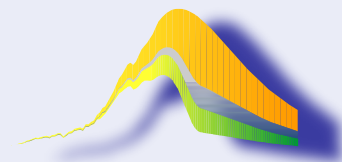




5th December 2005

Sir Nicholas Stern
Stern Review of Climate Change
2nd Floor, Room 35/36
HM Treasury
1 Horse Guards Road
London SW1A 2HQ



Dear Sir Nicholas

Contraction and Convergence [C&C] - GCI Contribution to your Review

Thank you for conducting this enquiry. The implications for energy demand and emissions of the prospects for economic growth over the coming decades are serious.

GCI has addressed this problem since 1990. Our primary emphasis has been the economic, social and environmental consequences of climate change in both developed and developing countries. The risks of increased climate volatility and major irreversible impacts, and the climatic interactions, as well as possible actions to adapt to the changing climate and the costs associated with them, are a function of the rate of damages - albeit from a lower base - already exceeding the rate of growth.

GCI believes that the framework of Contraction and Convergence [C&C] makes it possible - indeed is the necessary prerequisite - to address this death-trap. The impact and effectiveness of national and international actions reducing net emissions in a cost-effective way while promoting a dynamic, equitable and sustainable global economy, including distributional effects and impacts on incentives for investment in cleaner technologies is not possible without a C&C agreement.

The Prime Minister remarked recently: -

"We urgently need a framework, with the necessary targets, sensitively and intelligently applied over the right timeframe that takes us beyond 2012. It can only happen if the US, China and India join with Europe, Japan and others to create such a framework. Failure will mean not only increasing the damage to the environment but in a world of greater competition for carbon fuel, real pressure on energy supply and energy prices. Yet such an agreement cannot materialize without the major nations of the world agreeing an approach that is fair and balanced, sharing the most advanced science and technology to tackle carbon emissions; in other words, a just settlement as well as an effective one."

He is correct and C&C answers this call. The position is full-term constitutional. It has withstood fifteen years of criticism to become now the most widely quoted and supported position in the debate.

C&C has been formally advocated by the Africa Group since August 1997. This was reaffirmed by the Government of Kenya at the UNFCCC COP-11 in Montreal.

Enclosed is our submission to COP-11. I ask that your review focus on pages 12 - 15. Kenya's presentation at COP-11 was entitled, "The Rhino is Charging". The global average rate of damages from climate change is at least twice the global average rate of Economic Growth. This is the 'Rhino' that exercises all of us.

I hope you will find this useful and that the arguments inform the outcome of your review.

With best wishes

Yours sincerely

Aubrey Meyer



1. UNFCCC Objective

"Contraction & Convergence [C&C] is inevitably required" [UNFCCC Secretariat.]

2. Historic Responsibilities

Accelerate Convergence relative to Contraction, with Permit Trading.

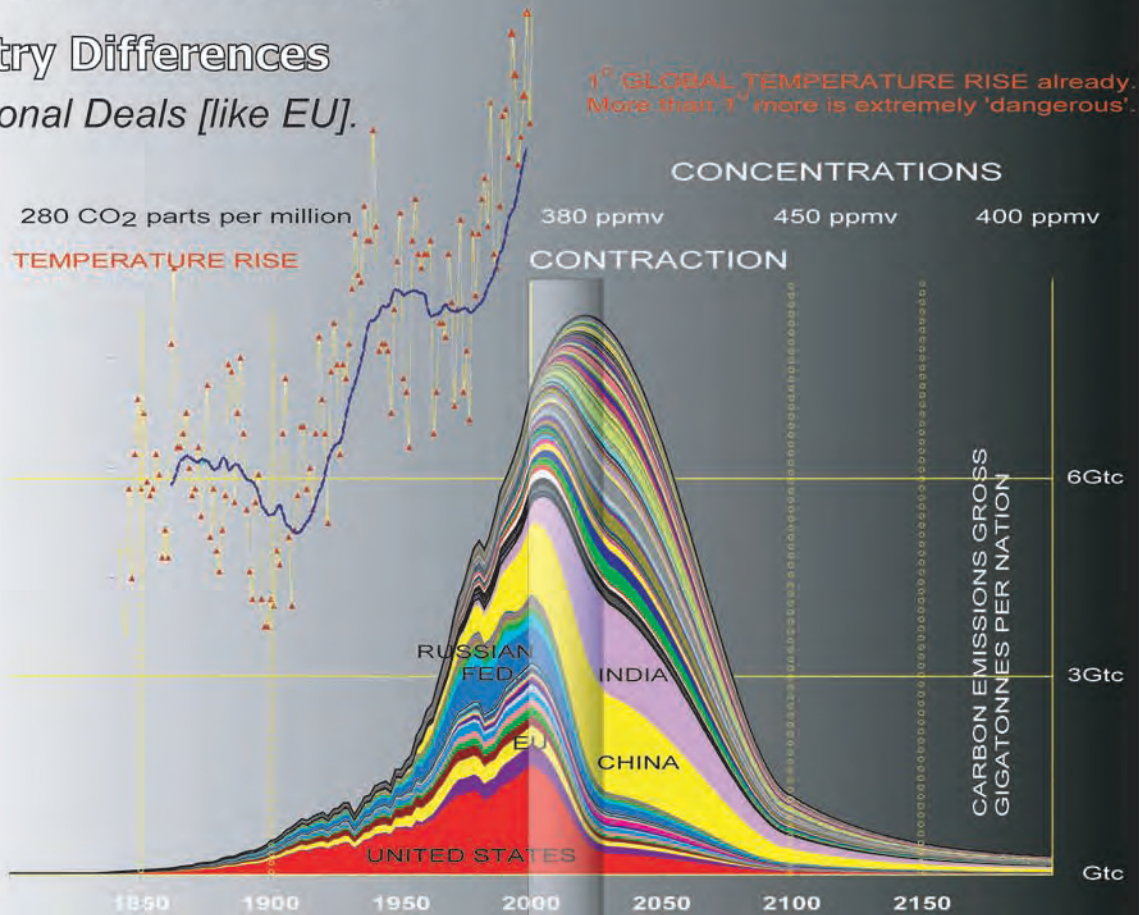
3. Country Differences

Intra-Regional Deals [like EU].

COP 11

GCI Montreal

Dec 2005



1° GLOBAL TEMPERATURE RISE already. More than 1° more is extremely 'dangerous'.

1. UNFCCC Objective

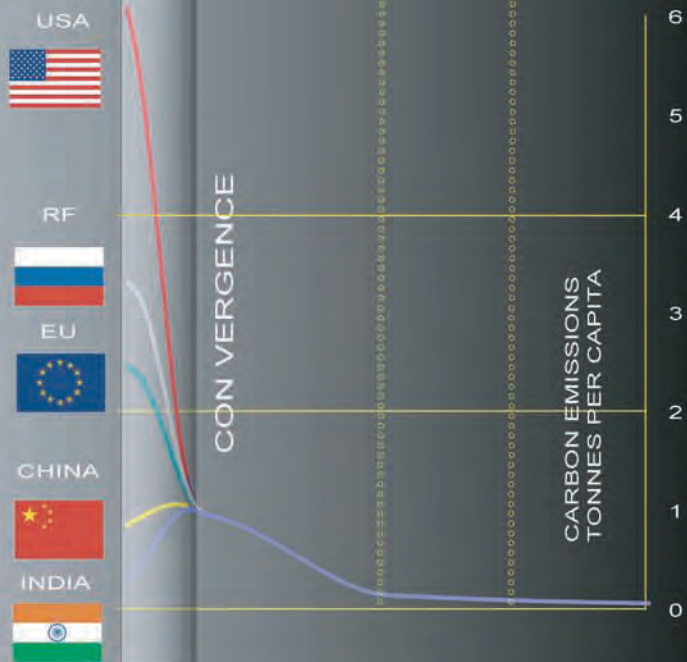
C&C is a rational full-term commitment to this objective.

2. Precaution & Equity

C&C is governed by these agreed UNFCCC principles.

3. Byrd Hagel 'Globality'

C&C is 'inclusivity' combining 'limitations' with 'reductions'.



URGENT MESSAGE TO COP-11 FROM GCI



There are no military solutions to climate change. Moreover, whatever the unresolved arguments are about where humanity has come from – ‘creationist’ versus ‘evolutionist’ – the rationale for an inclusive, full-term, framework-based-market of *Contraction and Convergence (C&C)* is fundamental to the future intelligent design of the means and ends of avoiding dangerous climate change.

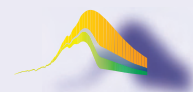
So, do we have or lack the judgement and the resolve to organize this effort? This challenge faces the UN; we are at the Eleventh Conference of the Parties to the United Nations Framework Convention to prevent dangerous Climate Change (UNFCCC), yet climate change is still accelerating dangerously.

The key messages in this document are: -

1. The UNFCCC *objective* was agreed in 1992. It is a safe and stable greenhouse gas [GHG] concentration in the global atmosphere. This is a quantitative limit, it is legally binding and must be set.
2. The agreed *principles of precaution and equity* in the UNFCCC are governed by this limit. These are meaningless without a global calculus for combining them with the objective so we can calculate how to come together at rates that are solving the problem faster than we are creating it. *Clean technology* is not relevant without - and only relevant *within* - this calculus.
3. The *historic responsibility* of industrialised countries for raising GHG concentration in the atmosphere is clear. To address this debt to the South, the C&C calculus demonstrates the future convergence to equal tradable shares per capita globally and that this can and must be *significantly accelerated* relative to the global contraction of emissions that stabilises GHG concentration in the atmosphere. This is the realistic way to resolve the North/South arguments about ‘blame’ for the past. Thus, in the interdependent context of surviving climate change, the historic grip of poverty gives way to the mutual benefit from the trading clean development for lucrative emissions equity and global survival.
4. To deal with the *differing national circumstances* that - subject to the accelerated convergence under contraction - remain, intra-regional arrangements can be created, as already happens in the European Union under the Kyoto Protocol, *but* - to avoid political chaos - *away from the UNFCCC* .
5. Not doing this is suicidal. Opposing this, as some do, is too. At the same time, proposing it in words while not proposing it in the numbers, as some others do, is neither competent nor honest. Still further, proposing to actually reverse existing per capita consumption differentials as yet others do, is deluded. Unlike C&C, all of these tendencies are anti-consensus, confused and dangerous.
6. From the outset, the US persistently and correctly demanded *globality* - all countries are involved. This was explained in the *Byrd Hagel Resolution* of the US Senate in 1997; commitment/entitlements inclusively combine ‘limitations’ with ‘reductions’ under a global cap. C&C is the only proposition in all the years of this process that directly answers and enables this demand. It prioritises globality with carbon equity over growth, whilst under-writing the clean growth that is still possible.
7. Led by the Africa Group and supported by India and China, C&C was proposed and accepted in Kyoto [See back cover]. C&C is now led again at COP-11 by - inter alia - the government of Kenya. This document lays out the essential text of this proposition in thirteen languages. Some of the clear support for C&C that has grown consistently since Kyoto, is at the end of this document.
8. Whatever atmospheric concentration target is set, C&C *“is inevitably required”* to achieve it. These are the words of former Executive Secretary to the UNFCCC, the late and greatly valued, Joke Waller Hunter. Then again, in the words of the Archbishop of Canterbury head of the Anglican Communion, *“C&C appears Utopian only if we refuse to contemplate the alternatives honestly.”*
9. It is evident time is against us. C&C can redress this and COP-11 can and should resolve to evaluate C&C in SBSTA/SBI and establish it as soon as possible as the formal basis of future effort.

Aubrey Meyer

Aubrey Meyer
Director GCI



the rhino cometh

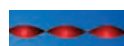


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SUSTAIN MAGAZINE September 2005 Aubrey Meyer

“Don’t Annoy the Rhino”

There is a tale about an angry Rhino and the Salisbury-Bulawayo Express. In what was old Rhodesia, a steam train used to go daily between those towns along a single track. But there was trouble. The train-track ran through rhino-territory and, as time went by, the cranky old lead-rhino took umbrage about the train and its route and planned a counter-strike. One day, as the train chugged south at 70 miles an hour, the rhino mounted the track and charged north. The resulting train-smash derailed the train and killed the rhino. A comparable kamikaze situation is developing with global climate change. With greenhouse-gas emissions still accelerating upwards, we are now going down the tracks towards the oncoming angry rhino of dangerous climate change at a rate that threatens chaotic impacts and challenges species survival.

In more technical language, despite the heroic arrangements in favour of the ‘Kyoto Protocol’, we continue globally to cause climate change much faster than our response to avoid it.

So the key question is, what does it really take to avoid this chaos? The answer is ‘Contraction and Convergence’ (C&C) – with appropriate haste, fossil-fuel emissions must contract globally while the international shares in this converge.

ANGRY RATES OF CLIMATE CHANGE

As demand in the formal economy grows at three per cent a year, burning fossil fuels for the energy requirement has grown at an almost equivalent rate. The greenhouse-gas emissions from this fuel-burning are accumulating in the global atmosphere and it is this raised concentration of heat-trapping gas that explains the rise in temperature and danger that is called global warming and climate change.

In turn, it is this increase in temperature that is behind the global growth of droughts, floods, crop-failures, hurricanes, glacial and ice-cap melt and so on. Estimated accounts for these climate-related damages have been kept by the Re-Insurance industry for the last 40 years.

The records show that this rate of growth, albeit from a lower based figure, is on average going at more than twice the rate of the growth of the economy. Looking forward on this track, it is only a matter of time before they impact and the human economy is derailed by angry rates of climate change.

FULL-TERM FRAMEWORK REQUIRED

To prevent this, the United Nations Framework Convention on Climate Change (UNFCCC) was created, signed and ratified between 1990 and 1995. Its objective was established as stabilising the rising concentration of greenhouse gas in the global atmosphere at a value that is safe. Its principles are precaution and equity.

Whatever else is true, in order to merely slow and then stabilise the rising atmospheric concentrations of greenhouse gas, the underlying net-emissions must contract globally to nearly zero within roughly 50 years if we are to avoid dangerous and potentially runaway rates of global climate change. There are arguments about these rates, but the basic message is inescapable – we are causing the problem faster than we are acting to avoid it. While everybody knows that the UNFCCC was the first step to deal with this, we also know that the ‘evolutionary’ patchwork of the Kyoto Protocol is not an adequate second step. A full-term framework is needed. To measure this, an adequate reading of the problem across global time/space is necessary, otherwise adequate action cannot be organised or even its need understood.

THE TREND-DYNAMIC

The first challenge is communicating the trend dynamic of the UNFCCC objective – all the time we are achieving this contraction, we are merely slowing the rise of concentrations, temperature and damages. The relationship between emissions and concentrations compares with an open tap and the bath into which its water is flowing. The problem is that the bath continues to fill while we are turning the tap off and if we are too slow, there is over-spill. To deal with this, a numerate full-term international greenhouse gas ‘concentrations/contraction’ arrangement is required by definition.

THE PRINCIPLE OF EQUITY

The second challenge is communicating the principle of equity – we need to address this survival challenge with a clear understanding of the pervasive and worsening asymmetry in the global economy. Over many decades, the persistent trend has been that two thirds of people globally (mostly, but not

only in the developing countries) have less than six per cent of global purchasing power with greenhouse-gas emissions to match, while the other third (mostly in developed countries) have 94 per cent of global purchasing power and with emissions to match. Those who argue to ‘make poverty history’ as a stand-alone argument are not only faced by those who don’t engage with that, they also face this asymmetry with the reality that climate change is making this ‘poverty’ into emiseration and fatality, particularly in Africa. A pre-defined global equity-based ‘contraction/convergence’ future emission permit sharing-arrangement is required by definition to deal with this. The issues of equity and survival cannot be separated. Inter alia, C&C is the position of the Africa Group of Nations.

THE PRINCIPLE OF PRECAUTION

The third challenge is communicating the principle of precaution – all our children are being born into what is becoming a worsening death-trap. As intelligent citizens and parents we know we cannot successfully separate issues of equity and survival from precaution. Hope is good – but not enough. Nor can we, in conscience, or assumed powerlessness, take the position that the present and future climate-casualties are wishfully just the lesser and unavoidable collateral costs of the ‘success’ story of economic growth. Trends show they are not. A precaution-based ‘concentrations/contraction/convergence’ agreement is imperative as damage-prevention takes precedence over future growth. If correctly understood, this underwrites whatever growth is still possible.

THE FUTURE IS LIFE

Further, whatever the bitter arguments between science and religion, about evolutionism versus creationism and intelligent-design, it is the future that speaks to us now. Future life on earth can only be protected against dangerous human-induced climate change with a deliberate and intelligently human-designed ‘Contraction and Convergence’ agreement. C&C, and the case for it, as argued by GCI since 1990, is summarised on the previous page and below. C&C is now the most widely known and supported basis for dealing with climate change in the international debate.

