

An Analysis of Australia's Carbon Pollution Reduction Scheme

Tek Narayan Maraseni^A

Australian Centre for Sustainable Catchments
University of Southern Queensland (USQ), Toowoomba, Queensland, 4350,
Australia,

Jerry Maroulis

Faculty of Education and Australian Centre for Sustainable Catchments
USQ, Toowoomba, Queensland, 4350, Australia

Geoff Cockfield

Faculty of Business and Australian Centre for Sustainable Catchments
USQ, Toowoomba, Queensland, 4350, Australia

ABSTRACT

The authors review the decision-making since the Labour Government came into office (November 2007). The Australian Government's 'Carbon Pollution Reduction Scheme' White Paper (15 December 2008) proposes that an Australian Emissions Trading Scheme (AETS) be implemented in mid 2010. Acknowledging that the scheme is comprehensive, the paper finds that in many cases, Australia will take a softer approach to climate change through the AETS than the European Union ETS (EUETS). The paper assesses key issues in the White Paper such as emissions reduction targets, GHG coverage, sectoral coverage, inclusion of unlimited quantities of offsets from Kyoto international markets and exclusion of deforestation activities.

Key Words: Australian Emissions Trading Scheme, Kyoto Protocol, greenhouse gas coverage, agriculture, offsets

^A Corresponding authors details: email maraseni@usq.edu.au ; phone 61746312995; fax 61746315581

INTRODUCTION

The previous Australian government, led by John Howard, played an important role in assisting in the development of the Kyoto Protocol's rules. Nevertheless, the government always refused to ratify the Protocol for two reasons:

- the Australian economy is highly dependent on fossil fuels and thus there were claims that ratifying the Kyoto Protocol would damage the Australian economy and,
- when climate change policy was being developed in 1990, developing countries accounted for only 40% of total global greenhouse gas (GHG) emissions. This increased to 54.3% in 2004 and is expected to increase to 66% by 2030 [1].

The Federal Howard Government believed that without shouldering the responsibility of emissions reduction from developing countries, the overarching target of global emissions reduction could not be achieved.

Sherrard and Tate [2] argued that if Australia had ratified the Kyoto Protocol earlier and developed a domestic emissions trading system, Australian farmers would have earned >\$1.8 billion in revenue by simply selling carbon from reduced forest clearing practices. They also found that the Australian economy lost ~\$3.8 billion of economic activity each year by not ratifying the Kyoto Protocol. These losses comprise:

- “\$1.24 billion per year in lost opportunities associated with emissions reductions projects in Australia;
- \$2.38 billion per year in lost opportunities associated with the Kyoto Protocol's Clean Development Mechanism projects in other countries; and
- \$180 million per year in lost opportunities associated with carbon credit transactions”[3].

The loss would have been even greater if the cost of failing to preserve the competitiveness of Australian coal, liquid natural gas exports and the retardation of new technology development was included [4].

There has always been debate among the Australian political parties on ratification. Commissions such as the Howard Government's Task Group on Emissions Trading (TGET), the states and territories' National Emissions Trading Task Force (NETT) and the Garnaut Climate Change Review [5] were established in consequence. With the demise of the Howard government on November 24, 2007, the newly elected Rudd government moved swiftly to ratify the Kyoto Protocol in early December 2007. Furthermore, Professor Garnaut not only commented that action on climate change was needed immediately, but also that Australia would be hurt more than other countries by unmitigated climate change because the continent is predominantly dry and surrounded by highly climate change vulnerable developing countries [5]. Despite many developed countries and some highly polluting developing countries not committing to significant cuts in GHG emissions, along with the absence of a post-Kyoto agreement, Australia is nonetheless pushing ahead with its Australian Emissions Trading Scheme (AETS) and its carbon targets in an attempt to pressure other countries to make global contributions to reduce GHG emissions.

The current Australian Government plans to implement its comprehensive climate change strategies that include mitigation, adaptation, and assisting global communities to seek global solutions. As a mitigation strategy, the Australian Government is committed to reducing Australia's GHG emissions by 60% below 2000 levels by 2050 [6]. To meet this target in a cost effective manner, the Australian Government's White Paper (15 December 2008) proposed a comprehensive Carbon Pollution Reduction Scheme (CPRS), scheduled to be implemented in mid 2010 [6].

This paper comments on the Federal Government's White Paper with reference to contemporary emissions trading schemes. In addition, it briefly discusses the evolution of the Kyoto Protocol and the theory behind emissions trading schemes.

KYOTO PROTOCOL AND EMISSIONS TRADING

Climate change caused by greenhouse gas (GHG) emissions is a major environmental issue for the world, now and in the future. Because of climate change, it is estimated that global air temperature could increase by 1.8°-4.0°C while sea level could rise by 9-88cm over the next 100 years [7]. Further, the zone of grain production will shift away from the equator by 10 km/yr [8]. With increased temperatures, many respiratory and cardiovascular diseases, coral bleaching and the frequency of heat waves, cyclones and extreme precipitation will increase [9-10].

