TO Ms Anthea Harris
Chief Executive Officer, Climate Change Authority

FROM Dr Harley Wright | Climate Sense | [redacted] | NSW [redacted]

DATE 31 May 2013

Dear Ms Harris

Comments on Issues Paper for Caps and Targets Review

I am pleased the Climate Change Authority is preparing Australia's first carbon emission Caps and Targets Review for Australia's Clean Energy legislation.

My comments on many of the issues in *Chapter 6 (Summary of issues for stakeholder input)* in the Issues Paper are grouped, below, into the four main issues in the issues paper *Summary*.

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Key Comments

1 Permanent Australian policy for this new economic constant – frames critical carbon abatement and price signals

The Government's Clean Energy package is an excellent, core framework for managing Australia's carbon reductions over the coming decades. It has the key control features with adjustable 'dials' which can be altered, when necessary[1] to suit requirements. The Climate Change Authority has an essential role in providing the advice to Government to make the appropriate settings on the dials, from time to time. This review is the first step to launch the program in July 2015. It is the first of many planned.

It is essential for business and general economic planning, including at the domestic level, that Australia has a clear, longterm policy on carbon reduction so the future costs of carbon[2] are available and can be factored in to investments. This is particularly important for long-lived assets involved in high carbon intensive activities. It is more generally important for the informed management of our whole economy. Uncertainty and unexpected changes are damaging to confidence and wise investment. Erratic and populist changes must be eschewed in this now permanent and significant element of the economy.

The CCA Issues Paper makes the key comment (page 3) that;

> *"The costs of action are less than the costs of inaction"*[3].

More expansively, key specific issues are highlighted elsewhere[4];

[1] See comments noting importance of policy stability to ensure credibility, at Emissions permits as major financial products, p 11

[2] Carbon emission units (permits) for *differ*ent years can have different costs. Hence the reference to carbon 'costs'.

[3] CCA quote from Ross Garnaut *Climate Change Review*, 2008, Ch 11

[4] *Australia's Low Pollution Future – The Economics of Climate Change Mitigation*, p ix, Australian Treasury, Oct 2008

"The Treasury's modelling demonstrates

- *that early global action is less expensive than later action;*
- *that a market-based approach allows robust economic growth into the future even as emissions fall; and*
- *that many of Australia's industries will maintain or improve their competitiveness under an international agreement to combat climate change"*

The Authority should emphasise to the public and the Government these critical reasons for commencing strong reductions now. Its planned modelling could support this.

2 New, urgent global action needed now

Major emitting countries should commission a group of world experts to recommend options for carbon abatement to avoid a temperature rise of 2°C.

Key elements of the group's policy study and report would be;

- a 'safe' global carbon budget, and
- means to share the budget between countries.

The means to share the limited global carbon budget (cumulative emissions over a long period, 50+ years) is the main impediment to obtaining agreement. Garnaut supports an approach leading to equal per capita emissions at some future point[5]. He notes;

> "The per capita approach has the virtue of simplicity. Equal per capita emissions is a natural focal point, and contestable computations based on economic variables do not need to enter the allocation formula."

This submission similarly supports the inevitability of an equal per capita emission, which can be reached using contraction and convergence. This principle and model is the fairest, least ambiguous or contestable and most likely policy for implementing future carbon budget allocations.

3 Australia's 2020 target should be a minimum cut of 25%

Earlier estimates suggested a four year delay in global abatement from 2016 to 2020 meant the necessary annual carbon reduction rate rose from 5.8% to 8.4% - either of which must be sustained to 2050 at least.

Australia's current commitment to a 5% cut by 2020 is inadequate compared with future necessary reductions.

The best time to start strong reductions is now with a 25% target for 2020. This submission notes that past Treasury estimates showed only a small effect on GNP with this reduction. Our GNP would still grow with a 25% cut to 2020, just a little more slowly. A small price to move towards sustainability.

[55] *The Garnaut Climate Change Review*, 2008, page 203

Emissions reductions to avoid 2°C

Recent major reports show that the world is not on track to avoid dangerous climate change. Reports in 2012 from the World Bank[6], the International Energy Agency[7], the United Nations Environment Program[8] and the Netherlands Environment Assessment Agency[9] all point to dangerous temperature rises of around 4°C by the end of the century with current abatement commitments and programs. They emphasise the need to take stronger action now.

The International Panel on Climate Change is the UN body charged with advising on the science and impacts of climate change. It's fifth assessment report is due soon – AR 5. While it will provide a detailed analysis of climate sensitivity to increasing atmospheric concentrations of greenhouse gases, the practical response to avoid dangerous climate change is dependent on political processes, which need to decide on future emission levels and countries' fair shares of these.

The aforementioned major reports note, along with many others, that the sooner we act with strong emissions reductions, the overall costs will be less and will lessen the risks of potential civil, economic and political disruption from the resultant stresses of future, dangerous climate change. In response to the UNFCCC call at Durban seeking *" . . . views on options and ways for further increasing the level of ambition . . . "*, I submitted to the UNFCC my Sydney Bridge proposal, which I copied to the Authority (22 Apr 2013). This proposal showed how the world could commence trading in emissions entitlements by the year 2016, involving a majority of major emitters/emissions; see Timetable in Attachment 2, p 20. A year after submitting the model, unfortunately, there is no progress with key decision steps in my suggested timetable.

A constant rate of reductions of around 5%/year of global emissions is required to achieve a 50% probability of avoiding a 2°C temperature rise by 2100 (Raupach et al[10]). This constant 5%/year rate of reduction in emissions is based on a commencement date of 2011 with a *global carbon budget*[11] of 458 Gt C. It is similar to my 5.8%/year estimate with reductions commencing in 2016. A delay in starting absolute reductions 'uses up' part of the budget and clearly increases the necessary reduction rate required, starting from a later starting date, to avoid exceeding the global carbon budget.

My Sydney Bridge model showed similarly, the longer we delay real global reductions, the greater will be the rate of future emissions required to avoid dangerous climate change. It estimated that a 4 year delay – from 2016 to 2020 – to start continuous reductions (as currently targeted by the Durban Platform) raises the necessary annual reduction rate; from 5.8% (2016) to 8.4% (2050). This is a serious and daunting challenge. If these estimates are anywhere near realistic, they support the strong calls for urgent action in the four aforementioned reports.

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[6] *Turn Down the Heat: Why a 4°C Warmer World Must Be Avoided*, A Report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics, Nov 2012

[7] *World energy outlook, 2012*, IEA

[8] *The Emissions Gap Report 2012, A UNEP Synthesis Report,* Nov 2012

[9] *Analysing the emission gap between pledged emission reductions under the Cancún Agreements and the 2°C climate target,* PBL Netherlands Environmental Assessment Agency, 2012

[10] M Raupach, I Harman and J Canadell, *Global climate goals for temperature, concentrations, emissions and cumulative emissions*, CAWRC technical report No 042, Canberra , Sep 2011

[11] A '*global carbon budget*' is the maximum cumulative emissions estimated for the specified probability of a specified temperature rise. See; M Raupach, I Harman and J Canadell

Global emissions budgets – absolute tonnes, not proportional emissions reductions

The UNFCCC has agreed that to avoid dangerous climate change, abatement efforts should avoid a 2°C temperature rise, and ideally a 1.5°C rise. To limit the temperature increase, the science is now sufficient to allow us to set either a global carbon budget (from some contemporary date) or to give a maximum global emission rate for say 2050. Perhaps both will be delivered by the impending IPCC report (AR 5). These longterm targets help set the framework for agreement on how to share amongst the world's countries a carbon budget and future emissions. This is the key impediment.

The Australian Government should promote globally, especially through the UNFCCC's Conference of Parties, the setting of targets and emission shares by absolute quantity.

Note that the science now suggests that it is sufficient to set a single global emissions budget – a longterm, cumulative aggregate – as an emission limit to avoid a specified temperature increase. This approach has merit over a conventional approach to set a proportional decrease in current emissions, eg, to aim for 80% reduction by 2050 of the baseline emissions in 1990. It could make it simpler to assign carbon quotas as absolute quantities to individual countries. This could reduce complexities and difficulties dealing with relative measures for each country. This is considered further below.

Approaches to sharing global emissions budgets among nations

In agreeing to the Kyoto Protocol, countries agreed to a constraint in their emissions, or a target, based on their *historic* emission levels in 1990. The principle to set short-term targets on recent individual country emission levels was understandable and practical at the time.

But there is around a tenfold difference in the per capita carbon emissions between some developed countries and some countries with low development. For instance Australia and the USA emit over 20 tonnes of CO2 per person, annually. But poor countries, such as India, Pakistan and Indonesia have low per capita emissions of around one or two tonnes per head of population. *On the basis of equity, it seems inevitable that the principle of equal per capita emissions will be increasingly demanded and accepted.* It would replace the current Kyoto-based principle of constraint relative to a country's historic baseline The equal per capita equity principle is at the core of most approaches summarised in Table 4 of the Authority's issues paper on which comments are made here in Table 1

Succinctly, Garnaut says;

> "The per capita approach has the virtue of simplicity. Equal per capita emissions is a natural focal point, and contestable computations based on economic variables do not need to enter the allocation formula."

Given the dangerously slow progress of the UNFCCC towards strong and effective emissions reductions, progress would be better if the proposed principles and measures for carbon abatement offer the greatest overall agreement and equity - together with avoiding complexity and unnecessary features.

In conclusion this submission notes that the contraction and convergence principle and model is the fairest, least ambiguous or contestable and most likely policy for implementing future carbon budget allocations.

Table 1 Comments on Table 4 of the Authority's issues paper – Approaches to sharing emissions budgets

Approach, Principles	Comments
Contraction and convergence	It's fundamental principle is rights to equal per capita emissions with a contraction over time in global emissions[12,13]. Importantly, emissions rights are tradable. At one extreme, the allocation of equal per capita emissions rights could occur at the start of an agreed mechanism, eg now. Buying the necessary permits would be a large shock to high-carbon economies (measured on a per capita basis) but a large export windfall to developing countries. Thus 'convergence' at an agreed future date lessens the economic shock. As Garnaut says, "the convergence date is the main equity lever"[14]
	At the other extreme, 2050 has been proposed as a contraction date (apparently in proposals at Copenhagen COP 15[15], contributing to the COP's failure). This date provides a long lead time to equity and gives little to developing countries for their emissions permits. It is unlikely to be acceptable to developing countries. The contraction date is the contestable part of contraction and convergence.
Modified contraction and convergence	This is developed by Garnaut[16], especially pages 43 to 45. It may be politically expedient to allow some countries to increase their emissions entitlements above the basic curve set by the basic contraction and convergence mode. However this does seem to award an extra benefit to the countries involved. This would be an additional contestable issue though it may be linked with the primary contestable determination of 'the contraction date'. Some flexibility could be made for various factors.
Multistage	No specific comment, except to note that this is similar to the point mentioned above about adding flexibility to cover different issues.
Greenhouse development rights	This approach is underpinned by contraction and convergence but adds extra principles and measures to address them. Overall, it seems to add many extra and unnecessary complexities to an already most difficult issue. Some aspects may seem a benefit in some eyes, but others may find questionable aspects and goals. Its added complexity and contestability on many fronts renders it impractical for serious consideration by the UNFCCC or Australian government.

[12] Global Commons Institute, see; http://gci.org.uk/

[13] Climate Consent, see; http://www.climateconsent.org/

[14] *The Garnaut Climate Change Review*, 2008, page 203

[15] Global Commons Institute, see; http://www.gci.org.uk/animations/COP_15_C&C.swf

[16] *The Garnaut Review 2011*, Australia in the global response to climate change, 2011

Approach, Principles	Comments
Equal cumulative per capita emissions	This approach is suggested for capturing responsibility for 'historic emissions'[17], viz emissions that powered the industrial revolution in the North since ca 1750 (a base year for the start of anthropogenic GHG emissions). While appreciating the philosophy, it seems unrealistic to suggest that values of historic emissions by each country (boundaries have changed) could be estimated with sufficient credibility to avoid irreconcilable argument. But the concept of a single reference year for population has merit for contraction and convergence in its basic mode. The per capita emissions allowance could be set for the population in the reference year (eg, start of measure, or 1990 base year for emissions].

Garnaut says;

The per capita approach has the virtue of simplicity. Equal per capita emissions is a natural focal point, and contestable computations based on economic variables do not need to enter the allocation formula.

This submission concludes;

The contraction and convergence principle and model is the fairest, least ambiguous or contestable and most likely policy for implementing future carbon budget allocations.