The future is life, if there is one. If there is a future, it will result directly from organising in this way based on this analysis. Humanity will not survive the head-on smash with the damages of global climate change that present trends dictate.

The moral? “*Don’t annoy the Rhino!*”



Contraction and Concentrations

Whatever future level of stable atmospheric CO₂ concentrations is deemed 'safe'

. . . . a future full-term global emissions contraction budget is required by definition to achieve it.

This is true because atmospheric concentrations are a response to emissions cumulatively.

Three contraction:concentration scenarios are shown here

. . . for 350, 450 and 550 parts per million by volume [ppmv] of atmosphere.

The carbon from one part per million CO₂ has a weight of ~ 2.13 billion tonnes of carbon [2.13 GtC].

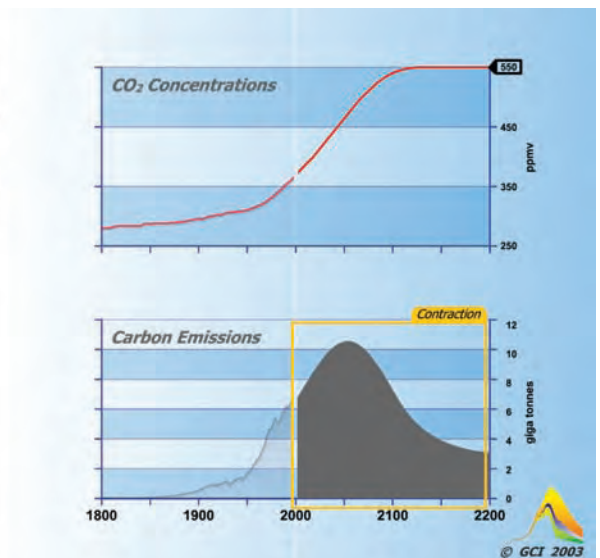
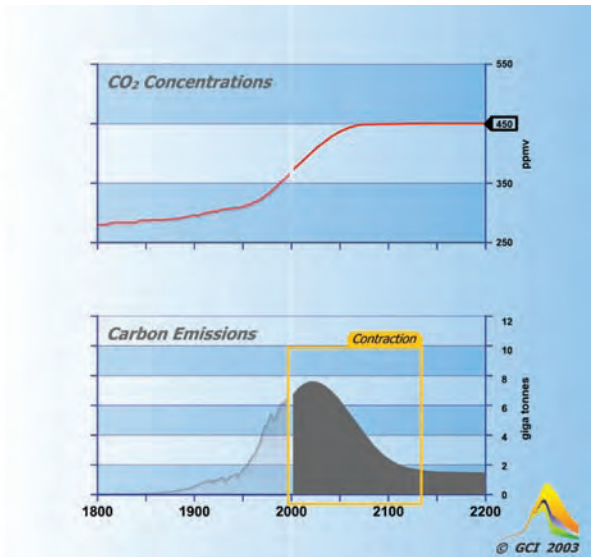
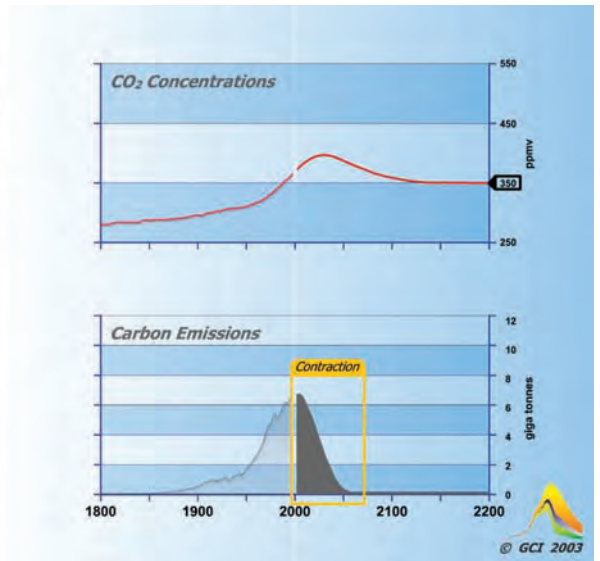
Human emissions from fossil fuel burning have been rising at ~ 2% a year since 1800. The current output is over 6 billion tonnes of carbon a year and rising.

The higher we allow this level to go, the greater are the dangers of runaway global warming and climate change.

So far the atmosphere has been retaining about half this amount each year, with the other half returning to the biosphere where natural sinks have been enlarging partly reabsorbing the increase.

Recent evidence show that the rate of reabsorption is reducing and the rate of atmospheric retention is increasing.

This suggests that the natural sinks are saturated and in some cases turning to sources themselves e.g. forests.



Carbon Cycle and Sequestration

Recent carbon-cycle modelling from the UK Met-Office 'Hadley Centre' suggests that when this effect is taken into account, future levels of atmospheric CO₂ concentrations associated with a contraction budget that would have yielded an outcome at 450 ppmv would in fact give an outcome nearer 550 ppmv.

These estimates show that a smaller and more rapid emissions contraction budget would be required to achieve a 450 ppmv outcome.

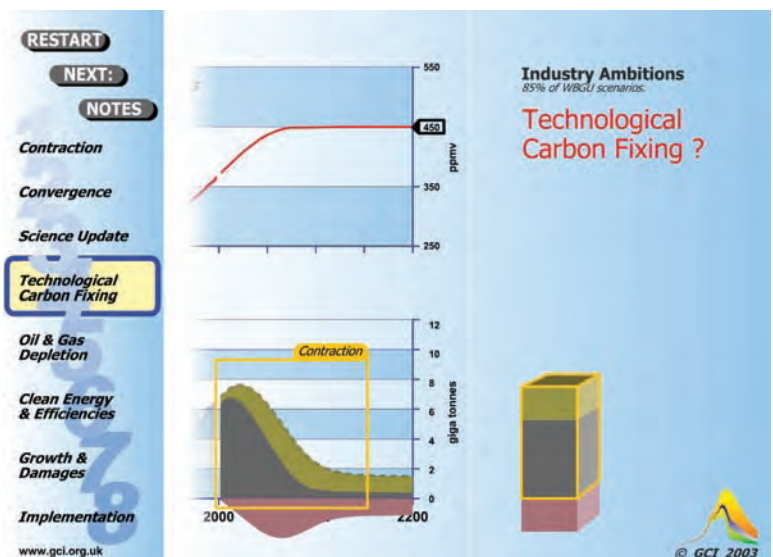
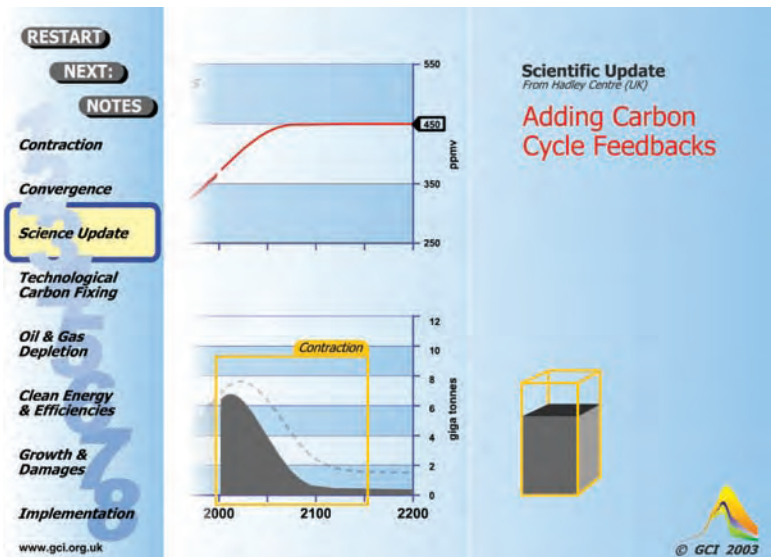
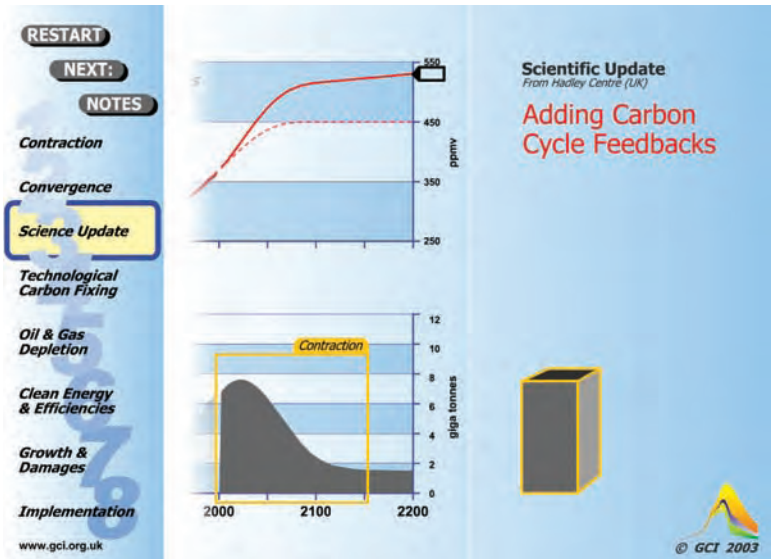
Yet more recent evidence show that these estimates need to be revised downwards yet again.

Soils beginning to release CO₂ and in the melting tundra threatening to release Methane.

One of the technical options suggested to try and mitigate this is the re-capture of CO₂ emissions [where these result from fossil fuel burning] followed by the deep disposal or geological sequestration of this capture.

The figure shown here [up to 2 GtC/year] has been suggested in scenarios published by the German Advisory Council on Environmental Change [WBGU].

The technology is unproven and the energy and economic cost of doing this on this scale, formidable.



C&C - Sunrise, Moonshine and Damages

Clean energy technology is already available in non-polluting and renewable forms, such as wind-power and photo-voltaics.

As we achieve stable concentrations with global contraction and convergence, the volume of energy consumption might double, as shown here in the 'sunrise' scenario.

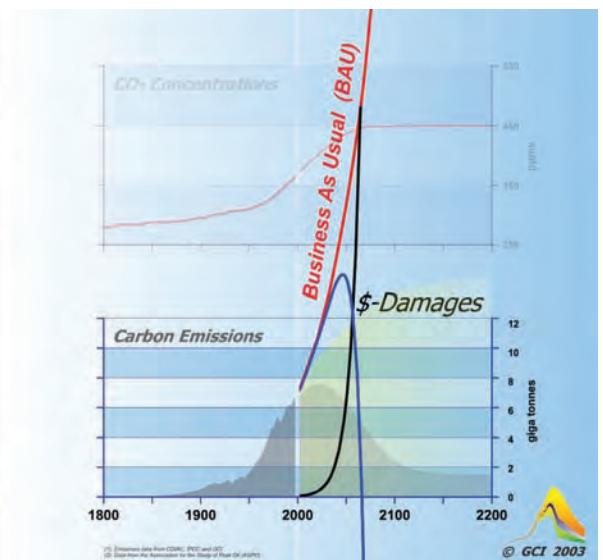
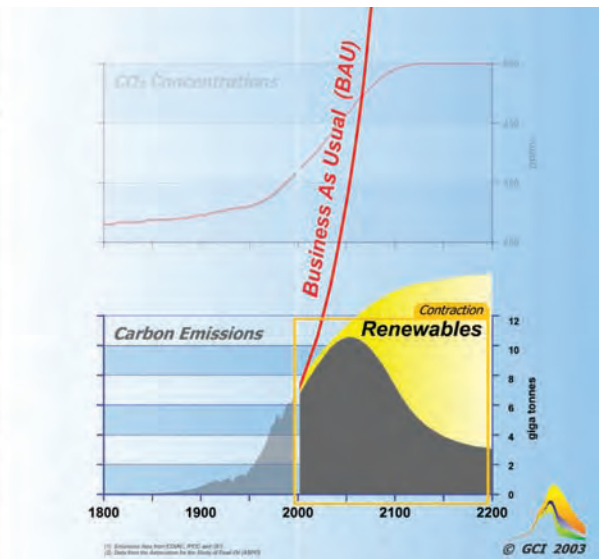
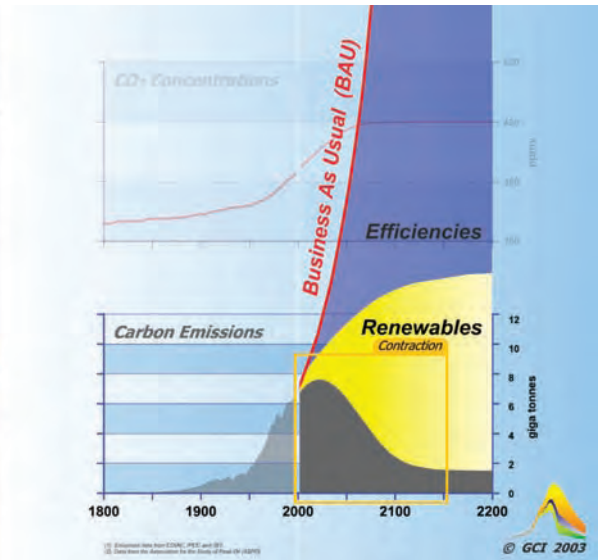
Some economists insist that the economy as a whole will continue to grow at a constant rate due to what they call 'efficiency gains'.

GCI takes the view this is 'moonshine'. The economy cannot grow indefinitely on a finite planet.

Moreover, economist largely ignore the mal-distribution of "Expansion and Divergence" where the trend has persistently been for one third of global population have 94% of global purchasing power and the other two thirds have the other 6%. [See pp 12 and 13].

Furthermore, with increasing damages coming into play as a result of the climate change that we have not managed to avoid, there is the increasing tendency for the growth to become 'uneconomic growth'.

This is portrayed in the lowest image here where growth at 3% a year is gradually over-taken by damages growing at 6% a year [as recorded by the Re-Insurance Industry]. Unless these trends are averted, climate change damages will bankrupt us all.



Contraction and Convergence [C&C]

Whatever level of atmospheric CO₂ concentration is deemed to be the 'ceiling' on what is 'safe', the effort to keep concentrations at and/or below that level will require an inclusive full-term global contraction budget of future emissions to achieve it.

This by definition means that international shares in this will converge.

Many have taken the position since 1990 that the standard for convergence should be per capita globally. The ethical case for this seems self-evident as the atmosphere is a global public good.

GCI takes the position that at the first order of argument, any other standard will remain too contestable to organize.

Future emissions permits are being negotiated and pre-distributed as 'tradable emissions entitlements'.

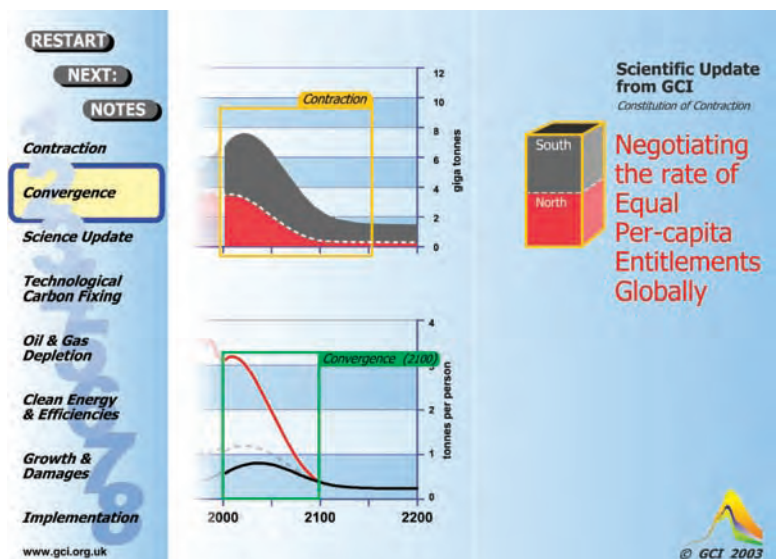
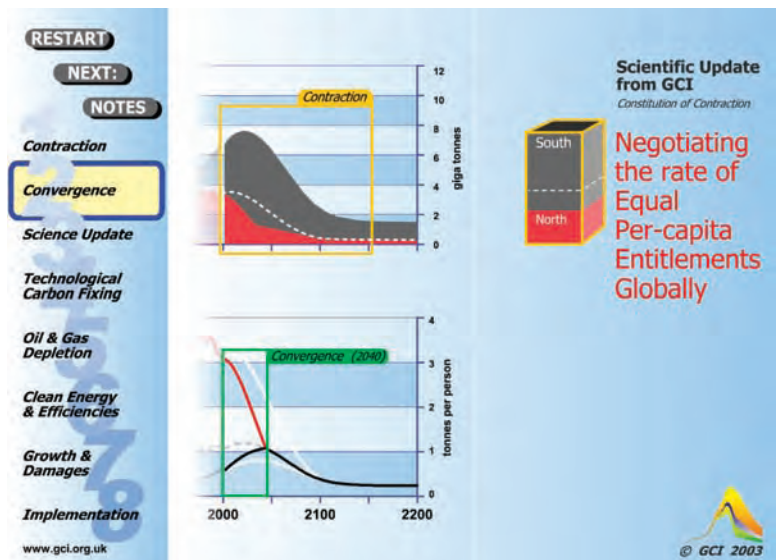
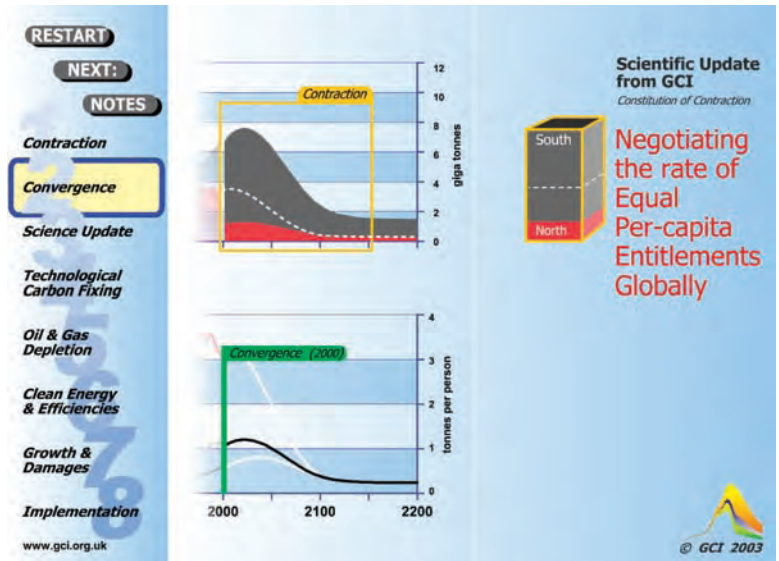
Thus they are commercially valuable and by definition not identical with the actual emissions that will occur.

