

Submission to  
**The Garnaut Climate Change Review**

Regarding  
**Land use – Agriculture and Forestry**

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## Executive summary

### We submit to the Garnaut Review

1. In order for Australia's citizens to make an appropriate contribution to solving the global problem of human induced climate change, they must be informed that the well being of the environment, including the atmosphere, will ultimately and absolutely determine the health of both our own and the global economy
2. The elevated levels of GHGs currently in the atmosphere were first released by Phase 1 producers (see Definitions). There are relatively very few Phase 1 producers.
3. Phase 1 producers have been encouraged to produce GHGs into the atmosphere, as the economic system now operating makes it possible and desirable for them to externalise the ecological and social, and therefore ultimately the financial costs of their production.
4. Phase 2 producers take products from Phase 1 producers and change their form, function, utility and value. They do not add additional GHGs into the system. The total mass of GHGs produced by Phase 2 producers can be no more than the mass initially introduced into the system by Phase 1 producers. There are a great many Phase 2 producers.
5. A reduction in demand by Phase 2 producers, through efficiency gains or other mechanisms, reduces the demand for Phase 1 production.
6. In order to internalise the existing externalities, all Phase 1 producers must bear a financial burden that reflects the true cost of their production. This financial burden must be set by market forces. Phase 1 producers should be the point of direct imposition of the true financial cost of all GHG production.
7. In order to establish the market, the Government need impose a cap and trade system only on ALL Phase 1 producers. The cap should continue to reduce in absolute terms until future production has been reduced (ideally to zero) and the elevated levels of atmospheric GHGs that now exist have also been reduced, ideally to pre-industrial levels.
8. Phase 1 consumption of atmospheric cyclical GHGs takes place via natural functions including the photosynthetic process. The carbon contained in some of the cyclical GHGs is first converted to plant material, and then through the food chain to all living organisms. The plants, and the organisms they sustain, are collectively termed the *biota*.
9. Two of the five major carbon sinks identified by the Intergovernmental Panel on Climate Change (IPCC) remain largely unexploited. In fact they currently produce rather than consume atmospheric GHGs. These two are soil and biota. Soil, which holds carbon deposited by plants, has a potential storage capacity 2.5 times that of the biota.
10. The full internalisation of all Phase 1 production costs through a cap and trade system and market forces, should be used to create the structural incentives that are necessary to facilitate the rapid adoption of existing (usually) low-technology, but management and knowledge intensive practices that boost the effectiveness of the natural Phase 1 consumption processes.
11. There is a so far unrecognised opportunity to consume some cyclical GHGs into the soils of up to 488 million hectares of Australia's savannah lands. The global potential for such management is approximately 5 billion hectares. Globally, each 1% change in soil organic matter over 5 billion hectares of savannah land will reduce atmospheric GHG levels expressed in terms of CO<sub>2</sub> equivalent by 64 parts per million (ppm).
12. Australia has the opportunity to be world leader in the management and knowledge intensive practices that boost the effectiveness of the natural Phase 1 consumption processes .

13. This arrangement means that the people who originally produce GHGs pay and those who consume GHGs are paid.

## **Definitions**

### ***Production and consumption***

We submit that all GHGs are '*produced*' into the atmosphere and that some GHGs are '*consumed*' from the atmosphere. Adopting these two concepts will assist in developing a sound policy and solution to the problem of global warming

### ***Phase 1 and Phase 2***

Both Production and Consumption of GHGs occur at two levels, which we have termed *Phase 1* and *Phase 2*.

*Phase 1 production* occurs when there is a 'first harvest' of GHGs. Typically this occurs as a result of either: a) the release of fossil energies and associated gases from their previous long term storage, b) land use change when there is removal of existing biomass such as by clearing of rainforests or savannahs, c) the release into the atmosphere of man-made GHGs such as halocarbons, and d) the production of agricultural products such as food, fibre and grain crops, plantation tree farms and production from managed grasslands and savannahs grazed by domestic animals.

*Phase 2 production* occurs when the outputs of the Phase 1 producer are taken in by the vast array of downstream businesses who transformed them into products of higher value, form or utility. Phase 2 production includes power generation, refinery products, and the production of all goods and services, including concentrated animal feeding operations.

**NB:** We strongly submit that the total GHGs produced throughout the entire system by all of the Phase 2 producers cannot be more than the amount initially introduced to the system by the Phase 1 producers.

*Phase 1 consumption* occurs as something new grows that did not previously exist. The photosynthetic process is usually involved in Phase 1 consumption.

*Phase 2 consumption.* We are unable to identify any Phase 2 consumption.

### ***Cyclical and linear***

*Cyclical GHGs* can be produced naturally or through the management decisions of humans. Regardless of how they are produced, over various time scales they break down and are consumed, either back through the photosynthetic process or by photochemical decomposition in the atmosphere.

*Linear GHGs* include a range of man-made GHG products. They did not exist until the 20<sup>th</sup> century, are not part of nor can they contribute to any natural cycle, and therefore their production into the atmosphere is linear in nature.

### **Internalising existing externalities**

We believe that all Phase 1 producers are currently permitted to externalise or avoid incurring for themselves the real ecological, financial and social cost of their activities. This ignores a fundamental planetary truth – our ecosphere functions in a cyclical manner. If the cycle is overloaded or otherwise damaged, then not only will businesses be challenged in unexpected ways but the entire well-being of the planet will be challenged, perhaps to the point of human extinction. The feedback loops now arising from the current levels of atmospheric GHGs are a clear indication that local economic decisions do affect global ecological and social outcomes. We contend that a decision or action that is not ecologically sound in both the short and long term cannot be considered financially sound, and that

actions that are not simultaneously financially and ecologically sound in the short and long term will not be socially sound.

**Reducing the current elevated levels of some atmospheric cyclical GHGs.**

Almost all focus in Australia, and throughout the world, is currently directed towards reducing future GHG production. It is clear that new GHG reducing technologies must be encouraged, and demand for products derived from GHG causing products must also be reduced. It is outside the scope of this paper to comment on the forms these solutions might take.

We note that virtually no effort has been directed at dealing with the task of consuming some of the cyclical GHGs produced in the past, which have already raised atmospheric CO<sub>2</sub> equivalent levels from 280ppm to 455ppm, moving to 550ppm<sup>1</sup>. These elevated levels are said to already be creating human induced global climate change, yet the almost universally held belief is that there is no practical way to bring them down.

Apart from some attempts since 1990 to encourage plantation tree farms, most thinking about the removal of elevated atmospheric cyclical GHGs has been directed towards finding technological solutions. Whilst reducing future GHG production will depend on advanced technological solutions, the immediate problem of consuming cyclical GHGs already in the atmosphere is a biological one that will depend on biological solutions.