The United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and the subsequent Conferences of Parties (COPs) raised concerns about stabilizing GHG concentrations in the atmosphere. The Kyoto Protocol, the third COP in 1997, was an important milestone as, for the first time, the majority of developed countries realised they were responsible for past emissions and accepted legally binding caps on GHG emissions [11]. In the Protocol, individual developed nations (Annex B countries) were allocated differentiated targets to achieve a collective GHG reduction target of at least 5.2% of 1990 levels by the first commitment period (2008-2012). The European Union (EU) agreed to reduce emissions by 8%, Canada and Japan by 6% while Australia was generously allowed to increase GHG emissions by 8% of 1990 levels in the first commitment period for two reasons [12].

1. Australia is a net emitter of GHG from land use and the forestry sector [13-14], and

2. Australia's economy is highly dependent on fossil fuels with energy exports accounting for \$38 billion per year, which is equivalent to 28% of total commodity exports [1].

To achieve these targets in a cost-effective manner, the Protocol adopted three flexible market-based mechanisms:

- International Emissions Trading,
- Joint Implementation (JI) and
- Clean Development Mechanism (CDM).

Since then, the carbon market has been steadily increasing — an estimated A\$67 billion in 2007, A\$30 billion in 2006, three times greater than the previous year which was itself 12 times greater than 2004 [15-17], and with this level of growth, it will shortly be the world's largest market [18].

Under JI, an Annex I country can meet part of its emission reduction target by carrying out a project in another Annex I country, whereas in CDM the project activities must be hosted by a non-Annex 1 country (developing country). CDM and JI help host countries with technology transfer and in achieving sustainable development.

International emissions trading involves the trading of emissions among the Annex B countries. The economic rationale, based on the seminal work of Coase [19] and Dales [20], is that each Annex B country could have different marginal abatement costs (MAC)—the cost of eliminating an additional unit of GHG—and trading among these countries provides an opportunity to find cost-effective ways to achieve the specified emissions reduction targets. A country in which MAC is lower than the market price can reduce emissions and sell the surplus to another Annex B country for which the MAC is higher than the market price and therefore abates a lesser quantity of emissions (up to the point where MAC and market price meet) and buy the deficit amount [21]. By using

these comparative advantages available to Annex B countries, both the buyers and the sellers will have benefited.

Through this basic principle, many other emissions trading schemes have been replicated at national and regional levels. Examples include the European Union Emissions Trading Scheme (EUETS), the New Zealand Emissions Trading Scheme (NZETS), the UK Emissions Trading Scheme (UKETS), and recently the Canadian and now the Australian Emissions Trading Scheme (AETS). Under these national (or domestic) emissions trading schemes, governments set emissions obligations to be reached by the participating entities, then the entities that emit more emissions than their allocated quota would have to buy credits from entities with a surplus. Non-compliers are penalised by being charged higher costs than the market price.

THE PROPOSED AUSTRALIAN EMISSIONS TRADING SCHEME (AETS)

1. Background of the AETS

The AETS (known as the Carbon Pollution Reduction Scheme (CPRS)) white paper proposed by the Australian Government [6] is very comprehensive in terms of the number of GHGs considered, sectoral coverage and the percentage of total national GHG coverage. The CPRS proposes to include all six major GHGs recognised by the Kyoto Protocol (these include: carbon dioxide (CO₂); nitrous oxide (N₂O); methane; sulphur hexafluoride; hydrofluorocarbon; perfluorocarbon). This compares with the EUETS—the largest carbon market in the world—which only included CO₂ in the first phase (2005-2007) and CO₂ and N₂O in the second phase (2008-2012) [22].

The AETS covers all sectors except agriculture; the decision whether to include agriculture under the AETS by 2015 will be made in 2013. But, the

EUETS does not cover both forestry and agricultural sectors. Similarly, the NZETS, which included forestry in 2008 and was supposed to include all other sectors (for instance, liquid fossil fuels in 2011, and agriculture, synthetic gases and waste in 2013) and all six GHGs in a stepwise manner [23], is being reviewed by the newly elected New Zealand government [6]. Therefore, the AETS is more comprehensive in terms of sectoral coverage.

The AETS covers over 75% of the national GHG emissions whereas the EUETS covers only 50% of EU GHG emissions. Moreover, in order to cover 75% emissions, the AETS will impact only around 1000 Australian companies (out of 7.6 million registered companies) that produce >25000 tCO₂e/yr, whereas the EUETS affects over 12000 companies to cover 50% of EU GHG emissions. Many small companies whose emissions are <5000 tCO₂e/yr are also covered in EUETS. About 57% of the total participants in the EUETS, representing the EU's cumulative annual emissions of 5%, produce <25,000 tCO₂e/yr [24]. The total one-off and recurrent costs (i.e., administration, monitoring, verification and certification costs) for these companies are high, and in some cases the costs of participation outweigh the benefits [24]. In this context, the AETS is considerably better than the EUETS, but as the AETS proposes to include six GHGs, the one-off and recurrent costs of participating companies in Australia would be higher than for European companies.

Benchmarking emissions, up to a prescribed level (>25,000 tCO₂e), is an effective way of reducing the one-off and recurrent costs to small emitters (those emitting <25,000 tCO₂e/yr), but in the long run it is necessary to include the small emitters for five reasons.

1. They are needed to achieve the emissions reduction targets and thereby achieve significant overall cuts in emissions. The White Paper claimed that around 75% of total emissions from Australia would be covered by the AETS.