Note re emissions trading:

There are many approaches to sharing future carbon emissions. Intrinsic in my comments here are some basic presumptions;

- The sharing of 'allowed' emissions between countries will use some kind of agreed 'emissions entitlement' or 'emissions rights' for countries.
- The emissions rights or entitlements (net of a country's physical emissions) will normally be tradable. These constitute 'emissions permits'.
- The authentication processes for emissions permits may vary – there are already a variety of tradable permits. These can have different values depending on the degree of credibility of the issuer.
- Emissions rights are not to be confused with physical emissions from countries. These too require verification. Emissions rights (net of actual emissions) can be traded to reconcile a country's physical emissions with its emissions entitlements.

Comments here assume some kind of legal agreement or acknowledgment of countries' carbon entitlements with reconciliation of physical emissions and emissions permits and compliance measures. The operation or principles of voluntary schemes outside of this formal approach are not considered because I see them as unreliable and insufficient to deal with the problem at this late and urgent stage.

[17] BASIC experts, 2011. *Equitable access to sustainable development: Contribution to the body of scientific knowledge*. BASIC expert group: Beijing, Brasilia, Cape Town and Mumbai

Fundamental attributes of a global emissions trading scheme are;

1. It promotes the least-cost means of reducing carbon reductions.
2. It embodies the 'user pays' / 'polluter pays' principle.

These are each important because of their resultant effects;

Point 1 – costs can be minimised: A great obstacle to obtaining acceptance to reduce emissions is concern about the costs of doing so – often more a fear of the unknown, than a rational appraisal of likely or estimable costs, and

Point 2 – Internalised pollution costs can assist efficient structural economic changes. High carbon-intensive activities and countries pay more for the right or privilege to pollute the atmosphere. Most of the costs for domestic permits help reduce costs in other parts of a high-carbon economy: while in low carbon-intensive countries, the export of permits above requirements, strengthens foreign earnings, which supports development. The lower the carbon intensity (per capita base) in a country, the greater the export income from permit sales. Considerable income flows from richer countries to poorer countries as shown by illustrative estimates in Table 2.

Tragedy of the Commons

The problem of getting agreement amongst countries to agree to a fair share of the limited, 'safe' carbon budget is a classic example of Hardin's parable[18]: individuals and countries act to maximise their individual gains in using the commons, while ignoring the harm done by the cumulative effects of their actions, when they reach the limits of optimal utilisation.

Countries signing Annex B of the Kyoto Protocol took a momentous first step to break the deadlock in the global commons climate dilemma. Those countries agreed to constrain their respective emissions even though it would adversely effect their economies. This act put global communal benefit ahead of short-term, individual country benefit. Copenhagen (COP 15 in 2009) was expected to finalise the second commitment period to follow Kyoto. Unfortunately this did not eventuate with expected strong commitments. Under the Durban Platform in 2011, the COP 17 decided *"to adopt a legal outcome . . . no later than 2015 . . . and for it to come into effect and be implemented from 2020"*[19] It is hard to be confidant that this dangerously late start (2020) will be met or will require the severe reductions necessary to avoid a 2°C temperature rise.

Need for global plan and framework for UNFCCC

The UNFCCC has as its "ultimate objective";

> "To achieve . . . stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."

But the UNFCCC doesn't have a prominent plan and timetable to achieve this objective. It has achieved a lot but in recent years it has lost focus on the means to achieve this core objective.

[18] Garrett Hardin published *The Tragedy of the Commons* in Science in 1968. Refer Wikipedia

[19] COP Durban Draft Decision /CP17 Cl 4

Table 2 Value of trade in emissions permits**

Income from sale, or cost to buy, emissions permits expressed as a percentage of each country's GDP at carbon price of $25/t CO_2 and 5.8% emission reduction in first year, 2011. Other key assumptions – below table.

Country ↓	Emissions % of world total [CDIAC CO_2]	Income from sale of excess permits @ $25/t CO2	Cost to buy permits @ $25/t CO2
Units→	*%*	*% of GDP*	*% of GDP*
China	24.6%		1.10%
United States	16.4%		0.30%
India	6.2%	6.9%	
Russia	5.0%		0.90%
Japan	3.4%		0.16%
Germany	2.3%		0.18%
Iran	1.7%		1.11%
South Korea	1.7%		0.44%
Canada	1.5%		0.26%
Saudi Arabia	1.5%		0.86%
United Kingdom	1.5%		0.17%
Indonesia	1.4%	2.9%	
Mexico	1.4%	0.4%	
South Africa	1.3%		0.98%
Brazil	1.3%	0.7%	
Italy	1.2%		0.16%
Australia	1.1%		0.23%
France	1.1%		0.11%
Poland	0.9%		0.52%
Pakistan	0.5%	11.5%	
World Sales revenue = Purchase cost	76.0%	$million 171,573	$million 171,573

Key assumptions;

- The model uses current 2010 data hence the past dates, (CDIAC CO_2 only)
- Equal per capita emissions entitlements start in 2011 (this is immediate convergence, under contraction and convergence, and would be resisted by the North)
- The aggregate world emissions (and entitlements) are 5.8% less in 2011 than the 2010 base data available. (5.8%/y on y contraction target. This rate needed to meet the Meinshausen limit of 1000 Gt CO_2 by 2050)
- Low-carbon countries (the South) sell all their entitlements that exceed their historic (2010) level (ie, they do not increase or decrease their carbon emissions)
- High-carbon countries (the North) buy all the available 'excess' entitlements from the South.
- With these assumptions, the model calculates the North's total carbon emissions allowance as is its per capita allowances [equal to the 2010 world average, reduced by a 5.8%/year contraction] plus purchases of excess permits from the South. The North's 2011 emissions permits total 6.6% less than its 2010 emissions, hence it reduces to meet this restraint.

The actual factors will vary with the market price of carbon and the ability to innovate and lower the carbon intensity of all economies. The date of convergence is most contestable.

**** Nb: These are unverified, preliminary estimates for illustrative purposes. They are based on some real data and hypothetical but possible conditions.**

Since developed countries pledged at Copenhagen to provide $100 billion to promote sustainable development in developing countries much of COP's effort is devoted to the Green Climate Fund. This is a noble cause but is only an allied issue, and seems to result in inadequate attention to the 'ultimate objective' and the unique problem of *how to share the limited carbon space*. Sadly the key carbon-sharing problem seems subsumed and conflated with finance for development.

It is surprising there is little consideration of the likely enormous potential income to developing countries from the export of carbon permits. The neat formulaic allocation of permits under eg, contraction and convergence, avoids the many complex and subjective issues to resolve in operating the Green Climate Fund - giving to it, and donating from it. The challenges being created with the GCF are daunting and the negotiating effort involved is considerable. But it does little to directly address the accelerating carbon problem.

There is no prominent plan and timetable to achieve the UNFCCC ultimate objective to reduce carbon emissions to prevent dangerous climate change.

The world seems to be diverted with the complex and subjective issues of the Green Climate Fund . . .

while doing less to directly address the accelerating carbon problem that could be resolved with a formulaic allocation of permits under eg, contraction and convergence.

Independent study to rocket boost UNFCCC processes

Current COP agreements are 'too little, too late', even with the best possible outcomes. If countries are serious about tackling climate change, they could support additional means to achieve abatement. Prof Garnaut[20] focuses on the critical impediment of how to share the limited carbon budget. He says;

> "It would be useful and probably necessary for heads of governments committed to strong global mitigation outcomes to appoint an expert group to develop such a framework for allocating the global effort among countries. Within the context of concerted unilateral mitigation, each country would be free to accept or reject guidance provided by such a framework. "

Garnaut looks at the current "pledge and review" process, noting that it requires a framework to allocate carbon abatement. Within this process, each country has the freedom to control emissions any way it wishes.

My preference is to resolve the carbon distribution dilemma by an expert group as he suggests. But it would be nice to have that group strengthen the role of international trade in carbon to foster lower cost abatement together with large payments for carbon allocations (permits) sold by low-carbon economies. This is a neat way to support development.

Accordingly, to expedite stronger measures soon, a group of major emitting countries could commission an urgent study by world experts to provide a synoptic view of possible options for carbon abatement to avoid a temperature increase of more than 2°C.

[20] Prof R Garnaut, *Removing Climate Change as a Barrier to Economic Progress*, Economic Analysis & Policy, Vol. 43 No. 1, Mar 2013

A mooted *International climate policy study and report* could provide several models or options of the required abatement sharing methods. It is unlikely the options would be acceptable to all countries. But they would provide a focal point for decision making. The *options, with planning steps and timetables*, would highlight and clarify to the general public, the enormous challenge we face and the need for compromises in finding a solution – from now for the next 40 years at least. This would shift the debate to *what needs to be done*, from the present inadequate state of *what some are prepared to do*.

The external group of world experts, commissioned to produce the report by major emitting countries, could produce options for emergency action for COP to consider. For speed and logical coherence of the options produced, the group would need to produce its report without prior COP approval of the contents.

Major emitting countries to commission group of world experts to recommend options for carbon abatement to avoid a temperature rise of 2°C.

Key elements of its policy study and report . . .

- **a 'safe' global carbon budget, and**
- **means to share the budget between countries**

Note re emissions accounting and obligations for various country groupings

There can be much uncertainty and confusion around the scope and measurement of GHGs.

Table 3 suggests different levels of GHG measurements which vary in the ease, confidence and accuracy of methodologies for estimation. For instance the level 1 emissions are called CDIAC emissions as they are monitored and reported by the Carbon Dioxide Information Analysis Center. Their most reliable measured emissions are those from fossil fuels and cement manufacture. These are readily estimated by stoichiometry – measurement of the mass of material multiplied by its carbon concentration – known to be released on combustion (fuels) or calcining (cement). These measurements are similar to those used to determine sales contracts and excise prices for fossil fuels. These involve $billions and measurement practices that are well established and reliable. Measurement of level 2 and level 3 emissions, as classified in the table, do not generally exhibit such ease and reliability and accordingly are separated on this basis.

It seems that some of the concerns around agreement to trade in emissions permits arise from uncertainty over the credibility of units traded as well as the costs of monitoring, reporting and verification required to establish tradable emissions 'permits to sell'.

'Permits to sell' *equal* a country's 'annual emission rights' *less* its 'reported (physical) emissions'.

Countries with high absolute emissions are most able to use more sophisticated means and achieve high reliability, versus countries with low emissions normally associated with small economies (GDP). The hierarchy of measurement classifications lends itself to graduated levels of requirements for assessing annual, available 'permits to sell'.

Requirements for monitoring, reporting and verification (based on the 'level' of measurement) can be adopted to suit the 'type' of country involved. An emission trading scheme with differentiated measures of actual emissions would better accommodate smaller economies for whom rigorous measurements, with high costs, would be unattractive.

Table 3 uses the Pareto Principle to focus most attention on the largest emitters. Rather than aim for a rigorous and idealistic application of carbon accounting processes on around 200 countries, it will be more productive (easier and less contestable) to address around 80% of emissions from the small number of countries – around 25 – with the ready capacity for accurate and comprehensive measurement.

'Covered' and 'uncovered' emissions – Australia and the world

Table 3 is a useful tool to consider the appropriate 'coverage' of Australia's Clean Energy measures. The broader the coverage, the better will the current carbon price infuse equally into the economy. This avoids distortions arising from different carbon pricing, that can occur with uncovered emission. Uncovered emissions can have an imputed carbon price, though often not readily 'seen'. It seems unlikely the imputed price would reach the market price of covered emissions.

It is prudent to include as many of the emissions, as can be practically assessed and measured, in the covered category. Where that is not practical supplementary measures should be considered and applied, unless deemed uncontrollable.

I noted above that all the fossil fuel emissions can be readily measured with little cost, relative to likely carbon and product prices. Vehicle fuel is currently exempt from the scheme for political reasons. If we are sensible and seek efficient measures, all fossil fuel exemptions should be removed.

It is noteworthy that Australia does include emissions of GHGs from landfill gases and sewage treatment works. This is probably a world first. It shows that even difficult emissions can be covered with careful development (this author was close to those developments at the time). And these emissions are small, only a few percent of Australia's total emissions.

Emissions from agriculture are not covered yet they are substantial. The Issues Paper says it is 16% of Australia's total. Methane from cattle and sheep is estimated with accepted measurement procedures applied to large aggregate numbers for animals. From this, a carbon emission liability, under our Clean Energy program, might be levied on a large aggregate of harvested animals going to market. But contention arises in determining a 'liable entity' responsible to pay the carbon price.