80% of emissions accumulated in the atmosphere so far have come from the 20% of global population who have lived in the industrial countries.

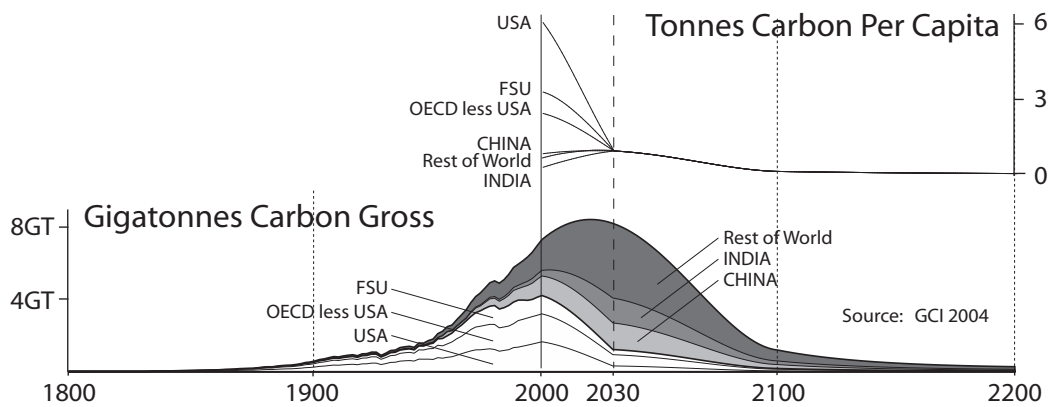
In order to settle this historic debt against the development opportunity cost to the industrialising countries, GCI has also proposed that the rate of convergence should be accelerated relative to the rate of global contraction.

Here convergence is shown at three rates; immediate, by 2050 and by 2100.

It seems likely that a compromise rate will be agreed around half way between the beginning and the end of the contraction budget.



GCI BRIEFING: "CONTRACTION & CONVERGENCE"



This example shows rates of C&C negotiated as regions.
This example is for a 450ppmv Contraction Budget, Converging by 2030.

The Global Commons Institute [GCI] was founded in 1990. This was in response to the mainstreaming of global climate change as a political issue. Realising the enormity of the climate crisis, we devised a founding statement on the principle of "Equity and Survival". [1]

In November 1990, the United Nations began to create the Framework on Climate Convention [UNFCCC]. GCI contributed to this and in June 1992 the Convention was agreed at the Earth Summit in Rio. Its objective was defined as stabilizing the rising greenhouse gas [GHG] concentration of the global atmosphere. Its principles of equity and precaution were established in international law. Climate scientists had showed that a deep overall contraction of GHG emissions from human sources is prerequisite to achieving the objective of the UNFCCC. In 1995 negotiations to achieve this contraction began administered by the specially created UNFCCC secretariat.

Between 1992 and 1995 and at the request of the Intergovernmental Panel on Climate Change [IPCC], GCI contributed analysis highlighting the worsening asymmetry, or "Expansion and Divergence" [E&D] of global economic development. It became clear the global majority most damaged by climate changes were already impoverished by the economic structures of those who were also now causing the damaging GHG emissions. [2]

To create a sustainable basis on which to resolve this inequity, GCI also developed the "Contraction and Convergence" (C&C) model of future emissions. In 1995 the model was introduced by the Indian Government [3] and it was subsequently adopted and tabled by the Africa Group of Nations in August 1997. [4]

Negotiations for the Kyoto Protocol to the UNFCCC ran from 1995 until 1997. In December 1997 and shortly before they withdrew from these negotiations, the USA stated, "C&C contains elements for the next agreement that we may ultimately all seek to engage in." [5]

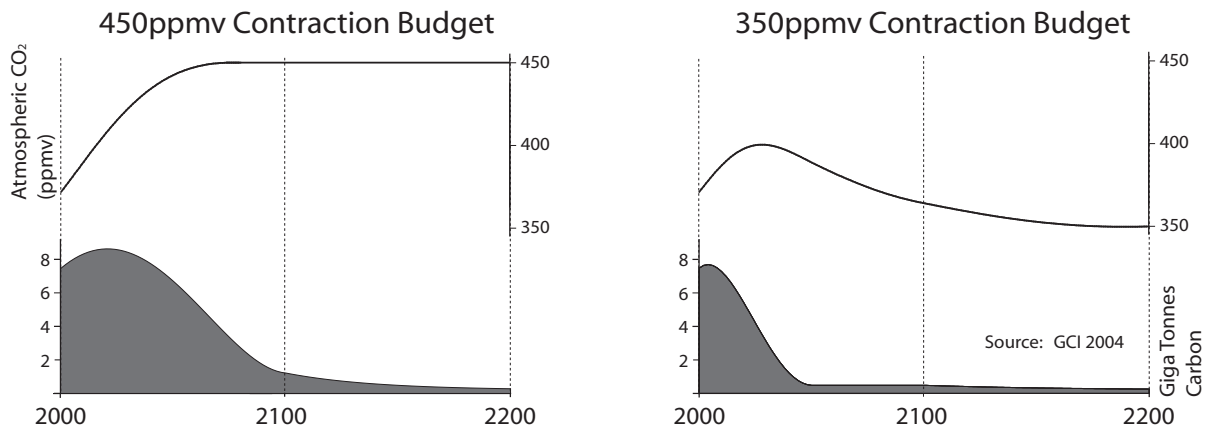
Since then C&C has been widely referenced in the debate about achieving the objective of the UNFCCC. In 2000 C&C was the first recommendation of the UK Royal Commission on Environmental Pollution in its proposals to government. [6] In December 2003 C&C was adopted by the German Government's Advisory Council on Global Change in its recommendations. [7] In 2003 the secretariat of the UNFCCC said the objective of the UNFCCC, "inevitably requires 'Contraction and Convergence'." [8] The Latin America Division of the World Bank in Washington DC said, "C&C leaves a lasting, positive and visionary impression with us." In 2004 the Archbishop of Canterbury took the position that, "C&C thinking appears utopian only if we refuse to contemplate the alternatives honestly." [9] In 2002, the UK Government accepted GCI authorship of the definition statement of C&C, recognising the need, "to protect the integrity of the argument."

This statement follows and is available in thirteen languages. [10] It has been adopted by the House of Commons Environmental Audit Committee and in part in the UN's forthcoming "Millennium Assessment." In 2005, the UK Government will host the next G-8 summit. The Government has already committed this event to dealing strategically with the problems of Africa and Climate Change. Numerous civil society and faith groups are now actively lobbying the Government to have C&C adopted as the constitutional basis for avoiding dangerous future climate change.

- [1] <http://www.gci.org.uk/signon/OrigStatement2.pdf>
- [2] <http://www.gci.org.uk/articles/Nairobi3b.pdf>
- [3] http://www.gci.org.uk/Archive/MegaDoc_19.pdf [page 116]
- [4] http://www.gci.org.uk/nairobi/AFRICA_GROUP.pdf
- [5] http://www.gci.org.uk/temp/COP3_Transcript.pdf
- [6] http://www.gci.org.uk/Endorsements/RCEP_Chapter_4.pdf
- [7] http://www.gci.org.uk/Endorsements/WBGU_Summary.pdf
- [8] http://www.gci.org.uk/slideshow/C&C_UNFCCC.pdf
- [9] <http://www.gci.org.uk/speeches/Williams.pdf>
- [10] <http://www.gci.org.uk/translations.html>

“CONTRACTION & CONVERGENCE” - DEFINITION STATEMENT

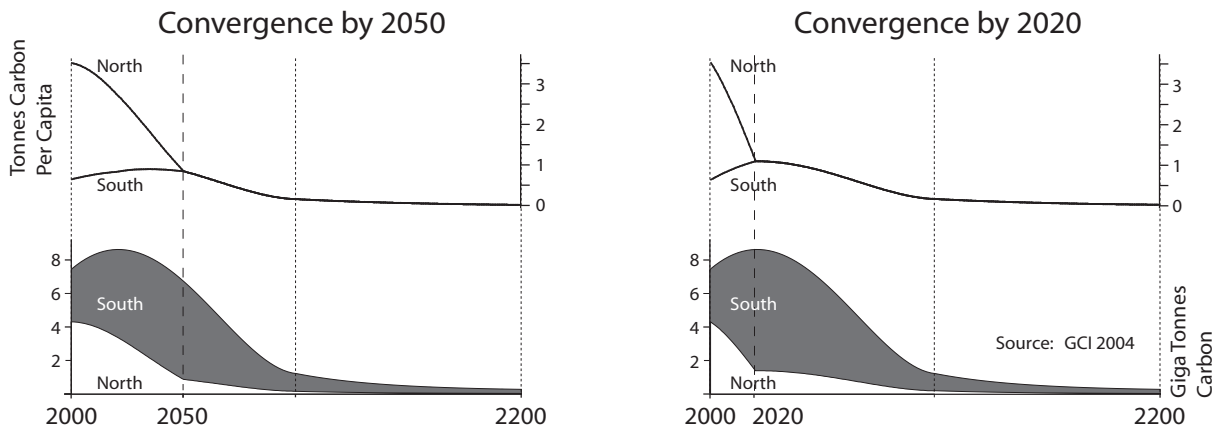
Negotiating Rates of Contraction



Annual Carbon Emissions contract over time to a sustainable level. This is the "Contraction Event".
 The Choice of a "safe" CO₂ stabilisation level determines the total tonnage of carbon to be burnt during the contraction event.
 Two examples of CO₂ stabilisation levels are shown above, with their corresponding contraction budgets.

1. "Contraction and Convergence" (C&C) is the science-based, global climate-policy framework, proposed to the United Nations since 1990 by the Global Commons Institute (GCI). [1,2,3,4]
2. The objective of safe and stable greenhouse gas concentrations in the atmosphere and the principles of precaution and equity, as already agreed in the "United Nations Framework Convention of Climate Change" (UNFCCC), provide the formal calculating basis of the C&C framework that proposes:
 - * A full-term contraction budget for global emissions consistent with stabilising atmospheric concentrations of greenhouse gases (GHGs) at a pre-agreed concentration maximum deemed to be safe, following IPCC WG1 carbon cycle modelling. (See Image Two on page two - GCI sees higher than 450 parts per million by volume [ppmv] CO₂ equivalent as 'not-safe').
 - * The international sharing of this budget as 'entitlements' results from a negotiable rate of linear convergence to equal shares per person globally by an agreed date within the timeline of the full-term contraction/concentration agreement. (GCI suggests [a] between the years 2020 and 2050, or around a third of the way into a 100 year budget, for example, for convergence to complete (see Image Three on page two) and [b] that a population base-year in the C&C schedule is agreed).
 - * Negotiations for this at the UNFCCC should occur principally between regions of the world, leaving negotiations between countries primarily within their respective regions, such as the European Union, the Africa Union, the US, etc. (See Image One on page one).

Negotiating Rates of Convergence



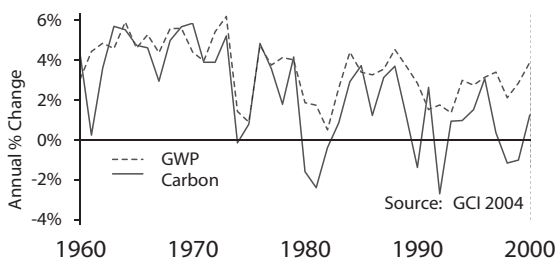
Per capita emissions around the World converge on equality by a negotiated "Convergence Date".
 Two examples of convergence are shown here, each within a 450ppmv contraction budget.

- * The inter-regional, inter-national and intra-national tradability of these entitlements in an appropriate currency such as International Energy Backed Currency Units [EBCUs - 5] should be encouraged.
- * Scientific understanding of the relationship between an emissions-free economy and concentrations develops, so rates of C&C can evolve under periodic revision.

3. Presently, the global community continues to generate dangerous climate change faster than it organises to avoid it. The international diplomatic challenge is to reverse this. The purpose of C&C is to make this possible. It enables scenarios for safe climate to be calculated and shared by negotiation so that policies and measures can be internationally organised at rates that avoid dangerous global climate change.

4. GHG emissions have so far been closely correlated with economic performance (See Image Four Page Three). To date, this growth of economies and emissions has been mostly in the industrialised countries, creating recently a global pattern of increasingly uneconomic expansion and divergence [E&D], environmental imbalance and international insecurity (See Image Four Page Three).

GWP, Carbon Lockstep



Year to year percentage change of Gross World Product, GWP (measured in US\$) and Global Carbon emissions

5. The C&C answer to this is full-term and constitutional, rather than short-term and stochastic. It addresses inertial argument about 'historic responsibilities' for rising concentrations recognising this as a development opportunity cost to newly industrialising countries. C&C enables an international pre-distribution of these tradable and therefore valuable future entitlements to emit GHGs to result from a rate of convergence that is deliberately accelerated relative to the global rate of contraction agreed (see Image Three on page two).

6. The UK's Royal Commission on Environmental Pollution [6] and the German Advisory Council on Global Change [7] both make their recommendations to governments in terms of formal C&C. Many individual and institutional statements supporting C&C are now on record. [8, 9] The Africa Group of Nations formally proposed it to the UNFCCC in 1997. [10] It was agreed in principle at COP-3 Kyoto 1997. [11] C&C conforms to the requirements of the Byrd Hagel Resolution of the US Senate of that year [12] and the

European Parliament passed a resolution in favour of C&C in 1998. [13]

7. This synthesis of C&C can redress the increasingly dangerous trend imbalances of global climate change. Built on global rights, resource conservation and sustainable systems, a stable C&C system is now needed to guide the economy to a safe and equitable future for all. It builds on the gains and promises of the UN Convention and establishes an approach that is compelling enough to galvanise urgent international support and action, with or without the Kyoto Protocol entering into force.

[1] <http://www.gci.org.uk>
 [2] <http://www.gci.org.uk/model/dl.html>
 [3] [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
 [4] http://www.gci.org.uk/images/C&C_Bubbles.pdf
 [5] <http://www.feasta.org/events/debtconf/sleepwalking.pdf>
 [6] <http://www.rcep.org.uk/pdf/chp4.pdf>
 [7] http://www.wbgu.de/wbgu_sn2003_engl.pdf
 [8] http://www.gci.org.uk/Archive/1989_2004
 [9] <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
 [10] <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
 [11] http://www.gci.org.uk/temp/COP3_Transcript.pdf
 [12] <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
 [13] http://www.gci.org.uk/consolidation/UNFCC&C_A_Brief_History_to1998.pdf [pp 27 - 32]

The charts on page four are stacked one above the other on the same horizontal time axis [1800 - 2200]. This helps to compare some of what is known about existing rates of system change with an underlying assumption in favour of a C&C arrangement being put in place.