How Australia is going to cover 75% GHG emissions is confusing, as it does not cover:

- forest clearing (contributes 11% of the national emissions);
- agriculture (contributes 17% of the national emissions and if we consider energy and transport used by agriculture it is up to 23%) [25]; and
- many polluting companies (only 1000 out of 7.6 million registered companies are included). Even if all 1000 companies affected by the scheme reduced their emissions by 80%—an impossible proposition—the Government target of reducing GHG emissions by 60% below 2000 levels by 2050, would not be met.

2. To provide a strong platform for the future under climate change.

3. To lower the carbon credit price (the broader the coverage, the lower the carbon price of AETS), which is needed for the smooth transition of the economy [5, 26, 27].

4. There is need for broad participation for innovation in emission reductions. Broad participation is one of the indicators of success of a scheme and is likely to generate innovation in emissions reduction [28].

5. If these small emitters/companies (which emits <25,000 tCO₂e) are not included, their emissions will be unchecked and there is every chance they will increase their emissions up to the benchmarked level. When considering these benefits, it is clear that many more companies could be included in the AETS. It is possible to reduce monitoring and reporting costs of these small companies by providing them with some form of exemption or applying simplified regulations to them.

2 The case for inclusion of the agricultural sector in the AETS

The proposed AETS, according to the White Paper [6], will initially cover all sectors except agriculture. Agriculture could be included in 2015, but the final decision will be made in 2013. The inclusion of agriculture under the AETS is a contentious issue in all domestic emissions trading systems [for detailed discussions about this issue, refer to 23, 28-31]. There are many unique features to the agricultural sector which make agriculture less suitable to include in an emissions trading scheme, such as the widely distributed nature of agriculture, the difficulty in measuring small changes in annual fluxes over wide areas, the non-permanence and reversibility of agriculture, and also high transaction and administration costs and leakages [26, 27, 32, 33].

Nevertheless, there are 7 reasons for including the agricultural sector in the AETS:

1. The Australian agricultural sector currently accounts for 17% of national GHG emissions and is the second largest source of emissions [34]; this contribution rises to 23% when agricultural energy and transport inputs are included [35]. This figure is significantly higher than corresponding values for the agricultural sectors in central and Eastern Europe (3%), former Soviet Union (3%) and the USA (5.5%) [31, 36].

2. From 1990 to 2005, Annex I countries collectively decreased their agricultural emissions by 10% [36] whilst Australia's emissions from agriculture increased by 3%, mainly from agricultural soil and increased savanna burning [27, 37]. The increase in Australia's emissions from agricultural soils was caused by a 325% increase in nitrogen fertiliser usage between 1987 and 2000 [37]. De-nitrification of nitrogen fertiliser emits significant amounts of N₂O [37], which has 310 times more global warming

potential than CO₂. Higher emissions from the burning of savannas are highly related with the positive SOI Phases (La Niña), which signifies higher than average rainfall in the Northern Territory. If emissions from agriculture are left unchecked, they are likely to increase dramatically in the future. These first two points indicate that if agriculture is not included in the AETS, then the Australian Government's emissions reduction target for 2050 would not be met.

3. There is significant potential for GHG mitigation in the agricultural sector [36]. Not all agricultural mitigation activities are impermanent. Examples of such long-term mitigation activities include the substitution of fossil fuels by bio-fuels; use of animal waste for bio-fuel production and replacement of inorganic fertilisers; the reduction of methane by feed management (improving feed efficiency and maximising digestibility); keeping highly productive animals; improving animal health and genotypes; and modifying rumen through feed additives [38, 39]. Similarly, increasing soil carbon also increases soil productivity, profitability, sustainability, water quality, plant and water holding capacity [4-46]: all being very important in the dry continent of Australia. These activities represent low-cost abatement options and thus win-win outcomes. In Europe, the reduction of livestock methane is the most cost-effective GHG mitigation option as recommended by the European Climate Change Program (2001). Although there is not much research in climate mitigation in the agricultural sector in Australia, a study conducted by the USA EPA [33] showed that the MAC for cropping activities are far less than the MAC for livestock which are less than the current carbon price.

4. To bring an AETS into the Australian economy (the most desired objective of the Australian Government) is only possible by lowering compliance costs (carbon price) and reducing the impact on national gross domestic product (GDP). If agriculture is included in the AETS, carbon price and GDP will be

significantly improved as it would reduce carbon prices from \$31/t to \$21/t and GDP from -1.1% to -8% [26].

5. Although agriculture contributes only 2% of the national GDP of Australia, 67% of agricultural products are exported. This is equivalent to 18% of all Australian merchandise exports [26, 47]. This compares with the global scenario where agriculture accounts for 24% of global GDP and provides employment for 22% (1.3 billion people) of the world's population [47]. There is an argument that including the agricultural sector in an emissions trading scheme would hurt agricultural exporters. But, agriculture will be affected even if it is not part of the AETS for two reasons:

- on-farm emission-intensive inputs such as fuel, fertilisers and chemicals account for up to 19% of farms costs [26] and these emission-intensive inputs will increase in price with emissions trading [26, 31]. On-farm costs of emissions intensive inputs (fuel, fertiliser and chemicals) were ~18%/yr from 2002/03 to 2006/07. Year 2006/07 was an abnormal drought year and therefore does not accurately represent the normal condition [26] and;
- if agriculture is not included, the carbon price will increase which further increases the emission-intensive input costs of agriculture. Therefore, the inclusion of agriculture in the AETS should be considered.