Uncovered emissions can be managed with complementary measures. These can include 'best practice' methods, which might be used because it seems easier than developing a suitable method to apply a direct carbon price . Intuitively, I would be surprised if complementary measures come close to achieving the pricing signals of covered emissions. Or more importantly, come close to the abatement achieved in the activity if it did incur full market carbon costs. In a similar way to including landfill gases it, would seem possible to develop a methodology to apply to agricultural emissions. We already have one for emissions in aggregate . If the procedures erred in the farmer's favour (eg, underestimated and charged for say only 80% of average animal emissions) it could help overcome political resistance. The benefits could be lower costs to implement and more effective price signalling with better carbon abatement and market adjustment.

Similarly with LULUCF emissions, Australia took a leading role in the development of methodologies contributing to the Marrakesh Accords. We can be clever, wise and constructive. We could assess whether LULUCF emissions and sequestrations could be covered by our emissions trading scheme.

Table 3 Matrix of carbon emissions by country and ease of estimating sources

Three *'types'* of Country → **Three *'levels'* of CO2e reliability / completeness ↓**	**A. Developed Countries,** Nos* 1 - 25 [emit 85% of world emissions]	**B. Developing Countries,** Nos* 26 - 55 [emit another 10% world emissions]	**C. Least Developed Countries + small emissions** Nos* 56 - 216 [emit 'last' 5% of world emissions]
1. CDIAC CO2, from fossil fuels + cement	**A** countries covered in trading	**A** countries covered in trading	Countries which are type **B or** type **C** may join trading later
2. Level 1 + all Kyoto GHGs, excluding LULUCF CO2. Includes biogenic CH4, N2O	**A** countries covered in trading	Countries which are type **B or** type **C** may join trading later	Countries which are type **C**, probably always exempt
3. All human-caused GHGs, viz **Level 2 + LULUCF etc**	Countries which are type **A or** type **B** may join trading later	Countries which are type **C**, probably always exempt	Countries which are type **C**, probably always exempt

*** The countries' 'Nos' refer to their rank based on total emissions from CDIAC 2008 emissions from fossil fuels and cement**

Reducing emissions will normally cost something. The more we can reduce the costs by smart policies and procedures the better off we will be as a community. This should be made clear to all, including those who feel most affected. But the personal and corporate difficulties of restructuring can be softened by the *phased introduction of measures*. This approach was used when tariffs were reduced on motor vehicles and clothing, footwear and textiles. We can do the same where there are national gains in prosperity from a better carbon scheme – phase in changes to allow time for adjustment.

Emissions permits as major financial products

To reduce emissions most efficiently requires either a carbon tax or an emissions trading scheme. A tax on carbon means that future prices are known but future emissions are not. Alternatively, by rationing carbon emissions in specified periods, the resultant permits (emission rights or entitlements) can be traded - but their future carbon prices on secondary markets will vary. Either method encourages market freedom to find least cost methods of abatement. This promotes innovation and changes in consumption. The Australian carbon constraint measure is moving to emissions rationing and the Authority's review addresses this measure. The White Paper on the proposed Carbon Pollution Reduction Scheme (Dec 2008) said;

> An effective carbon global carbon market will play a key role in developing sound international solutions to climate change by fostering least-cost global abatement. Contributing to a robust international carbon market is a strategic priority for Australia.

Accordingly, Australia's forthcoming cap and trade scheme, ie, emissions trading scheme, is an efficient, desirable and effective measure to deal with this diabolical problem.

Credibility of the carbon market is essential because the annual value of this market could be in the order of $10 billions, ie, around 1% of GNP (+ / -). The resulting permits (emission units) and the market will share features akin to government bonds where a few key factors can have a critical effect on the market price.

A lack of faith in a permit to emit carbon, could seriously erode the scheme. Those dealing in carbon commodities can have the value of their investment significantly affected by changes to the price determining factors - particularly government statements on the structure and operation of the scheme. Estimates of future caps, budgets, targets or gateways are key factors informing the market and affecting prices. Robust monitoring, accounting and verification process also contribute to a credible carbon emission market. This is particularly important in the context of international permit trade in regard to carbon management.

Accordingly, governments and commentators need to act carefully and with measured views. A lot will soon be at stake.

International action to reduce emissions

There is little to add that has not been said earlier. Table 2 in the Issues Paper outlines climate change policies and measures in key major emitters. And Table 3 gives emissions reduction goals for key major emitters. The UNFCC Convention was agreed to in 1992. Yet 21 years later the many worthy policies and actions still lack a clear and firm direction that would show that the issue was well under control. The failure at Copenhagen was the nadir of disappointment.

Yet Ross Garnaut recently provided encouraging news about recent carbon abatement in an international context, including the largest emitters, China and the USA. He concludes;

> "Reducing the emissions intensity of economic activity is proving to be less costly and disruptive than had been anticipated by expert observers."

Let's hope such evidence can quell the fears and antagonism, in the world and Australia, to the action needed.

This submissions notes repeatedly that the problem will not be solved in time unless the world quickly agrees on a framework for allocating the global effort among countries. Heads of governments committed to strong global mitigation outcomes could appoint an expert group to this end. The group could prepare a synoptic view of possible options and means to avoid a temperature increase of more than 2°C. It is frustrating when there is scant evidence that the core issue is being addressed with the necessary urgency, and willingness to compromise, as may be needed for a solution.

Economic and social implications of different goals for Australia

Australia's longterm and short-term emissions caps and targets

2050

Australia's measures to deal with carbon abatement are best served by strong integration with a global agreement that has a timetable for abatement and an agreed process for sharing the abatement burden – more specifically, allotting a finite carbon emission quantum (budget) to each country. That is why previous comments here emphasised the global issues around carbon reduction measures. Our efforts are subordinate to the global solution – yet essential to it.

The Authority's issue paper notes Australian emissions targets and seeks comment on these re suitability and sufficiency;

- Undertaking under UNFCCC to reduce 2020 emissions by 5% of 2000 levels (unconditional), and
- Objective to reduce 2050 emissions by 80% from 2000 levels

To determine targets on a fair-share global basis, the global longterm target can be assessed and from that, consider our fair share of it.

Australia has the highest per capita emissions profile of all developed countries in the world so its future emissions allowances need to fall more rapidly than other countries under this policy measure.

Some rudimentary values and estimates are sufficient to illustrate the serious challenge Australia faces in moving to a fair share of global emissions. Assume our per capita emissions allowances fall to meet the global average in 2050. My estimates in Table 4 suggest that Australia will need to reduce its emissions annually (ie, year on year) by around 8.9% so that our emissions reduce to a world average emission entitlement of 0.98 tonne per person of CO2e in 2050.

Table 4 Indicative rates of continuous annual reductions* to meet global emissions budget[21] of 1500 t CO_{2e}

	Actual emissions in 2014, *t CO_{2e}/ person***	**Emissions - annual rate reduction from 2016, *%/year***	**Target emission rights in 2050, *t CO_{2e}/ person*****	**Relative emissions reduction; present to 2050**
Global	5.8***	5.8%	0.98	83%
Australia	27.5	8.9%	0.98	96%

* sources used for these estimates were not always internally consistent or verifiable. So they cannot always be taken as firm but they serve as relative, indicative estimates.

** Assumes constant population base for per capita emissions of 7.3 billion people

***Per capita average for highest 20 emitting countries. Probably lower average for all countries

With current emissions of around 27 t CO2e per person, the rough indication of a 2050 equitable emissions target of 0.98 t CO_{2e} represents a reduction of 96%. This is over three times Australia's current legislated reduction of 80%. These are physical emissions, not entitlements.

When the forthcoming IPCC estimates are available (AR 5), the accepted global emissions budget can estimate a *2050 equal per capita emissions value.* This could be the basis for all countries' emission rights in that year, though it might still be tempered by the UNFCCC Principle 1, *". . . in accordance with their common but differentiated responsibilities and capabilities".* A firm employment of a contraction and convergence global measure would likely lessen the need for 'adjusting' (under Principle 1) an equal allocation of emissions rights in 2050.

A realistic contraction date, under contraction and convergence, is likely to be much before 2050 - some decades, I suggest. If Australia retains its 2050 objective (an 80% decrease in physical emissions), it faces continuing costs in buying emission permits – indicatively, an amount several times its physical emissions in 2050. The implications are discussed at Treasury modelling of costs, page 16.

[21] Emissions from 2000 to 2050 giving 25% probability of exceeding 2°C, Greenhouse-gas emission targets for limiting global warming to 2°C, Meinshausen et al, Nature Vol 358, p 1161, 30 Apr 2009

Managing Australia' emissions trajectory – cumulative budgets, caps, targets, and gateways

Assume that Australia agrees on longterm emissions budget, viz the cumulative total it can emit as it moves to a low or zero carbon economy. What is a suitable way to work within this total budget?

I would set a trajectory based on a constant rate of reduction (ie, exponential reduction) to meet the budget. Australian emissions permits can be issued to meet the covered parts of this theoretical trajectory. Complementary measures would apply to uncovered emissions. The CPRS White Paper[22] sets out a sensible model to manage permits to fit a planned trajectory (pp 10-9 to 10-13). As I read it, a firm cap is set for 5 years hence and some portion of permits, probably with annual vintages, are issued for each of the intervening years. Gateways are set for years 10 and 15. These are target bands. These give the upper and lower bounds of the future firm cap, which will eventually be set 5 years before its time.

The CPRS model seems quite suitable as a basis for managing to meet a longterm budget limit. The calculated trajectory first estimated may change over time, eg, as the agreed world view on a fair share changes, or as we over- or under- achieve the set caps. The more we fail to meet caps and the trajectory, the greater the liability – the catch up – we leave for others to deal with later. That's not a responsible legacy.

Treasury modelling of costs

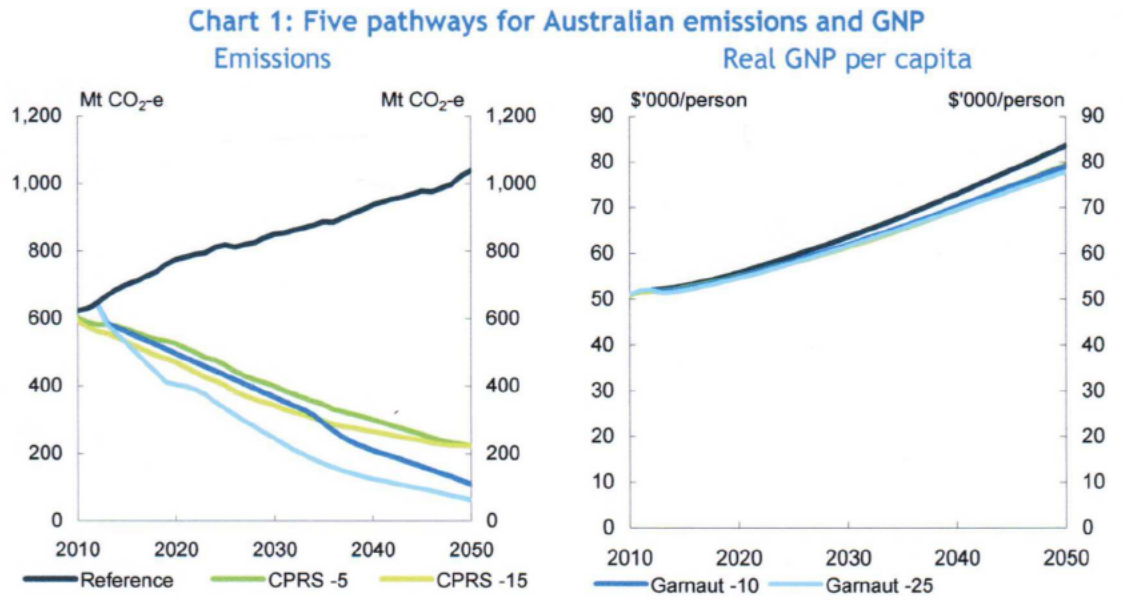
In 2008 the Treasury estimated the changes in the economy for different scenarios. They provide a helpful picture of the relatively small costs of carbon abatement, even with a 2020 target of a 25% cut. The starting date for reductions was 2010, so new estimates to be provided by the present Review, will be higher than the values quoted from Treasury's 2008 report. Nonetheless the comparison is important in dispelling people's common fears of the 'unknown costs' of abatement. Treasury's graphs Figure 1(page xii of Ref) illustrate the almost imperceptible decrease in GNP with various abatement scenarios.

In summary (see Attachment 1, p 20), the effect on GNP per capita of a 25% emissions cut, relative to a business as usual scenario is;

	Annual % growth in GNP per capita
• business as usual	1.22%
• 25% emissions cut	1.05%
• Ie, drop in GNP growth/year	0.17%

[22] *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future*, White Paper Vol 1 Dec 2008

Figure 1 Treasury's estimates for Australian emissions and GNP



Note: Units are in Australian dollars, 2005 prices. The reference scenario shows modelled emissions, while the policy scenarios show allocations (policy targets). Actual emissions differ from allocations due to banking of permits and international permit trade.
Source: Treasury estimates from MMRF.

