al, 2007;); *environmental accounting* (Mathews, 1997 and Adams, 2004) and links between CSR, *environmental reporting and financial performance* (Waddock and Graves, 1997; Preston and O'Bannon, 1997; Orlitzky, 2001; Orlitzky, et.al. 2003; Hopkins, 2005; Orlitzky, 2005; Ratnatunga, et.al. 2005; Shank, et.al. 2005);

However, excepting for some reports from *Governmental* (DPMC, 2007; COAG,

⁵ These have to be 'incremental', i.e. a new tree planted. Pre-1990 trees still existing are not considered as sinks for carbon credit purposes. Some developed countries are giving developing countries 'grants' to use in preventing illicit logging. Such grants are outside the Kyoto protocol.

⁶ This is based on the historical cost doctrine in which transactions impact the 'accounting equation': Assets – Liabilities = Equity, and changes in equity through operations was given by the equation: Profit = Revenue – Expenses. Of the four variables that impact on Equity, i.e. assets, liabilities, revenue and expenses, the non-current assets value is subject to the most manipulation.

2006; Stern, 2006; DEFRA, 2007; EC, 2007; IPCC, 2007; NSW Greenhouse Office, 2007) and *Non-Governmental Organisations* (NGOs such as CCE, 2007; ISO, 2006; IGCC, 2006; RGGI, 2007; World Business Council, 2007) there is no literature available in the academic journals that deals specifically with the impact of carbon trading on financial reporting and assurance theory and practice.

Therefore the undertaking of a typical academic empirical-descriptive study of practices in the field was of little value as the area was so new and there were little (if any) practices to report. What was required, instead, was 'theory building' research of a normative or prescriptive nature. Such theory building research is just starting in the fields of financial reporting and assurance mainly via the Accounting and Auditing Standards Boards. This research will be discussed later in the paper.

The paper will proceed as follows. The next section considers the implications of the Kyoto Protocol internationally: for individual countries and for companies and other business entities within a country, and for individuals. This is followed by a section that deals with the mechanics of carbon emissions trading. Next, carbon emission and sequestration accounting (CES accounting), generally known as 'carbon accounting', is discussed, where the measurement issues of carbon emission management in organisations are considered. Also in this section is a discussion on the assurance and verification of the reports produced by such CES accounting systems.

The paper concludes with a discussion of the measurement and reporting issues faced by the accounting profession, if and when a financial value is placed on a tradable carbon allowance.

Implications of the Kyoto Protocol

International Implications

From the above discussion, it can be seen that it is possible that some countries will

be able to be a *net-sequester* of CO₂ whilst other would be *net-emitters*. This has resulted in a market developing for trading of CO₂ emissions where 'carbon credits' are sold by *net-sequesters* to *net-emitters*. Theoretically, if a country is incapable of meeting its target, it can buy credits (or permits) from countries that are under their targets, but if it still falls short, then it is expected that such non-compliance will invite a monetary penalty.

The Kyoto Protocol provides for three mechanisms that enable developed countries with quantified emission limitation and reduction commitments to acquire greenhouse gas reduction credits. These mechanisms are Joint Implementation (JI), Clean Development Mechanism (CDM) and International Emission Trading (IET).

Joint Implementation (JI): Here a developed country (say USA) with relatively high costs of domestic greenhouse reduction would set up a project in another developed country (say Australia) that has a relatively low cost, such that the CO₂ emission of the project is counted within a country that has a surplus.

Clean Development Mechanism (CDM): Here a developed country (say USA) can take up a greenhouse gas reduction project activity in a developing country (say China) where the cost of greenhouse gas reduction project activities is usually much lower. The developed country would be given credits for meeting its emission reduction targets, while the developing country would receive the capital and clean technology to implement the project.⁷

International Emission Trading (IET): Here countries can trade in the international

⁷ This has funded hundreds of projects that save about 104 million tonnes of carbon. However, there have been some concerns with CDM schemes. A recent study found that factories in China were using relatively cheap cleaning systems and then exploiting a loophole in the Kyoto Protocol to claim carbon credits amounting to more than US\$700 million (Stephen Wyatt, "Cleaning up in the Carbon Game, *The Australian Financial Review*, 10 April, 2007, p. 53).

carbon credit market. Countries with surplus credits can sell them to countries with quantified emission limitation and reduction commitments under the Kyoto Protocol.

In all these three mechanisms (especially the latter two) the concept of a 'carbon credit' as a measurable and tradable instrument that is acceptable across nations is required. As per the Kyoto protocol, each carbon credit represents one metric tonne of CO₂ either removed from the atmosphere or saved from being emitted.

Theoretically, a carbon credit need not have a monetary value, and instead can be 'bartered' across nations. The problem is that these 'carbon credits' are not issued by a single international Emissions Trading Authority (at least not yet). Instead, different countries (and different State authorities within those countries)⁸ issue these carbon credits (or permits) based on a monetary price.⁹

Thus, these 'carbon credits' are similar to 'taxi licenses' issued by a local authority that can be then traded for money. However, even though the underlying basis of calculating a carbon credit is international, the pricing of carbon credits varies from country to country and state to state (just like taxi licenses).¹⁰

This means that until the market becomes 'efficient', significant arbitrage opportunities will arise where 'CO₂ emitters' in high cost countries can buy credits from trading exchanges in low-cost countries.

⁸ For Example, in the State of New South Wales, Australia, carbon credits are issued from tree sequestration projects, such as Forests NSW.

⁹ Such credits are not, however, (as yet) fungible, i.e. where one unit of commodity or currency is equivalent to another, and may be substituted for the other with no loss of value. For example, the NSW scheme credits not fungible with the credits being traded in Europe.

¹⁰ Credits can be exchanged between businesses or bought and sold in international markets at the prevailing market price. Two pioneering exchanges for carbon credits trading are the Chicago Climate Exchange and the European Climate Exchange.

Implications for Individual Countries

In order to meet the quota targets set by the Kyoto Protocol with regards to the amount of greenhouse gases countries can produce; countries can in turn, set quotas on the emissions of business entities (and individuals).