6. Although Australian soils are relatively infertile compared to many parts of the world, with a climate displaying the highest variability in rainfall and runoff on the planet, and competitors having subsidy schemes, Australian agriculture has always been remarkably competitive. If emissions trading schemes were implemented in all countries and if GHG emissions from agriculture were included, then New Zealand and Australia would benefit the most because of their reliance on grass feeding and all-year round outdoor husbandry in

comparison with emissions-intensive agriculture in Europe, North America, Japan and Korea [5, 48]. For example, the UK produces 35% more GHG emissions/kg of milk solid than New Zealand and 31% more emissions/ha than New Zealand - even when including transportation from New Zealand to Britain and the carbon dioxide generated in that process. Similar results are estimated for lamb. Even if food miles are considered, rearing and distributing British lamb produces more CO₂ emissions than importing the meat from New Zealand, as New Zealand farmers use more renewable energy but less fertiliser than in the UK [48]. By including agriculture in the AETS, Australia would accelerate international climate change negotiations for similar provisions around the world.

7. The pyrolysis of crop waste has many environmental and financial benefits for Australia. This process uses large quantities of agricultural residues and produces three environmentally friendly by-products (bio-oil and syngas, agrichar). Bio-oil can be used for fuelling space heaters, furnaces and boilers, and also to fuel some combustion turbines and reciprocating engines. Syngas can be burned directly, used as a fuel for gas engines and gas turbines, and for the production of methanol and hydrogen. Both syngas and bio-oil can be “upgraded” to bio-diesel and gasoline substitute. Agrichar can be injected directly into the soil and can be retained in soil for ~5,000 years [49]. Besides the carbon benefits, agrichar has many co-benefits for soils:

- reduces the leaching of soil nutrients;
- enhances nutrient availability for plants;
- increases water quality of runoff;
- reduces dependency on artificial fertilizers;
- reduces toxicity of aluminum to plant roots and microbiota;
- increases soil structure and pH, thus reducing the need for lime;

- reduces bioavailability of heavy metals, thus works as bioremediation; and
- decreases N₂O and CH₄ emissions from soils, thus further reducing GHG emissions [5-52].

In a country such as Australia, where 75% of agricultural land has <1% organic carbon and soil water retention is a major issue [53], agrichar has enormous potential for increasing the productivity, profitability and sustainability of soil systems and for the permanent sequestration of soil carbon. To promote the pyrolysis of agricultural wastes and injection of agrichar into Australian soils, agriculture should be included in the AETS.

3. Inclusion of the forestry sector in the AETS

The Australian Government has taken a positive step to include forestry in the AETS on an *'opt-in'* basis, and is considering bringing the issue of carbon sequestration benefits of harvested wood products, which can store carbon for tens of years in timber, furniture, flooring, decking etc, into international climate change negotiations (Australian Government, 2008). But, the Government does not plan to include deforestation in the AETS - a decision which should be reconsidered. By reducing forest clearing rates since 1990, Australia has already saved 75 MtCO₂e of emissions and by 2010, GHG emissions are expected to be reduced a further 83 MtCO₂e [2].

As Australia did not ratify the Kyoto Protocol during the term of the Howard Government and did not then have a domestic emissions trading system in place, Australian farmers lost >\$1.8 billion in revenue earned by selling carbon from reduced forest clearing practices [2]. There are stark differences in Australian GHG emissions calculations when taking into account clearing and non-clearing activities. For instance, if land clearing activities were not included, Australia's GHG emissions in 2005 were 125.6% of 1990 levels [12],

and in a *business-as-usual* scenario, emissions are predicted to exceed 137.5% in 2012. Thus, Australia would not meet its Kyoto target of 108% of 1990 levels by 2012. But, if forestry activities are included, Australia's GHG emissions in 2005 were 104.5% above the 1990 levels [12] and in a *business-as-usual* scenario emissions are expected to increase to 106.6% in 2012. This would be sufficient to allow Australia to meet its Kyoto target.

In Australia, forest has been extensively cleared for cropping and grazing. Although the rate of clearing decreased from 546,000 ha/year in 1988 to 187,000 ha/year during 2000 to 2003, it is still higher than the current average plantation rates of 74,000 ha/yr [14, 54]. Therefore, Australia is a net source of GHGs from the forestry sector, with 11% of national share [6]. If deforestation activities are not included in AETS, forest clearing activities may worsen. This would have adverse effects on unique floral and faunal diversity.

The Australian Government has been strongly supportive of the Reducing Emissions from Deforestation and Forest Degradation (REDD) initiative in international forums. Consequently, the Government has established a \$200 million International Forest Carbon Initiative to reduce GHG emissions from REDD in developing countries especially Indonesia and Papua New Guinea [55]. It would be beneficial if the Australian Government implemented a similar incentive mechanism for Australian farmers.