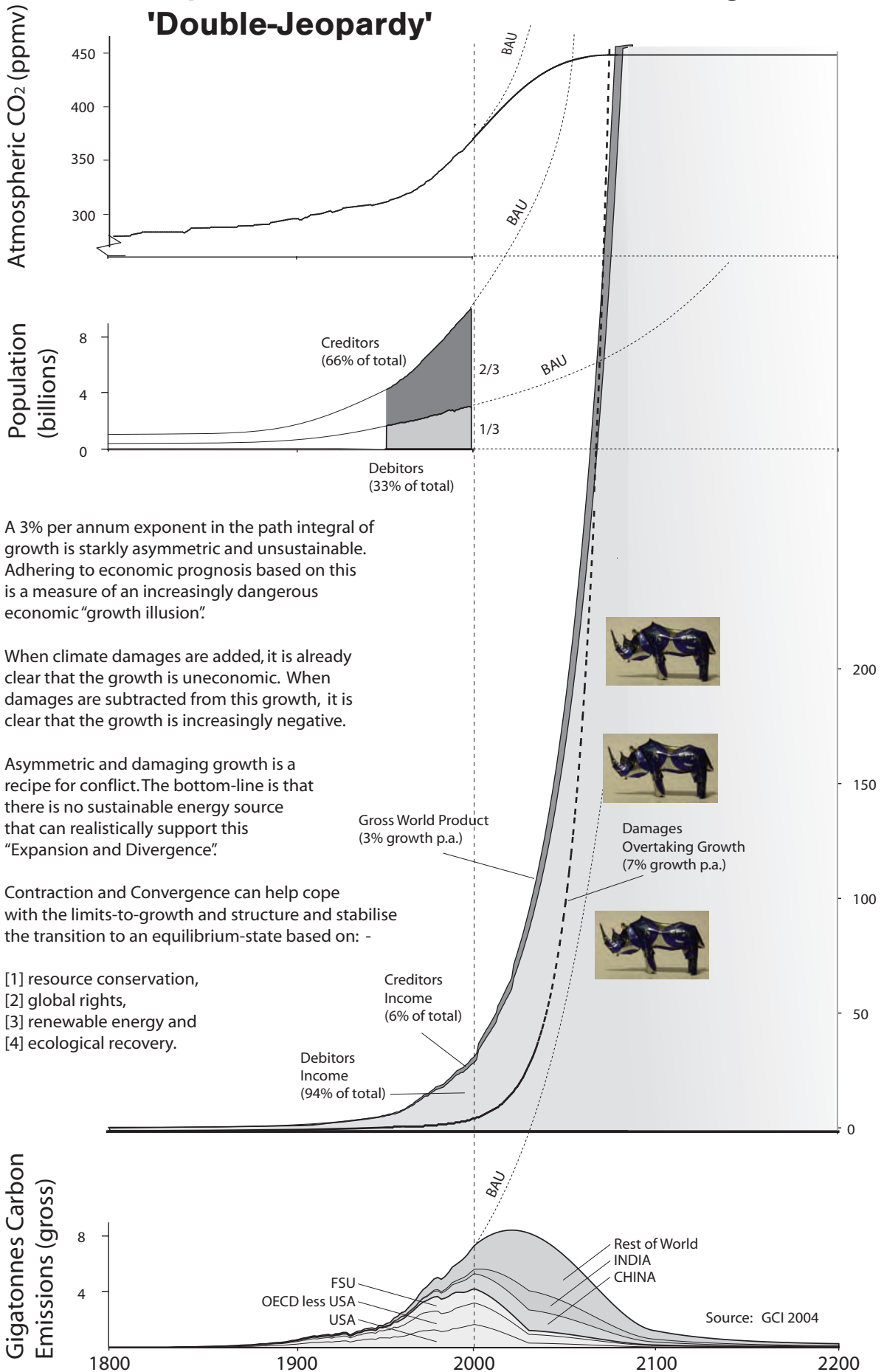
A new feature shown is the rate of economic damages from increasingly 'unnatural disasters' (measured as 'uninsured economic losses' by Munich Re) now rising at 7% per annum, twice the rate of global growth. Another is the devastating and worsening economic asymmetry of "Expansion and Divergence" (E&D). This shows a persistent pattern of increasingly dysfunctional economic growth. One third of population have 94% of global purchasing power and cause 90% of GHG pollution. [We call these 'debtors']. The other two thirds, who live on less than 40% of the average global per capita income, collectively have 6% of global purchasing power and a 10% share of GHG pollution. [We call these 'creditors'].

To escape poverty, it is creditors who embody the greatest impulse for future economic growth and claim on future GHG emissions. But this group also has the greatest vulnerability to damages from climate changes.

Most institutions now acknowledge that atmospheric GHG stabilization, "inevitably requires Contraction and Convergence". However, some of the response to C&C, sees it merely as 'an outcome' of continued economic growth with only tentative acknowledgement of the damages and little comprehension of E&D.

While C&C is not primarily about 're'-distribution, it is about a 'pre'-distribution of future tradable and valuable permits to emit GHGs. Its purpose is to resolve the devastating economic and ecological imbalance of climate change. GCI's recommendation to policy-makers at the United Nations is for the adoption of C&C globally for ecological and economic recovery as soon as possible.

Asymmetric Growth & Climate Damages 'Double-Jeopardy'



A 3% per annum exponent in the path integral of growth is starkly asymmetric and unsustainable. Adhering to economic prognosis based on this is a measure of an increasingly dangerous economic "growth illusion".

When climate damages are added, it is already clear that the growth is uneconomic. When damages are subtracted from this growth, it is clear that the growth is increasingly negative.

Asymmetric and damaging growth is a recipe for conflict. The bottom-line is that there is no sustainable energy source that can realistically support this "Expansion and Divergence".

Contraction and Convergence can help cope with the limits-to-growth and structure and stabilise the transition to an equilibrium-state based on: -

- [1] resource conservation,
- [2] global rights,
- [3] renewable energy and
- [4] ecological recovery.



A BILL to Establish that Contraction and Convergence will be the strategic goal of national climate change policy; and for connected purposes.

Be it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:-

1. Interpretation:

In this Act, "Contraction and Convergence" means:

The rational, science-based, full-term climate-policy framework embodying and quantifying the objective of safe and stable greenhouse gas concentrations in the atmosphere and the principle of the equitable distribution of carbon emission rights to all human beings, as already agreed in the "United Nations Framework Convention of Climate Change" (UNFCCC) www.unfccc.de .

"Carbon emissions" is used throughout this Act to refer to the range of greenhouse gases.

2. Method of calculation and implementation:

To establish the Contraction and Convergence framework, the UK government shall:

- Seek agreement on the precautionary basis already agreed in the UNFCCC, to define and achieve a full-term "contraction-budget" for global greenhouse gas emissions consistent with stabilising atmospheric concentrations of greenhouse gases (GHGs) at a pre-agreed concentration maximum deemed to be safe, based on the carbon cycle modelling as published by the Intergovernmental Panel on Climate Change [IPCC]. <http://www.ipcc.ch/>
- For the purpose of putting the negotiations on the constitutional rights-based basis of global equity already agreed in the UNFCCC, will seek with or without a population base-year selected for the accounts, [the internationally pre-distributed shares under the C&C projections] the international or inter-regional pre-distribution of this "contraction-budget" as emissions 'commitment/entitlements,' resulting from a negotiated rate of linear "convergence" to equal shares per person globally by an agreed date within the timeline of the full-term contraction budget.
- For the purpose of resolving the historic responsibilities of the already industrialised countries referred to in the UNFCCC, seek agreement to accelerate the rate of global "convergence" relative to the rate of global "contraction" in the "contraction-budget", within the UNFCCC between the regions of the world, whether developed or not, leaving negotiations between countries within their respective regions, to resolve differential circumstances perceived within the regions.
- Encourage the development of international and intra-national tradability of these entitlements which will ensure that rates of investment in emissions-free energy technologies and poverty-free sustainable development for all, and accelerates the existing rate of energy investment consistent with these ends.
- Seek the periodic and timely negotiated revision by the COP/MOPs [Conferences of Parties and Meetings of Parties] to the UNFCCC of the rates of C&C agreed under paragraphs 2(1) and 2(2) to reflect improvements in the scientific understanding of the dangers of climate changes in the SBSTA/SBI [Subsidiary Bodies on Science, Technological Assistance and Implementation] and the IPCC.

3. Report to Parliament

1. Each year, the Secretary of State will publish a report to parliament which will contain:

- an assessment commissioned by the Secretary of State of global greenhouse gas emissions
- a statement by the Secretary of State on the progress or otherwise made in negotiations towards implementing the provisions of this Act
- a statement by the Secretary of State of the efficacy of domestic policy instruments currently in place designed to comply with the Contraction Budget
- a statement by the Secretary of State of the previous year's overall movement towards attaining the Contraction and Convergence event in its entirety - see above.

4. Short title

(a) This Act may be cited as the Contraction and Convergence (Climate Change) Act 2005

Explanatory note:

Presently, the global community continues to generate dangerous climate change much faster than it organises to avoid it. The international diplomatic challenge is to reverse this. The purpose of C&C is to make this possible. It enables scenarios for safe climate to be calculated and shared by negotiation so that policies and measures can be internationally organised at rates that avoid dangerous global climate change.

GHG emissions have so far been closely correlated with economic performance. To date, this growth of economies and emissions has been mostly in the industrialised countries, creating recently a global pattern of increasingly uneconomic expansion and divergence [E&D], environmental imbalance and international insecurity.

The C&C answer to this is full-term and constitutional, rather than short-term and stochastic. It is envisioned as “a robust, inclusive and binding international treaty” as called for by the UK Prime Minister and exemplifies the *“sound, rational, science-based unity, which ensures the right legally-binding framework to incentivise sustainable development.”*

We entirely endorse the Prime Minister’s remarks that *“we need to cut greenhouse gas emissions radically but Kyoto doesn’t even stabilise them”* and his observations that Kyoto, *“won’t work as intended, either, unless the views as expressed in the Byrd Hagel Resolution of the US are part of it.”*

It addresses inertial argument about ‘historic responsibilities’ for rising concentrations recognising this as a development opportunity cost to newly industrialising countries. C&C enables an international redistribution of these tradable and therefore valuable future entitlements to emit GHGs to result from a rate of convergence that is deliberately accelerated relative to the global rate of contraction agreed.

The UK’s Royal Commission on Environmental Pollution and the German Advisory Council on Global Change both make their recommendations to governments in terms of formal C&C. Many individual and institutional statements supporting C&C are now on record. The Africa Group of Nations formally proposed it to the UNFCCC in 1997. It was agreed in principle at COP-3 Kyoto 1997. C&C conforms to the requirements of the Byrd Hagel Resolution of the US Senate of that year and the European Parliament passed a resolution in favour of C&C in 1998. Reflecting the call for cross-party unity in the UK parliament on the matter of climate change, C&C is already the party position of the Scottish Nationalists, the Welsh Nationalists, the Liberal Democrats and the Greens with many individual members of other parties already supporting it.

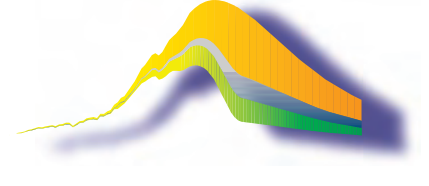
This synthesis of C&C can redress the increasingly dangerous trend imbalances of global climate change. Built on global rights, resource conservation and sustainable systems, a stable C&C system is now needed to guide the economy to a safe and equitable future for all. It builds on the gains and promises of the UN Convention and establishes an approach that is compelling enough to galvanise urgent international support and action, with or without the Kyoto Protocol remaining in force.

Contraction Budget means; - Full-Term Global Emissions Time-Dependent Integral consistent with a pre-defined atmospheric greenhouse gas concentration that is stable and safe actuarially defined by: -

1. Total weight over time integral [EG 360 Billion Tonnes Carbon over 60 years with average 6 Billion-Tonnes per Annum against a concentration value of 400 parts per million [ppmv] by 2070];
2. First year output value [eg 2010, 6 Billion Tonnes per Annum];
3. Final year output value [eg 2070, 1 Billion Tonnes per Annum];
4. Between and including the first and the final years, the year-on-year output progression with a sigmoid positive-to-negative growth function that year-on-year reconciles the carbon-path-integral with the full-term carbon-weight-integral and thus the ppmv outcome.

C&C

"Contraction and Convergence"



[http://www.gci.org.uk/translations/CandC_Statement\(Arabic\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Arabic).pdf)

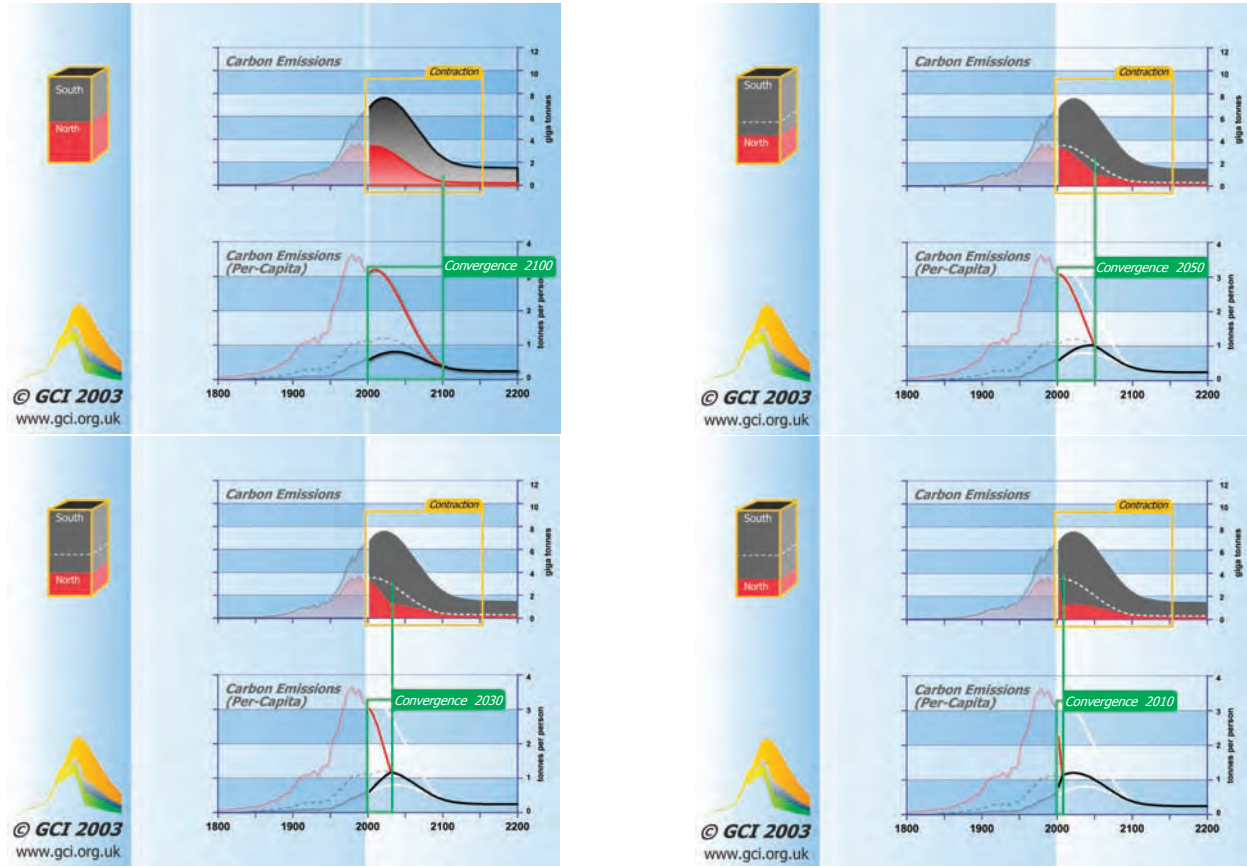
[ARABIC TEXT]

"التخفيض والاقتراب"