An abatement of 25% to 2020 results in our annual GNP growth per person dropping from 1.22% to 1.05%. Ie, the growth reduction is 0.17% each year. Real growth continues with abatement, simply a little less strongly. To many people, this would seem a small price to hopefully avoid dangerous climate change. If made clear to the public there would be even more support for strong abatement, meaning a 25% emissions cut by 2020.

In its Fourth Assessment Report the IPCC[23] in 2007 suggested that Annex I countries should cut their 2020 emissions by 25% to 40%. Given that global emissions since then have been above expectations in 2007, it seems likely that the IPCC's AR 5 will suggest tighter targets. Australia seems unreasonably reticent to commit unconditionally to its fair share.

2020 and other years to 2050

In light of the serious reduction challenges Australia faces (noted in Table 4,page 15) it is prudent economically to strengthen our immediate reduction targets now. A lower overall cost for the economy longterm is the responsible option.

Probably most of the reaction against carbon reduction measures comes from fears over the costs. The costs most commonly considered are immediate ones, ie, those that flow through to the prices we pay for goods and services today. This short sighted perspective ignores the significant challenge and hardship we bequeath to future generations by avoiding strong action now. As well as economic reasons, strong ethical reasons say we should not leave an increasing financial burden for our children.

Note that benefits of addressing climate change are seldom quantified. It is difficult to estimate the avoided climate costs by limiting the temperature rise to 2°C . It is generally accepted as a 'given' that a rise of 4°C and more is unacceptable. As Garnaut notes whimsically (p ix), *". . . if we knew that doing*

[23] IPCC 2007 *Fourth Assessment Report Working Group III report*, in Box 13.7, page 776

something [ie, business as usual – viz ignore carbon reduction] *would give lots of benefits now but would cause the extinction of our species in half a century, the calculations would tell us to do it"*!

In late 2012 I wrote to the Government and my local member arguing that "Australia should sign on now to Kyoto phase 2 with firm cuts of 25% by 2020" – see Attachment 4.

Earlier estimates suggested a four year delay in global abatement from 2016 to 2020 meant the necessary annual carbon reduction rate rose from 5.8% to 8.4%.

Australia's current commitment to a 5% cut by 2020 is inadequate compared with future necessary reductions.

The best time to start strong reductions is now with a 25% target for 2020.

Unrealistic straight line trajectory in the Issues Paper

The caption to Fig 5 of the issues paper says in part; "*Trajectories are illustrative [and] they begin in **2012 and assume a straight line reduction to the target [2050]".*** It is surely unrealistic to suggest that abatement to 2050 would be linear? This puts the abatement burden on future generations. It could be seen as a deceptive approach to carbon abatement. Many kinds of economic and social change occur on a relative basis, where change is measured in one year relative to the previous. The paper cited by Raupach, Harman and Canadell uses exponential decay for estimating future emissions reductions. This is a first order, basic position for the major emission reductions and economic adjustments required. This is what I have used in my estimates above. A constant rate reduction (ie, exponential or year on year) should be used and explained in future work of the Authority[24]. The exponential reduction may look worse at the start of abatement but is clearly more realistic and we need to face up to this.

[24] Over the decades involved, the straight line model has a low relative reduction in early years and can give a false sense of comfort to the longterm challenge. In the early years, a realist exponential reduction (the rate itself is constant – its intrinsic quality) gives a faster absolute reduction than the unrealistic straight line, each ending at the same final level. An initial emission of 100 units reduced linearly by 80% over 35 years emits 2.28 units less each year. This is only a **2.28% decrease** in the first year. But in year 35, a 2.28 unit drop from the 34 year emission of 22.28 is a **10.2% decrease!** And for a 90% linear decrease over 35 years (probably necessary for Australia), **the first year reduction of 2.57% increases to 20.4% in year 35!**

Glossary

Abbreviation	Explanation	Abbreviation	Explanation
AR 5	Assessment Report 5, by the IPCC	IPCC	International Panel on Climate Change
Carbon	A general term normally incorporating all GHGs, essentially CO_{2e}	LULUCF	Land Use, Land Use Change and Forestry
CCA	Climate Change Authority, Australia	North	North countries in UN terms are the developed countries [essentially what has been called the West]. Generally carbon-intensive economies.
CDIAC	Carbon Dioxide Information Analysis Center	South	Similarly, South countries in UN terms are the developing countries and those with economies in transition[essentially the East plus eg, Latin America and some others]. Generally low carbon-intensity.
COP	Conference of Parties (to the UNFCCC)	UNEP	United Nations Environment Program
CO_2, CO_{2e}	CO_2 is normally used when only carbon dioxide is meant or measured. CO_{2e} is normally used to mean all of the GHGs, and when measured, includes the respective CO_2 warming equivalent for each of the other Kyoto GHGs.	UNFCCC	United Nations Framework Convention on Climate Change

Attachments

Attachment 1 Treasury estimates – GNP growth with different carbon scenarios

Australia's low pollution future, p xii, Treasury 2008

Table 1 Australia's emissions and economy

Personal calculations of annual average (constant) growth rates, added and highlighted

	Reference	CPRS -5	CPRS -15	Garnaut -10	Garnaut -25
Greenhouse gas stabilisation goal, ppm CO2-e	n/a	550(a)	510(a)	550	450
Current levels — at 2008					
GNP per capita, $'000/person	50.4	50.4	50.4	50.4	50.4
Start of scheme - at 2010 or 2013(b)					
Emission price, nominal, $/tCO2-e	n/a	23	32	30	52
Medium term — at 2020					
Emission allocation, change from 2000 level, per cent	40	-5	-15	-10	-25
GNP per capita, $'000/person	55.9	55.2	54.9	55	54.7
Annual growth from **base 2008**, over 42 years	**0.867%**	0.761%	0.715%	0.731%	0.685%
Growth rate is lower by (difference of rates)	0.000%	0.106%	0.152%	0.136%	0.182%
Long term — at 2050					
Emission allocation, change from 2000 level, per cent	88	-60	-60	-80	-90
GNP per capita, $'000/person	83.7	79.4	78.7	79.1	78
Annual growth from **base 2008**, over 42 years	**1.215%**	1.088%	1.067%	1.079%	1.045%
Growth rate is lower by (difference of rates)	0.000%	0.127%	0.148%	0.136%	0.170%
Overall mitigation cost, 2010-2050					
Real GNP per capita, average annual growth, per cent	1.2	1.1	1.1	1.1	1.1
Real GDP per capita, average annual growth, per cent	1.4	1.3	1.3	1.3	1.2

Note: Units are in Australian dollars 2005 prices. Emissions in the reference scenario are actual emissions from MMRF.

(a) Assuming comparable global mitigation effort is sustained after 2050.

(b) Emission pricing commences in 2010 in the CPRS scenarios, and in 2013 in the Garnaut scenarios.

Note: Units are in Australian dollars 2005 prices. Emissions in the reference scenario are actual emissions from GTEM.

Source: Treasury estimates from MMRF and MAGICC.

Page xii

Attachment 2 Sydney Bridge - Framework to fair, strong carbon reductions to start 2016

See separate pdf item, “Attachment 2, Wright, Sydney bridge - Framework to fair, strong carbon reductions to start 2016, v20120528.pdf”. Also available at;
http://www.gci.org.uk/Documents/Sydney_Bridge.pdf

Attachment 3 Author’s brief cv

See separte pdf item, “Attachment 3, Harley Wright, CV Oct 2012.pdf”

Attachment 4 Australia should cut 25% by 2020 Kyoto phase 2

See separate pdf item, “Attachment 4, Wright, Australia should cut 25% by 2020 Kyoto phase 2.pdf”

TO **UNFCCC Secretariat**

Ad Hoc Working Group on the Durban Platform for Enhanced Action, **ADP**

secretariat@unfccc.int

FROM **Dr Harley Wright** – ('About the Author' page 19)

Climate Sense, Sydney Australia

[redacted]

DATE 22 Feb / 18 Apr 2012

Submission to UNFCCC

Mandate: FCCC/CP/2011/L.10, paragraph 8:

> *"Requests* Parties and observer organizations to submit by 28 February 2012 their views on options and ways for further increasing the level of ambition and decides to hold an in-session workshop at the first negotiating session in 2012 to consider options and ways for increasing ambition and possible further actions. Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action"

FRAMEWORK TO SHARE CARBON SPACE TO 'INCREASE AMBITION' & 'ENSURE HIGHEST POSSIBLE MITIGATION'

"If for some reason you are not willing to lead; leave it to the rest of us; please get out of the way"
Kevin Conrad, Bali Dec 2007

From Current status → **Framework for timetable of strong action**

- Future vision unclear
- Methodical, serial decision making.
- No clear timetable for abatement
- Lacks formulaic basis to share emissions

- Full consensus on all decisions – slow, incremental progress

- Seeks an agreement "applicable to all Parties"

- Simple, fair, transparent, good future vision
- Flexible, adopts simple, least contentious options first
- Timetable sets decisions, → emissions trajectory
- A move to equal per capita emissions gives formula to share emissions
- Voluntary participation for 2016 start to strong reductions. Late starters encouraged to join (ethical pressure, trade equalisation)
- Accepts some Parties may not participate at start (2015/16)
- Startup period uses reliable emission values (fossil fuel and cement = CDIAC CO_2); coverage around 2/3 of total CO_{2e}.
- Include more GHGs (hard to estimate) CH_4, N_2O and LULUCF, later when practical for most countries.

Executive summary

Recent reports from the OECD and EIA give stark warnings of the need for urgent and strong action to reduce greenhouse gas emissions.

The science is clear that there is a limited quantity of GHGs which can be emitted in the future. If we started in 2016, world emissions must reduce by almost 6 percent, year on year, to stay within the emission 'quota' to 2050. Any further delay makes the task harder still.

This framework can assist COP's Durban Platform for Enhanced Action [1] complete its work no later than 2015. The timetable (page 20) shows steps leading to worldwide emissions reductions and trading in 2016.

It provides a fresh approach to speed up climate negotiations. It addresses two primary issues;

- Allocation of future emissions rights amongst Parties
- Funding contributions to support development in developing countries.

Measures outlined here can:

- Provide a legal agreement between most Parties to determine their carbon constraints and enable widespread trading in emissions entitlements.
- Provide a framework to reduce global emissions to an agreed safe level over time
- Provide substantial funds for sustainable development in low-carbon countries
- Require participating countries to agree to future emissions entitlements (= emissions profile), which can be traded (as permits).

The proposal is founded on **the principles of Contraction and Convergence[2].** It has four essential steps:

1 Agree on a global maximum emissions cap to 2050 [eg, 1000 gigatonne CO_2]. This is **contraction**.

2 Agree on the principle of equal per capita emissions at some stage (the date is not determined in this step, simply the principle). This is **convergence**

3 Agree on the *date* when all emissions entitlements become equal per person. This is the crux of the issue. The **date**(s) **of convergence** determines the size of the high value trade in entitlements between high-carbon and low-carbon countries, viz, developed and developing countries

4 Determine **emissions profiles**, issue permits, manage reconciliation and facilitate global trade. High-carbon countries buy permits from low-carbon with annual trade of around $100 billion or more depending on the carbon price.

These four steps enable a fair determination of each country's emissions entitlements. Step 3 in particular, is highly contestable and most difficult. **Agreement on these four steps can resolve the crisis and hiatus. Other issues are secondary to these core steps which need to be resolved first.**

Acknowledgment and disclaimer

I am pleased to acknowledge much valuable assistance from friends and colleagues – they know who they are. My calculations and graphs are presented for illustrative purposes in a semi-quantitative sense. They are not forecasts and may not be accurate.

[1] Durban Platform for Enhanced Action includes: Item 6, Decision; "the process shall raise the level of ambition"; Item 7, Decision; "close the ambition gap with a view to ensuring the highest possible mitigation efforts by all Parties"; Item 8, Request; "consider options and ways for increasing ambition and possible further actions."

[2] Contraction and Convergence at; candcfoundation.com/pages/whatis.html also www.gci.org.uk/Documents/ZEW_CONTRACTION_&_CONVERGENCE.pdf.

Contents

A. Introduction & background

Kyoto a landmark – more needed

The Kyoto Protocol was a momentous landmark in global agreement. At Kyoto, almost 40 developed countries in Annex B agreed to constrain their emissions. They knew this would be adverse to their current economy, yet realised this small cost was necessary for the common good of the world's climate and to avert ever increasing costs of climate effects. It was the first step of contraction. Many more steps are needed.