4. *Offset Credits*

Offset credits are credits given for emissions reductions in an uncovered domestic or international sector. In order to achieve an emissions reduction target in a cost-effective manner, the Kyoto Protocol adopted three flexible market-based mechanisms of which the Clean Development Mechanism (CDM) and the Joint Implementation (JI) are offset schemes. Offsets are important

weapons for achieving cheaper emissions reduction, broader participation and generating innovation in uncovered sectors.

The proposed AETS entertains unlimited international offsets, but does not consider domestic offsets, as it attempts to cover all domestic sectors. As with any emissions trading scheme, the AETS will increase the cost of living. Therefore, while designing the AETS, the major concern of the Government is the smooth transition of the AETS into the economy. In order to achieve this, the emissions reduction compliance costs should be kept as low as possible. As noted, this is possible through the provision of domestic and international offsets. The EPA (2008) in USA estimated that unlimited use of domestic offsets and international credits in the Lieberman-Warner Bill would help reduce carbon prices in 2020 by 71%, from US\$51/t to US\$15/t, compared to the Bill as reported out of committee, with equivalent GDP savings of US\$333 billion in 2020. If no offsets were allowed, the price would increase by 93% in 2020 [28]. Similarly, by allowing up to 15% international offsets would reduce carbon prices in 2015 from US\$40/t to US\$15/t, by which time the estimated impact on electricity prices would decrease from 20% to 7%, and natural gas prices from 10% to 5% [28].

CDM projects raise several issues;

- CDM encourages countries to avoid broader commitments and thus reward exactly the opposite behaviours;
- As at December 2008, 1360 CDM projects were registered by the CDM Executive Board with 17 of them as HFC-23 projects [56]. These projects are very cost effective (abatement costs of 0.5 €/tCO_{2e}; [57]) and thus are highly beneficial for project owners and investors. But, they do not support sustainable development (one of the main objectives of the CDM)

[56-57]. Surprisingly, these 17 projects are expected to share >55% of the total carbon credits [56].

- CDM offsets create asymmetrical incentives that encourage only some activities to “opt-in” to regulation while leaving other emissions unchecked. Thus, the overall effect would not be encouraging [58].

Considering all these issues, some developed countries are either limiting or completely avoiding credits from CDM projects. Some companies are more concerned about their reputation and brand protection and are hesitant to develop projects that do not adequately support the sustainable development objectives [16-17]. For example, in the EUETS, the amount of CDM and JI credits allowed during Phase III (2012-2020) is restricted to what is left from the 1,400 MtCO₂e allowed during Phase II (2008-2012). This removes any new demand from CDM and JI projects (World Bank, 2008). The proposed Lieberman-Warner Bill, Climate Security Act (2007) in the USA does not recognise CDM [17]. Similarly to discourage *hot air* sales, many buyer countries demanded the inception of a Green Investment Scheme (GIS), as there is political resistance in Annex B countries to acquiring emissions reduction benefits that occurred not because of environmental action, but as a result of economic collapse two decades ago [17].

The concept of a GIS offers an approach to overcome this issue of environmental additionality. It is a voluntary mechanism established by a selling country to assure buyers that money from transactions will finance bilaterally agreed environmental- and climate-friendly projects and programs. These include direct investment in projects or policies to encourage fuel switching and non-fossil energy use and improve energy efficiency. They support environmental objectives such as slowing the rate of deforestation or other measurable policy and investment initiatives. Bulgaria, Latvia, Czech

Republic, Romania, Hungary, Poland, Ukraine and Russia have expressed their interest to set-up a GIS [17].

By allowing unconditional, unlimited, international offsets, the financial burden to the Australian people would be low but the AETS would appear weak in international carbon markets. In extreme cases, if other developed countries do not allow international offsets, Australian pollution permits may not be fungible in international markets. Therefore, while making policy for international offsets (CDM and JI projects), Australia needs to be consistent with the market provisions of Europe and the USA.

5. *Allocation of pollution permits*

There are several ways of allocating pollution permits, although they are always debated between the business community and economists: the business community prefer free allocation whereas economists favour auctions [59]. In the EUETS, 95% of total permits in Phase I (2005-2007) and 90% of total permits in Phase II (2008-2012) were allocated freely [22]. In New Zealand, free permits were given to forestry owners. Forestry is the only sector included in the NZETS in 2008 [23].

The AETS follows the economists' view and proposes to auction most of the permits. Therefore, unlike other emissions trading schemes, the AETS will generate a significant revenue stream (around \$11.5 billion in 2010-11 and \$12 billion in 2011-2012). This could be used to support middle and low income households, "emissions intensive trade exposed industries", "strongly affected industries", fuel tax adjustment and managing the climate action fund [6]. Thus, the AETS makes the polluters confront social equity issues. This aggressive approach could result in a backlash from the Australian business sector.

At this preliminary stage of the AETS, when no emissions reduction obligations exist elsewhere in developing and in many developed countries, and

the post-Kyoto rules are not yet set, a ‘softer’ approach of allocating pollution permits as in the EUETS would boost the confidence of the Australian business community. Otherwise, highly polluting Australian companies, which are emissions-intensive but not trade-exposed, could shift to countries with no emissions reduction obligations but an abundance of cheap labour. This outcome would hurt Australia’s economy and also make the main objective of the UNFCCC, to reduce the impact of net global burden of GHG emissions, unachievable. Therefore, as in other emissions trading systems, free permit allocations would make Australian companies more supportive, and would lessen the chance of Australian companies moving themselves and their emissions offshore to developing countries.