1. "التخفيض والاقتراب" (C & C) هو الإطار العلمي العام لسياسة مناخ عالمية تم اقتراحها إلى منظمة الأمم المتحدة منذ سنة 1990 من قبل المعهد العالمي للعوام (GCI).
2. يوفر هدف تحقيق تراكيز سليمة ومستقرة من الغاز المحترس في الغلاف الجوي وتطبيق مبادئ الوقاية والعدالة كما تم الاتفاق عليها مسبقاً في "إطار بنود اتفاقية الأمم المتحدة الخاصة بالتغير المناخي" (UNFCCC)، الأساس الرسمي المنظم لإطار مفهوم "التخفيض والاقتراب" (C & C) الذي يقترح: - تخصيص ميزانية تخفيض طويلة الأجل للانبعاثات الغازية العالمي تتوافق مع إجراءات تثبيت معدلات تركيز الغازات المحترسة (GHGs) ووفق حد أعلى من التركيز متفق عليه مسبقاً يمكن اعتباره آمناً اعتماداً على نموذج دورة الكربون المقر من قبل مجموعة IPCCWG1 [ويعتبر المعهد العالمي للعوام GCI معدلات ثاني أكسيد الكربون التي تزيد عن 450 جزء بالمليون "غير آمنة"] - إن المساهمة الدولية في هذه الميزانية بشكل "استحقاقات" مالية تنشأ عن معدل ممكن تحقيقه من الالتقاء الخطي للحصص المتكافئة للشخص الواحد على نطاق عالمي بموجب تاريخ متفق عليه ضمن النطاق الزمني للمدة الكلية لاتفاقية التخفيض والتركيز الغازي. ويقترح معهد GCI [1] سنة 2030 أو 2040، أو بحدود ثلث الطريق باتجاه إعداد ميزانية لمدة 100 سنة على سبيل المثال لإكمال التقارب [أنظر الفقرة 5 والصور 1 و 2 أدناه] و [2] تم الاتفاق على سنة الأساس السكاني في جدول "التخفيض والاقتراب" (C & C) - وينبغي أن تجرى المفاوضات المتعلقة بهذا الشأن على مستوى (UNFCCC) في الدرجة الأساس بين أقاليم العام، متيحة المجال لإجراء مفاوضات بين الأقطار الواقعة في الأقاليم الخاصة بها أصلاً كالإتحاد الأوروبي، والإتحاد الأفريقي، والولايات المتحدة، الخ. - وينبغي التشجيع على إنشاء نظام للتبادل التجاري البيئي والضماني على النطاقين الإقليمي والوطني لهذه الاستحقاقات باستعمال عملة متداولة مناسبة كالوحدات النقدية الدولية المدعومة بالطاقة [EBCUs]. لقد تطور الفهم العلمي لطبيعة العلاقة بين اقتصاد خالٍ من الابعثات والتركيز الغازية، لذا فإن معدلات "التخفيض والاقتراب" (C & C) يمكن لها أن تتطور بموجب إجراءات للمراجعة الدورية.
3. ويستمر المجتمع الدولي في الوقت الحاضر بإحداث تغييرات مناخية خطيرة بوتائر أسرع مما يجعله قادراً على اتخاذ إجراءات لتفاديها. ويكمن التحدي الدبلوماسي في عكس هذا التأثير. وينحصر الهدف من سياسة "التخفيض والاقتراب" (C & C) في جعل ذلك ممكناً. إذ أنه يُمكن من اعتماد سيناريوهات والمشاركة في إعدادها لتحقيق مناخ آمن من خلال التفاوض حتى يمكن تنظيم السياسات والإجراءات عالمياً بوقائع تتجنب إحداث تغييرات مناخية خطيرة.
4. كانت الإبعثات الغازية المحترسة GHG حتى الآن مرتبطة إلى حد بعيد بعلاقة متبادلة مع الأداء الاقتصادي. ويحدث هذا النمو الحالي في الاقتصادات والإبعثات غالباً في الدول الصناعية محدثاً في الآونة الأخيرة نمطاً عالمياً متزايداً في التوسعات والتحويلات غير الاقتصادية وحالة من عدم التوازن البيئي وعدم الاستقرار العالمي.
5. استجابت سياسة "التخفيض والاقتراب" (C & C) لهذه التغيرات على نحو شامل ومنطقي ولم يتم إعدادها للمدى القصير أو بطريقة عشوائية. كما أنها تناولت النزاع العميق بشأن المسؤوليات التاريخية المتعلقة بزيادة التركيز الغازية واعتبار ذلك كفرصة تموية للدول المصنعة حديثاً. وتساعد سياسة "التخفيض والاقتراب" (C & C) على تحقيق توزيع دولي مسبق لهذه التبادلات وبالتالي فإن أية استحقاقات مستقبلية قيمة لبعث غازات محترسة ستنشأ من معدل تقارب تم تسريعه على نحو متعمد ذو صلة بالمعدل العالمي للتخفيض المتفق عليه [أنظر الصورة رقم 2].

6. قامت المفوضية الملكية للحد من التلوث البيئي في المملكة المتحدة والجمعية الاستشارية الألمانية للاهتمام بالتغيرات المناخية العالمية بتقديم توصياتهما بشأن التغييرات المناخية إلى حكومتي بلديهما فيما يتعلق بسياسة "التخفيض والاقتراب" (C & C) الرسمية. كما تم إدراج العديد من التصريحات الفردية والمؤسسية المؤيدة لسياسة "التخفيض والاقتراب" (C & C) في السجلات. وقد تم اقتراحها من قبل مجموعة الدول الأفريقية للعمل بها رسمياً ضمن "إطار بنود اتفاقية الأمم المتحدة الخاصة بالتغير المناخي" (UNFCCC) في سنة 1997. وقد تم الاتفاق مبدئياً في مؤتمر كيوتو COP-3 الذي عقد في سنة 1997 على تطابق سياسة "التخفيض والاقتراب" (C & C) مع الشروط الأساسية لقرار "باريد هاغل" في مجلس الشيوخ الأمريكي من تلك السنة كما أن الاتحاد الأوروبي أصدر قراراً لصالح تطبيق سياسة "التخفيض والاقتراب" (C & C) في سنة 1998.
7. إن إعداد سياسة "التخفيض والاقتراب" (C & C) يمكن أن يقوم الاتجاه المتزايد الخطورة في عدم توازن التغيرات المناخية العالمية. وقد تم بناؤها استناداً إلى حقوق عالمية وقواعد للمحافظة على الموارد وأنظمة مدعمة، إن توفير نظام مستقر "للتخفيض والاقتراب" يعد أمراً مطلوباً في الوقت الحاضر لتوجيه عجلة الاقتصاد وتحقيق مستقبل آمن ومتكافئ للجميع. ويستند تحقيقه على مكاسب ووعود اتفاقية الأمم المتحدة ويؤسس منهجاً قوياً ما في الكفاية لبلورة دعم واتخاذ إجراء عالمي عاجل مع دخول اتفاقية كيوتو الدولية حيز التطبيق أم بدونها.

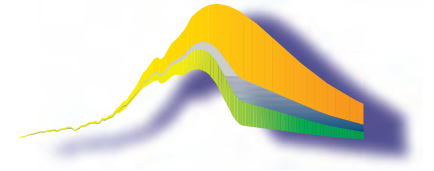
- i <http://www.gci.org.uk>
ii <http://www.gci.org.uk/model/dl.html>
iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
v <http://www.feasta.org>
vi <http://www.rcep.org.uk/pdf/chp4.pdf>
vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
viii http://www.gci.org.uk/Archive/1989_2004
ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
xiii http://www.gci.org.uk/consolidation/UNFCC&C_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

“Contraction and Convergence”

[http://www.gci.org.uk/translations/CandC_Statement\(Chinese\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Chinese).pdf)



[CHINESE TEXT]

“紧缩与趋同” (C&C)

1. “紧缩与趋同” (C&C)是一项建立在科学分析基础上的全球气候政策框架，1990年起由英国“全球公共资源研究所 (GCI)”向联合国提交^{ii iii iv}。
2. C&C框架的计算方法本着预防和公平的原则，目标是使空气中的温室气体浓度达到安全和稳定的水平（这两点已得到《联合国气候变化框架公约》(UNFCCC)的认同）。该框架内容如下： -

- 控制全球排放水平，使空气中的温室气体 (GHGs) 浓度保持稳定，不超过根据IPCC WG1 二氧化碳循环模型预先设定的安全值[GCI认定空气中二氧化碳含量达到450ppmv即为“不安全”]，并根据这一标准设定长期减排预算。
- 享有碳排放权是世界各国的基本“权利”。确保享有这项“权利”的总预算要由各国分摊。根据人均原则在长期减排/浓度协议规定的时间内制定某一目标年全球统一的人均排放目标。[GCI提出两条建议：[1]到2030或2040年，或在100年期预算的前三分之一时间内实现全球人均排放的趋同[参见第5点及以下图1和图2]；[2]各国应就C&C框架实施时间表的人口基数年达成一致意见]。
- 在UNFCCC举行的磋商应主要为地区层次间的磋商，国家间的磋商应主要放在各地区（如欧盟、非洲联盟和美国等）内部进行。
- 应鼓励采用“国际能源货币单位 (EBCU)”等适当货币作为排放权在地区间、国家间和各国国内的交换工具。
- 随着人们对达到何种排放浓度即被视为无排放经济体这一科学认识的深化，C&C比率可定期加以调整。

3. 当前，世界各国采取措施避免气候恶化的步伐，仍跟不上各国过量排放导致气候恶化的速度，气候恶化已经达到了危险的程度。国际社会正在采取外交努力，力图扭转这一危险趋势，这也正是C&C的宗旨。由于它的作用，在协商过程中各国能够对安全气候的情景预测加以计算和共享，从而使各国能够迅速统一地制定政策措施，避免全球气候发生危险变化。
4. 迄今为止，温室气体排放水平始终与经济运行状况密切相关。目前，经济和温室气体排放同步增长的现象主要发生在工业化国家，导致近期全球经济发展出现不经济的扩张和分散、环境失衡和国际安全形势的恶化。
5. 针对这一问题，C&C框架提供的是长期的和机制上的保证，而并非短期的权宜之计。

一直以来，有一种观点将气候的恶化看作经济发展的机会成本，将全球温室气体排放浓度的增加归咎为新兴工业化国家的“历史责任”。对此，C&C框架预先分配了各国未来的温室气体排放权（由于可交换，因此具有价值）。趋同速度在各国一致同意的全球统一减排速度基础上加速得出。[见图2]

6. 英国皇家环境污染^{vi}委员会和德国全球变化^{vii}委员会都建议各自政府正式采纳C&C框架，以应对气候变化。个人和机构对C&C的支持声明屡见报端^{viii ix}。“非洲国家组织已于1997年^x正式提议UNFCCC采纳C&C框架，并于1997年COP-3京都^{xi}原则上通过。C&C于当年^{xii}通过美国参议院“Byrd Hagel Resolution”的相关要求，欧洲议会也于1998年^{xiii}通过决议，支持C&C框架。
7. C&C这一整套框架，能够矫正全球气候变化失衡的危险趋势。C&C框架着眼于全球利益、资源保护和可持续发展机制，因此我们需要稳步实施C&C框架，以指导全球经济发展，为所有人创造安全和公平的未来。
C&C框架是对联合国公约原则的继承和发扬。它所提出的解决方案将得到各方认同，因此，无论《京都议定书》能否生效，C&C框架都一定能够得到国际社会的支持和行动回应。

i <http://www.gci.org.uk>

ii <http://www.gci.org.uk/model/dl.html>

iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)

iv http://www.gci.org.uk/images/C&C_Bubbles.pdf

v <http://www.feasta.org>

vi <http://www.rcep.org.uk/pdf/chp4.pdf>

vii http://www.wbgu.de/wbgu_sn2003_engl.pdf

viii http://www.gci.org.uk/Archive/1989_2004

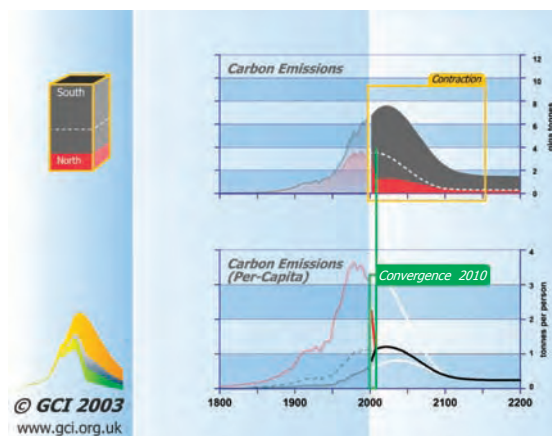
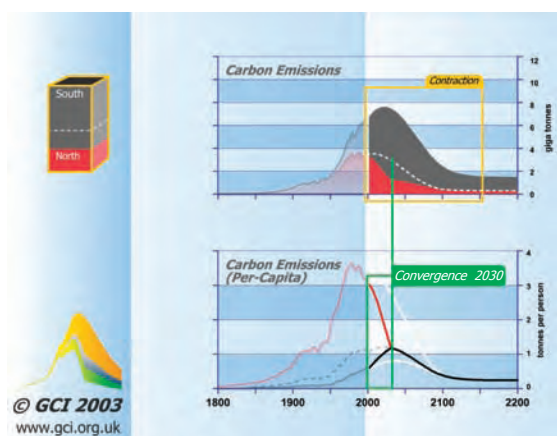
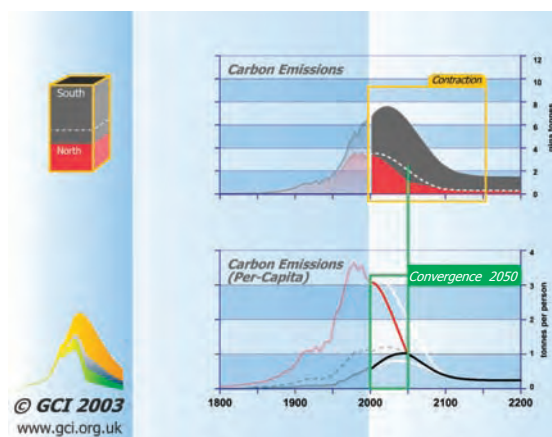
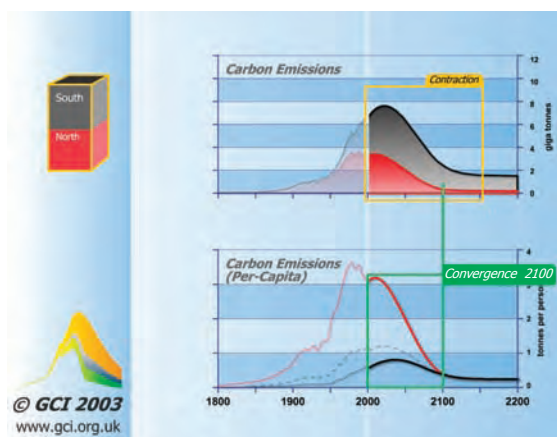
ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>

x <http://www.gci.org.uk/papers/zew.pdf> [附录 C，第16页]

xi http://www.gci.org.uk/temp/COP3_Transcript.pdf

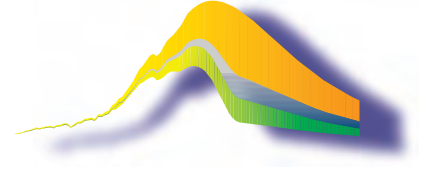
xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>

xiii http://www.gci.org.uk/consolidation/UNFCC&C_A_Brief_History_to1998.pdf [第27 - 32页]



C&C

“Contraction and Convergence”



[http://www.gci.org.uk/translations/CandC_Statement\(Hindi\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Hindi).pdf)

[HINDI TEXT]

“कन्ट्रैक्शन और कन्वर्जेंस” (C&C)

“Contraction and Convergence” (C&C)