In the absence of any current technological alternative, we suggest that Australia and the world have little option but to rapidly adopt policies that encourage increased Phase 1 consumption of GHG carbon. This carbon can be safely captured and stored into the largest manageable 'sink' that presently exists, which is the soils of the world. If, in the future, technological methods of consuming existing GHGs are also proven, we would encourage their adoption as well.

**Increasing Phase 1 consumption of cyclical GHGs**

Increasing the Phase 1 consumption of cyclical GHGs means expanding, on a national and international scale, the effectiveness of the only existing method of cycling and holding carbon that currently exists, which is the naturally occurring photosynthetic process.

We submit that an appropriate policy framework will lead to rapid and widespread adoption of existing low-technology but management and knowledge intensive practices that will, in particular, lead to restoration of vast areas of presently degrading savannah lands.

In Australia, approximately 488 million hectares (58% of the national land area) is savannah land. These lands are currently and erroneously seen as over-utilized. The restoration of these savannahs is achieved by promoting the natural photosynthetic process. As increasing photosynthesis continuously produces more carbon-rich vegetation, the outcome is ever more effective natural biological function.

Appropriate international policies will lead to restoration of up to 5 billion hectares of the world's savannah lands. For additional evidence of this capacity readers are invited to [click here](#), where they can download a PowerPoint presentation or a pdf file.

In Australia, a permanent increase of 1% in soil organic matter (SOM) within the top 33.5 cm of the identified lands will consume about 48.8 billion tonnes of atmospheric CO<sub>2</sub> into the soil, with additional tonnages held in the biota above and below the soil surface. We submit that strong policy leadership coupled with appropriate market based incentives for land managers, would achieve a permanent lift of 1% in SOM. Changed land management

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<sup>1</sup> Garnaut

resulting in a permanent 1% increase in SOM on 5 billion hectares would consume 64 ppm of the current excess or legacy loading of CO<sub>2</sub> from the atmosphere. An increase of 4.2% SOM on the 5 billion hectares of global rangeland could potentially reduce atmospheric CO<sub>2</sub> to pre-industrial levels.

**Dealing with specific queries raised in Issues Paper 1 Agriculture and Forestry  
Box 2.1**

We submit that redefinition of “Sectors” to “Phases of Production and Consumption” will assist the Review define many aspects of an Emissions Trading Scheme (ETS) policy.

**Section 3.1 – Adaptation**

To a very large extent, sufficient research into better cropping and grazing procedures has already been undertaken, and certainly sufficient has been done to make a start immediately. The proven results of this research are not yet widely adopted in practice, largely because there has to date been insufficient economic incentive.

A scheme that provides up-front payments will cover the relatively low capital cost of changing farming skills and infrastructure would be appropriate. The Chicago Climate Exchange (CCX) and the Voluntary Carbon Standards, 2007 (VCS) each offer models that might be adapted for use in an Australian ETS.

**Section 3.2 and 3.3 – Mitigation**

Provided that an ETS is instituted without excessive exemptions and loopholes, we submit that biomass production for electricity or fuel production would be subject to the same economic forces as any other business activity. Biomass produced using high levels of Phase 2 production inputs will be less economically viable than biomass produced by systems that use lower levels of Phase 2 production inputs.

If there is a Phase 1 production activity such as land use change, by, for instance land clearing the ETS would impose a financial burden.

All agricultural producers will incur some additional costs due to use of some Phase 2 production inputs such as fuel, machinery, transport, etc. The more they rely on Phase 2 production inputs the the higher their cost of production. In order to facilitate the ETS, provision will need to be made for aggregation of Phase 1 consumption offsets.

There is no need for difficult or cumbersome monitoring and accounting facilities at the farm (Phase 2 production) level. Neither is there a need for assessment by proxy. So long as the financial burden imposed on the Phase 1 producer is sufficient to create the change of behaviour required, the financial costs will be passed through to the Phase 2 producer, and ultimately (of course and inevitably) to the end consumer.

Agriculture should be included from day 1 of any ETS. There should be no transition period, but rather sufficient notice of the implementation date should be given to every business, so they can plan accordingly.

**Section 3.4 – International frameworks**

While there are several physical monitoring protocols currently under development it is often considered that there is an absence of suitable (effective and financially viable) protocols for detailed physical measurement of changes in Soil Carbon levels. We submit that based on the experience of the Chicago Climate Exchange (CCX) modelling the Review might consider that relatively low levels of CO<sub>2</sub> may be deemed to have been consumed so long as certain readily auditable activities have been carried out. In the case of the CCX these activities relate primarily to changes of management. This would allow time for more comprehensive measurement and modelling to be developed.

## Introduction

**Tony Lovell** is a practising accountant in partnership, based on the Gold Coast of Queensland. He has an agricultural background, and a keen desire to see degrading Australian farmlands restored.

**Bruce Ward** has a farming background. He has managed and been director of a major Australian publicly listed cotton producing company, and a director of a US based not-for-profit organization devoted to land restoration. Since 1994 he has conducted training and consulting programs for farmers in Australia and New Zealand, and his techniques are now utilised on several million hectares across both countries.

## Background

The contents of this paper arose from a discussion about how the real costs to society could best be taken into account when considering how to pay for Human Induced Global Climate Change. The particular methods evolved from a discussion about using a model based on Australia's GST to transmit costs through the system to the end user.

On further discussion we realised two things:

1. a GST based model is unnecessarily complicated, involving many millions of individuals and businesses; and
2. It is vitally important that the real costs and benefits should impact as close to the source as possible.

We submit it is necessary to re-frame the language of Climate Change somewhat. We have added two important definitions: *Producers* of Greenhouse Gases (GHGs) release them into the atmosphere whilst *Consumers* remove GHGs from the atmosphere.

## Simplicity

We submit that our proposal to identify Phase 1 and Phase 2 producers and consumers enables the real costs of Climate Change to be impacted most effectively and efficiently at their source.

We submit that there are relatively few Phase 1 producers of GHGs – several hundred fossil energy producers and perhaps 30,000 to 40,000 farmers. We submit that many Australian small farm businesses actually make little material difference to the GHG outcome, either individually or cumulatively. Accordingly policy framers should identify a practical form of analysing the minimum production. Below this level we submit that the Phase 1 producer may choose to be exempt, much as small businesses below a certain turnover can elect to opt out of GST. This would substantially reduce the number of Phase 1 producers and consumers who would be subject to the reporting and compliance obligations of an ETS, whilst not materially reducing its effectiveness.