Many countries are considering 'managing' their CO₂ targets through its regulation of business entities and individuals in their own countries in three principle ways:

- By *taxation*. Here the government imposes a straight tax on CO₂ emissions. The advantage of this is that it is immediately implementable, transparent and similar tax regimes could be harmonised around the globe perhaps under the oversight of the International Monetary Fund. The disadvantage is that business may absorb or pass on the tax to consumers, and not cut emissions (Tounson, 2007).
- By *allocating* carbon credits or 'permits' to these entities or individuals for the emission of a certain quantity of greenhouse gases in a particular period (i.e. a permitted quota).¹¹ These permits may be given away free, sold at a predetermined price or auctioned. This is a carbon emission 'rationing' system.
- By *approving* certain organisations as being able to issue legitimate carbon credits (called 'abatement certificates') by undertaking work to either increase the capacity of sinks, or reduce CO₂ emissions from sources. Known as a *cap (or benchmark) and trade system*, greenhouse performance levels are set whereby those that can deliver a particular product with emissions below the benchmark can earn (create) abatement credit certificates. For example, power stations can create

¹¹ Some countries are considering proving each of their citizens an annual carbon emissions quota via a 'personal allowance' ration card which would have to be handed over every time a form of non-renewable energy was purchased - at the filling station, or when buying tickets for a flight - for points to be deducted.

credits to the extent their greenhouse intensity of their electricity is lower than a predetermined level.¹² Another example would be an organisation that grows trees for the purposes of CO₂ sequestration and the creation of 'accredited' carbon credits¹³, all with private sector funding. However, as Australia has not signed the Kyoto Treaty, such credits are not part of the booming international trade. Other examples of such organisations are *Forests NSW* that plants a predetermined number of trees for every carbon credit it sells, or *Easy Being Green* that replaces light bulbs in homes for high-efficiency globes. These abatement certificates are then sold to polluters.¹⁴

The pros and cons of carbon credits continue to be debated by the international community, especially as to if they go far enough in solving the problems of global warming.¹⁵ For example, while forests are an important CO₂ sink, there is a limit to the amount of CO₂ that they can store. The largest CO₂ sink is in the fossil fuels in the ground, but we are currently using them as a major source of energy and emitting CO₂ into the atmosphere as a result.

It has therefore been argued that, a number of lifestyle changes (from countries, organisations and individuals) are needed to achieve a substantial decrease in emissions.

¹² This approach is known as a Solution-based market that prescribes targets in terms of units of production from a prescribed sub-section of abatement technologies such as megawatts-hours of electricity generated from renewable energy.

¹³ In New South Wales, Australia, companies that carry out work to reduce greenhouse gases can create 'Abatement Certificates' under the Greenhouse Gas Abatement Scheme. These are then purchased by polluters such as Electricity retailers who have been imposed annual reduction targets.

¹⁴ Since 2003, about 37 million tons (worth more than A\$ 400 million) have been traded, making NSW one of the largest carbon trading markets in the world. (Tom Dusevic, "Ready or Not, Here Come the Carbon Traders", *TIME Magazine*, Feb 26, 2007, p.12).

¹⁵ For example, there is a view that the EU gave away too many permits by grandfathering the emissions from existing generators. These permits were sold and companies got windfall profits.

It will require reduced energy demand, increased energy efficiency, using less fossil fuels and more renewable energy sources. It will also require research and development of sustainable technologies that reduce CO₂ emissions.

Implications for Companies and Other Business Entities

In theory businesses and individuals that are over their quotas could buy carbon credits for their excess emissions, while businesses that are below their quotas can sell their remaining credits. By allowing credits to be bought and sold, a business for which reducing its emissions would be expensive or prohibitive can pay another business to make the reduction for it. This minimises the quota's impact on the business, while still reaching the quota. If all entities and individuals reach or balance their quota, then the country itself can reach its Kyoto Protocol quota, i.e. if permits are only issued to a level equal to or below the assigned amount, then a country should meet its Kyoto commitment (assuming that the measures of its emissions are accurate).

Carbon credits thus create a market for reducing greenhouse emissions by giving a monetary value to the cost of polluting the air. This means that carbon becomes a cost of business and is seen like other inputs such as raw materials or labour.

As emission levels are predicted to keep rising over time, it is envisaged that the number of companies wanting/needing to buy more credits will increase; hence pushing the market price up, and thus encouraging more groups to undertake environmentally friendly activities which create for them carbon credits to sell.

Whilst high CO₂ emitting entities will have an extra cost of running their businesses, there could be money for others who do not, at present, consider CO₂ as a separate line of business, such as foresters and timber companies.¹⁶

¹⁶ Note however, that the tree must be 'incremental', i.e. planted after 1990.

Carbon Emissions Trading

Carbon emissions trading will come about only if a *cap-and-trade* scheme (also known as a *Pollution*-based carbon market) is established in a country. It would work like this: companies are told how much CO₂ they can emit (the cap). If they produce less than the cap, they have surplus credits for sale.¹⁷ If they emit more than their cap they can buy credits from other businesses that come in under their cap (the trade). Trade takes place in an over the counter market, or via a Carbon Credit Exchange trading market.

In terms of the 'cap', it has been suggested that initially the quotas given by governments should be liberal, which would make the demand for carbon credits, and their resulting price, low so that business find it easy to transition towards paying for credits. Then over time, the quota of emissions a government sets (based on, say, international agreements) will gradually be reduced until the target level of emissions is reached.

A cap-and-trade system should ideally be based on free-market principles whereby those best placed to reduce their emissions can reduce emissions for those less well placed and then sell these reductions.

Due to the possibility of trading, carbon credits are poised to emerge as the world's hottest, yet least understood commodity. The carbon trading market internationally was about US\$100 million total value about 10 years ago. Now it is about US\$18 billion. It is therefore, one of the fastest growing commodity markets in the world of any kind.

In a cap and trade program, each individual emission allowance has a 'vintage year' designation (that is, the year an allowance may be used). Emission allowances with the same vintage year designation are fungible within a particular jurisdiction and can be used by any party to satisfy pollution from any source. Vintage year swaps are common among participants in a U.S. cap

and trade program. In a vintage year exchange, a company with a current allowance shortfall exchanges allowances with a later vintage year designation for allowances with a current designation with an entity that has an opposite exposure.

Brokers and other non-participants typically buy and sell emission allowances in secondary markets.¹⁸ The secondary market for emission allowances is quite vibrant. Many believe worldwide markets will continue to develop for the trading of emission allowances.

One of the earliest such trading schemes is the *European Union Emission Trading Scheme (EU ETS)* which is the world's largest multi-country cap and trade system. The EU has established a cap that limits emissions for its member states, each of which has been given a specific number of credits. The total amount of credits cannot exceed the cap, limiting total emissions to that level.