1. “कन्ट्रैक्शन और कन्वर्जेंस” (“Contraction and Convergence” (C&C)) विज्ञान पर आधारित दुनिया भर में मौसम से सम्बन्धित नीति है जो संयुक्त राष्ट्र को 1990 से ग्लोबल कामन्स इन्सटीट्यूट (GCI) द्वारा प्रस्तावित की गई है।^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}
2. वातावरण में सुरक्षित और स्थिर ग्रीनहाऊस गैस के जमावड़े के लक्ष्य और सावधानी और सुनीति के सिद्धान्त जो पहले ही “युनाइटेड नेशन्स फ्रेमवर्क कन्वेंशन आव क्लाइमेट चेंज” (UNFCCC) “United Nations Framework Convention of Climate Change” (UNFCCC) में सहमत की गई हैं, जो औपचारिक रूप से C&C के काम करने के ढांचे को आँकने के आधार को प्रदान करता है जो निम्नलिखित प्रदान करता है : -
 - दुनिया भर में निकालियों के लिए पूरे समय का ऐंटा हुआ बजट जो ग्रीनहाऊस की गैसों (GHGs) के वातावरण में एकाग्रता को स्थिर बनाए जो पहले ही से सहमत अधिकतम एकाग्रता को बनाना जो सुरक्षित माना जाए, IPCC WG1 कार्बन साईकल की मॉडलिंग के बाद। [GCI को तब अधिक माना जाता है जब यह 450 ppmv से अधिक हो जो कार्बनडाईऑक्साईड के ‘सुरक्षित नहीं है’ के बराबर है]।
 - इस बजट को ‘ऐन्टाईटलमेन्ट्स’ के रूप में अन्तर्राष्ट्रीय स्तर पर विभाजन करना हर व्यक्ति के बराबरी के शेयरों के रेखाबद्ध केन्द्र अभिमुखता के विनिमेय दर का एक परिणाम स्वरूप है जिसे पूरे समय के कन्ट्रैक्शन/कन्वर्जेंस की सहमति सहमत की गई तिथि पर पूरे समय की समय सरणी के अर्धन दिया हो। [GCI यह सुझाव देता है कि [1] वर्ष 2030 या 2040, या लगभग रास्ते का तिहाई जो 100 वर्ष में हो, उदाहरण के रूप में, केन्द्र अभिमुख को पूरा करने के लिए [अंक 5 और तस्वीरें 1 और 2 को नीचे देखें] और [2] C&C की समय-सारणी में जनसंख्या के वर्ष के आधार को माना जाए]।
 - इसके लिए UNFCCC की बातचीत को सैद्धान्तिक रूप में दुनिया के क्षेत्रों के बीच होना चाहिए, जिसमें बातचीत को देशों के मध्य उनके क्षेत्रों में छोड़ देना चाहिए, जैसे कि योरोपियन यूनियन, अफ्रीका यूनियन, यू.एस. आदि।
 - इन ऐन्टाईटलमेन्ट्स की सम्बन्धित मुद्दा में अन्तर-क्षेत्रीय, अन्तर-राष्ट्रीय और आन्तरिक राष्ट्रीय व्यापारिक योग्यता को बढ़ावा दिया जाना चाहिए जैसे कि अन्तर्राष्ट्रीय ऊर्जा से सहायता की मुद्दा की इकाईयाँ (इन्टरनैशनल ऐनर्जी बैकड करन्सी युनिट्स - International Energy Backed Currency Units [EBCUs]) को बढ़ावा दिया जाना चाहिए।
 - निकासी से मुक्त अर्थव्यवस्था और जमावड़े के विकास के बीच सम्बन्ध को वैज्ञानिक तरीके से समझना, इसलिए C&C की दरों को समय-समय पर पुनिर्वचार किया जाता है।
3. वर्तमान में, भौगोलिक समुदाय ख़तरनाक मौसम के बदलाव को तेज़ी से पैदा कर रहा है विपरीत इसके कि वह उसे रोकने के लिए संगठित हो। अन्तर्राष्ट्रीय दूत के लिए इसे उल्टा करने की चुनौती है। इसको सम्भव करना C&C की भूमिका है। यह मौसम की सुरक्षित स्थितियों को आँकने की योग्यता करता है और जो बातचीत द्वारा बाँटा जा सके ताकि नीतियाँ और मापों को उन दरों के आधार से अन्तर्राष्ट्रीय स्तर पर संगठित किया जा सके जिससे दुनिया में मौसम के ख़तरनाक बदलाव को रोका जा सके।
4. GHG की निकासी को अभी तक आर्थिक प्रदर्शन के साथ समीप से सम्बन्ध कराया गया है। आज तक, G यह आर्थिक अवस्थाओं और निकासी का विकास अधिकतर औद्योगिक देशों में हुआ है, जिससे हाल ही में एक भौगोलिक नमूना तैयार किया जाना जो अधिक तौर पर गैर आर्थिक अवस्था के बढ़ाव के फैलाव और भिन्नता [E&D], पर्यावरण असंतुलन और अन्तर्राष्ट्रीय असुरक्षा।
5. C&C का इसके प्रति उत्तर है पूरे समय और संविधानिक है वजाए कि कम समय के लिए और बेतरतीब के। बढ़ रहे जमावड़ों के लिए यह ‘ऐतिहासिक जिम्मेदारियों’ स्थिर बहस का हल करता है जिसे नए औद्योगिक देशों के लिए यह एक विकास के अवसर को कीमत के रूप में पहचानता है। C&C इन व्यापार योग्य और इसलिए भविष्य के लिए कीमती अधिकारों की पहले से निर्धारित अन्तर्राष्ट्रीय वितरण के लिए योग्य करता है जिससे GHGs की गैसों का निकास हो सके जो केन्द्र अभिमुख की दर के परिणाम स्वरूप हो जिसे सहमत की गई दुनिया भर की सिकुड़न के साथ सम्बन्ध में जान वृद्ध कर बढ़ावा दिया गया हो [तस्वीर 2 देखें]।

6. यू के का रॉयल कमिशन ऑन ऐनवायरनमेन्टल पॉल्यूशन और जर्मन ऐडवाइज़री काऊन्सिल ऑन ग्लोबल चेंज^{vii} (The UK's Royal Commission on Environmental Pollution^{vi} and the German Advisory Council on Global Change^{vii}) दोनों C & C के औपचारिक रूप से मौसम के परिवर्तन में अपनी सिफारिशें सरकार को देते हैं। कई लोग और संस्था के ब्यान जो C&C को समर्थन देते हैं उनको रिकार्ड पर रखा गया है।^{viii} अफ्रीकी गुप आव नेशन्स (The Africa Group of Nations) ने इन्हें औपचारिक तौर पर UNFCC को इसका प्रस्ताव रखा 1997 में रखा था।^v सैद्धांतिक रूप में इसे COP-3 Kyoto 1997 में सहमत किया गया था।^{vi} C&C युनाइटेड स्टेट्स सैनेट की उस वर्ष की वाईर्ड हेगल रैज़ोल्यूशन (Byrd Hagel Resolution) की ज़रूरतों को मानता है^{xii} और योरोपियन पारलिमेन्ट ने C&C के समर्थन में 1998 में एक प्रस्ताव को पास किया था।^{xiii}
7. C&C का यह संकलन दुनिया भर के मौसम के परिवर्तन में बढ़ रहे ख़तरनाक असंतुलन में सुधार कर सकता है। दुनिया भर के अधिकारों, स्रोतों के संरक्षण और देर तक चलने वाली प्रणाली पर बनी यह C&C की एक प्रणाली अर्थव्यवस्था का मार्गदर्शन करने के लिए अब आवश्यक है जिससे सभी को सुरक्षित और समान भविष्य प्राप्त हो। यह युनाइटेड नेशन्स कन्वेंशन (UN Convention) के लाभों और शर्तों पर निर्मित है और ऐसी पहुँच को स्थापित करता है कि जो काफी बाध्य है जिससे आवश्यक अन्तर्राष्ट्रीय समर्थन और कार्यवाही को क्योटो प्रोटोकॉल (Kyoto Protocol) का बल में दाख़िल हुए या इस के बिना इस को उभार सके।

i <http://www.gci.org.uk>

ii <http://www.gci.org.uk/model/dl.html>

iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)

iv http://www.gci.org.uk/images/C&C_Bubbles.pdf

v <http://www.feasta.org>

vi <http://www.rcep.org.uk/pdf/chp4.pdf>

vii http://www.wbgu.de/wbgu_sn2003_engl.pdf

viii http://www.gci.org.uk/Archive/1989_2004

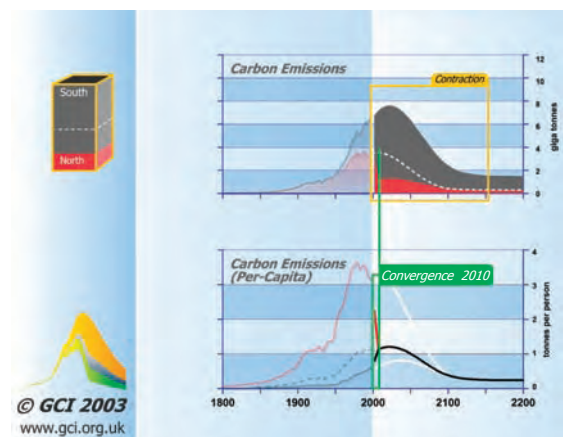
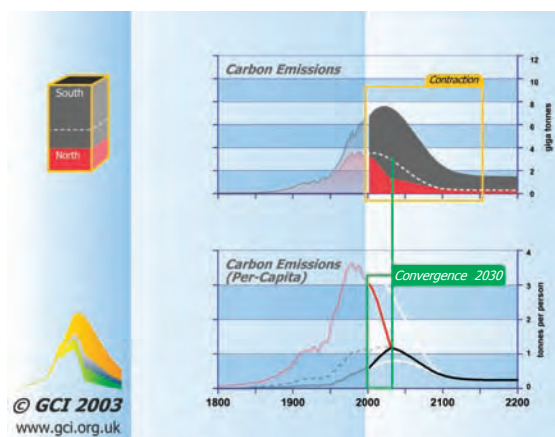
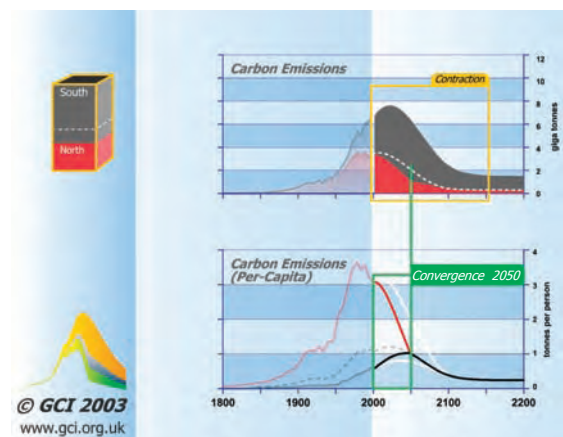
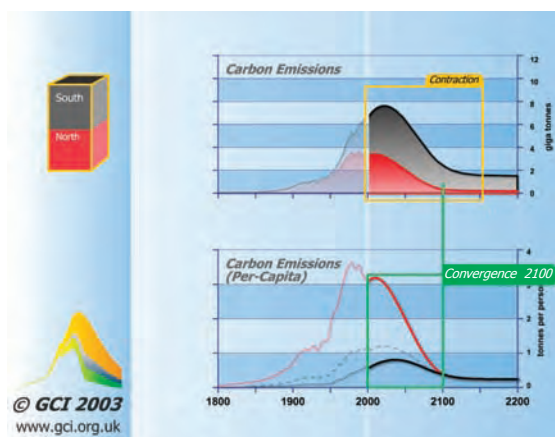
ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>

x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]

xi http://www.gci.org.uk/temp/COP3_Transcript.pdf

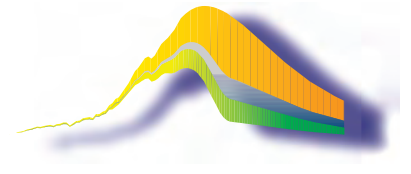
xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>

xiii http://www.gci.org.uk/consolidation/UNFCC&C_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

“Contraction and Convergence”



[http://www.gci.org.uk/translations/CandC_Statement\(Japanese\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Japanese).pdf)

[JAPANESE TEXT]

1. 「Contraction and Convergence(C&C)」は、Global Commons Institute (GCI、地球の民協会)が1990年から国連に提案している科学的見地に基づいた地球規模の気候政策の枠組みⁱ_{ii iii iv}である。
2. 「国連気候変動枠組条約(UNFCCC)」によってすでに合意されたように、大気中の温室効果ガスを安全かつ安定した濃度に保つという目的と、警戒と公平の原則とによってC&Cの枠組みに基づく公式算出基準が規定され、それによって下記のような提案が行われる。
 - 大気中の温室効果ガス(GHG)濃度を、IPCC WG1炭酸ガスサイクルモデリングに従って安全とみなされる最大限の数値として事前に合意された濃度で安定させることができるレベルまで、地球全体の排出量を削減するための長期的な削減予算[GCIは450 ppmv CO₂相当を「安全でない」とみなしている]。
 - 国家間での予算配分は「資格」として、長期的な削減/濃度協定のスケジュール内の合意された日までの直線的な縮小率の交渉可能な比率から、一人一人に均等に配分されるよう算出されたものである。[GCIでは、[1] 2030年または2040年、または例えば削減を完了する100年分の予算の約1/3[下記第5項、画像1、2参照]と、[2] C&Cスケジュールにおける人口ベース年に賛成することの2点を示唆している]
 - UNFCCCにおけるこの交渉は、各地域の国家間で最初に行われる交渉として世界の地域間すなわち欧州連合、アフリカ連合、米などの間で主に行われるべきである。
 - これらの資格をInternational Energy Backed Currency Units (国際エネルギー本位通貨単位) [エネルギー本位通貨]^vなどの適切な通貨を使用して地域間、国家間、国家内で取り引きすることを奨励するべきである。
 - 排出量ゼロの経済と濃度との関係に対する科学的な理解の発展に従って、C&Cの比率は定期的に見直しを行って変更することが可能である。
3. 現在、地球社会において継続している危険な気候の変化は、それを防止するための対応準備よりも速く進んでいる。国際的外交の課題はこの流れに逆らうことであり、C&Cの目的はこれを可能にすることである。これによって危険な地球の気候変動を防止できる速さで国際的な政策と措置が行われるよう、安全な気候を算出し交渉によって配分できるようなシナリオが可能となる。
4. GHGの排出は、現在に至るまで経済活動と密接な関連がある。今日までこの経済成長と排出量の増加はほとんど工業国で起こっているものであり、近年では地球規模のパターンとして不経済な拡張と相違[E&D]や環境の平衡失調、国際的な不安を生み出している。
5. これに対するC&Cの回答は、短期的確率論的であるよりもむしろ長期的体質的なものである。C&Cは濃度の増加についての「歴史的な責任」においては、新たに工業が発展してきた国々にとってはこれが発展する機会の代償であることを認識しながら、慣性を根拠として提起している。C&Cによって、このように取引可能でそれゆえ価値のある、将来温室効果ガスを排出する資格を国際的に配分することが可能となり、それは合意された地球全体の削減率に関連して慎重に早められた縮小率から得られた結果である[画像2参照]。

6. 英国王立環境汚染委員会^{vi}とドイツ地球変動報告会議^{vii}は、いずれも気候変動に関する政府への推奨事項として公式のC&Cの観点から述べている。多数の個人、機関によるC&C支持の発言が記録されている^{viii ix}。1997年にはAfrica Group of Nations（アフリカ国家グループ）がUNFCCCに対して公式にC&Cを提案している^x。これは1997年京都で開催された第3締約国会議(COP-3)においては、原則として合意された^{xi}。C&Cは同年米上院で採択されたバード決議の要求事項^{xii}に準拠し、また欧州議会では1998年にC&Cに賛成する決議案が通過した^{xiii}。
7. このようなC&Cの統合によって、より危険度を増す傾向にある地球の気候変動の不安定さを是正することが可能となろう。地球上での権利、資源の保護と持続可能なシステムを基礎とする安定したC&Cシステムは、あらゆるものにとって経済を安全で公平な未来に導くために必要とされている。同システムは国連の条約における利益と約束とに基づき、京都議定書の発効のいかんにかかわらず緊急に国際的な支持と対策を得るのに十分な強制力を持つアプローチを確立している。

i <http://www.gci.org.uk>

ii <http://www.gci.org.uk/model/dl.html>

iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)

iv http://www.gci.org.uk/images/C&C_Bubbles.pdf

v <http://www.feasta.org>

vi <http://www.rcep.org.uk/pdf/chp4.pdf>

vii http://www.wbgu.de/wbgu_sn2003_engl.pdf

viii http://www.gci.org.uk/Archive/1989_2004

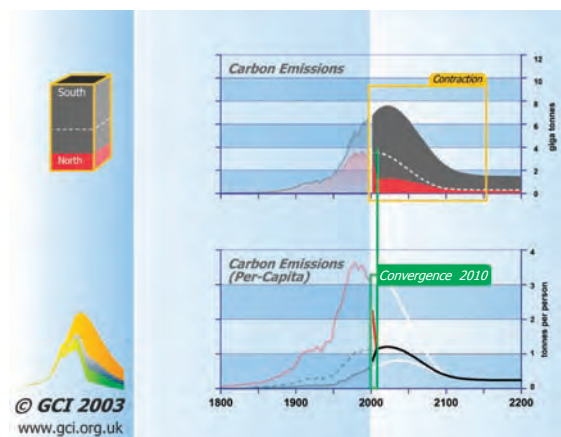
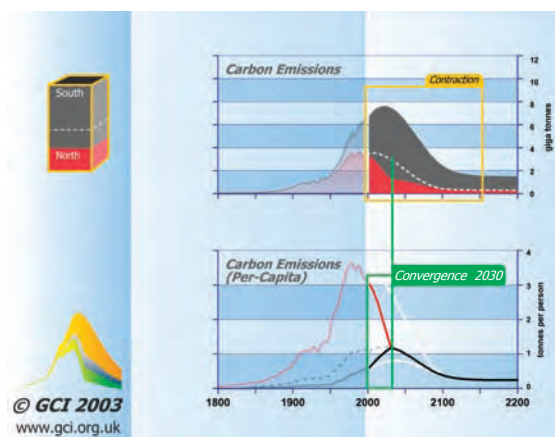
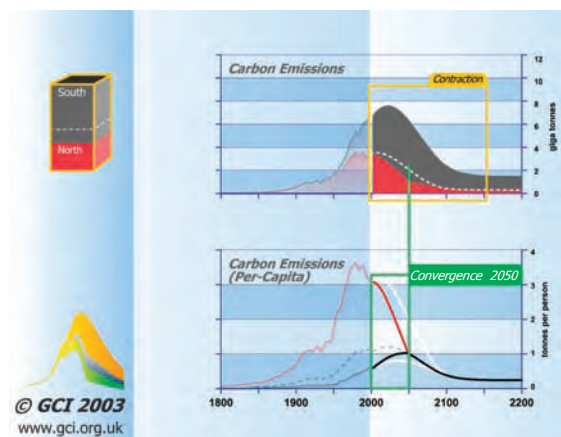
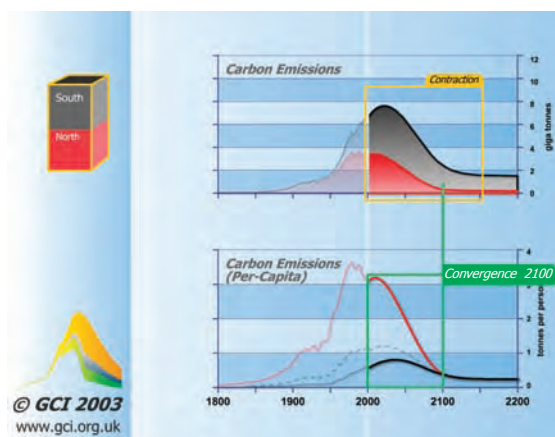
ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>

x <http://www.gci.org.uk/papers/zew.pdf> [付属書C、16ページ]

xi http://www.gci.org.uk/temp/COP3_Transcript.pdf

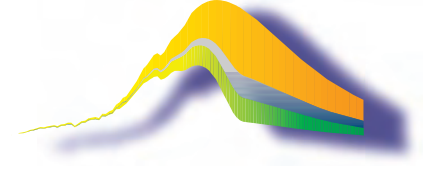
xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>

xiii http://www.gci.org.uk/consolidation/UNFCC&C_A_Brief_History_to1998.pdf [27～32ページ]