6. *Global share*

Australia accounts for only 1.5% of global emissions [27]. If Australia achieves its emissions reduction target (60% below 2000 levels by 2050) it would have reduced its GHG emissions by 300 MtCO₂e/yr at the end of 2050. This is only 0.7% of current annual global emissions and 0.01% of the current atmospheric stock. Therefore, without involving the major global polluters, meeting the UNFCCC emission targets will not be possible. This is a global problem and requires a global solution. Australia should be vigilant and promote global action on GHG emissions, and at the same time continue to promote its aggressive but environmentally and economically responsible AETS.

Climate change is already happening with impacts being felt year by year. Even if all countries committed today to severely cut emissions, the effects will only be seen after a long period of time. In Australia, where climate change and climate variability are already having an enormous impact, even with modest temperature rises, drought is expected to increase by 70% in New South Wales, Melbourne's water supplies will be cut by more than a third, and the Murray-

Darling system will dry up by another 25% [60]. Therefore, adaptation should be given equal priority along with mitigation.

CONCLUSIONS AND RECOMMENDATIONS

The AETS is more comprehensive than any other ETS in the world, as it will cover all six GHGs, all domestic sectors (except agriculture) and 75% of the national GHG emissions since its commencement. But, in many other cases, Australia is going to take a softer approach to climate change than the EUETS. The Government's decision, to aim at softer emissions reduction targets and to permit unconditional and unlimited carbon credits from international markets, suggests that Australia is more concerned about the livelihood of its people than global solutions and international reputations. The international community believed that Australia, especially because it has at last ratified the Kyoto Protocol, would take a very hard-line and proactive approach to climate change. Instead, this watered-down approach has raised concerns about the AETS as a climate change solution. It seems that the AETS is highly influenced by short-term financial problems, not long-term climate change solutions. Moreover, Australia's short-term emissions reduction target (5% by 2020) is incompatible with her long-term emissions target (60% by 2050). How Australia can reduce its GHG emissions by a further 45% between 2020 and 2050, yet just 5% by 2020 is a question.

This dry continent, surrounded by climatically-fragile developing countries, will be hardest hit by climate change impacts [5]. Thus Australia should lead by example in its emissions reduction attempt, through implementing a sound and robust emissions trading scheme. If the AETS was stricter, then Australia would meet two objectives:

- influence global climate change negotiations; and

- pressure major polluters to take reciprocal actions.

Both of these are vital.

References

- [1] Department of the Prime Minister and Cabinet, 2007, Australia's climate change policy our economy, our environment, our future, One National Circuit, Barton ACT 2600 Australia p 46
http://www.pmc.gov.au/publications/climate_policy/docs/climate_policy_2007.pdf accessed 22 October 2007.
- [2] Sherrard J. and Tate, A., 2006, Australia's farmers miss out on \$billions, *Australian Emissions Trading Forum Review*, Oct/Nov 2006, pp 6-8.
http://www.aetf.emcc.net.au/pdf_reviews/ReviewOctNov2006.pdf accessed 24 October 2007
- [3] Sherrard, J. & Tate, A., 2007, The Business Case for Access to the Kyoto Protocol, The Australian Conservation Foundation. September 2007, p 1-18.
http://www.acfonline.org.au/uploads/res/Cambiar_report_FINAL_5-9-07.pdf, accessed 24 October 2007.
- [4] Maraseni, T.N, Maroulis, J. and Nooriafshar, M., 2008, An analysis of anthropogenic greenhouse gas emissions status of Annex I countries: can they meet Kyoto targets? *Australasian Journal of Business and Behavioural Sciences*, **3** (2). pp. 3-13.
- [5] Garnaut Climate Change Review, 2008, Final Report, 30 September 2008, accessed from <http://www.garnautreport.org.au/index.htm> on 30 December 2008
- [6] Australian Government, 2008, Carbon Pollution Reduction Scheme White Paper, Department of Climate Change, Canberra, December 2008
- [7] IPCC (Intergovernmental Panel on Climate Change), 2007, Climate Change 2007: The Physical Science Basis, Summary for Policy Makers, Cambridge University press, Cambridge.

- [8] Quiggin, J. & Horowitz, J., 2003, Costs of adjustment to climate change. *The Australian Journal of Agricultural and Resource Economics*, **47**, 429-446.
- [9] Preston, B. L. & Jones, R. N., 2006, Climate change impacts on Australia and the benefits of early action to reduce global GHGs emissions. CSIRO, Australia.
- [10] Stern, N., 2006., Stern review: The economics of climate change, accessed 7 April 2008, http://www.hm-treasury.gov.uk/media/3/2/Summary_of_Conclusions.pdf
- [11] UNFCCC, 1997, The Kyoto Protocol to the United Nations Framework Convention on Climate Change, UNEP/WMO.
- [12] UNFCCC, 2007, Kyoto Protocol: status of ratification, accessed 18 October 2007 from http://unfccc.int/files/kyoto_protocol/background/status_of_ratification
- [13] Australian Government, 2005, National plantation inventory Australia: 2005 updates, <http://affashop.gov.au/PdfFiles/>, accessed 10 September 2006.
- [14] AGO (Australian Greenhouse Office), (2000), Land clearing: a social history”, National Carbon Accounting System, Technical Report no 4, Greenhouse Office, Canberra.
pp. 492-515
- [15] World Bank, 2007, State and trends of the carbon market 2007, Washington, D.C. assessed 24 December 2007
<http://carbonfinance.org/docs/>
- [16] World Bank, 2008, State and trends of the carbon market 2008, Washington, D.C. assessed from <http://siteresources.worldbank.org/NEWS/Resources/State&Trendsformatted06May10pm.pdf> on 16 May 2008
- [17] Point Carbon, 2008, Carbon market monitor, 17 January 2008, www.pointcarbon.com