The EU ETS is only open to countries that have signed the Kyoto Protocol. Japan has a voluntary scheme. Having not signed the Kyoto Protocol, the US has no formal carbon emissions trading market, although two regional emissions trading zones have developed, in the East and West Coast. The Chicago Climate Exchange is a self-regulated voluntary and legally binding program that allows participants to register and trade greenhouse gas emissions through direct trading and through credits from offset providers, such as plantation forestry companies. Many companies from overseas countries have joined the Chicago Climate Exchange.¹⁹

Despite not having signed the Kyoto Protocol, Australia had the first operating carbon emissions trading scheme in the

¹⁸ Carbon Planet and Nextgen are examples of such private companies that act as carbon credit brokers in Australia.

¹⁹ For example, Australia's largest energy retailer, AGL has joined, stating that membership of the global scheme would allow the company to put a price on its own emissions and better cost future investments.

¹⁷ Called 'Renewable Energy Credits (RECs).

world, the NSW Greenhouse Gas Abatement Scheme, which began operating in January 2003. Participants can trade 'carbon offsets' among themselves or with outside parties such as banks. Even retail investors can trade (only those with assets in NSW are currently eligible). Under this NSW scheme, as well as under an Australian Federal Scheme for Renewable Energy, brokers started carbon trading, even before there was an actual exchange set up. This over-the-counter trading system continues although recently the *Sydney Futures Exchange* was established as a carbon credits trading market. Many CO₂ emitters are buying credits from forest growers via this exchange.

The Australian Federal Government has just announced that a national carbon emissions trading market is unlikely until 2011, as it does not want to set caps and targets. Unfortunately, an emissions trading system cannot work efficiently without caps or targets as scarcity is not created (Hannam, 2007).

Many of Australia's largest companies, however, from banks to energy producers, claim to have already significantly reduced emissions and are therefore joining local de facto trading schemes²⁰ or heading overseas to put a price on carbon that they can factor into the cost of new investments (Weekes, 2007).

In many parts of the world therefore, there is recognition that CO₂ emission is an environmental issue that can be clearly *monetised*. When the New South Wales Greenhouse Abatement Certificate (NGAC) scheme first started, a carbon credit was priced at A\$3.50 per tonne. The prices have traded in recent years between A\$3.50 and A\$14.75 per metric tonne in the spot

market. This range in prices is minor compared to the volatility of the EU ETS, where due to uncertainty; there has been a significant slump in carbon prices of Emissions Allowances (known as EUAs) over the years from with a high of 30 Euro to a low of less than 1 Euro.²¹ A crash in the EUA followed the release of a series of National Emission Compliance Reports for 2005 indicating that there had been an over-allocation of allowances to emitters for that period because EU Governments did not want to place too high a burden on industries subject to the scheme. This apparently caused a rush of sellers into the EUA market and a resultant large diminution in their value (Janissen, 2007).

If a carbon emission trading (monetised or bartered) becomes a widespread phenomenon, there will be significant changes in the countryside of many countries, including Australia. Countries have worked hard to get rid of their trees because they hindered agriculture, or were required for building and even for fuel. In many countries such logging was illegal. Now the world recognises that these very trees deserve a bit more 'credit' than that.

Carbon (Emission and Sequestration) Accounting

Measurement Issues in CES Accounting

The mechanism for calculating the quantum of CO₂, either emitted by a source or sequestered in a biomass sink, is referred to as 'carbon accounting'. This has very little to do with monetary values usually associated with the term 'accounting'. Therefore, in this paper we will refer to it as 'carbon emission and sequestration (CES) accounting'. The CES accounting mechanism must be sufficiently robust that the carbon trading market has confidence that the amount of carbon sequestered can be both measured and considered to be

²⁰ Origin, Australia's number two energy producer and retailer, has set up a local de facto trading scheme, which aims to provide businesses with a standard method of buying and selling verified carbon offsets. This scheme has been developed in consultation with the Australian Conservation Foundation, St James Ethics Centre and Energetics, and has signed up major companies such as the AFL, NAB, Transurban, Lend Lease, Insurance Australia Group, STA Travel and Intrepid Travel.

²¹ The reasons for such volatility is unclear, but the low end of the price range was when there was a significant surplus due to either longer and hotter summers, or the anticipated allocation was too high, or because carbon credit securities cannot be held or banked past a limited period (vintage year).

equivalent in its impact on global warming potential to the CO₂ released to the atmosphere from activities producing greenhouse gases.

In terms of CES accounting of *carbon sources*, a study done in Australia by the Investor Group on Climate Change (IGCC), which manages funds totalling \$225 billion, found only about 9 per cent of respondents among leading listed companies have disclosed their emissions (Hannam, 2007). At its extreme, every company with employees would have to adjust their CES accounting systems to identify their greenhouse gas pollution.

In the USA and Australia, State Governments²² have been far more active than their respective Federal Governments to support the use of a National pollution reporting system. Companies in Europe took about 2½ years to introduce the necessary CES accounting system changes for the European Union's Emissions Trading Scheme, and many other regions including California are already making changes that Australian companies would be able to learn from,

In terms of CES accounting of *carbon sinks*, in order for the CO₂ sequestered in vegetation to be used as part of an emissions trading regime, it is essential that correct and defensible accounting be undertaken of the amount of CO₂ that is captured in biomass. It is also necessary that correct accounting treatment is applied to situations in which that CO₂ is no longer sequestered in biomass, such as through fire, disease or destruction of the biomass.

Confidence in the CES accounting system is fundamental to building confidence in use of CO₂ sequestration in a carbon trading market, thereby underpinning growth and investment in new planted forests to create new carbon credits from sequestration.²³ As

²² California and New York in the USA; and New South Wales and Victoria in Australia.

²³ Forestry projects are the largest source of carbon offsets in Australia because Kyoto compliant land – cleared before 1990 – is plentiful., the science is available and photographs of trees are good for

any trading system involves the issuing of carbon credits for *incremental* afforestation and reforestation activities, it requires an assessment to answer questions such as: Was the forest established after 1990? How quickly is it growing? How much CO₂ is it sequestering?

Some caution is required because accounting for the CO₂ contained in forests is difficult. The amount of CO₂ in forest soils, forest litter and the trees themselves needs to be measured. Different types of trees store different amounts of CO₂ when growing on different types of soils in different climates. In addition, we might expect natural year-to-year variations in CO₂ stored, related to climate variations. And there is the added difficulty of monitoring the long-term fate of carbon – will the sink become a source? In other words, will a carbon asset become a liability?

Consider what happens in a plantation harvested for pulp. Much of the CO₂ stored in the roots, leaves, bark and branches of trees is released into the atmosphere as the dead vegetation rots. The stems are turned into pulp, which is manufactured into a range of paper and wood fibre products. Many of these are used once and then discarded – they will also rot or be incinerated, returning their CO₂ to the atmosphere. Even trees harvested for long-term uses such as furniture and house frames will lose a large proportion of their stored CO₂ to the atmosphere through waste during processing.