## Dealing with the legacy load

We submit that a sound national (and global) Climate Change policy must not only ensure a significant reduction in future emissions but must simultaneously ensure that appropriate time, money and energy are applied to the critically important task of dealing with the excess loading of cyclical GHG's currently in atmospheric circulation that are capable of being consumed by the soil and the biomass.

We submit that this presentation addresses this issue in a manner that is simple, transparent and readily applicable.

**January 9, 2008**

## Response to Issues Paper 1. Land Use – Agriculture and Forestry

This submission has been prepared in response to the call by the Garnaut Climate Change Review (the Review) for feedback to its *Issues Paper 1*.

### **Preamble**

Australian Governments are developing policies that address the risks of human induced global climate change. Policies are created to either prevent a problem occurring, or to deal with an existing problem. The underlying principle is that sound policies transcend or move beyond either the potential or existing problem. We submit that sound policies allow and encourage behaviours that lead towards what people want, and that the same behaviours are also likely to avoid what they do not want.

We observe that sound policies result when people work from the big picture towards the detail. This is not a natural process and once people home in on the detail it is very difficult to pull back and see the big picture again. Accordingly, it is the intention of this submission to remain focused on the big picture. In this case of a very complex situation the planning work to complete the full policy document will require time for analysis of ideas, and to prepare the painstaking detail, clear writing, and the final testing towards the outcomes described below.

### **Outcome of this document**

This document provides the Review and Government with information to assist in the creation of Australian policy conditions to:

1. Reduce future Greenhouse Gas (GHG) emissions to an appropriate level; and
2. Substantially consume the excessive levels of some cyclical GHGs, collectively known as legacy loadings, that are now in the atmosphere and already causing damage to the environment

### **Global targets, stabilization, and linear thinking**

We submit that the application of linear thinking to what is essentially a cyclical issue within a complex environment, is leading to incorrect conclusions. We note that while a great deal of time and energy is devoted to arguing the merits of alternative measures designed to reduce future emissions of GHGs into the Earth's atmosphere, almost no time or energy is being devoted to the equally important task of consuming the excess loading of cyclical GHGs currently in atmospheric circulation.

We note the following comments in Professor Garnaut's paper presented at the inaugural S.T. Lee Lecture on 29 November 2007:

*(page 6) Currently, the concentration of carbon dioxide equivalent in our atmosphere is 455 parts per million CO<sub>2</sub> equivalent. There is a widespread view, based on the science, that the risks of "dangerous" climate change and the risk of abrupt climate change, are **already at unacceptably high levels** at this point. Another view argues for an objective of stabilisation at 550ppm CO<sub>2</sub> equivalent, on the grounds that **any global target below this level would be impractical**. Stern (2006) was inclined to this view.*

*(page 8) We have exceptionally rich resources for solar, geothermal, and wind energy and possibly for biofuels from the **savannahs that currently make minor contributions to food production**.*

We submit that the highest and best use for the savannahs mentioned above is NOT in production of biofuels. We submit that their highest and best use is as Phase 1 Consumers of GHGs (see Definitions immediately below)



## **Definitions**

We submit that the present, well-intentioned definitions surrounding Climate Change do not provide an adequate base for the Australian government (and the global community) to develop policies that will overcome and then reverse the still escalating problem of human induced global climate change. The following additional definitions are core to our submission.

### **1. Producers and Consumers of Greenhouse Gasses (GHGs)**

There are two phases of human induced production and consumption of GHGs:

- **Phase 1 producers of GHGs:**

- Those people who extract and release GHG containing materials from long term storage
- Those people who create and release man-made GHGs

*Phase 1 products include fossil fuels and the GHG emissions that are associated with their extraction from natural storage; the GHG products that are associated with the deliberate reduction of biomass and/or soil carbon, or released as a result of land-use change; and the release of man-made, linear GHGs*

- **Phase 2 producers of GHGs:**

Those people or businesses who take product from Phase 1 producers and enhance its utility or value.

*All users of fossil energy and its derivatives lie beyond the point of extraction and are therefore Phase 2 producers. Phase 2 agricultural producers include all intensive livestock production such as feedlots for beef cattle and dairy cows, and intensive raising of pigs and poultry. Each of these activities utilise carbon containing grain and other feed materials which were harvested by Phase 1 agricultural producers .*

- **Phase 1 Consumers of GHGs – including naturally occurring Carbon Capture and Storage:**

Those people or businesses whose activities produce something new that did not exist before, through the capture and storage of some atmospheric GHGs, creating new carbon-rich biomass through photosynthesis.

*Photosynthesis is the process by which green leaves in the presence of sunlight and water, capture and cyclically consume atmospheric CO<sub>2</sub>, converting it into materials such as timber, grains, vegetables or grasses. Many of these products are first harvested by Phase 1 consumers of GHGs and then find their way as inputs to Phase 2 GHG producers.*

*In addition, and of vital importance for the planet, the photosynthetic process cyclically maintains stable levels of life preserving oxygen, which is continuously released into the atmosphere.*

*Through forestry projects, approximately 5% of the Australian potential for natural carbon capture and storage capability is recognized. Approximately an additional 64% of the consumptive potential of our landmass, located in the rangelands and crop lands, remains unrecognized. [Click here](#)*

- **Phase 2 Consumers of GHGs:**

We are unable to identify any existing Phase 2 Consumers of GHGs

### **2. Types of Greenhouse Gas (GHG) produced and consumed**

There are two types of GHG production and consumption:

- Natural

Some GHGs are produced into and consumed out of the atmosphere as a natural function of the environment. For example, all living organisms release CO<sub>2</sub> into the atmosphere as they respire.

- Man-made  
Man-made GHGs are produced into the atmosphere as the result of deliberate human decisions

### 3. Types of GHG movement in the atmosphere

There are two types of movement for GHGs:

- Cyclical  
Some GHGs such as the carbon containing gases Carbon Dioxide (CO<sub>2</sub>) and Methane (CH<sub>4</sub>) can be produced into and consumed from the atmosphere in natural cycles and accordingly are cyclical
- Linear  
Some other GHGs once released into the atmosphere do not form part of a natural cycle, and accordingly are linear.