Regrettably, we have made little progress since to make more cuts.

Sharing limited 'carbon space' – solving the problem

Carbon emissions – a finite resource

The maximum aggregate emissions from 2010 to 2050 is estimated to be 1000 Gt CO_2 (Meinshausen 2010[3] and BASIC Experts 2011[4]) to keep the temperature increase to below 2°C with a 25% probability of exceeding 2°C.

How does the world go from its current annual emission of 9.1 Gt CO_2 in 2010[5] to 2050 while maintaining a maximum aggregate of 1000 Gt? How do we share this 'carbon space' amongst the Parties?

Reducing emissions with a constant exponential rate means that the difficulty is constant in relative terms. Using this form of reduction, a 5.8% per year rate of exponential decrease is required to limit aggregate emissions to 1000 Gt CO_2, from 2000 to 2050. By the time these proposed cuts could start in 2016, around 460 Gt of CO_2 will already be emitted. The CO_2 emissions reduction, from 2016 at 5.8%/year is shown by the lower curve labelled, 'CO_2 CDIAC' in Figure 2 (page 14). The world's annual emissions drop to 4.8 Gt CO_2 (7.2 Gt CO_{2e}) in 2050.

This is a daunting challenge for the developed countries alone (the North) were it not for the obvious needs of developing countries (the South) to

1. higher energy use, which normally means higher carbon emissions, and
2. other per capita increases, eg meat and fertilisers which also have high carbon intensity.

The BASIC countries seek: "equitable access to the carbon space" and "equitable access to sustainable development". (BASIC Experts 2011[6])

A restraint on emissions is unfamiliar and unwelcome. It affects lifestyle choices and economic activity.

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3 Meinshausen et al, *"Greenhouse-gas emission targets for limiting global warming to 2°C" Nature* **458**, 1158-1162, 2009)

[4] *Equitable access to sustainable development – a paper by experts from BASIC countries*, embargoed 3 Dec 2011

[5] *Record High 2010 Global CO2 Emissions .."* See http://cdiac.ornl.gov/trends/emis/prelim_2009_2010_estimates.html

[6] *Equitable access to sustainable development – a paper by experts from BASIC countries*, embargoed 3 Dec 2011

Methods to share and limit emissions

What methods or theories can help us find an appropriate path?

COP needs to set a target on the size of the abatement needed, eg, a limit of 1000 Gt CO_2 from 2010 to 2050 or a perhaps a range may be suitable to allow for later adjustments. But how is this shared amongst Parties?

There are various proposals of how abatement could be effected. Like this submission itself, proposals are commonly of a single approach. In contrast, Prof Ross Garnaut wrote a Review for the Australian Government in 2008[7]. Chapter 9, "*Towards global agreement*", provides an excellent review of various options and methods which the world could use to reduce emissions. Methods reviewed include carbon taxes and tradeable emissions entitlements:

From this inciteful analysis of alternatives Garnaut concludes:

> **"The only realistic chance of achieving the depth, speed and breadth of action now required from all major emitters is allocation of internationally tradable emissions rights across countries. For practical reasons, allocations across countries will need to move gradually towards a population basis."**

He notes also

> "Under contraction and convergence, each country would start out with emissions entitlements equal to its current emissions levels, and then over time converge to equal per capita entitlements, while the overall global budget contracts to accommodate the emissions reduction objective. This means that emissions entitlements per capita would decrease for countries above the global average, and increase (albeit typically at a slower rate than unconstrained emissions growth) in countries below the global average per capita level. Emissions entitlements would be tradable between countries, allowing actual emissions to differ from the contraction and convergence trajectory."

And further

> "The contraction and convergence approach addresses the central international equity issue simply and transparently. Slower convergence (a later date at which per capita emissions entitlements are equalised) favours emitters that are above the global per capita average at the starting point. Faster convergence gives more emissions rights to low per capita emitters. The convergence date is the main equity lever in such a scheme."

I know of no better appraisal of plausible methods of abatement which have the breadth and depth of Garnaut's Chapter 9, His careful and objective analysis confirmed my own intuitive view of our best option. Hence this submission is based on equal per capita emissions. What plan or methodology is COP following? Garnaut's Chapter 9 is embedded for consideration.

[7] *Garnaut Climate Change Review*, Australian Government, 2008


Garnaut 2008 Chapter9.pdf [double click to open]

The need for full consensus on decisions at COP constrains rapid progress. Progress seems to be in small, incremental steps ('incrementalism'). There is still no clear framework to agree on the emissions which each Party may make in the future. There seems no timetable to achieve such a framework.

My submission proposes [heroically!] such a framework and timetable. The framework aims for fairness and wide acceptance. The framework aims to start strong abatement as soon as possible. We are running out of time to manage the problem without serious distress. The timetable (page 20) aims to start strong abatement from 2016.

With speed and strong abatement the priority, this framework suggests streamlining options. My framework accepts that not all Parties may be prepared to participate from 2016 (when it first commences). So be it in the short term. Second, it proposes that the formally constrained and traded emissions would be those most easily and unambiguously measured.

Contraction and Convergence – ethical imperative

The key purpose of the contraction and convergence principles and measures is to determine a fair share of future carbon emissions for each country, noting that:

- Current world emissions need to be cut significantly- **the key principle of contraction**
- Developed countries have high per capita emissions arising from practices convenient in building and maintaining their standard of living
- Developing countries have low per capita emissions. They now aspire to become developed in accord with the Millennium Development Goals[8]. This development will require higher emissions in the short term before changes enable low emissions with a satisfactory quality of life.

The key principle of convergence is that each person has a right to emit the same amount of a controlled substance (GHGs) to the atmosphere – the global commons. This equity principle is embodied in:

- The Universal Declaration of Human Rights[9]
- United States Declaration of Independence[10]

A climate agreement is based on the allocation of national emissions targets, determined by population. This enables emissions entitlements/permits to be traded globally. Developing countries get substantial incomes from selling emissions permits in early years to developed countries. The market establishes carbon prices at future times and trading allows developed countries to meet their reduced emissions targets at least cost.

Ideally, all UNFCCC countries need to commit to this framework soon. Given the probable difficulty, this proposal suggests that a legal agreement be made when sufficient participating countries have emissions meeting a suitable threshold, eg 70% of world emissions. Prof Garnaut noted, *"Deep trade among a set of countries which includes major sellers and buyers of entitlements is enough to secure these benefits; not all*

[8] UN Millennium Development Goals

[9] Article 1. "All human beings are born free and equal in dignity and rights."

[10] "We hold these truths to be self-evident, that all men are created equal,"

countries need to participate in trade."[11] Garnaut also proposed a graduated approach to national entitlements.

Ethical imperative

The contraction principle is implicitly embodied in the Framework Convention and associated agreements. The principle of convergence is widely accepted. It is formally endorsed by many countries.

But **convergence** is not yet formally implemented by the Convention. Yet this principle is at the heart of the last 50 years of environmental law and policy. The Brundtland report[12] endorsed the internalising of externalities – the policy principle to implement the 'polluter pays' principle, which Brundtland also promoted. These principles are widely adopted in laws around the world. They also align with ecological principles where harvesting should be limited to the 'sustainable yield' - while emission loads should be limited to the 'assimilable capacity' of the environment. Limiting the emissions of greenhouse gases is a global exemplar. The common means to limit extractions from, or discharges to, the environment is by rationing, and the use of quotas or ration permits.

The allocation of limited permits to emit to the atmosphere on an equal per capita basis is undeniably equitable. Yet many of us are used to discharging GHGs above the assimilable capacity of the atmosphere. The Kyoto response at the time was practical. Emissions from high-carbon countries were limited in proportion to their *historic* emissions. Moves to allocate emissions permits on *a per capita basis* will continue. The world (through COP) can move as quickly as is reasonable in this direction now. Prompt and efficient abatement could result. Or the COP can avoid the fair and inevitable process and continue to negotiate with slow, unsatisfactory and fitful gains. Delays to abatement now, will likely lead to dangerous climate change.

Permit trade provides large funds to developing countries

Agreement on the above enables emissions profiles to be set for each country with agreed parameters, applicable to all. Emissions permits, based on emissions profiles can be issued and traded which allows each country to reconcile its actual emissions with purchased or sold permits. Large payments flow from high-carbon countries to low-carbon countries. Total annual payments up to $250 billion could be paid by developed countries to developing countries[13]. This is in the same order of magnitude as the payments mooted for the Green Climate Fund, which is to assist developing countries adopt low-carbon and sustainable technologies.

The contraction and convergence model uses agreed and transparent emissions criteria as the basis for traded permits. The consequent large wealth transfer to developing countries helps provide for sustainable development. The size of the trade derives directly from the agreed and explicit principles. Other processes, including the Green Climate Fund, lack such explicit and agreed factors. The basis for the level of funds contributions by countries, and allocations to countries, seems qualitative and prone to gaming and continuing dispute, and this risks delivering the promised funds. Contraction and convergence avoids these issues and could reduce the funding needs of the Green Climate Fund.

Legal framework necessary

Contraction & Convergence (C&C) is arguably the only practical model leading to the sustained emissions reductions necessary and in time to avoid dangerous climate change. These proposed measures require a

[11] *The Garnaut Review 2011*, Cambridge Uni Press, p 45.

[12] Brundtland report, *Our Common Future*, 1987

[13] Developed countries might need to buy in aggregate 5 Gt CO_{2e} and pay up to $50/t of CO_{2e}, ie, $250 billion.

legal framework for all Participants. Voluntary actions (eg, the Hartwell Paper, 2009[14]) have scant hope of providing the necessary levels of quality assurance for high value trade in entitlements or the high rates of abatement needed in future.

Section B in this paper (*Four essential steps for COP adoption of Contraction & Convergence*, pages 9 to 14) sets out the key steps and policy decisions needed to adopt C&C. It deals with a few critical issues and allows several years if necessary to resolve the **major issue of the timing of convergence**.

This framework aims for speed in start up and the confidence of the Parties in the processes. Accordingly, the essential and simplest aspects are adopted first. Many more complex and difficult issues can be solve later from a sound working core. This promotes a wide understanding and confidence in the process, which developing countries have sought with the Kyoto Protocol.

[14] Hartwell Paper at; http://www2.lse.ac.uk/researchAndExpertise/units/mackinder/theHartwellPaper/Home.aspx

B. Four essential steps for COP adoption of contraction and convergence

The following policy steps are proposed as, "options and ways for further increasing the level of ambition", sought in the Durban Platform for Enhanced Action, COP 17.

Participation in Contraction and Convergence

Participation under the UN Framework Convention needs to include virtually all countries. However, to ensure it starts as soon as possible, full participation may not be complete in the early years. The process should start with as many countries as possible participating (initial Participants). The Participants would set the rules for the formal process of allocating and trading international emissions entitlements. This formal process is called the UN 2C process or zone[15] for convenience. It would be the main means of reducing emissions. Other complimentary processes can apply to those emissions not covered by the UNFCCC process. Those Non-Participants - not committing at the outset - should be encouraged into joining as soon as possible. Some means are mentioned later.

The Contraction and Convergence principles[16] should be a key part of determining all countries' fair shares of future GHG emissions. I suggest the following four essential steps are sufficient to establish a sound and practical base for strong abatement of emissions using contraction and convergence.

1. Science sets the contraction needed

The IPCC reports will inform the COP on the contraction needed in world emissions to avoid dangerous climate change. At its broadest, a specified contraction could be a maximum aggregate emission by a date – eg, 1000 Gt CO_2 by 2050. The timetable in section F (page 20) has this being agreed to in 2012 at COP18. Additionally, contraction in world emissions may be set by a more specific profile of emissions over time, eg, set amounts for every 10 year period – in the timetable, at COP19, 2013.

To allow changes to future targets due to changes in goals, (eg, due to improved understanding of the climate science) bands of emission quantities may be set instead of a single value. This then provides flexibility for changing targets which in turn change the value of emissions entitlements/permits, which have already been issued for later years. Australia explained a useful model of 'gateways' leading to specific 'caps'[17], which is considered further (page 12).

2. The Principle of Convergence

Hopefully, all signatories to the UNFCCC will agree to the principle that per capita emissions should, at some yet to be specified time, become equal. It is sufficient that a majority of countries agree and is timetabled for COP18, 2012.

3. Dates of Convergence

[15] 'UN 2C' is a suggested abbreviation for the UN Process using Contraction and Convergence, for several reasons. First; '2C' has an immediate correlation with the aim to limit temperature increase to 2°C [though 1.5°C needed]. Second; 'UN 2C' would be used for the formal, rule-governed processes under UNFCCC/COP and differentiate it from the generic use of Contraction and Convergence which would still be used.