Planting trees for conservation purposes – where they are unlikely to ever be harvested – will be of more long-term benefit to the global carbon cycle than will plantings for some commercial harvesting (e.g., trees for logging and pulping). But even trees for conservation purposes may be lost in a forest fire – and most of the stored CO₂ would return to the atmosphere. Furthermore, a new forest acts as a sink only until it reaches maturity, at which time

publicity (Amita Tandukar, "From Neutral into Drive", *BRW Innovation*, March 15-21, 2007, pp. 74-75).

new growth is compensated by death and decay.

Measurement issues still have not been agreed to in CES accounting. For example, the amount of CO₂ stored in each of these pools is most commonly estimated by developing relationships between easily measured things like stem diameter or stem volume and harder to measure things like canopy and root biomass. It is also necessary to establish the pattern of changes in sinks (pools) like soil carbon and understorey over the time frames of forest growth.

There are two key points to note with regard to CES accounting under the Kyoto Protocol. The first is that the amount of CO₂ sequestration that can be claimed as a 'carbon credit' is limited to the net amount of *change* in the total forest carbon pool from one period to the next. This referred to as *stock change accounting*.

The second key point is that, even though CO₂ remains stored in the products produced from harvested logs (paper, reconstituted boards, veneers, sawn timber etc), this on-going 'capture' is not recognised under carbon accounting rules as applied to the first Kyoto Protocol commitment period of 2008-2012. Recognition may occur in later periods.

As can be appreciated, the detailed requirements for a CES accounting system are continually being developed by organisations such as the Intergovernmental Panel on Climate Change (IPCC, 2007) under the United Nations Framework Convention on Climate Change (UNFCCC). Any CES accounting standard developed by a country or NGO will need to be consistent with the IPCC principles before carbon credits generated from carbon sinks can be used in an emissions trading regime under the Kyoto Protocol.

Other CES measurement and reporting approaches recognised in a global context are the Global Reporting Initiative (GRI, 2006); the United Nations Conference on Trade and Development's (UNCTAD) Intergovernmental Working Group of

Experts on International Standards of Accounting and Reporting (UNCTAD 2006) and the World Resources Institute and the World Business Council for Sustainable Development (2007) with its Greenhouse Gas Protocol (GHG Protocol).

The GHG protocol is an international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions. The protocol consists of two modules:

- *Corporate Accounting and Reporting Standards:* This provides methodologies to business and other organisations to inventorise and report all of the CO₂ emissions they produce.
- *Project Accounting Protocol and Guidelines:* These are geared toward calculating reductions in CO₂ emissions from specific carbon emission reduction projects.

The developers claim that GHG Protocol provides the CES accounting framework for nearly every GHG standard and program in the world - from the International Standards Organization to the EU Emissions Trading Scheme to the California Climate Registry - as well as hundreds of GHG inventories prepared by individual companies; and that it also offers developing countries an internationally accepted management tool to help their businesses to compete in the global marketplace and their governments to make informed decisions about climate change.

With respect to the CO₂ emissions costing component of the wider environmental costing components, the US EPA has created a Waste Reduction Model (WARM)²⁴ as a web-based calculator to help organisations calculate greenhouse gas emissions (CO₂ and BTU) reductions from different waste management practices (e.g. source reduction, recycling, combustion, composting, and landfilling). The results are given as one metric tonne of CO₂ either

²⁴ See <http://yosemite.epa.gov/oar/globalwarming.nsf/WARM?openform>

removed from the atmosphere or saved from being emitted. The challenge for the cost accountant is to 'convert' this to a product or service related cost.

The US EPA has also created a Recycled Content (ReCon) Tool as a web-based calculator²⁵ to help companies and individuals estimate greenhouse gas emissions and energy impacts from purchasing and/or manufacturing materials with varying degrees of post-consumer recycled content. GHG Protocol is also available as a web-based calculator (World Business Council for Sustainable Development (2007)).

There are also many organisations, governmental and private, that provide web-based calculators to determine the reduction in specific air emissions (nitrogen oxides, sulphur dioxides, CO₂, volatile organic compounds, particulates and mercury) resulting from energy conservation initiatives in business organisations.²⁶ Information can be entered for both electricity reduction (in kilowatt hours) and natural gas reduction (in therms). There are other calculators that allow you to determine greenhouse gas emissions resulting from the use of cars²⁷ and airlines²⁸ for travel.

Some of these web-based calculators have a detailed description of the methodology and metrics used in the calculation.²⁹ Others do not. Whatever the methodology or approach taken, the issue for the financial and cost accountant is the monetary value of the CO₂ that these calculators say has been either removed from the atmosphere or saved

from being emitted by an organisation's products, services, equipment and processors. The existence of an efficient carbon trading market would put a price on this in terms of a carbon credit (or allowance).

In Australia, many research institutions – including the Cooperative Research Centre for Greenhouse Accounting, the Cooperative Research Centre for Greenhouse Gas Technologies and the Australian Greenhouse Office – are developing knowledge to underpin an acceptable approach by Australia.

To help account for CO₂ flow, the Australian Greenhouse Office, the CSIRO and the Australian National University have developed methods to reliably measure greenhouse gas emissions. The methods calculate emissions resulting from variables such as soil cultivation, fire management, fertiliser application, climate, different plant species and land management systems. Methods for measuring emissions are evolving and improving as a result of new research.

Several other organisations, such as *Standards Australia*, the *Australian Greenhouse Office* and the *Electricity Retailers in NSW*, have been developing CES accounting systems with a primary focus to date on CES accounting in forests as opposed to other forms of vegetation.

From the above discussion it can be seen that the Accounting profession would need to obtain the services of outside consultants to undertake CES accounting projects. Such use of external experts is not uncommon, however. The profession often incorporates reports from company directors, actuaries, business analysts, engineers, quantity surveyors, lawyers etc., especially in the area of asset valuation and fair-value accounting. Using expert opinions in accounting for CO₂ flows would be no different.

²⁵ See

<http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsWasteToolsReconOnline.html>

²⁶ For example,

http://www.cleanerandgreener.org/resources/emission_reductions.htm

²⁷ See <http://www.terrapass.com/road/carboncalc.php>

²⁸ See <http://www.terrapass.com/flight/index2.htm>

²⁹ See

<http://www.cleanerandgreener.org/download/efactors.pdf>

CES Accounting: Assurance and Verification

An important issue in the process of CES accounting is that of *assurance and verification*. An entity's carbon accounts will need to be independently verified by qualified assurers before they are accepted for use in an emissions trading regime. There needs to be accountability, transparency and integrity in relation to compliance arrangements, especially in relation to the inputs that are going into this scheme. If such assurance is not present, then business organisations are not going to have comfort or certainty in investing in such a market.