	Producer	Consumer
Phase 1	<p>Fossil energy releasers Producers of halocarbons Land use changers First harvest Agricultural producers (Plantation tree farms, food and fibre crops, grazed grasslands/rangelands)</p> <p><b>Relatively small number of Phase 1 GHG producers in Australia</b></p> <p><b>Must all reduce production of GHGs in order to contribute to the solution</b></p>	<p>First harvest Agricultural producers (Plantation tree farms, food and fibre crops, grazed grasslands/rangelands)</p> <p><b>Cumulatively the ONLY manageable, large scale, consumers of atmospheric GHGs throughout the world.</b></p> <p><b>Immediately expandable, cyclical consumer of GHGs - particularly in Australia</b></p>
Phase 2	<p>All other businesses (Take in products of fossil energy, halocarbons and agriculture, to change and convert them, adding value or utility)</p> <p><b>Relatively large number of Phase 2 GHG producers in Australia and worldwide</b></p> <p><b>Can only contribute to the solution by reducing their intake from Phase 1 producers ie efficiency gains</b></p>	<p><b>No identifiable consumers of GHGs currently exist within this category</b></p>

Table 1: Summary of the additional definitions included immediately above

## **Diagnosing the root cause of the problem of human induced global climate change**

As Government is seeking to develop policies to address an existing problem (the impact of Climate Change) we submit a diagnosis used to determine the root cause of Climate Change, so that our recommendations will deal with the problem itself and not its symptoms.

### ***Q What is Climate Change?***

The United Nations Framework Convention on Climate Change (UNFCCC) refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed. It is evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level that the warming of the climate system is unequivocal, and can be attributed directly or indirectly to human activity.

### ***Q What human activities cause climate change?***

Human activities that result in emissions of four long-lived GHGs: CO<sub>2</sub>, methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and halocarbons (a group of gases containing fluorine, chlorine or bromine) cause climate change. Global atmospheric concentrations of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years.

Many halocarbons (including hydrofluorocarbons) have increased from a near zero pre-industrial background concentration, primarily due to human activities.

### ***Q Where do these Greenhouse Gases (GHGs) come from?***

These GHGs come from both natural and man-made sources, and are summarised below.

#### **Carbon dioxide (CO<sub>2</sub>).**

Natural producers and consumers of carbon dioxide include every single life form on the Earth, as they all contribute to the natural carbon cycle. All animals produce carbon dioxide as they breathe. During their vegetative period plants use solar energy to absorb carbon dioxide and transform it into biomass by the process of photosynthesis. During their decomposition period some of this stored carbon is released.

The main spheres of human activity directly or indirectly impacting carbon dioxide concentration in the atmosphere are:

- fossil fuel combustion in all spheres of human activity
- non-energy industrial processes (organic and non-organic chemistry, production and use of mineral products, etc.); and
- forestry and land-use change

#### **Methane (CH<sub>4</sub>).**

Natural producers of methane are:

- anaerobic decomposition of organic substances in biological systems
- wood digestion by termites
- enteric fermentation and the manure of wild ruminants and livestock in 'Phase 1 agriculture'
- biomass burning triggered by natural events (eg lightning strikes); and
- oceans, seas and lakes.

The main spheres of human activity directly or indirectly impacting methane concentration in

the atmosphere are:

- rice cultivation
- enteric fermentation and manure of livestock in 'Phase 2 agriculture'
- decomposition of solid wastes
- production, transportation, distribution and storage of coal, oil, and gas
- deliberate biomass burning
- incomplete fuel combustion

Methane is consumed from the atmosphere over a decade or so by breakdown into carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O). At this point it rejoins the carbon cycle.

### **Nitrous oxide (N<sub>2</sub>O).**

Natural producers of atmospheric nitrous oxide are oceans, soils, forests, and meadows. The main natural consumer of nitrous oxide is photochemical decomposition in the atmosphere.

The main spheres of human activity directly or indirectly impacting nitrous oxide concentration in the atmosphere are:

- agricultural soils, especially through the use of nitrogenous fertilizers
- fossil fuel combustion
- production of adipic and nitrous acids; and
- deliberate biomass burning.

### **Halocarbons (halofluorocarbons, perfluorocarbons and sulphur hexafluoride)**

Halocarbons are almost exclusively man-made. They first appeared in the atmosphere in the 20th century and are emitted in industrial processes. Whilst these substances are used in a variety of industrial applications, they are not part of any cycle and accordingly are linear in nature.

### ***Q What causes atmospheric concentrations of GHGs to increase?***

Atmospheric concentrations of GHGs increase when production processes are larger than consumption processes. The links between production and consumption processes for carbon dioxide, methane and nitrous oxide are best viewed as a cycle.

These natural carbon and nitrogen cycles were stable because of balanced feedback mechanisms. For example, it is proven that a small increase in carbon dioxide concentration in the atmosphere leads to intensified photosynthesis and, therefore, an increase in the amount of land biomass. The flows of carbon dioxide and nitrogen occur in huge volumes but were sufficiently balanced to maintain the cycle until human activity disturbed this balance. This previously balanced cycle has become unbalanced in both possible ways – by producing more GHGs and consuming less of them.

Increased production has come about primarily by way of massive use of fossil fuels. Increased production has also been a direct result of human land use decisions including deforestation and inappropriate agricultural practices.

Decreased consumption has almost exclusively been a direct result of human land use decisions, once again including deforestation and inappropriate agricultural practices.

In the case of the halocarbons there is no effective consumption process, and as such any production results in increasing their concentration.

**Q *Why have atmospheric concentrations of GHGs been allowed to increase?***

The unfettered increase in GHGs is a classic case of both the tragedy of the commons and externalities.

**Tragedy of the commons<sup>2</sup>**

The tragedy of the commons is a type of social trap, often economic, that involves a conflict over finite resources between individual interests and the common good. Free access and unrestricted demand for a finite resource ultimately structurally dooms the resource through over-exploitation. This occurs because the benefits of exploitation accrue to individuals or groups, each of whom is motivated to maximize use of the resource to the point at which they become reliant on it. Meanwhile the costs of the exploitation are distributed among all those to whom the resource is available (which may be a wider class of individuals than that which is exploiting it). This, in turn, causes demand for the resource to increase, which causes the problem to snowball to the point at which the resource is exhausted.

**Externalities<sup>3</sup>**

In economics, an externality is an impact (positive or negative) on any party not involved in a given economic transaction. An externality occurs when a decision causes costs or benefits to third party stakeholders, often, although not necessarily, from the use of a public good. In other words, the participants in an economic transaction do not necessarily bear all of the costs or reap all of the benefits of the transaction. For example, manufacturing that causes air pollution imposes costs on others when making use of public air. In a competitive market, this means too much or too little of the good may be produced or consumed in terms of overall cost or benefit to society, depending on incentives at the margin and strategic behavior.

In the absence of significant externalities, parties to an economic transaction are assumed to benefit, improving the overall welfare of society. If third parties benefit substantially, such as in areas of education or safety, the good may be under-provided (or under-consumed); if costs to the public exceed costs to the economic decision makers, such as in pollution, the good may be over-provided, in terms of overall benefit or cost to society. Here, overall benefit and cost to society are defined as the collective economic utility for society.