C&C

“Contraction and Convergence”



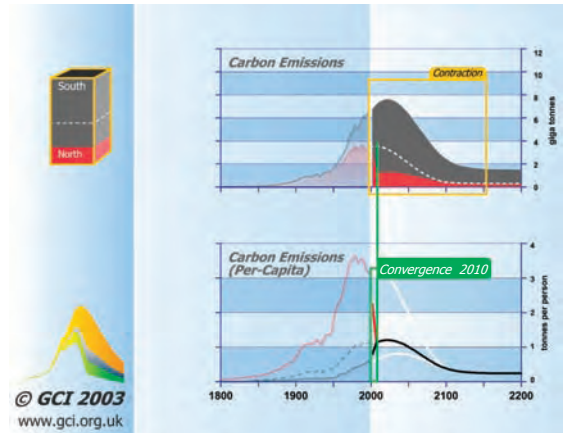
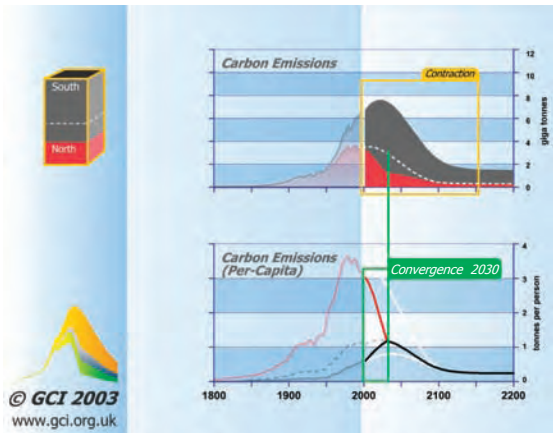
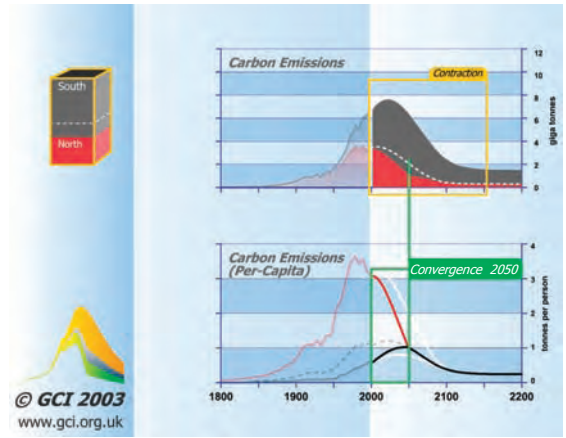
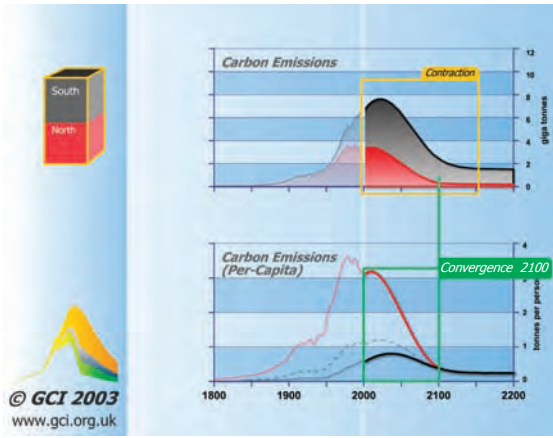
[http://www.gci.org.uk/translations/CandC_Statement\(Turkish\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Turkish).pdf)

[TURKISH TEXT]

1. Contraction and Convergence (C&C), Global Zenginlikler Enstitüsü (GCI) tarafından 1999'dan beri Birleşmiş Milletlere (UN) teklif edilen, bilim tabanlı global iklim politikası çevresidir.
2. Birleşmiş Milletler İklim Değişikliği Çevre Antlaşması'nda (UNFCCC) daha önce kabul edildiği gibi, atmosferdeki sera gazlarının, güvenli ve dengeli konsantrasyonlarına ulaşma ve önceden önlem alma ve hakkaniyet ilkeleri amaçları, aşağıdakileri teklif eden C&C çevresinin resmi hesap temellerini oluşturmaktadır.
 - * IPCC WG1 karbon döngü modelini izleyerek (GCI, 450 ppmv CO₂ yayımını güvenli değil olarak kabul etmektedir) sera gazlarının atmosferik konsantrasyonlarını, daha önce güvenli olarak kabul edilmiş azami konsantrasyon seviyesinde stabilize etme düşüncesiyle tutarlı, tam zamanlı bir global sera gazı yayımı planı.
 - * Tam zamanlı kısıtlama planında kabul edilen tarihte, global olarak, akdolanabilir doğrusal yaklaşma sonucu, kişi başına hesaplanarak bu plan uluslararası alanda paylaşılır. GCI şunları teklif etmektedir: 1) Yaşınlaşmanın tamamlanması için 2030 veya 2040 yılı, yada 100 yıllık bir planın 1/3'ü kadar içinde bir zaman ve 2) C&C programında yer alan nüfus tabanlı bir yılın kabulü
 - * UNFCCC'de bu konuda yapılacak müzakereler, temel olarak dünya bölgeleri arasında yapılmalı ve ülkeler arası müzakereler (örn. Avrupa Birliği, Afrika Birliği ve ABD gibi) söz konusu bölgelere bırakılmalıdır.
 - * Elde edilen hakların bölgeler arası, uluslararası ve yurt içi değişimi için Uluslararası Enerji Destekli Para Birimi'nin (EBCU) kullanımı teşvik edilmelidir.
 - * Zararlı gazları yaymayan ekonomiler ve bu gazların konsantrasyonu arasındaki bilimsel anlayış geliştikçe, periyodik düzenlemeler gözetimi altında C&C'nin tayin ettiği oranlar değiştirilebilir.
3. Şu anda global topluluk, kaçınıldığından daha fazla, tehlikeli iklim değişikliğine neden olmaktadır. Uluslararası diplomatik mücadele bunu önlemektir. C&C'nin amacı, bu hedefi gerçekleştirmektir. C&C, dengeli iklim senaryolarının hesaplamalarını yaparak, ve müzakere yolu ile bunları paylaşarak, tehlikeli global iklim değişikliklerinden kaçınmayı sağlayacak uluslararası politika ve önlemlerin organize edilmesini sağlamaktadır.
4. Sera gazları (GHG) yayımı bugüne kadar hep ekonomik performans ile ilişkilendirilmiştir. Günümüze kadar, ekonomilerin bu büyümesi ve GHG yayımı, daha çok endüstriyel ülkelerde olmuş ve yakın bir zamanda, ekonomik olmayan bir genişlemenin (expansion) ve uzaklaşmanın (divergence) [E&D] yanı sıra, çevresel dengesizlik ve uluslararası güvensizlik yaratmıştır.
5. C&C'nin bu konudaki yanıtı, kısa dönemli ve tahmini olmaktan çok, tam zamanlı ve yapısalıdır. Bu konuda, atalet halindeki artan konsantrasyon karşısında "tarihi sorumluluk meselesi"ni ele alarak, bunu yeni yeni endüstrileşen ülkeler için bir kalkınma imkanı masrafı olarak tanımlamıştır. C&C, gelecekte elde edilecek, bu, alınıp satılabilir olduğu için değerli olan GHG yayma haklarının uluslararası dağıtımını sağlamakta ve global antlaşmalarla kabul edilen kısıtlamalara (contraction) göreceli olarak, kasıtlı olarak hızlandırılan bir yaklaşma (convergence) oranından kaynaklanmasını istemektedir. (bkz. şekiller)

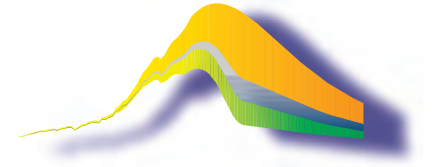
6. İngiltere'nin Çevresel Kirlenme ile İlgili Kraliyet Komisyonu (UK's Royal Commission on Environmental Pollution) ve Almanya'nın Global Değişim Danışma Konseyi (German Advisory Council on Global Change) , resmi C&C'ye dayanarak, iklim değişikliği konusundaki tavsiyelerini hükümetlere sunmaktadır. C&C'yi destekleyen sayısız kişisel ve kurumsal ifade kayda geçmiştir. Afrika Milletler Topluluğu (Afrika Group of Nations) bunu 1997'de UNFCCC'ye teklif etmiştir. Bu husus ilke olarak COP-3 Kyoto 1997'de kabul edilmiştir. C&C aynı yıl ABD Senatosu'nun onayladığı Byrd Hagel Önergesi'nin taleplerine uymaktadır ve 1998 Avrupa Parlamentosu C&C lehine bir önergeyi kabul etmiştir.
7. C&C'nin bu sentezi, global iklim değişikimi dengesizliklerinin bu yönelimini ıslah edebilir düzeydedir. Global haklar, kaynakların korunması ve kendi kendine yeten sistemler üzerine kurulan dengeli bir C&C, global ekonomiyi güvenli ve adaletli bir geleceğe yönlentmek için artık gereklidir. C&C, Kyoto Protokolü uygulansın veya uygulanmasın, Birleşmiş Milletler Antlaşmalarının kazançları ve taahhütleri üzerine yapılanmakta ve acil uluslararası desteği harekete geçirecek kadar zorlayıcı bir yaklaşımı oluşturmaktadır.

- i <http://www.gci.org.uk>
ii <http://www.gci.org.uk/model/dl.html>
iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
v <http://www.feasta.org>
vi <http://www.rcep.org.uk/pdf/chp4.pdf>
vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
viii http://www.gci.org.uk/Archive/1989_2004
ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
xiii http://www.gci.org.uk/consolidation/UNFCCC_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

“Contraction and Convergence”



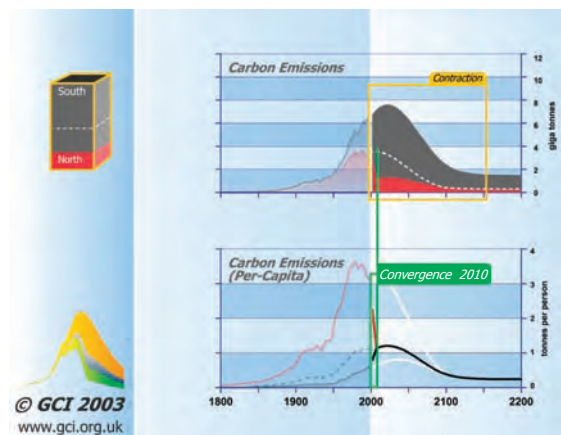
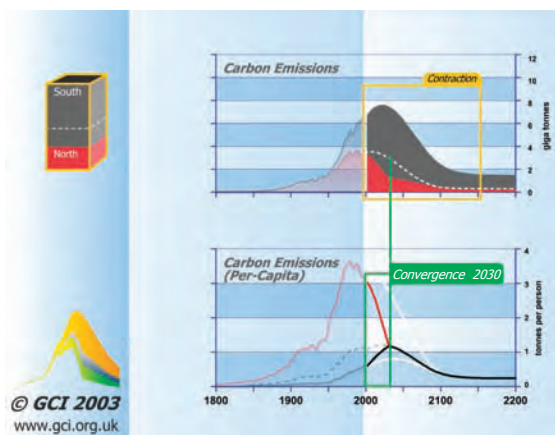
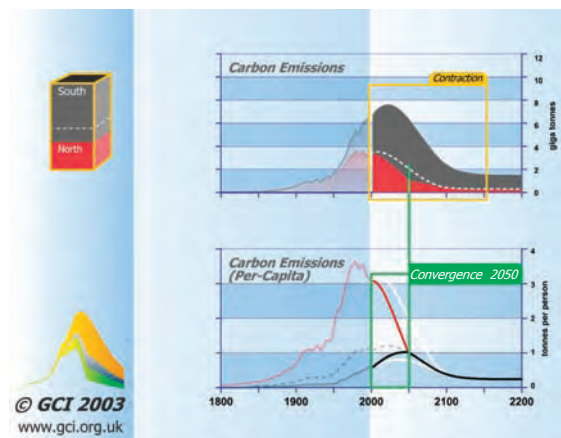
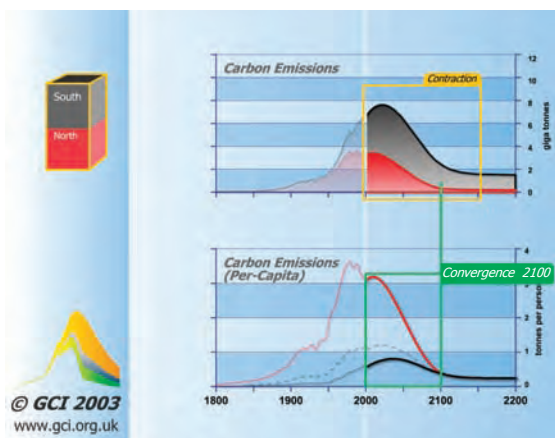
[http://www.gci.org.uk/translations/CandC_Statement\(Swahili\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Swahili).pdf)

[SWAHILI TEXT]

1. Upungufu na Ukaribiano “Contraction and Convergence” (C&C) ni sayansi iliyo na msingi kutoka kwa maongozi ya hewa ulimwenguni yaliyo azimiwa na Global Commons Institute (GCI) kwa Umoja wa Mataifa tangu 1990. i ii iii iv
2. Lengo la gesi ya nyumba ya kijani (Greenhouse) katika anga na kanuni za upingaji na uadilifu, kama ilivyo kubaliwa katika Mkataba wa Umoja wa Mataifa juu ya Mabadiliko ya Hali ya Hewa (United Nations Framework Convention on Climate Change - UNFCCC), zinaandaa msingi ya kukadiri C&C. Msingi huu unaazimia:-
 - * Kipeto kilichokomaa cha uzalishaji wa gesi kinalainika na kusawazisha mkusanyo wa gesi (greenhouse gases (GHGs)) angani. Ili mkusanyo huu uwe katika kiwango kinacho kubaliwa kuwa ni salama, kwa kufuatia mfano wa carbon wa IPCC WG1. [GCI ina hesabu kiwango juu ya 450 ppmv CO2 kutokuwa salama].
 - * Kugawanya kipeto hiki kati ya mataifa kinaonekana kuwa ni haki, kina sababishwa na kupatikana kwa kima cha mstari uliokaribiana na vipande kwa kila mtu duniani kwa wakati unaofaa kukomaa kwa mkataba wa upungufu/mkusanyo. [GCI inadokeza [1] mwaka 2030 au 2040, au karibu na thuluthi ya kipeto cha miaka 100. Kwa mfano, kwa kumaliza ukaribiano [ona alama 5 na picha 1 & 2 ifuatayo] na [2] zinazo onyesha msingi wa umma katika ratiba ya C&C inakubaliwa].
 - * Majadiliano ya mambo haya katika UNFCCC yanafanyika hasa kati ya sehemu za dunia, kwa hivyo yanaacha majadiliano yawe kati ya nchi zilizo katika sehemu hizi, kama Muungano wa Ulaya, Umoja wa Nchi za Afrika, Amerika na kadhalika.
 - * Kustahilisha biashara kati ya sehemu, taifa, na nchi kwa fedha inayofaa kama Nguvu Ya Kimataifa Ya Kudhamini Fedha International Energy Backed Currency Units [EBCUs] v inabidi iendelezwe.
 - * Uelewaji wa kisayansi wa uhusiano kati ya iktisadi isiyokuwa-na-uzalishaji-wa-gesi na mkusanyo unaoendelezwa, ili viwango vya C&C vidhihirike ndani ya marejeo.
3. Kwa wakati huu, jumuiya ya ulimwengu inaendelea kutoa mabadiliko hatari ya hewa upesi kuliko inavyo simamia kuyaepuka. Mwito wa usuluhivu wa kimataifa ni kugeuza hili tatizo. Nia ya C&C ni kusababisha mwito huu. Inawezesha hali ya hewa salama ihesabiwe na ifikiriwe katika majadiliano ili maongozi na hatua zichukuliwe kimataifa kwa viwango vitakavyoepusha mabadiliko hatari ya hewa.
4. Uzalishaji wa gesi GHG imehusiana na matekelezo ya iktisadi. Kwa sasa, ukuaji wa iktisadi na uzalishaji wa gesi upo hasa katika nchi zilizoendelea, kwa hivyo vinaunda mfano wa kuongezeka kwa iktisadi usiyofaa na mazingira yasiyofaa.
5. Jibu la C&C kwa jambo hili ni muda mrefu na halali, na sio muda mfupi na ovyoovyo. Jibu hii inajaribu kusuluhisha majadiliano ya muda mrefu kuhusu ni nani aliyesababisha nyongeza la gesi hizi. Inajaribu kubaini kuwa nyongeza la gesi hii ni gharama ya lazima inayolipwa na nchi zinazoendelea.. C&C inawezesha ugawanyaji wa biashara na kutoa kiwango cha gesi kinacho lingana na upungufuu uliokubaliwa [angalia picha.2].