Some advances have been made in the accreditation of 'voluntary offset' schemes. Accreditation programs such as the Gold Standard³⁰ and Voluntary Carbon Standard³¹ provide independent verifications. The more rigorous offset accreditation systems test whether projects are environmentally sustainable. Such accreditation must also be followed by regular audits.³²

In general, however, although the interest in the carbon trading market is high, the new market is largely unregulated and lacks transparency. Government policy in countries such as the USA and Australia is in a constant state of change, and questions of quality and pricing are far from settled. In essence business organisations and individual customers³³ have no way of

discriminating (Tanduka, 2007) between providers who claim that in their scheme:

$$X \text{ trees} = \text{the sequestration of } Y \text{ tonnes of } CO_2 \text{ emissions} = \$Z$$

There are very few surveys comparing different schemes³⁴, and with those that exist, their independence needs transparency checks as well.³⁵ Currently the auditing and ranking of environmentally sustainable initiatives is in chaos with dozens of organisations offering accreditation and auditing services, across the globe, but none being committed to a standardised methodology for auditing or reporting corporate effort. Walters (2006) lists at least 11 such organisations, none having standards compatible with another. These and other organisations providing CES accounting and assurance are listed in Appendix One.

Before any 'assurance' can be given, it is therefore clear that the framework for reporting must be agreed upon, i.e. a necessary condition for an assurance engagement is that first the reporting framework is accepted as suitable criteria for CES accounting.

An NGO called AccountAbility, with its assurance standard AA1000 AS, has been one of the first groups providing guidance on assurance for sustainability assurance engagements (Mock et al. 2007). AccountAbility recently enhanced the AA1000 AS assurance standard by issuing a "Guidance Note on the Principles of Materiality, Completeness and Responsiveness as they Relate to the AA1000 Assurance Standard" (AccountAbility 2007).

³⁰ Set up by the global conservation organisation WWF to verify whether CDM and voluntary carbon offset projects cut emissions and benefit the communities that host the projects.

³¹ Set up by a not for profit organisation called The Climate Group (UK), the International Emissions Trading association and the World economic Forum.

³² Carbon Trust, a UK Government backed audit organisation, also conducts accreditation audits worldwide.

³³ Sergey Brin, the zillionaire founder of Google buys carbon credits to offset the immense amount of CO₂ emitted by his private Boeing 767, but confesses he is not sure if it really does anything (Charles Krauthammer, "Limousine Liberal Hypocrisy", *TIME Magazine*, Commentary, March 26, 2007, p.16).

³⁴ An organisation called 'Green Electricity Watch' provided a 'Star Rating' of Electricity company schemes in Australia (Debra Cleveland, "Trim Energy Bills and Save Planet", *Sydney Morning Herald*, April 1, 2007, Investor, p.3)

³⁵ Tufts University has done a study of air travel offsets, and recommended only one Australian company, Climate Friendly. University studies whilst seemingly independent, should disclose funding.

The auditing profession has been slower than NGOs such as the above organisation in providing assurance standards. The International Auditing and Assurance Standards Board (IAASB) has issued ISAE 3000, Assurance Engagements other than Audits and Reviews of Historical Financial Information (IAASB, 2004) to cover the assurance on sustainability reports. This was released in Australia as AUS 108 “The Framework for Assurance Engagements”. It is a framework that applies equally to assurance engagements on historical financial information and on other information. In a country that has adopted ISAE 3000, any assurance engagement on other than historical financial information is to be undertaken by the auditing firms in accordance with ISAE 3000. The American Institute of Certified Public Accountants (AICPA, 2005) also put out *Statement of Position 03-2: Attest Engagements on Greenhouse Gas Emissions Information*, but this provided very little detail.

It must be pointed out that ISAE 3000 is a very general standard for assurance engagements that covers a wide range of possible subject matters, with sustainability being just one. Due to the broad scope of sustainability, numerous challenges exist regarding the suitable criteria to use that fulfil the assurance requirements of relevance, completeness, reliability, neutrality and understandability.

It will be perhaps easier to build assurance standards for carbon emissions reports as the subject matter is more easily defined and measured. However, to date, no specific carbon emission standard has been released by any organisation. Neither AA1000 AS nor ISAE 3000 provides specific guidance or standards regarding CES accounting assurance. This has stifled the auditing profession’s responsiveness in undertaking engagements relating to global warming issues. The problem remains that until proper CES accounting standards are agreed to, there would be significant constraints in developing specific standards for undertaking CES assurance.

Carbon Financial Statement Accounting

From the foregoing discussion, it can be seen that interesting Financial Accounting issues arise depending on if an allowance or credit is:

- granted free to a business entity by a government,
- purchased in an auction run by a government,
- purchased in a free-market, or
- created by a company allowed by a State Authority to issue them.

The main issue revolves around the issue if the requirements of the Kyoto Protocol give rise to an asset (carbon sink) or a liability (carbon source). If the government rations CO₂ emissions via a ‘cap and trade’ allowance scheme, then that allowance will have a monetary value and the following questions will follow: Is the ‘allowance’ an asset? If a separate asset is recognized, what is the nature of that asset? Is there ‘income’ when the allowance is received, or is income deferred until the allowance is traded? If income is recognised, how is it measured? Is the potential penalty, which will be incurred if a participant fails to deliver sufficient allowances to cover its actual emissions, be recognised as a contingent liability, and how should it be measured? These and other questions will be discussed in this section.

It is generally agreed that a ‘carbon allowance’ is an intangible asset. However, it is a new category of intangible asset, i.e. one that should be measured at fair value with changes in value recognised in profit or loss.³⁶ Further, depending on the business, it could be argued that this category of intangible assets can be accounted in three ways: as items of

³⁶ If intangible assets arise due to a third party transaction such as a purchase of a carbon allowance, then it can meet the accounting profession’s reliability test. However, carbon credits created internally by carbon sinks cannot be recognised until they are sold in open trading. An inconvenient truth is that the profession has great difficulty in internally generated intangible assets such as brand values and intellectual property, and it is still coming to terms with reporting issues arising due to carbon trading.

inventory if the organisation is set up to trade in ‘allowances’; as *financial assets* and measuring them at fair value with gains and losses recognised in income, and as *derivatives* by accounting for them as a cash flow hedge.