**Q *What is the inevitable outcome whilst ever the consequences of these externalities remain inadequately addressed?***

The inevitable conclusion is that atmospheric concentrations of GHGs will continue to increase unless and until these externalities are internalised.

**Q *What will continuing to increase GHGs mean for the planet?***

In a complex natural system such as our world it is not possible to fully predict either the local or global nature, scale, timing or effect of the many feedback loops that have or will be precipitated as a result of the increase in GHGs which has occurred, and which continues to occur.

As there is little historical evidence that global disruption of natural ecosystem function leads to widespread ecologically beneficial outcomes, we submit it should be assumed with a very high level of certainty that the unchallenged outcome of global climate change will be massive global environmental degradation.

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<sup>2</sup> Wikipedia

<sup>3</sup> Wikipedia

### **Social disruption**

Looking just at direct human costs, at best this global environmental degradation will lead to massive social disruption on a planetary scale, with deaths in the hundreds of millions. At worst the global increase in GHGs will mean our planet becomes uninhabitable, leading to the extinction of the human race.

### **Outcome will not be dependent on prosperity**

We submit that for each nation the exact outcome within this range of possibilities will not be materially effected by national prosperity, and only to a very minor degree upon the prosperity and affluence of individuals within each nation. Everybody will be effected in some way. “All ships rise and fall on the tide”.

### **Cities at greatest risk**

We submit that the populations at greatest risk reside in the cities of the world, including all of our Australian cities. Farmers around the world can and would return to peasant farming, and eke out a meagre but sustained existence. The consequent disruption to food, water and air must undermine the very basis on which all individuals and businesses within cities survive, and will severely impact national commerce and economies.

## Framework of a National Climate Change Policy

### ***The framework must be appropriate***

For a national climate change policy to successfully work we submit that its framework must create conditions that allow the policy to:

- Directly affect those it needs to affect
- Be easy to administer
- Be transparent in concept and operation
- Produce measurable outcomes
- Be responsive to the measured outcomes

### ***Three outcomes must simultaneously be achieved***

We submit that within Australia and WORLDWIDE, sound Climate Change policy must simultaneously be directed towards achieving three important outcomes:

1. **There must be a deliberate policy link between the well being of the environment and the health of our own and all other economies:**  
Without clear, unequivocal acceptance of this linkage, we submit that Australian policies may be misdirected, seeking to achieve ultimately unattainable or unsustainable outcomes, or attempting to protect people from the inevitable consequences that accompany the scale of change required to tackle this global problem.
2. **Future production of GHGs must be reduced and then stopped:**  
We expect this will occur largely through the encouragement and implementation of a wide range of targeted technological solutions. We are not competent to specify what these targeted solutions should be, and this document makes no comment about methodologies.

We do however offer suggestions about the conditions that will be required in order for appropriate reduction policies to work. [Click here](#)

3. **Past emissions (the legacy loading now in the atmosphere) must, as far as practical, be consumed out of the atmosphere**  
If it is accepted that legacy loadings are already causing (perhaps irreversible) environmental change, then there must be a concerted effort to address this.

Government already accepts that biological processes consume GHGs, and already support and encourage plantation tree farms. We demonstrate in following sections that there is a substantially greater opportunity immediately available over an additional 64% of Australia, and world-wide, across about 5 billion hectares.

## Dealing with each of these outcomes in detail

### **1 Deliberate policy link between the health of the environment and the health of our own and other economies**

This is essentially a question of economic leadership. Such leadership might be displayed by, for instance, the development of an education program for the citizens of Australia, which deliberately ties the economic and social well-being of individuals, families and business to the health of the land. As discussed earlier, the environment and particularly the land, provides a range of economic services to the community, including clean, oxygen rich air, water for the cities and food and fibre for all citizens. We submit it is not widely understood within the general community that loss of environmental services will inevitably lead to individual and national disruption. An appropriate education program will modify individual

and therefore national behaviour, particularly if reinforced with financial signals as described in the following section.

## **2 Future production of GHGs must be reduced and then stopped**

A successful Australian Climate Change policy must ensure that all externalities are internalized. We submit that the following features are integral to a successful policy:

### **2.1 There must be direct imposition of a financial obligation on Phase 1 producers of GHGs**

The most effective and efficient way to fully internalize the externalities previously referred to is by direct imposition of a financial obligation on the relatively small number of Phase 1 producers of GHGs.

**Note:** As the total GHGs produced throughout the entire system by all the subsequent Phase 2 producers cannot be more than the amount introduced into the system by the Phase 1 producers, it therefore follows that a reduction achieved at Phase 1 must result in a reduction overall.

#### **Fossil fuel producer**

If the GHGs are produced as a result of fossil fuel consumption or use, then the direct imposition of a financial obligation on the relatively small number of Phase 1 producers of fossil fuels would result in increasing the cost of production of the fossil fuel to its correct amount.

#### **Production via land use change**

If the GHGs are produced as a result of land use change (eg land clearing or inappropriate land management) then the direct imposition of a financial obligation on the relatively small number of Phase 1 producers of agricultural products would result in increasing the cost of production of the Phase 1 agricultural product to its correct amount.

#### **Production due to deliberate use of fire**

If the GHGs are produced through the deliberate use of rangeland fires then the direct imposition of a financial obligation on the relatively small number of Phase 1 producers affected would result in increasing the cost of production of their Phase 1 agricultural product to its correct amount.

#### **Production of linear, man made GHGs**

The producers of those GHGs that are inherently linear should face a direct imposition of a financial obligation priced in terms of their global warming potential, expressed in terms of CO<sub>2</sub> equivalent .

The quantum of this obligation in each case should be calculated by first assessing the total amount of GHGs (calculated in tonnes of CO<sub>2</sub> equivalent terms) introduced into the system by their Phase 1 activities. This amount would then be multiplied by a dollar value per tonne of CO<sub>2</sub> equivalent where that dollar value is set by market forces.

### **2.2 Market forces must be allowed to operate**

We then recommend allowing the "push" of subsequent market price increases to appropriately impact all downstream Phase 2 producers. This simple step eliminates the need to impose any direct financial or recording obligation on the relatively huge and diverse number of Phase 2 producers, thus dramatically lessening the difficulty in implementing and monitoring this policy.



### **2.3 Establish reducing caps to Phase 1 production of GHGs**

The first and most critical step in creating the financial obligation mentioned previously is to establish an upper limit or cap on the total amount of GHGs that can physically be introduced into the system by Phase 1 producers on an annual basis, from a selected date forward. As mentioned previously the total GHGs produced throughout the entire system by all the subsequent Phase 2 producers cannot be more than the amount first introduced into the system by the Phase 1 producers. It therefore follows that a reduction achieved at Phase 1 must result in a reduction overall.