- [18] Hodge, N., 2007, Trading carbon credits: The world's next biggest market assessed 24 December 2007 <http://www.energyandcapital.com/articles/>
- [19] Coase, R., 1960, The problem of social cost. *Journal of Law and Economy*, **13** (1) pp1-44
- [20] Dales, J., 1968, Pollution, property and prices, University of Toronto Press, Toronto
- [21] IEA (International Energy Agency), 2001, International Emissions Trading from concept to reality Organisation for Economic Co-Operation and Development, Paris, accessed on 15 June 2008 from <http://www.iea.org/textbase/nppdf/free/2000/trading2001.pdf>
- [22] European Commission, 2007a, EU action against climate change, EU emissions trading — an open system promoting global innovation, 20 pp accessed 11 August 2008 from http://ec.europa.eu/environment/climat/pdf/bali/eu_action.pdf
- [23] MAF (Ministry of Agriculture and Forestry), 2007, Commentary on the Exposure Draft of the Climate Change (Forestry Sector) Regulations, accessed 18 June 2008 from <http://www.maf.govt.nz/climatechange/legislation/regulations/>
- [24] European Commission, 2007b, Small installations within the EU Emission Trading Scheme, report under the project “Review of EU Emissions Trading Scheme” pp32, accessed 11 August 2008 from http://ec.europa.eu/environment/climat/emission/pdf/finalrep_small_installations.pdf
- [25] Hatfield-Dodds, S., Carwardine, J., Dunlop, M., Graham, P. and Klein, C., 2007, Rural Australia Providing Climate Solutions. Preliminary report to the Australian Agricultural Alliance on Climate Change. CSIRO Sustainable Ecosystems, Canberra

- [26] ABARE (Australian Bureau of Agricultural and Resources Economics), 2007, Climate change, *Australian Commodities*, **14**, no. 3, September quarter.
- [27] DCC (Department of Climate Change) 2008, National greenhouse gas inventory 2006, Department of Climate Change, Australian Government, accessed 11 August 2008 from <http://www.climatechange.gov.au/inventory/2006/pubs/inventory2006.pdf>
- [28] IETA (International Emissions Trading Association), 2008, Making the case for a federal greenhouse gas offsets program, <http://www.ieta.org/ieta/www/pages/getfile.php?docID=2968> assessed 15 June 2008.
- [29] Cowie, A. L., Kirschbaum, M. U. F., & Ward, M., 2007, Options for including all lands in a future greenhouse gas accounting framework. *Environmental Science & Policy*, **10**, 306-321.
- [30] PMTG (Prime Ministerial Task Group on Emissions Trading), 2007, Report of the task group on emissions trading, Commonwealth of Australia, 2007.
- [31] NFF (National Farmers' Federation), 2007, Submission to the prime ministerial task group on emissions trading from the National Farmers' Federation, accessed 28 June 2008 from http://www.pmc.gov.au/climate_change/emissions/task_group/submissions/212_sub_emissionstrading.pdf
- [32] DEFRA (Department for Environment, Food and Rural Affairs), 2006, Market based mechanisms for greenhouse gas reductions in the agriculture, forestry and land management sector' accessed 17 June 2008 from <http://www.defra.gov.uk/environment/climatechange/uk/>
- [33] LWA (Land and Water Australia), 2007, Agriculture, forestry and emissions Trading: how do we participate? Issues paper May 2007.

Retrieved 14 June 2008 from

http://downloads.lwa2.com/downloads/publications_pdf/ER071301.pdf.

- [34] NGGI (National Greenhouse Gas Inventory), 2007, National greenhouse gas inventory 2005, Australian Government, Canberra
- [35] AGO (Australian Greenhouse Office), 2006, Reducing GHG emissions from Australian agriculture: the role of benchmarking in driving best management practice, assessed on 17 December 2007
<http://www.greenhouse.gov.au/agriculture/publications/pubs/benchmarking.pdf>,
- [36] Smith, P., Martino, D., Cai, Z., Gwary, D., Janzen, H.H., Kumar, P., McCarl, B., Ogle, S., O'Mara, F., Rice, C., Scholes, R.J., Sirotenko, O., Howden, M., McAllister, T., Pan, G., Romanenkov, V., Schneider, U., Towprayoon, S., Wattenbach, M. & Smith, J.U. (2008). Greenhouse gas mitigation in agriculture', *Philosophical Transactions of the Royal Society*, B. **27**, 89-813.
- [37] Dalal, R.C., Wang, W., Robertson, G.P. and Parton, W.J., 2003, Nitrous oxide emission from Australian agricultural lands and mitigation option: a review. *Australian Journal of Soil Research*, **41**, 165–195.
- [38] CLAN (Climate Change in Agriculture and Natural Resource Management), 2006, Reducing greenhouse gas emissions from Australian agriculture: the role of benchmarking in driving best management practice accessed 26 June 2008 from
<http://www.greenhouse.gov.au/agriculture/publications/pubs/benchmarking.pdf>
- [39] Maraseni, T.N., & J. Maroulis, 2008, Piggery: From environmental pollution to a climate change solution, *Journal of Environmental Science and Health Part B* **43** (4): 358-363
- [40] Bhattacharyya, R., Kundu, S., Pandey, S. C., Singh, K. P. & Gupta, H. S, in press, Tillage and irrigation effects on crop yields and soil properties under