Considering all views and alternative treatments, the current thinking of the financial accounting profession appears to be that a carbon emissions trading scheme give rise to at least three treatments:

- A *government grant* (when allowances are allocated by governments for less than fair value) (debit: intangible asset; credit: revenue)³⁷ This government grant is measured at cost when received from the government. The grant of allowances is recognised in income on a systematic basis over the compliance period.
- An *asset for allowances held*. (Debit: intangible asset; credit: equity reserves) at fair value.³⁸
- A *liability* for the obligation to deliver allowances equal to emissions that have been made (debit: expense; credit: liability) at fair value, and ultimately purchasing in an open market ‘carbon credits’ equal to the shortfall (debit: liability; credit: cash) at market value.

The major concern is the separate recognition of the asset and liability and the different treatment of such. For example a *net model* has been proposed whereby an entity does not recognise allocated allowances (they remain off-balance sheet), and accounts for actual emissions only when it holds insufficient allowances to cover those emissions by buying carbon credits (debit: expenses; credit: cash) at market price. In contrast an *amortising model* has been proposed whereby an entity recognises allocated allowances as an asset (debit: asset; credit: equity reserves) at cost

price, but then amortises the allowances as it pollutes (debit: expense; credit: asset).

The entity therefore recognises a liability for actual emissions only when it holds insufficient allowances to cover those emissions (debit: expense; credit: liability). The liability that the entity incurs as it emits is measured at the cost of the allowances held by the entity. However, ultimately the entity has to purchase ‘carbon credits’ in an open market equal to the shortfall (debit: liability; credit: cash), and there would be an over/under provision of this liability depending on market price.

Most approaches treat carbon assets (i.e. allowances) independently to the liabilities (i.e., obligations), and accordingly, netting off (i.e., offsetting) of the assets and liabilities is not likely to be permitted. Thus carbon allowances/liabilities could represent a significant figure and thus have an impact on the “bottom line” volatility of a company’s reported financial statements.

This perceived (artificial) volatility in the income statement is a major concern for CFOs, as they have to record a gain in the value of emission rights to equity, but the loss related to revaluing the liability as a profit or loss item. Further, the current thinking is that they would need to record a loss in the value of emission rights against previous gains recognised in equity, but the gain related to revaluing the liability would be recorded in profit or loss.

The release of the government grant to revenue by reference to the initial value of the allowances can also cause volatility as the liability that arises as the entity emits is measured by reference to the current market value of the allowances. Even if the entity elects to measure the allowances subsequently at market value, a mismatch arises because some gains and losses are reported in the income statement and others in equity.

In the United States, the guidance contained in the Federal Energy Regulatory Commission’s (FERC) Uniform System of Accounts is the only accounting guidance currently available that explicitly addresses

³⁷ Questions as to if such revenue is taxable or exempt from tax will be based on a specific country’s tax policy.

³⁸ The fair value would be based on market values if a trading scheme exists.

emission allowances. FERC requires companies to recognise emission allowances on a historical cost basis. The Financial Accounting Standards Board (FASB) has researched the actual practices of companies, and reports that whilst there is a diversity of practices, most follow the FERC guidelines. The FASB also reports that some companies follow an intangible asset model for emission allowances and that there is no authoritative guidance that addresses the accounting for RECs.³⁹

Other guidelines have been issued, but often withdrawn subsequently. For example, the Emerging Issues Task Force (EITF) Issue No. 03-14, "Participants' Accounting for Emissions Allowances under a 'Cap and Trade' Program," attempted to address emission allowances by providing a comprehensive accounting model for participants in a cap and trade emission reduction program and alternative views for classification. This was removed as it was seen by some to have implications beyond cap and trade emission programs and by others as irrelevant as they did not perceive a practice issue or diversity in the accounting for emission allowances.

Another example was the International Financial Reporting Interpretations Committee's IFRIC 3: *Emission Rights* that attempted to address how participants account for cap and trade emission trading schemes. IFRIC 3 stated that allowances are intangible assets and should be measured at fair value when received from the government. The grant of allowances is recognised in income on a systematic basis over the compliance period.

However, in 2005, the International Accounting Standards Board (IASB) voted to withdraw IFRIC 3 in light of the reduced urgency for an interpretation, requests from the IFRIC to amend IASB standards, and concerns expressed by the European Commission. In late 2005 the IASB decided to add a project to its agenda to provide a comprehensive model for emission

allowances similar to issues discussed in IFRIC 3. This is yet to be released.

A further example of the financial accounting profession's inability to deal with the issue is that after the FASB Statement No. 153, *Exchanges of Nonmonetary Assets*, was issued in December 2004, questions arose in practice related to its scope and, specifically, whether exchanges of emission allowances (vintage year swaps) should be accounted for at fair value or carryover basis. On August 8, 2006, the Technical Application and Implementation Activities (TA&I) Committee approved a recommendation for the Board to add a project to its agenda to address the nature of emission allowances and clarify the accounting for vintage year swaps of emission allowances by participants in emission trading schemes.

Issues that are still to be considered by the accounting profession are on how to account for allowances and obligations if there is *no active market*, and the accounting requirements of *brokers and other position-taking institutions* that are not subject to an emission limit or cap.

In summary, the position of the financial accounting profession is by no means clear, although there seems to be some agreement that once allowances are issued, a company should recognise them as a *new asset* on the balance sheet. As actual emissions occur a *liability* should be recognised and *changes in the market price* of allowance (i.e., gains and losses on allowances) are to be recognised in the *profit and loss account*. Companies will also need to consider issues such as *fair value* accounting⁴⁰ and *impairment* of assets.

As fair value accounting and asset impairment tests are still the subject of

³⁹

http://www.fasb.org/project/emission_allowances.shtml (accessed April 18, 2007)

⁴⁰ Pricing of allowances may be difficult to determine without a liquid market: The suggested approach of adopting mark-to-market accounting could have a significant impact on a company's profit and loss. The volatility in prices would need to be reflected in the income statement; as such profit and loss figures could be subject to disturbances with severe price spikes (that could easily happen in a thin market).

much debate in the profession with regards to even conventional tangible asset valuations, an inconvenient truth is that companies to date have very little guidance from accounting and assurance standard setters as to the treatment of carbon related intangible assets.

Management accountants, on the other hand, are not constrained by GAAP, accounting standards and assurance requirements in reporting and information provision. Research into issues such as carbon pricing, whole-of-life costing, carbon efficiency management and product-distance evaluations, would perhaps be avenues by which the accounting profession can play its part in help reducing global warming.