As the problem of GHGs is quantifiable in tonnages of GHGs (expressed in terms of CO<sub>2</sub> equivalent) produced by the relatively small number of Phase 1 producers, it is apparent that to be fully effective, this cap should be set in absolute tonnage terms and not expressed as a 'share of GDP' or any other non-specific term or measurement. By taking this approach the policy will successfully impact those that it needs to impact.

The cap should be set initially below the amount of GHGs currently being produced, and further should reduce (we submit, ideally to nil) in substantial increments over a short to medium time frame.

A combination of increasing demand (by way of a reducing cap) together with reducing supply ("low-hanging fruit" such as simply turning off unneeded lights being quickly taken up) would result in the market price per tonne of CO<sub>2</sub> equivalent increasing over time.

This will ensure that Phase 1 producers actively seek significant and genuine efficiency gains in terms of production per tonne of CO<sub>2</sub> equivalent in their own production processes. These same price signals will ensure the downstream Phase 2 producers also actively seek significant and genuine efficiency gains in their production processes.

Those Phase 1 and Phase 2 producers who are able to achieve the most significant gains in efficiency will accordingly reduce their cost of production relative to inefficient producers. In a competitive market this will translate into a price advantage and will lead to increased market share.

#### **Application to other industries**

This same principle will apply to all industries as the following diverse and unrelated examples show.

#### ***Example 1 - A wind farm or solar thermal establishment***

##### **Establishment phase**

A wind farm or solar thermal establishment will incur additional costs during this phase of development. These costs will occur because of the Phase 2 consumption of (now more expensive) energy required to manufacture, assemble, transport and erect the turbines, panels and distribution infrastructure. There will be a natural tendency for owners to develop increased efficiencies throughout the establishment phase, to minimize their actual Phase 2 consumption. Because the real cost of the Phase 2 production was internalized at the Phase 1 level, and passed through as a financial cost, the proponents of the wind farm or solar thermal project do not incur any other costs at establishment

##### **Operational phase**

Maintenance costs will increase for the same, Phase 2 consumption, reason as their establishment costs increased, but overall, operational costs can be expected to be at an advantage compared to energy developed through extensive and constant use of Phase 2 products such as coal, oil or gas.

## **Example 2 - Land use and land use change in Australia**

### **Establishment phase**

A farmer planning to clear land for cropping (ie land use change) will incur a number of costs associated with both Phase 1 and Phase 2 production:

**Phase 1** costs associated with the release of soil carbon and carbon contained within the removed biota will be assessed. The farmer will need to go to the market to cover his financial obligation for the Phase 1 production. We strongly advocate that there be no 'averaging' provision or other offset from year to year for these financial obligations.

**Phase 2** costs associated with the land use change will also be incurred. The input costs the farmer will incur for his Phase 2 consumption of fuel, fertilizers, chemicals etc., to clear and operate the land will include the Phase 1 costs transmitted downstream via his suppliers.

**Note:** Any Phase 2 supplier of goods who does not pass on the full Phase 2 cost of his upstream inputs will experience an increased cost of production compared to his peers, and risk loss of profitability.

### **Operational phase - inputs**

The day-to-day operations of the business will incur Phase 2 costs for products purchased from suppliers. As the volume of inputs in a farming operation automatically rises as farm soil carbon levels go down, farmers who are not capturing and holding carbon in their soil will incur higher Phase 2 production costs each year than farmers who are capturing and holding carbon.

### **Operational phase - outputs**

If the farmer can demonstrate, (using accepted and acceptable methods) that his soil carbon levels have risen as a result of his activities, he can release appropriate offsets to the carbon market that will accompany the ETS.

On the other hand, if soil carbon levels reduce, then by definition this is a Phase 1 production, and the farmer will need to go to the market to offset his own GHG emissions.

**NB: This simple policy will rapidly and appropriately transform agriculture to a net Phase 1 consumer of cyclical GHGs via natural processes such as photosynthesis.**

## **3 Past emissions must, as far as practical, be consumed out of the atmosphere**

Critically important to successfully dealing with the reduction of existing atmospheric concentrations of GHGs is active support of measures designed to significantly enhance the consumption processes for those GHGs that are cyclical.

It is a reality of our current level of scientific knowledge that the only known answer to increasing the consumption side of this cycle lies with Phase 1 producers of agricultural products. They are the only ones who create additional carbonaceous biomass when photosynthesis captures atmospheric CO<sub>2</sub> into materials such as timber, grains, vegetables or grasses.

If GHGs are consumed as a result of land use change (eg forest planting or more appropriate land management) then the direct application of a financial incentive to the relatively small number of Phase 1 producers of agricultural products would result in reducing the cost of production of those now more appropriately produced Phase 1 agricultural products.

We then recommend allowing the "pull" of subsequent market forces to build interest in these more appropriate land uses and management practices, thus increasing their supply and consuming ever more cyclical GHGs from the atmosphere.

**The following section expands on the importance of Phase 1 consumption of GHGs**

## Consuming excess loadings of atmospheric GHGs

### ***Where carbon can be stored***

There are five discrete locations that hold carbon. Of these, one is already severely over used; given present knowledge and technology, two are either inaccessible or unmanageable; and two are producing GHGs instead of consuming them. These five locations are known as ‘sinks’<sup>4</sup>. In order of increasing capacity (measured in gigatonnes) they are:

Biota	600	(Manageable by humans, currently producing GHGs)
Atmosphere	750	(Over used by humans)
Soil organic	1,500	(Manageable by humans, currently producing GHGs)
Oceans	38,000	(Not manageable by humans, very slow consumer)
Lithosphere	10 x 10 <sup>8</sup>	(Not easily managed, doubtful consumer and currently a major source of GHG production)

By simultaneously changing the management of biota and soil organic matter there is substantial opportunity to cease producing GHGs in the croplands and rangelands of the world. To date there has been no economic incentive to study or develop these techniques and accordingly no incentive to seriously and rapidly adjust management of these areas to become huge consumers of GHGs.

### ***Degrading savannahs are not necessarily over-utilized savannahs***



Photo 1: In 1992 each hectare of this area, located near Kunnanurra, WA could supply one day of feed per year for one cow



Photo 2: By 2001, under determined, active management each hectare, each year now yields sufficient feed to satisfy 800 cows for a day

The savannah lands of Australia and the rest of the world are currently often either inappropriately managed, not managed at all, or have already experienced severe breakdown of natural function, and as a consequence they are presently degrading (such as in Photo 1 to the left). Observation of this degradation has led to the widespread but (we submit) erroneous belief that the savannah environments are over utilized. It is our submission that between now and 2050, under active and appropriate management these same savannahs have the capacity to consume massive amounts of GHGs from atmospheric circulation, and may in fact have sufficient capacity to make a global target below 550ppm or even 445ppm practical and achievable.