[16] Contraction and Convergence homepage at; http://www.gci.org.uk/index.html

[17] "*Carbon Pollution Reduction Scheme*" Australian Government White Paper vol 1, sections 10.1, 10.2, Dec 2008

Agreement on the date when all emissions entitlements become equal per person is the crux of the issue. It determines the size of the high value trade in entitlements between high-carbon and low-carbon countries, viz developed and developing countries.

3.1. I suggest dates from 2008 (the commencement of contraction under the Kyoto Protocol) through to 2050 in the timetable (page 20) as the broadest range to agree on at COP18, 2012. Future negotiations should work to agree on a single date in this range.

3.2. A narrower date range only might be agreed at COP19, 2013, given the crucial effect on large trade values. The timetable suggests 2015 to 2030.

3.3. The timetable tentatively suggests a final convergence date of 2025. COP will debate this vigorously – it is a key determinant of the size of future trade in entitlements/permits.

4. Emissions profiles; Permits issue and trade; Reconciliation

Participants in UN 2C set the world's **emissions contraction** as a maximum aggregate emission up to some future date – over the period of the contraction. They can then set a global emissions profile, eg assume a constant rate of reduction.

The emissions profile of each country sets its future allowed emissions which it agrees to meet through a reconciliation of its actual emissions with purchased or sold permits. Setting the emissions profiles is the critical part of the UN 2C process as these determine the amount of emissions entitlements/permits available for trade. Each profile will be determined by the common and agreed targets for either;

- **Simple Convergence**
  All countries converge to an equal per capita emission by a specified date, eg, somewhere between say 2015 to 2030. Note that fast convergence will be of greater benefit to developing countries than slow convergence. Conversely, fast convergence is more adverse to developed countries who, facing steep cuts in emissions, will be buying more permits from developing countries. As there seems little basis for settling the self-interest aspects involved, this is likely to be a strongly contested issue, which could invoke many aspects; or

- **Modified Convergence**
  Participants in the UN 2C process may modify the simple model outlined. Most likely, emissions profiles for developing countries may allow faster expansion of emissions in early years (providing 'head space') before falling faster, later (than a steady rate of change).
  Many variations are possible for the emissions profiles and they may be considered as the process develops. Note though, that increasing the complexity can make it harder in the future if further modifications are considered.

In general, Participants are issued entitlements/permits to emit equal to their original profiles. The permits are issued under the UN 2C process and are freely tradable.

Trading of permits enables reconciliation of actual emissions with a permitted profile:

Each **developing country** is allocated permits that allow for per capita emissions, generally at levels above its needs in early years.

Permits issued to **developed countries** will often be less than their needs, in which case they will buy permits (of the relevant currency period) from developing countries for reconciliation. The reconciliation process would build upon current MRV protocols. It will check that the sum of actual

emissions plus permits relinquished or sold matches each country's (or group of countries') emissions profile. A country's actual emission should equal its allocated emission permits from the UN 2C process plus or minus the permits bought or sold respectively. Small discrepancies might be carried forward for adjustment in the next reconciliation period.

Shortfalls in permits below a country's actual emissions in a period could be compulsorily reconciled by subsequent pruchase of permits – probably from a later vintage (designated period). A difficult situation might arise if many high-carbon countries had actual emissions plus purchased permits, each exceeding their respective entitlements in a period. The necessary purchase of of more permits to reconcile their aggregate exceedence of their entitlements might send the carbon permit market to unrealistic high prices, which could challenge the trust in the system. Measures to manage the stability of the market, the supply of permits and overall trust and confidence in the process could be developed. This will be a new fully international market of substantial value of a novel commodity – a colourless gas. Yet its mass and effects are as tangible as its human production from fossil fuels, carbonate rocks and other sources. Astute structure and management is a requirement for its lasting success.

Achieving full participation in the UN 2C process[18]

Initial Participants can use the same principles and calculations to set emissions entitlements for all countries, including the Non-Participants. It would be reasonable that high-carbon, late-joining Parties to the UN 2C process would have to account for their emissions, from the start of the process, before they joined. This, together with a demonstration of a significant and effective trading and accounting process by a majority of countries could induce Non-Participants to join. Non-Participants might also be labelled as 'free-loaders'.

Materiality – Emissions threshold to participate

The measurement, reporting and verification costs become proportionally larger for small emitters and economies. The COP may wish to set thresholds below which Parties are not obliged to participate in the UN2C permit and compliance process. Complementary Measures could apply to these exempt countries.

Border Adjustment Measures *[Comment[19]]* could be applied on emissions-intensive products imported from Non Participants into Participating countries *[Comment[20]]*. Appropriate modifications could be made to the General Agreement on Tariffs and Trade[21] (GATT, with the WTO). Participants would publish criteria and means to calculate appropriate import (BAM) fees under rules made by the UN 2C zone Participants.

Non-Participants pay BAMs on exports to UN 2C zone

[18] Countries that do not commit to the UN 2C process would be deemed Non-Participants.

[19] BAM is a common term commonly used in this debate. Hence it's included here as many can relate to this. Note that France has pushed for this for the EU – but was rejected. Ross Garnaut's Review (2008) favours some form of BAM given appropriate amendments to GATT.

[20] This is a means to pressure countries to participate in the UN 2C zone. Focus on high-carbon imports can keep transaction costs low.

[21] The following provision in GATT 1947 Article XXV, point 5, says;

- "In exceptional circumstances CONTRACTING PARTIES may waive an obligation ,,, and may;
- (i) prescribe such criteria as may be necessary …
- (ii) define certain categories of exceptional circumstances …"

Waivers under this provision of GATT might be developed to allow for border adjustment measures by the UN 2C zone – without compromising sound, free-trade principles. The reasons for, and uses of, this exception to GATT would be clearly explained to prevent escalating trade wars. These GATT provisions seem suitable to enable this.

Non-Participants are not obliged to reconcile their emissions. However the deviation of a Non-Participant's actual emissions from its published emissions profile can be included and used in the calculation of BAM fees levied on its products exported into the Participating zone.

Factors to determine Border Adjustment Measures

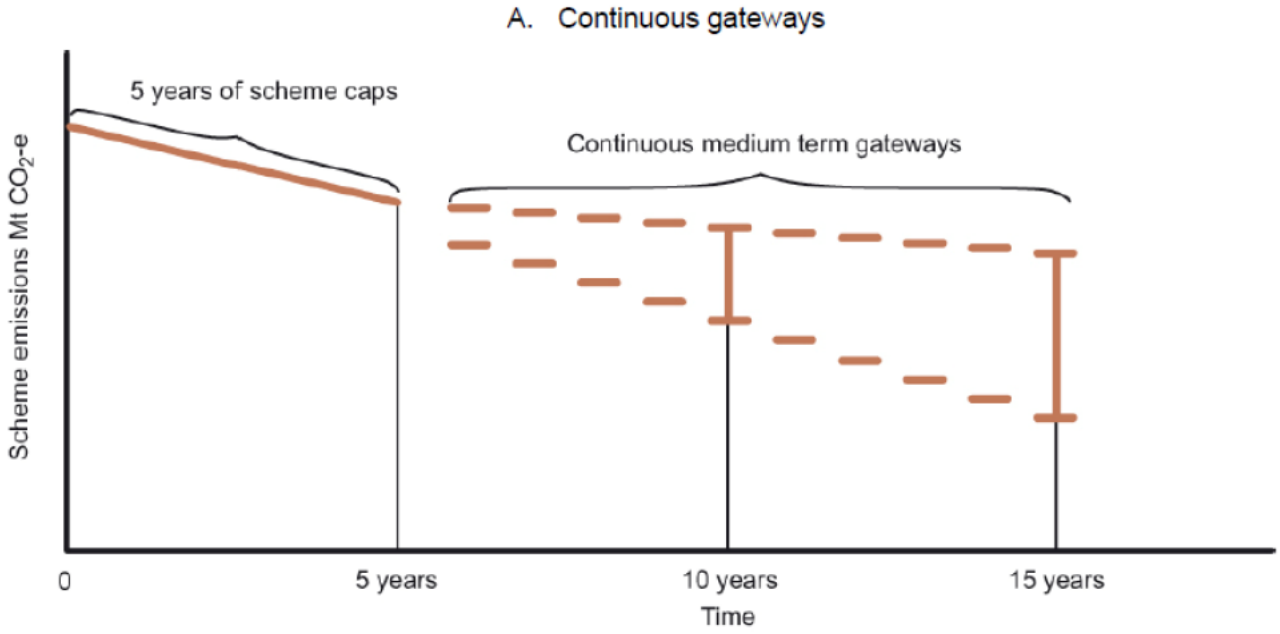
The level of Border Adjustment Measures to be applied to high (emissions) intensity imports from Non-Participating countries would have regard to:

a) The imputed intensity (tonne CO_{2e}/ unit or /weight or /value) of the import based on the emissions intensities of the economic inputs to make the high intensity imports (in its own country)
b) The traded price of CO_{2e} prevailing at the time, and
c) The degree to which the exporting, Non-Participating country is meeting or exceeding an emissions profile determined by the UN 2C process.

Coping with changes in emissions targets

Agreed targets – either emissions or dates – may need to change as circumstances change. Emissions permits in current and future years will have values which would be affected by changes in targets. Substantial revaluations might occur unless care is taken to avoid risks to the value and reliability of the scheme. An Australian model for emissions permits set longterm targets in a range ('gateways') to be targeted. But short-term targets – up to 5 years away - were set as a single value. Figure 1 from Australia's model is shown[22].

Figure 1: Forms of gateway



This model has the benefit of providing carbon prices (for emissions) for the next 15 years. This is a great benefit to informed decision making in all aspects of the economy – consumers, high carbon product producers, and government.

[22] *Carbon Pollution Reduction Scheme*, Vol 1, page 10-10, Australian Government, Dec 2008

I suggest similar target ranges could be made for, eg;

- The aggregate world emissions stock to 2050 (as first set in Step 1.2)
- The exponential decay rate (constant) to set the world's total emissions trajectory
- The convergence date for equal per capita emissions (Steps 3.2 & 3.3).

Basic coverage of emissions – facilitates easy start for all Parties

High participation is required for the UN 2C process to start. To encourage participation, it is suggested the process be simplified to the most simple needs. The coverage of GHG emissions is an aspect which can be simplified.

The Convention defines six greenhouse gases and aims to reduce the combined effect of these. The contraction and convergence framework requires estimates of GHG emissions, the allocation of emissions entitlements to countries, and trade in entitlements.

The majority of GHGs can be easily and accurately estimated. But others are diffiuclt and estimates vary depending on the methodology. The Marrakesh Accords are a great achievement in dealing better with many of these, including LULUCF.

Developed countries provide estimates of virtually all their GHG emissions when reporting under the Kyoto Portocol. Many of the minor emissions such as methane from landfills and sewage treatment are relativeley difficult to measure. The cost of estimating these emissions is relatively high compared to their relatively small contribution to total emissions, eg a few percent in developed countries.

Developing countries have argued against reporting their emissions, which is unnecessary when they have no specific targets. But to benefit from the sale of unused permits, through the UN 2C process, Parties need to account for their emissions.

The CO_2 emissions from burning fossil fuels and making cement are easily and reliably measured and reported. The CDIAC records these, which account for around two thirds of total GHG emissions. This subset of total GHG emissions provides reliable and easily measured values that should be suitable to estimate each country's allocation, thence allow trade in permits. This compromise requires that complimentary measures are needed to deal with emissions not covered by this [UN 2C] process.

Figure 2 shows model emissions trajectories for three different measures of CO_{2e} which range from 'full' coverage Kyoto emissions through reducing coverage to 'CDIAC CO_2' - the basic emissions of fossil fuels plus cement manufacture. A continuous 5.8%/year rate of reduction is required for the Meinshausen limit (1,000 t CO_2) to be met, starting with base 2015 emissions of 36.7 Gt CO_2.

The upward pointing arrow in Figure 2 shows how the core emissions of the UN 2C scheme would be expanded later with wide adoption of more detailed processes for measuring and verifying other GHG emissions. Emissions not included in the formally constrained and traded UN 2C process would be subject to complementary measures which all countries would be asked to implement.

Accounting for emissions

The UN 2C process, estimates and accounts for all actual and reliably estimated carbon emissions and limits these. It is simple and sufficient to manage the contraction of covered emissions.

Mechanisms such as CDM and JI have evolved as a means to extend abatement activities to areas outside the ambit of direct Kyoto obligations. Such measures invoke 'additionality', viz an imputation of emissions reductions relative to what would have occurred without the additional action. Such measures do not allow a reliable estimate of net additions of GHGs to the atmosphere and are inherently less reliable than direct measures of emissions. There is no benefit in measures based on additionality for emission sources already covered in the process. Such mechanisms need to be ended fairly, whenever full emissions accounting is established.