Summary

The concentrations of greenhouse gases in the atmosphere have risen dramatically leading to an out-of-balance greenhouse effect that most scientists believe will continue to cause a very rapid warming of the world's climate. The possibility of costly disruption from rapid climate change either globally or locally, calls for greater attention and precautionary measures to be put in place. Governments, business entities and consumers would be impacted by the extent to which such precautionary measures are incorporated in their decision making process.

Governments need to consider 'carbon regulation' issues such as rationing or taxing of net- CO₂ *emitting* entities (organisations and individuals) and providing credit allowances or tax-breaks for net- CO₂ *absorbing* entities. Business entities need to consider issues such as trading in carbon allowances (or permits), investment in low- CO₂ emission technologies, counting the costs of carbon regularity compliance and passing on the increased cost of carbon regulation to consumers through higher prices. Consumers need to consider if, given a choice, they are willing to pay a higher price for CO₂ neutral products and services so as to play their part in reducing CO₂ emissions.

These decisions and their consequences will impact the accounting profession significantly. Unfortunately, in terms of financial reporting, the current financial accounting framework appears to be ill-equipped to provide the information required by companies to meet the challenge of global warming. This is mainly because accounting information systems based on the accounting equation are not designed to cope with non-monetary measures such as CO₂ sources and sinks. As such, despite emissions trading being prevalent in most developed countries (within and outside the Kyoto protocol) the accounting standard setters have yet to come up with an acceptable standard to account for such activity.

It has been left to organisations outside the accounting profession to develop CES accounting, measurement, reporting frameworks. These have proliferated, with only few providing detailed approaches and metrics, and all being incompatible with each other. This lack of consistency has then resulted in almost no development in assurance standards, from within or outside the accounting profession. It is most likely that these developments will be from outside, as the inconvenient truth is that the accounting profession is hampered by a conceptual framework that is ill equipped to meet the challenge of reporting within a global warming context. Research into the management accounting issues of efficient carbon management is perhaps the only window of opportunity left for the profession as a whole.

References

- AccountAbility, (2007), "Application of the Principles of Materiality, Completeness and Responsiveness as they Relate to the AA1000 Assurance Standard", available at <http://www.accountability21.net/aa1000/default.asp?pageid=286>, accessed 30 March 2007.
- Adams, C. A. (2004). "The Ethical, Social and Environmental Reporting-Performance Portrayal Gap", *Accounting, Auditing and Accountability Journal*, 17(5), pp.731-747.

- Amalric, F., and Hauser, J. (2005). "Economic Drivers of Corporate Responsibility Activities", *Journal of Corporate Citizenship* (20), pp. 27-38.
- American Institute of Certified Public Accountants (AICPA), (2005), *Statement of Position 03-2: Attest Engagements on Greenhouse Gas Emissions Information*, New York.
- Chicago Climate Exchange (CCE), (2007), "Welcome to the Chicago Climate Exchange", available at <http://www.chicagoclimatex.com/>, accessed 30 March 2007.
- COAG Greenhouse and Energy Reporting Group, (2006), "A National System for Streamlined Greenhouse and Energy Reporting by Business", available at <http://www.greenhouse.gov.au/reporting/pubs/ris.pdf>, accessed 30 March 2007.
- CPA Australia, (2005), "Sustainability Reporting Practices, Performance and Potential, A Research Project Commissioned by CPA Australia", University of Sydney, available <http://www.cpaaustralia.com.au>, accessed 30 March 2007.
- De Bakker, F. G. A., Groenewegen, P., and Den Hond, F. (2005). "A Bibliometric Analysis of 30 Years of Research and Theory on Corporate Social Responsibility and Corporate", *Social Performance, Business and Society*, 44(3), pp. 283-317.
- Department for Environment, Food and Rural Affairs (DEFRA), (2007), "EU Emissions Trading Scheme - Guidance on Annual Verification, United Kingdom Government, Version 3, 12 February 2007", available at www.defra.gov.uk/Environment/climatechange/trading/eu/permits/pdf/annverifguide.pdf, accessed 30 March 2007.
- Department of Environment and Heritage (DEH), (2005), "The State of Sustainability Reporting in Australia", Australian Government, available at <http://www.environment.gov.au/settlements/industry/corporate/reporting/survey.html>, accessed 30 March 2007.
- Department of Prime Minister and Cabinet (DPMC), (2007), "Prime Ministerial Task Force on Emissions Trading", Australian Government, available at <http://www.dpmc.gov.au/emissionstrading/index.cfm>, accessed 30 March 2007.
- Dunn, J. (2007). "Carbon Trading Leaves it to Market Forces", *The Weekend Australian Climate Change Special Report*, March 24-25, p. 12.
- European Commission. (2001). *Promoting a European framework for corporate social responsibility*. Luxembourg: European Communities.
- European Commission (EC), (2007), "European Union Emissions Trading Scheme", available at <http://ec.europa.eu/environment/climat/emission.htm>, accessed 30 March 2007.
- Federation des Experts Comptables Europeens (FEE), (2006), "Key Issues in Sustainability Assurance: An Overview", available at http://www.fee.be/publications/default.asp?library_ref=4&content_ref=580, accessed 30 March 2007.
- Global Reporters, (2004), *The Global Reporters 2004 Survey of Corporate Sustainability Reporting*, "Risk and Opportunity: Best Practice in Non-Financial Reporting", available at www.sustainability.com, accessed 30 March 2007.
- Global Reporting Initiative, (GRI), (2007), "GRI Register", available at <http://www.globalreporting.org/ReportsDatabase/SearchTheDatabase/>, accessed 30 March 2007.
- Hannam, P. (2007). "Emissions Trade on Ice until 2011", *The Age*, Business Day, April 10, p. 2.