Photo 2 shows an 800% increase in carbonaceous plant material produced from the same land, entirely due to determined management. In fact as the following calculations show, and as Professor Tim Flannery has observed, appropriate management of the Earth’s soils and biomass has the potential to consume from atmospheric circulation all the carbon dioxide emitted since the beginning of the Industrial Revolution:

<sup>4</sup> Source: IPCC

- An additional 1 ppm by volume of carbon dioxide in the Earth's atmosphere equates to an additional 2.13 gigatonnes of Carbon<sup>5</sup>. This is an additional 7.8 gigatonnes of carbon dioxide placed in the atmosphere
- 1 gigatonne is 1 billion tonnes so this 1 ppm is 2,130,000,000 tonnes of solid carbon (or a 1 cubic kilometre block of graphite).

### ***Determining how much carbon dioxide (CO<sub>2</sub>) can physically be consumed from the atmosphere?***

As the planet has 7.8 billion tonnes of carbon dioxide in circulation for each 1 ppm, and there are 5 billion hectares of inappropriately managed or unmanaged, desertifying savannahs on the Earth (which on empirical evidence we contend to be the case), the question that should sensibly be asked is:

***How much carbon dioxide would be absorbed if policies were put in place (in Australia and elsewhere) that caused the focus of on-ground management to be deliberately directed towards the widespread consumption of cyclical GHGs within the currently under-utilised savannah lands?***

### **Consumption of CO<sub>2</sub> per hectare**

- One hectare is 10,000 sq. metres. If a hectare of soil 33.5 cm deep, with a bulk density of 1.4 tonnes per cubic metre is considered, there is a soil mass per hectare of about 4,700 tonnes.
- If appropriate management practices were adopted and these practices achieved and sustained a 1% increase in soil organic matter (SOM)<sup>6</sup>, then 47 tonnes of SOM per hectare will be added to organic matter stocks held below the soil surface
- This 47 tonnes of SOM will contain approximately 27 tonnes of Soil Carbon<sup>7</sup> (ie 47 tonnes at 58% Carbon) per hectare
- In the absence of other inputs this Carbon may only be derived from the atmosphere via the natural function known as the photo-synthetic process. To place approximately 27 tonnes of Soil Carbon per hectare into the soil, approximately 100 tonnes of carbon dioxide must be consumed out of the atmosphere by photo-synthesis<sup>8</sup>
- A 1% change in soil organic matter across 5 billion hectares will sequester 500 billion tonnes of physical CO<sub>2</sub>

### **Converting global Soil Carbon capacity to ppm of atmospheric GHGs**

1. Every 1% increase in retained SOM within the topmost 33.5 cm of the soil must capture and hold approximately 100 tonnes per hectare of atmospheric carbon dioxide (the variability in the equation being due only to the soil bulk density). We submit that under determined, appropriate management, that this is readily achievable within a very few years
2. For each 1% increase in SOM achieved on the 5 billion hectares there will be removed 64 ppm of carbon dioxide from atmospheric circulation (500,000,000,000 tonnes CO<sub>2</sub> / 7,800,000,000 tonnes per ppm = 64 ppm).

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<sup>5</sup> Tables from <http://cdiac.ornl.gov/pns/convert.html>

<sup>6</sup> Soil Organic Matter is the plant material released into the soil during the natural phases of plant growth. It includes root material sloughed off below the soil surface and plant litter carried into the soil by microbes, insects and rainfall

<sup>7</sup> Soil Carbon is the elemental carbon contained within Soil Organic Matter (SOM).

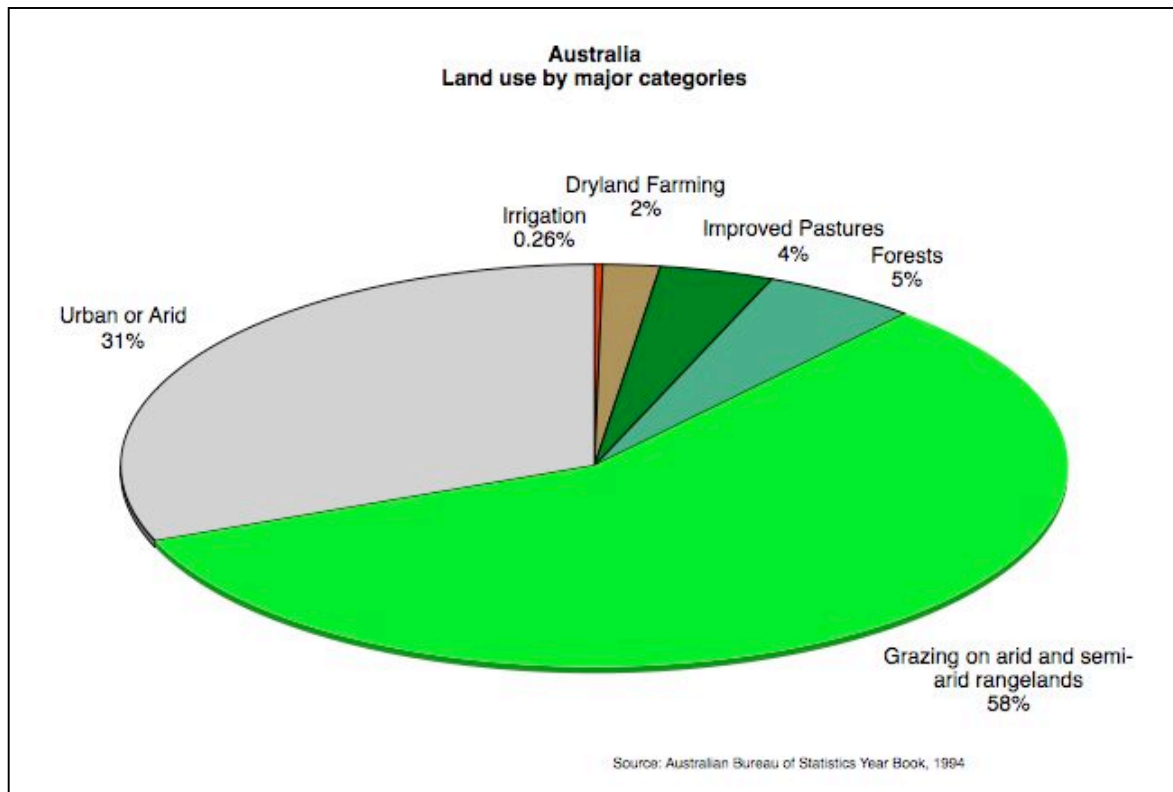
<sup>8</sup> One tonne of CO<sub>2</sub> contains 12/44 units of carbon (ie 0.27 tonnes of carbon per tonne of CO<sub>2</sub>). Therefore 27 tonnes of carbon sequesters 27/0.27 = 100 tonnes CO<sub>2</sub> (rounded). NB Carbon atomic weight 12, oxygen atomic weight 16 ie CO<sub>2</sub> = 12+(16+16) = 44

### **The global opportunity and numbers**

It appears that the pre-industrial level of atmospheric carbon dioxide was 280ppm, and that globally we are now at 455ppm, and heading towards 550ppm. To get from 550ppm back to 280ppm, 270ppm must be removed. Globally, a 4.2% increase in SOM would potentially reverse the expected situation. In any case, any form of determined management will substantially reduce the now crippling legacy loadings in the atmosphere.