The REDD scheme is an example of a complementary measure to manage LULUCF emissions.

Figure 2: Various sources of GHGs – constant 5.8%/y rate of reduction[23]

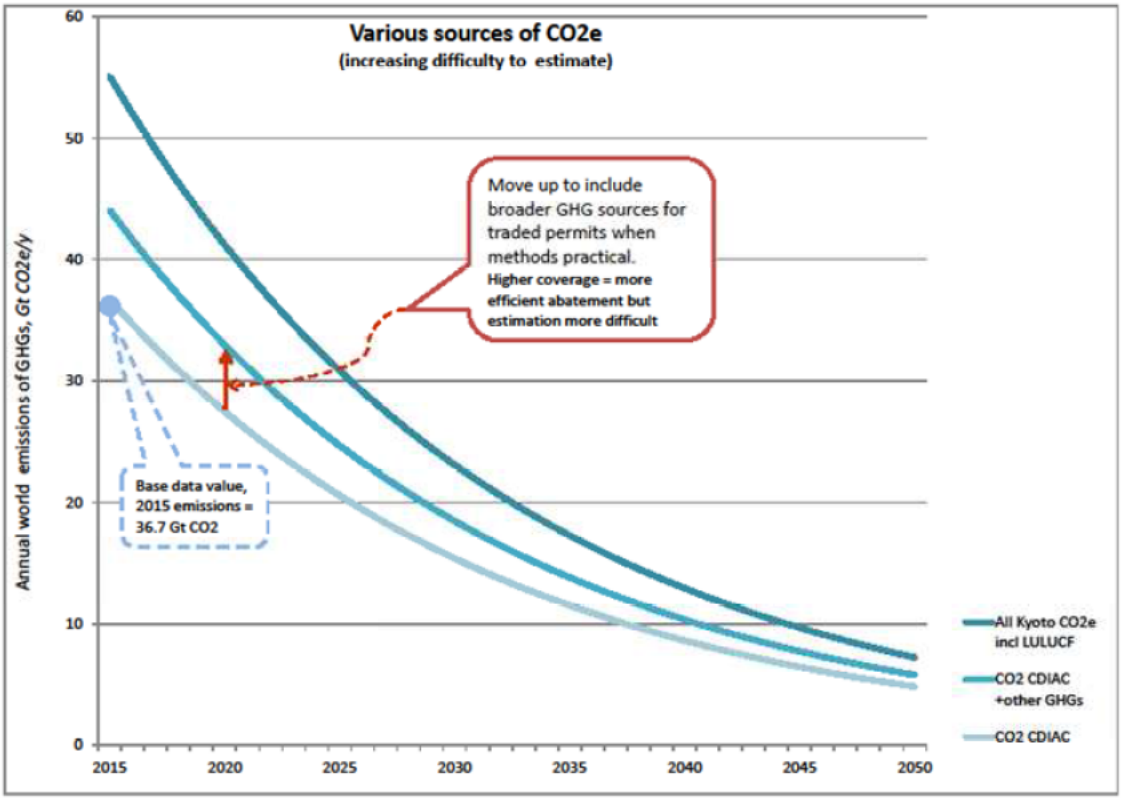


Figure 2 details: Three hypothetical emissions reduction trajectories. I determined the base data value, 2015 emissions = 36.7 Gt CO2 from fossil fuels and cement by extrapolation from CDIAC data[1]. And the 2015 emissions values are calculated as; 'All Kyoto CO2e incl LULUCF' = 'CO2 CDIAC' * 1.5, and 'CO2 CDIAC +other GHGs' = 'CO2 CDIAC' * 1.2. These relationships are simply indicative for illustrative purposes.
The exponential reduction rate for the CO2 CDIAC curves was set to give the aggregate emissions of 1,000 Gt CO2 from 2000 to 2050 (the Meinshausen limit). I used the CDIAC data to estimate CO2 emissions from 2000 to 2015 at 464 Gt CO2. Almost half the limit has expired before we commence strong abatement! The constant reduction rate needed is 5.8%/y.

[23] Calculations for these curves yet to be verified

Urgent action needed if we aim to limit temperature to 2℃

There are many reasons why action is urgently needed to reduce emissions. Here I illustrate how the window is closing on our ability to constrain the temperature rise to 2C.

In the graphical illustration of reductions in Figure 2, emissions reduce by 5.8%/y commencing in 2016, from a 2015 peak emission. But what happens if emissions levelled for four years from 2016 to end 2019 – before we started strong reductions? **Figure** 3 illustrates the situation. The critical feature is that now we need a constant reduction rate of 8.4%/y starting from 2020, rather than the 5.8%/y reduction if we started just 4 years earlier, in 2016. Since the formal agreement to avert dangerous climate change in Rio in 1992, we have sadly lost a lot of time. If my sums and estimates are reasonable, we face an unprecedented social and technical challenge. A quantum leap in effective effort is needed now.

Figure 3: Effect of 4 year delay in abatement[24]. Reductions go from 5.8%/y to 8.4%/y

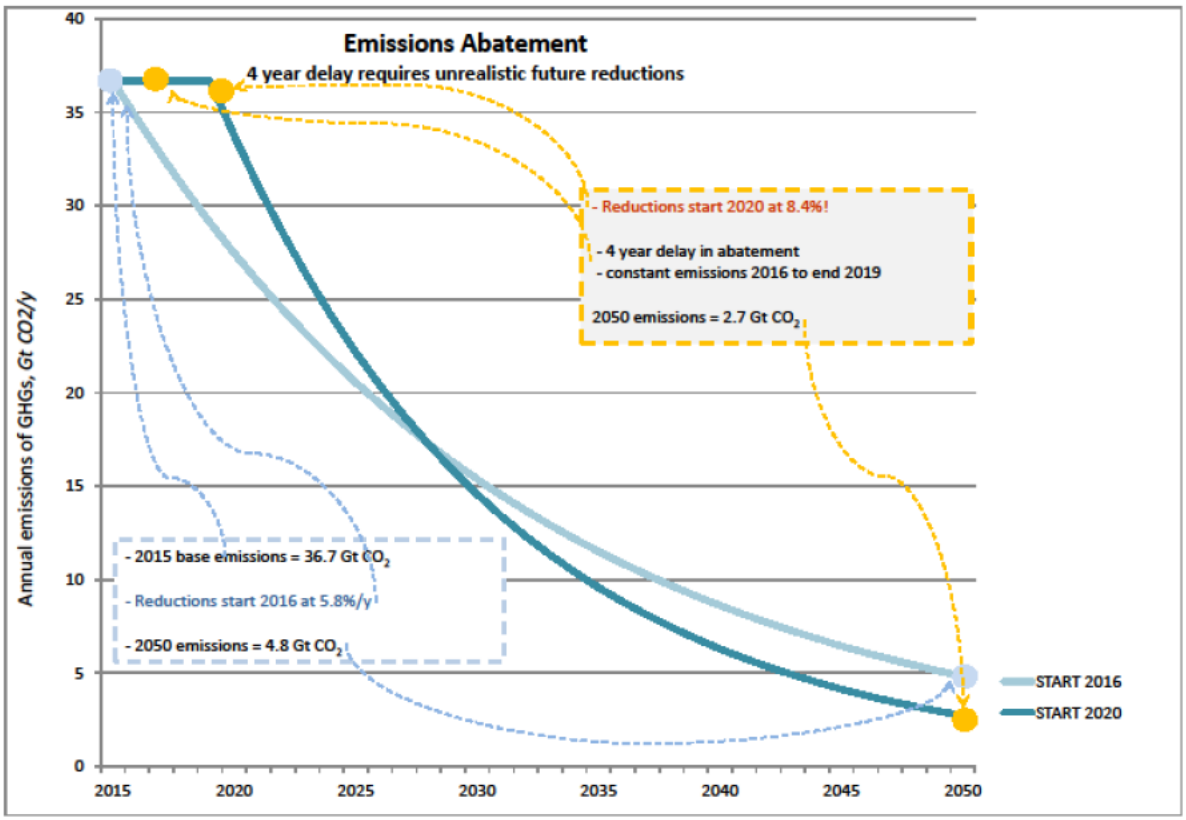


Figure 3 details: Two hypothetical emissions reduction trajectories. The curve decreasing from 2015 is the same CO2 CDIAC curve in Figure 2. The other curve shows constant emissions from 2015 to end 2019. Then an annual reduction of 8.4% (year on year) is needed to keep the aggregate emissions under 1,000 Gt CO2 from 2000 to 2050 (the Meinshausen limit).

[24] Calculations for these curves yet to be verified

C. Further issues require consideration

The following issues will need attention in the development of a detailed UN 2C process. Initial comment is provided but need not be decided upon in formulating a formal decision on the framework for the UN 2C process. There are other issues, not specifically mentioned, which the UN 2C process may need to address also.

Measurement, accuracy and compliance

The quality of emissions data varies widely amongst countries. Considerable monetary payments and receipts directly depend on the emissions data under the UN 2C process. In COP discussions some countries have opposed obligatory reporting of their emissions. Under the proposed UN 2C process, all participating countries (Participants) would have to provide reliable, audited estimates of emissions. Developed countries generally have reliable measurement of their emissions which can be audited against MRV standards developed under past COP processes. It is not reasonable to expect developing countries to have processes to provide accurate and reliable emissions data of the same high standards. Accordingly, different measurement methods might have a range of accuracies and reliabilities. This is the basis for suggesting the initial coverage being CDIAC CO_2, viz, from fossil fuels and cement, which are most reliably estimated.

The difference in a country's actual emissions estimate (eg, for 1 year) to its emissions entitlement is the estimate of that countries entitlement surplus or deficit. Some conservative adjustment could be made to surplus and deficit estimates before trading and requiting. The adjustment would depend on the accuracy and reliability of the estimates of actual emissions. The adjustment would be greater for estimates with less reliability. By such means, estimates for countries of varying reliability *[Comment[25]]* can be used as 'certified emissions' in a trading process involving billions of dollars. Normalising emissions estimates by conservatively adjusting them should enable most countries to participate in emissions trading, even when the accuracy or reliability of their emissions is not strong.

Population

Population is an important factor. World population is expected to grow around 30% by 2050 at which time it should be close to a plateau. This increased population aggravates the emission problem. Each country's current population would be used to calculate its future emission profile. But what happens as a country's population changes in future? This question is left to the UN 2C process. It is suggested now that the populations used at the start of the calculations be locked in (stay constant) for future calculations but further consideration is warranted.

Time of joining the UN 2C zone – initial Participants, Non-Participants, late Participants,

No details are suggested here for dealing with timing issues for joining the UN 2C zone. There would be the initial establishment by Participants. Later, other countries could join. Key issues include how to deal with past exceedences of emissions, relative to the emissions profiles established for all countries by the founding participants. Further consideration is needed here.

Historical emissions – pre 1992 Rio UNFCC Convention

The normal contraction and convergence measure is applied in a forward time sense, with an inherent starting time of the present. However the BASIC Experts say that those countries who have contributed to

[25] Currently, the trade in various units of CO_{2e} use different prices (per tonne CO2) for different sources. I am not familiar enough with this to know if this might work instead of the process suggested here. This proposal normalises data with different reliability in a conservative way that helps avoid fiddling the data. Also, it is designed to simplify the process for developing countries to become Participants and benefit from selling excess emission permits.

higher atmospheric levels of GHGs should now be responsible for their past emissions[26], [27]. Difficulties arise with this concept. There is the issue of making a law applying retrospectively to actions not known to be undesirable, let alone 'illegal' or otherwise penalised – see [28]. Note further, that assessing each country's emissions prior to say 1990 would be difficult and inaccurate, particularly with LULUCF emissions over some centuries. The arguments include a Party's past emissions [historic – eg, last 100 years] need not be resolved with a yes/no acceptance. Firstly, this contentious issue should be deferred from the immediate task of the early steps in the timetable. And when it is addressed later, it could be considered and resolved with an arbitrary, proportional value. Eg, acceptance of responsibility for 10%, 20% or some other proportion.

Ambit claims? It may be impolite to suggest, but perhaps some calls from the South and the North can be seen as ambit claims; ie, simply stating an extreme, perhaps unreasonable position, as a means to shift a compromise in a direction favourable to their own situation. So the South's call to include 'historic emissions' could be an ambit claim, as could the North's call for a convergence date of 2050, as is said to have occurred at Copenhagen, and a basis for a failure to agree.

A possible starting time for the UN 2C process could be 1992 when international agreement was reached on the UNFCCC at Rio in 1992. But later dates, eg, the start of contraction in the Kyoto commitment period, 2008, seem more suitable.