- Hopkins, M. (2005). "Measurement of Corporate Social Responsibility", *International Journal of Management and Decision Making*, 6(3/4), pp. 213-231.
- Intergovernmental Panel on Climate Change (IPCC), (2007), "Climate Change 2007: The Physical Science Basis", available at www.ipcc.ch/SPM2feb07.pdf, accessed 30 March 2007.
- International Auditing and Assurance Standards Board (IAASB), (2004) "ISAE 3000: Assurance Engagements Other than Audits or Reviews of Historical Financial Information", New York.
- International Organization for Standardization (ISO), (2006), "ISO 14064-3: Greenhouse Gases – Part 3: Specification with Guidance for the Validation and Verification of Greenhouse Gas Assertions", Geneva.
- Investor Group on Climate Change Australia/New Zealand (IGCC), (2006), "Carbon Disclosure Project Report 2006 Australia & New Zealand", available at <http://www.cdproject.net/>, accessed 30 March 2007.
- Janissen, B. (2007). "Emissions Trading: New Markets for the 21st Century", *INFINACE*, March, pp. 38-40.
- KPMG. (2005). *KPMG International Survey of Corporate Responsibility Reporting 2005*. Amsterdam: KPMG Global Sustainable Services.
- Lantos, G. P. (2001). "The Boundaries of Strategic Corporate Social Responsibility," *Journal of Consumer Marketing*, 18(7), pp. 595-630.
- Mathews, M. R. (1997). "Twenty-five Years of Social and Environmental Accounting Research: Is there a silver jubilee to celebrate?," *Accounting, Auditing and Accountability Journal*, 10(4), pp. 481-531.
- Matten, D., and Crane, A. (2005). "Corporate Citizenship: Toward An Extended Theoretical Conceptualization," *Academy of Management Review*, 30(1), pp. 166-179.
- Mock, T., Strohm, C. and K. Swartz, (2007), "An Examination of Worldwide Assured Sustainability Reporting", *Australian Accounting Review*, 17 (1): pp. 67-77.
- NIVRA - Koninklijk Nederlands Instituut van Registeraccountants (2007), "Assurance Engagements Relating to Sustainability Reports", available at <http://www.nivra.nl/> accessed 30 March 2007.
- NSW Greenhouse Office, (2007), "Greenhouse Gas Reduction Scheme", available at <http://www.greenhousegas.nsw.gov.au/>, accessed 30 March 2007.
- Orlitzky, M. (2001). "Does Firm Size Comfound the Relationship Between Corporate Social Performance and Firm Financial Performance?," *Journal of Business Ethics*, 33(2), pp. 167-180.
- Orlitzky, M. (2005). "Payoffs to Social and Environmental Performance," *The Journal of Investing*, 14(3), pp. 48-51.
- Orlitzky, M., Schmidt, F. L., and Rynes, S. L. (2003). "Corporate Social and Financial Performance: A Meta Analysis," *Organization Studies*, 24(3), pp. 403-441.
- Parliamentary Joint Committee on Corporations and Financial Services (PJCCFS), 2006, "Corporate Responsibility: Managing Risk and Creating Value", available at http://www.aph.gov.au/senate/committee/corporations_ctte/corporate_responsibility/report/index.htm, accessed 30 March 2007.
- Preston, L. E., and O'Bannon, D. P. (1997). "The Corporate Social-Financial Performance Relationship," *Business and Society*, 36(4), pp. 419-429.
- Ratnatunga, J., Vincent, M., and Duval, L. (2005). "The Need for a 5-Star Reporting Index™ for the Ranking of Publicly Listed Companies: A Conceptual Framework",

Journal of Applied Management Accounting Research, 3(2), pp. 1-20.

Regional Greenhouse Gas Initiative (RGGI), (2007), "Regional Greenhouse Gas Initiative: An Initiative of the Northeast and Mid-Atlantic States of the U.S.", available at <http://www.rggi.org/about.htm>, accessed 30 March 2007.

Salzmann, O., Ionescu-Somers, A., and Steger, U. (2005). "The Business Case for Corporate Sustainability: Literature Review and Research Options", *European Management Journal*, 23(1), pp. 27-36.

Shank, T., Manullang, D., and Hill, R. (2005). "Doing Well While Doing Good" Revisited: A Study of Socially Responsible Firms' Short-Term versus Long-term Performance," *Managerial Finance*, 31(8), pp. 33-46.

Stern, N., (2006), "Stern Review Report on the Economics of Climate Change", available at http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm, accessed 30 March 2007.

Tandukar, A. (2007). "From Neutral into Drive", *BRW - Innovation*, March 15-21, pp. 74-75.

Tounson, A. (2007). "Exxon, Greens in Carbon Consensus", *Weekend Australian, Business*, March 24-25, p. 36.

United Nations Conference on Trade and Development (UNCTAD), (2006), "Review of Practical Implementation Issues of International Financial Reporting Standards", available at http://www.unctad.org/en/docs/c2isar18_en.pdf, accessed 30 March 2007.

Waddock, S. A., and Graves, S. B. (1997). "The Corporate Social Performance-Financial Performance Link", *Strategic Management Journal*, 18(4), pp. 303-319.

Walters, K. (2006). "Certified Green", *Business Review Weekly*, 16-22 November, pp. 39-40

World Business Council for Sustainable Development & World Resources Institute, (2007), "The Greenhouse Gas Protocol – The GHG Protocol for Project Auditing", available at http://www.ghgprotocol.org/DocRoot/m1Tv5lnUuFTjYZx3x1ev/GHG_Project_Protocol.pdf, accessed 30 March 2007.

APPENDIX ONE: Accreditation, Measurement and Assurance in the Environmental Arena in Australia

Organisations offering auditing, reporting standards, ranking, accreditation and/or endorsements for environmentally sustainable products or services:

1. AccountAbility: *AA1000 Auditing Standard*.
2. Auditing and Assurance Standards Board Framework: *ISAE 3000 Auditing Standard*.
3. Australian Greenhouse Office: *Greenhouse Friendly*.
4. Australian Greenhouse Office, the CSIRO and the Australian National University:
5. Australian Environmental Labelling Association: *Good Environmental Choice label*.
6. Carbon Trust (UK): *Carbon Accreditation Audits*.
7. Climate Group (UK): *Voluntary Carbon Standard*.
8. Cooperative Research Centre for Greenhouse Accounting
9. Cooperative Research Centre for Greenhouse Gas Technologies
10. Dow Jones Sustainability Index: *Publishes rankings of companies on sustainable practices by industry, geography and other criteria*.
11. Electricity Retailers in NSW: *Certification*.
12. Ernst & Young Environment and Sustainability Services: *Audits using ISAE 3000 and other standards if requested*.
13. Ethical Investment Association: *Certification*.
14. Forest Stewardship Council: *FSC logo*
15. Green Electricity Watch: *Ranks the environmental performance of electricity companies (STAR) Ratings*.
16. Greenhouse Gas Protocol Initiative: *GHG protocol corporate standard*.
17. Green Pages Australia: *Advertisers must meet the organisation's criteria*
18. Standards Australia: *Under Development*
19. United Nations Conference on Trade and Development's (UNCTAD): *Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting*
20. The United Nations Framework Convention on Climate Change (UNFCCC): *Intergovernmental Panel on Climate Change Report*
21. US EPA: *Waste Reduction Model (WARM)*
22. US EPA: *Recycled Content (ReCon) Tool*
23. World Wildlife Fund (WWF): *Gold Standard*.