### **The Australian situation**

If a policy of deliberately taking action to reduce existing cyclical GHG loadings through the encouragement of Phase 1 consumption is adopted in Australia, then this, when coupled with the financial market that will be developed under an ETS, will profoundly transform the economics of Australian agriculture.



The land mass of Australia is approximately 762,000,000 hectares<sup>9</sup>. The major land use types are shown in the following pie chart.

Ignoring those areas that are either too arid or are urban, approximately 58% of Australia is termed rangeland - what might broadly be termed *savannah* lands. If, in addition to this 58%, the 4% regarded as improved pastures and the 2% regarded as dryland farming were added, then some 64% of Australia (487,700,000 hectares) could participate between now and 2050 in a national and global initiative to consume existing excessive levels of cyclical GHGs.

A permanent increase of just 1% SOM within the soils of 64% of Australia would alone consume approximately 48,770,000,000 tonnes of physical CO<sub>2</sub>. On a pro-rata basis this represents approximately 9.75% of the global opportunity. When our political stability, and

<sup>9</sup> ABS Yearbook, 1994

our level of education, technology and skills are considered, Australia may well exceed that potential.

***Other national benefits automatically accrue***

Apart from the desirable reduction in atmospheric GHGs there are several major beneficial outcomes that will occur if restoration of landscapes is deliberately encouraged and adopted as part of the overall policy mix for Australia. They are:

- The flow of cyclical GHGs presently releasing from agricultural soils will be reversed on a scale hitherto thought impossible (and that indeed is impossible when relying solely on scarce government funds, as is now happening with National Heritage Trust funding of Landcare and other similar programs)
- Biodiversity will dramatically improve as carbon levels in soils and biota increase
- This carbon increase will reduce both the frequency and severity of floods and droughts, as increased carbon levels allow soils to capture and hold up to 600% more water.  
The effect of reducing the frequency and severity of floods and droughts will be felt in national budgets for years to come
- Agricultural productivity will significantly increase in the presence of more effective ecosystem processes, and costs of production will lower. This will assist Australia cushion any unexpected adverse consequences to our economy as a result of Climate Change

## Dealing with Imports and Exports

### During the Kyoto Protocol period

We expect that Australian policy will largely be domestic during the period up to the expiry of the Kyoto Protocol (Kyoto). The opportunity for leadership lies in any agreement that follows Kyoto.

### International post-Kyoto agreement period

It is anticipated that Australia will participate in a future international agreement, and that this agreement will be between most but not all of our trading partners. In general terms Australia will export and import in quantities that are either material or not - and we will export or import either Phase 1 products or Phase 2 products.

We submit that Australian policy and its ETS needs to address the embedded GHG component of products that fall into categories determined by answers to these 4 questions:

1. Are we dealing with imports or exports?
2. Is the other party to the transaction a member of the global "Post Kyoto" agreement or not?
3. Are we dealing with a Phase 1 product or a Phase 2 product?
4. Is there a material quantity of GHGs embedded in the product being imported or exported?

### Post-Kyoto member countries:

1. **Material quantities of Phase 1 products (predominantly coal and natural gas) exported to member countries:**

The GHG cost should be borne by the Australian Phase 1 producer, but the quantity of GHGs embedded in the material being exported should be applied against the cap of the importing country.

*ie An Australian Phase 1 producer has to bear the imposition of the direct financial obligation on its TOTAL production of GHG containing material. This cost will be passed on to the importing customer and from them on down the Phase 2 chain of production within the importing country. With global tradability and fungibility the costs borne by the Australian Phase 1 producer will be the same as they would be if borne by the importer instead.*

*However only so much of the GHGs embedded in the Australian Phase 1 producers production that relates to use by Australian Phase 2 producers should be included in calculation of their compliance under an Australian ETS.*

2. **Material quantities of Phase 2 products (such as iron ore, lotfed beef, inbound tourism services) exported to member countries:**

As the importing country is a member of a global agreement and the GHG cost is globally tradeable then there is probably no need to financially compensate exporters in this situation.

*It needs to be determined if the small increased cost of production of these Phase 2 products as a result of imposition of the GHG cost on the suppliers of Phase 1 inputs results in any material market disadvantage (as against competing suppliers) that is worthy of any compensatory measures. We caution that any such compensation risks distorting the purpose of the ETS. There is ample international experience of the problems such distortion may create.*



3. **Material quantities of Phase 1 products (such as oil) imported from member countries:**

These products will already have had their embedded GHG cost reflected in their cost to the Australian importer. This is appropriate and consistent with Australia's current import parity pricing policy for oil imports.

*In order to match the GHG cap aspect mentioned in (1) above regarding exports of Phase 1 products, the quantity of GHGs embedded in the material exported should be applied to the cap of the importing country, which in this case is Australia.*

4. **Material quantities of Phase 2 products imported from member countries:**

As the importing country (Australia) is a member of a global agreement and the GHG cost embedded in the imported Phase 2 product is globally tradeable then there is probably no need to impose a direct financial obligation on importers in this situation.

**Non post-Kyoto member countries**

1. **Material quantities imported from or exported to non-member countries:**

Our admittedly non-expert review of the relative positions of Australia's trading partners indicates that it is unlikely that there will be either material exports to or imports from non-member countries. If there are, then it will fall to the Review and to Government to devise an appropriate mechanism to ensure that the GHG component of these exports or imports is correctly accounted for, so as to ensure the integrity of the Australian ETS, as well as ensuring that climate change is being genuinely addressed.

2. **Immaterial quantities imported from or exported to non-member countries:**

As the quantities are by definition immaterial there is no need to consider their impact in any Australian ETS. Of course it is the responsibility of the Australian government to determine appropriate levels for this materiality, so as to ensure the integrity of the Australian ETS, as well as ensuring that climate change is being genuinely addressed.