D. What happens . . . ?

(Possible questions to answer)

If COP does not adopt contraction and convergence?

Ans: There is widespread acceptance of the C&C principles from all sides of the debate, particularly the rich/poor (high carbon / low carbon) divide. There is no apparent alternative model to achieve the necessary consensus to equitably allocate emissions entitlements to countries, thence reduce emissions. If contraction and convergence is not adopted very soon, the continuing discussions down various deviating paths are unlikely to achieve sufficient reductions in time to avoid dangerous climate change. Contraction and convergence is the one possible path out of this most difficult problem. It addresses the key issues directly. It is sensible and fair and it has the potential to achieve the necessary reductions. Nothing else comes close. It should be adopted urgently. Perhaps the Easter Islanders and Mayans ignored the warnings of the OECD and IEA.

To the Green Climate Fund?

Ans: The Green Climate Fund would become less important because high-carbon countries will pay large sums to low-carbon countries to purchase emissions entitlements (permits). Annual payments for permits could likely exceed $100 billion. There are existing structures for guiding aid in developing countries and these could be an appropriate way to guide wise investment of the large

[26] Greenhouse gas emissions reduction: A theoretical framework and global solution" by Project Team of the Development Research Centre of the State Council, People's Republic of China, ca 2008

[27] *Equitable access to sustainable development – a paper by experts from BASIC countries*, embargoed 3 Dec 2011

[28] Universal Declaration of Human Rights, Article 11 says; • "(2) No one shall be held guilty of any penal offence on account of any act or omission which did not constitute a penal offence, under national or international law, at the time when it was committed."

income in developing countries from sale of permits. The funding needs for the Green Climate Fund would be much reduced. Note too, that the bases for developed countries to fund the GCF are qualitative and endlessly debatable.

To JI and CDM?

Ans: It is likely these will fade with time. There seems no basis for these mechanisms when the carbon accounting principle uses actual emissions, not imputed reductions using additionality. Transitional arrangements need be made.

If the USA does not become a Participant in UN 2C?

Ans: It will be the elephant in the room. It would be increasingly hard politically for the US to stay isolated from a separate world committed to abatement. The UN 2C process would be a virtuous commitment of rich and poor countries and large and small emitters - committed to international emissions constraint. It would seem hard for the US to stay outside this agreement.

When countries wish to commit to UN 2C after it has commenced

Ans: Let's leave this to COP to consider after it has agreed on the core aspects of the UN 2C process and agreement.

If a country wishes to leave the UN 2C?

Ans: As for point 5. above. Let's leave this to COP to consider after it has agreed on the core aspects of the UN 2C process and agreement.

E. Glossary

Abbreviation	Meaning	Comments
BAM	Border Adjustment Measures	These are 'waivers' under section XXV of GATT, which are yet to be detailed by Participants to UN 2C.
Carbon, C	The term 'carbon' is commonly used to designate CO_{2e}	If the cost (or other reference to carbon) is given as eg, $/t carbon it is to be interpreted as 1 tonne of carbon in its atomic abundance. Ie, 44 tonne CO_2 or CO_{2e} equals 12 tonne of carbon. A price of $10/t CO_{2e} is equivalent to a price of $36.67 /t carbon emitted (as 44/12 t, emitted in the form of CO_2 or other GHG)
CO_2	Carbon dioxide	
CO_{2e}	Carbon dioxide equivalent, as defined in the agreements under UNFCCC.	
Entitlement	issued to a country to emit a quantity of CO_2 or CO_{2e} in a specified period.	Entitlement is issued under a UNFCCC agreement and method. It is the basis for permits which can be traded.
GCF	Green Climate Fund	
GHG	Greenhouse Gases	
LULUCF	Land use, land use change, and forestry	

Abbreviation	Meaning	Comments
MRV	Monitoring, Reporting and Verification	
Non-Participant	A country not participating in the UN 2C policy; [*Term coined in this proposal*]	
Participant	A country participating in the UN 2C policy; [*Term coined in this proposal*]	
Permit	Derived from entitlements, to adjust for reliability of data. These are tradable units.	
REDD & REDD-plus	international UNFCCC process of reducing emissions from deforestation and forest degradation	
UN 2C	All aspects of the formal UNFCCC/COP adopted 'contraction and convergence' policy, process, rules and zone or group of participating countries in the process; [*Term coined in this proposal*]	

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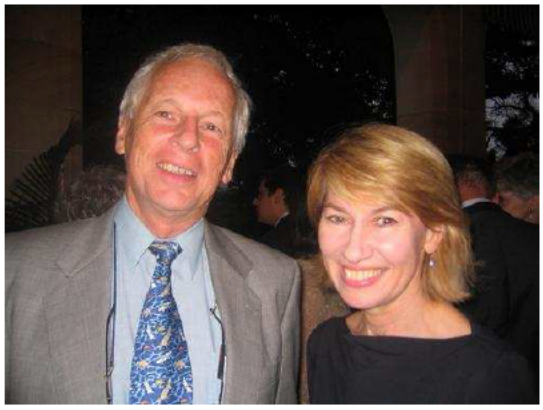
22 Feb / 18 Apr 2012

About the Author;

I have been an environmental scientist and manager for 30 years, coming from a training in physical chemistry. I have had frequent, detailed engagement on climate change policy from national and corporate perspectives. I provided detailed expert commentary on the penultimate draft of the IPCC's *Synthesis Report* and *Summary for Policy Makers* to the Third Assessment Report. Now retired, I work on policy aspects of climate change and having no commercial or government affiliations, I act on my own account. I am an Australian citizen who is deeply concerned that the world is not acting firmly enough to deal with the increasing threats from global warming. I hope this helps.



Harley discusses climate change with Maxine McKew, ALP candidate for Bennelong, NSW Government House, 5 Mar 2007

F. COP – Timetable

Policy Steps to ensure "highest possible mitigation" – global emissions trading starts 2016

Step	Policy steps	2012	2013	2014	2015	2016
1. Contraction			Kyoto 2nd Period Ends 2015, Cap & Trade starts Jan 2016			
1	**Agree to Contraction** (qualitative only)	Agreed COP 18				
1.2	Maximum emissions for 2050, 2030	Agreed COP 18				
1.3	Maximum emissions by 2020 eg: Annex I = 1990 -25%; non Annex I = 1990 +20%		Agreed COP 19			
2. Convergence						
2	**Agree to Convergence** (qualitative – no time limit)	Agreed COP 18				
3. Convergence Date						
3.1	Agree shortest & longest convergence dates, eg, 2008 to 2050	Agreed COP 18				
3.2	Agree tighter dates, eg 2015 to 2030		Agreed COP 19			
3.3	Agree convergence date, eg 2025			Agreed COP 20		
4. Entitlement Profiles						
4	**Emissions Profiles, Permit issue & trade, Reconciliation**					
4.1	Framework – Principles & Policy Steps to be developed	Agreed COP 18				
4.2	Agree each Annex B country's target for Kyoto2 2013-2017	Agreed COP 18				
4.3	Working Party sets emissions entitlement (permit) profiles (say in 5 y steps)			Agreed COP 20		
4.4	Working Party develops • permit management, compliance • & late-joiners policy			Agreed COP 20		
4.5	Agree full compliance to start cap & trade 2016			Agreed COP 20		
4.6	The full working measure is finalised in 2015 & approved at COP21.				Finalise details. Agreed COP 21	Jan: **CAP &TRADE STARTS**
Other policies, issues						
	Green Climate Fund					
	Others - Many					

HARLEY J L WRIGHT

Environmental scientist and manager
cv, Oct 2012

Overview

Age 68. I initially studied as a chemist and have a PhD in Physical Chemistry, [Uni Syd], and later a postgraduate Diploma of Environmental Studies [Macquarie].
Relevant positions from past to present:- worked in CSR on mineral processing developments, especially iron ore (~7 years); over 25 years in environmental management, including Macquarie University – economic models of energy, resources and pollution - and the state EPA managing hazardous chemicals and contaminated sites. Was Environmental Manager with paper company Kimberly-Clark Australia for over 18 years, being active in diverse aspects of environmental issues and management, including waste water, air emissions, solid wastes, forestry, National Pollutant Inventory, and especially active in greenhouse policy developments and reporting.

Energy and Greenhouse Aspects

In 1979 I investigated and reported on energy options for Australia in the Myers' Committee of Inquiry into Technological Change. The emphasis then was to see how Australia could get liquid fuels for transport, following the two oil shocks of the 70s. My work for the Myers Report gave me a thorough and synoptic view of Australia's energy supplies and use, and possible alternatives. Greenhouse became an active issue soon after.

In 1982 I worked on energy, water, and pollution using economic models of the Hunter Valley and Australia at Macquarie University (Centre for Environmental and Urban Studies). I also completed a post graduate Diploma of Environmental Studies at Macquarie.

From 1984 to 1991 I was at the NSW State Pollution Control Commission (now the EPA) - my main position being Manager Chemicals and Wastes. I implemented the first controls on contaminated sites in Australia and was responsible for, environmentally hazardous chemicals and dealing with chemical incidents. I was also Director of the Centre for Environmental Toxicology and gave talks on the Precautionary Principle and toxicological risk assessment. .

From 1991 to 2008 I was Environmental Manager at Kimberly-Clark Australia - experience noted in first paragraph.

Environmental Philosophy

My areas of special interest and broad expertise include greenhouse policy and economic measures, water quality policy, tradeable emission permits, solid waste management and recycling and environmental economics. I am keen that environmental controls address genuine environmental problems directly at source (a key principle promoted by Brundtland) and are not out to ban this or that unnecessarily because of a whim or false perception.

I favour the use of economic measures to internalise environmental externalities then allow people's choice, with maximum degrees of freedom, to allow the most efficient and democratic outcome.

Managing greenhouse emissions is the big and longterm challenge for the next century. I consider it essential that there is a greater acceptance and use of economic measures to facilitate least cost solutions to this diabolical problem. I favour the rationing of carbon emissions. Then the allocation of emissions entitlements moving over time from historic per capita levels (as per Kyoto) to equal per capita levels (contraction and convergence). I see no other way that is as broadly acceptable or feasible. I remain active in policy development with colleagues and organisations, proposing stronger commitments to fair reductions in global carbon emissions.

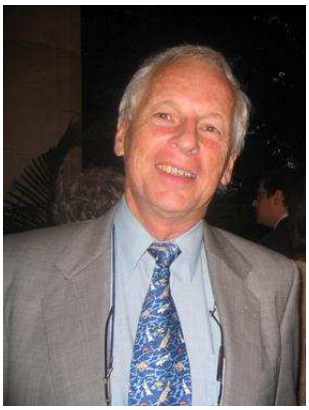
Current affiliations:

Member	Environment Institute of Australia & NZ
Member	Australian Water Association
Member	Waste Management Association of Australia
Member	Australian Institute for International Affairs, NSW Branch

Personal

My real love is the bush and the coast. I am often bush walking, camping, snorkelling, kayaking, cross country skiing - or even tending my native garden and orchids. Have recently trained as an arborist to aid managing my trees. I was Chairman of the Middle Harbour Catchment Management Committee (1992 – 2000) and am involved in natural resource management issues, with special expertise in the adverse effects of urban runoff on natural bushland.

Harley JL Wright BSc, MSc, PhD, PostGradDipEnvStudies
October, 2012



Australia's greenhouse gas emissions are highest in developed world

- per capita basis – over 20 tonne CO_2 equivalent per year.

Australia should sign on now to Kyoto phase 2 with firm cuts of 25% for 2020

This block of dry ice (frozen CO_2) is the average weekly emission of one Australian (photo © H Wright)

Australia needs to reduce its emissions by over 80% by 2050. This requires an annual reduction in emissions of around 5% each year, starting now. This is challenging. But worse if we delay.

The longer we delay, the emission reductions we make in future become harder and more costly. The sooner we start to make strong reductions, the less costly and harmful it will be. A smooth transition to a low carbon economy now, means we can get the most out of existing infrastructure and processes. If we wait until drastic cuts are needed later, we will write-off high carbon infrastructure prematurely which is wasteful and costly.

IPCC report that the developed world needs to reduce emissions by 25% to 40% by 2020.

Australia should sign on now to Kyoto phase 2 with firm cuts of 25% by 2020.

This will give us clear domestic targets and strong carbon pricing to stimulate low-carbon innovation. It will show the world we are responsibly and fairly addressing our 'worst in class' emissions. There are other notable countries who are yet to commit responsibly and this strengthens the message that all strong emitters must make small sacrifices to keep the world fit for our descendents – my son (photo) and all our children.

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