the rice-wheat system in the Indian Himalayas. *Agricultural Water Management*, In Press.

- [41] Lal, R., 2004, Soil carbon sequestration impacts on global climate change and food security. *Science* **304**, 1623–1627.
- [42] Jones, C., 2006, Soil carbon means water for me, paper presented in Border Rivers-Gwydir CMA and Grain Graze “Practical clues for pasture cropping” workshops, at Malgardi 27 February, Gowrie 28 February and Kyabra 1 March 2006. accessed 28 June 2008 <http://www.managingwholes.com/soil-carbon-means-water.htm>
- [43] Kuntal, M., Hati, A. S., Dwivedi, A.K., Misra, K.K., 2007, Changes in soil physical properties and organic carbon status at the topsoil horizon of a vertisol of central India after 28 years of continuous cropping, fertilization and manuring, *Agriculture, ecosystems & environment*, **119**, pp.127-134
- [44] Pittaway, P., 2006, Putting a dollar value on organic carbon in soil’, accessed 24 April 2008 from http://www.bfa.com.au/_files/CANDO%2016.doc
- [45] Reynolds, W. D., Drury, C. F., Yang, X. M., Fox, C. A., Tan, C. S. & Zhang, T. Q., 2007, Land management effects on the near-surface physical quality of a clay loam soil. *Soil and Tillage Research*, **96**, 316-330.
- [46] Ross, D.S., 2007, A carbon-based method for estimating the wetness of forest surface soil horizons, *Canadian Journal of Forest Research*, **37** (4), p846-852,
- [47] Dean, T., 2000, Development: agriculture workers too poor to buy food. UN IPS, New Work.
- [48] Lincoln University, 2007, New ‘food miles’ report shows NZ dairying still more efficient than UK, greenhouse gases included, 27th July 2007, accessed 26 June 2008, <http://www.lincoln.ac.nz/story21175.html>

- [49] Cheng C.H., Lehmann, J. and Engelhard, M., 2008, Natural oxidation of black carbon in soils: changes in molecular form and surface charge along a climosequence, *Geochimica et Cosmochimica Acta* **72**, pp1598-1610.
- [50] Lehmann, J.A., Gaunt, J. and Rondon, M., 2006, Bio-char sequestration in terrestrial ecosystems – a review, *Mitigation and Adaptation Strategies for Global Change* **11**, 403-427
- [51] Yanai, Y., Toyota, K. and Okazani, M., 2007, Effects of charcoal addition on N₂O emissions from soil resulting from rewetting air-dried soil in short-term laboratory experiments. *Soil Science and Plant Nutrition* **53**, 181-188
- [52] Mathews, J. A., 2008, Carbon-negative bio-fuels, *Energy Policy*, **36**, 940-945.
- [53] Russell, K., 2008, Zero waste Australia, a letter submitted to the Garnaut Climate Change Review, Melbourne, accessed 17 July 2008, from www.zerowasteaustralia.org
- [54] BRS (Bureau of Rural Science), 2005, National Plantation Inventory Australia: 2005 Updates, <http://affashop.gov.au/PdfFiles/>, accessed 10 September 2006.
- [55] Minister for Climate Change and Water and Minister for Foreign Affairs, 2008, Media release on 23 April 2008, \$3 million to help reduce deforestation in Papua New Guinea accessed 11 August 2008 from <http://www.environment.gov.au/minister/wong/2008/pubs/mr20080423.pdf>
- [56] UNFCCC, 2008, CDM statistics, access from <http://cdm.unfccc.int/Statistics/index.html> on 12 December 2008
- [57] Liu X., 2008, Rent extraction with a type-by-type scheme: an instrument to incorporate sustainable development into the CDM. *Energy Policy* **36**: 1873–1878.
- [58] Warra, W. W. and Victor, D.G., 2008, A realistic policy on international carbon offsets, published by Program on Energy and Sustainable Development Working Paper #74, April 2008.

- [59] Hepburn, C., Grubb, M., Neuhoff, K., Matthes, F. & Tse, M., 2006, Auctioning of EU ETS phase II allowances: how and why? *Climate Policy* **6**, 137–160.
- [60] Anderson, M., 2009, Australia Government Blames deadly heat wave on climate change, access from <http://www.desmogblog.com/australia-government-blames-deadly-heat-wave-climate-change> on 10 February 2009