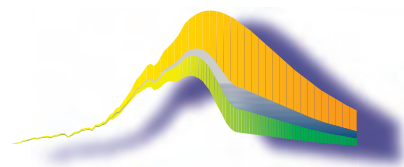
6. Jumua ya uchafu wa mazingira ya Uingereza na Jumua ya mabadiliko ya hali ya hewa ya Ujerumani vii, yote yanatoa mapendekezo kwa serekali kuhusu C&C. Watu wengi na taasisi wametoa maandiko kuauni C&C na imerekodiwa. viii ix Kikundi cha mataifa ya Afrika waliazimu kwa UNFCCC mwaka 1997 na kilikubaliwa katika COP-3 Kyoto 1997. xi C&C inajilainisha na mahitaji ya azimio ya Byrd Hagel ya baraza ya Amerika ya mwaka huo xii na bunge la Ulaya ilipitisha azimio kuendeleza C&C mwaka 1998 xiii .
7. Kufanyiza kwa C&C inaweza kurekebisha hatari inayotokana na mabadiliko ya hewa ulimwengni. C&C imejengwa kwa haki za ulimwengu, uhifadhi wa mali na utaratibu unaotegemewa. Kwa hivyo utaratibu wa C&C unatajikana kuongoza ikistadi kwa wakati ujao ulio salama na adili. Itajenga kwa faida na ahadi za Umoja wa mataifa na kustawisha njia iliyo na nguvu ya kupata mategemeo na hatua kutoka kwa mataifa, kuwa na kutokuwa na mshawishi ya Kyoto Protocol.

- i <http://www.gci.org.uk>
- ii <http://www.gci.org.uk/model/dl.html>
- iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
- iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
- v <http://www.feasta.org>
- vi <http://www.rcep.org.uk/pdf/chp4.pdf>
- vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
- viii http://www.gci.org.uk/Archive/1989_2004
- ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
- x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
- xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
- xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
- xiii http://www.gci.org.uk/consolidation/UNFCCC_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

“Contraction and Convergence”



[http://www.gci.org.uk/translations/CandC_Statement\(Russian\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Russian).pdf)

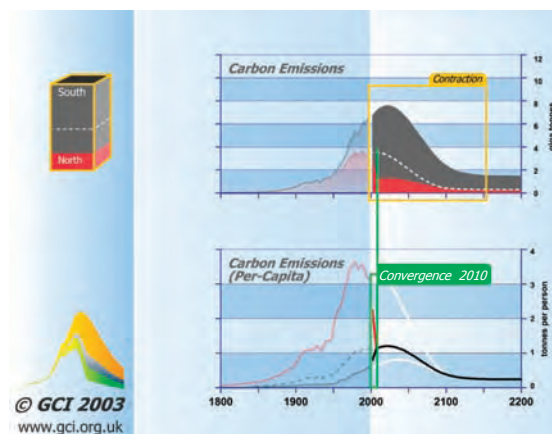
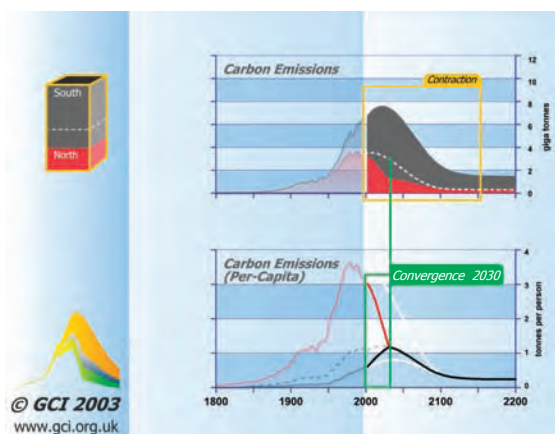
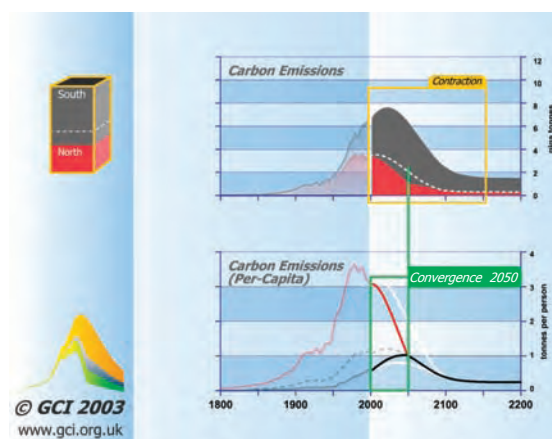
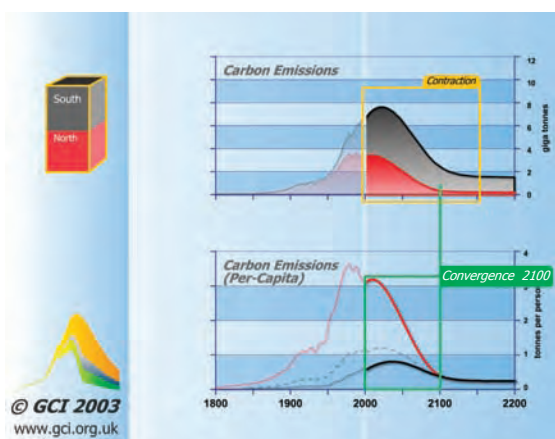
[RUSSIAN TEXT]

1. “Сокращение и конвергенция” (СК) [C&C]- это разработанная на научной основе структура глобальной политики в области климата, предложенная Организации Объединенных Наций с 1990 года Институтом общего достояния человечества (ИОДЧ).i ii iii iv
2. Задача достижения безопасной и стабильной концентрации парникового газа в атмосфере и принципы осторожности и справедливости, как это уже согласовано в “Рамочной конвенции Организации Объединенных Наций об изменении климата” (РКООНИК), обеспечивают официальную расчетную основу структуры СК, которая предлагает:
 - * Долгосрочный бюджет сокращения глобальных выбросов, отвечающий требованиям по стабилизации концентрации в атмосфере парниковых газов (ПГ) на уровне заранее согласованной максимальной концентрации, которая считается безопасной после моделирования круговорота углерода, проведенного рабочей группой РГ1 МГЭИК. [ИОДЧ считает, что концентрация CO₂ свыше 450 частей на миллион объема является “небезопасной”].
 - * Международное распределение этого бюджета в виде “прав” является результатом могущей быть переуступленной нормы линейной конвергенции на равные доли на человека по всему миру к согласованной дате в рамках плана-графика долгосрочного договора о сокращении/концентрации. [ИОДЧ предлагает [1] 2030 или 2040 год или примерно третью часть бюджета на 100 лет, например, в отношении конвергенции для завершения [смотрите пункт 5 и снимки 1 и 2 ниже], и [2] что год на базе населения в графике СК согласован].
 - * Переговоры относительно этого в РКООНИК должны вестись главным образом между различными регионами мира, оставив проведение переговоров между отдельными странами главным образом внутри их соответствующих регионов, таких как Европейский Союз, Африканский Союз, США и т.д.
 - * Должна поощряться межрегиональная, межгосударственная и внутригосударственная реализуемость этих прав в соответствующей валюте, такой как международные валютные единицы, обеспеченные энергией [ВЕОЭ] v.
 - * Научное понимание взаимосвязи между экономикой без выбросов и концентрациями развивается, поэтому нормы СК могут меняться в результате периодически проводимых пересмотров.
3. В настоящее время всемирное сообщество продолжает создавать опасные климатические изменения быстрее, чем принимает меры с целью не допустить их. Задача международной дипломатии – изменить такую ситуацию. Целью СК является сделать это возможным. Она дает возможность рассчитать и распределить путем переговоров различные сценарии для обеспечения безопасного климата с тем, чтобы можно было провести в мировом масштабе организационные мероприятия по разработке стратегий и мер на уровне, который бы дал возможность не допустить опасного глобального изменения климата.
4. Выбросы парниковых газов до сих пор тесно привязывались к результатам экономической деятельности. По состоянию на сегодняшний день этот рост экономики и выбросы имели место в основном в промышленно развитых странах, в результате чего в последнее время образовалась глобальная структура все возрастающей неэкономической экспансии и дивергенции [ЭД], экологического дисбаланса и ненадежности международного положения.
5. Ответ СК на это является долгосрочным и органическим, а не рассчитанным на краткосрочную перспективу и стохастическим. В нем рассматривается порожденный инерцией мышления аргумент относительно “исторической ответственности” за повышающуюся концентрацию, считая его альтернативными издержками развития новых индустриализующихся стран. СК открывает возможности международного предварительного распределения этих реализуемых и в этой связи ценных будущих прав на выброс ПГ в результате нормы конвергенции, которая преднамеренно ускорена по сравнению с согласованной глобальной нормой сокращения [смотрите рисунок 2].

6. Как Королевская комиссия Великобритании по загрязнению окружающей средыⁱ, так и Консультативный совет Германии по глобальным изменениямⁱⁱ представляют свои рекомендации по изменению климата правительствам с точки зрения официального СК. Были занесены в протокол многочисленные индивидуальные и поступившие от различных организаций заявления в поддержку СК.^{viii} ix Африканская группа наций официально предложила ее РКООНИК в 1997 году.^x Она была в принципе согласована на COP-3 (3-я конференция участников) в Киото в 1997 году.^{xi} СК подчиняется требованиям Резолюции Берта-Хагеля Сената США того же года^{xii}, и Европейский парламент принял резолюцию в пользу СК в 1998 году.^{xiii}

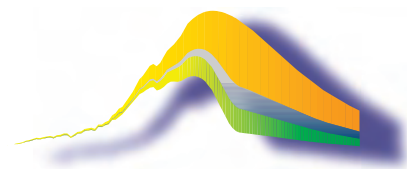
7. Этот синтез СК может исправить все возрастающую опасную тенденцию нарушения баланса глобального климатического изменения. Стабильная система СК, разработанная на основе глобальных прав, рационального использования природных ресурсов и устойчивых систем, в настоящее время нужна для того, чтобы направлять экономику по пути безопасного и справедливого будущего в интересах всех людей. Она построена на основе поступлений и обещаний Конвенции ООН, и в результате создаются основы подхода, который в достаточной степени гальванизирует срочную международную поддержку и действия, независимо от того, вступит ли Киотский протокол в силу или нет.

- i <http://www.gci.org.uk>
- ii <http://www.gci.org.uk/model/dl.html>
- iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
- iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
- v <http://www.feasta.org>
- vi <http://www.rcep.org.uk/pdf/chp4.pdf>
- vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
- viii http://www.gci.org.uk/Archive/1989_2004
- ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
- x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
- xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
- xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
- xiii http://www.gci.org.uk/consolidation/UNFCC&C_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

“Contraction and Convergence”

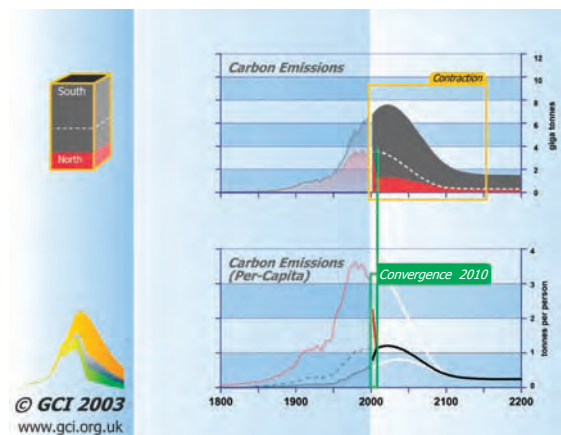
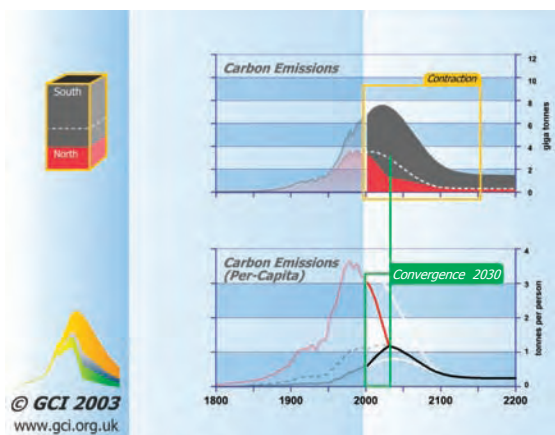
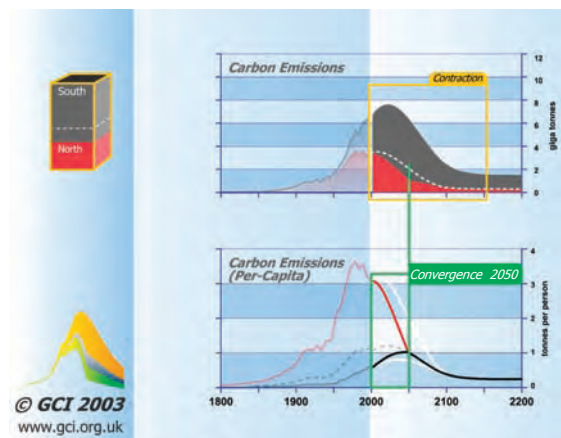
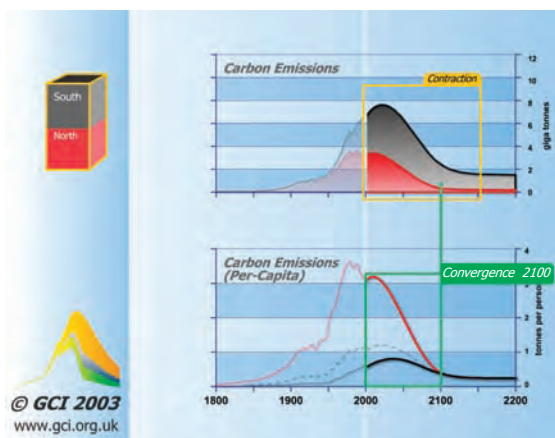


[http://www.gci.org.uk/translations/CandC_Statement\(Portuguese\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Portuguese).pdf) [PORTUGUESE TEXT]

1. “Contração e Convergência” (C&C) é o enquadramento global de políticas climáticas com base científica proposto às Nações Unidas a partir de 1990 pelo Global Commons Institute (GCI).i ii iii iv
2. O objectivo das concentrações dos gases de efeito de estufa seguras e estáveis na atmosfera e os princípios da precaução e da equidade, conforme já acordado na “United Nations Framework Convention of Climate Change” (UNFCCC), proporcionam a base de cálculo formal do enquadramento da C&C que propõe: -
 - * Uma quota de contração a longo prazo das emissões globais consistente com a estabilização das concentrações dos gases de efeito de estufa (CFCs) na atmosfera a uma concentração máxima considerada segura previamente acordada, segundo o modelo do ciclo do carbono IPCC WG1. [O GCI considera uma taxa de CO₂ superior a 450 ppmv equivalente a ‘não segura’].
 - * A partilha internacional desta quota sob a forma de “créditos” resulta de uma taxa negociável de convergência linear que iguala globalmente as quotas por pessoa, até uma data limite acordada, dentro do prazo do acordo de contração/concentração. [O GCI sugere [1] o ano de 2030 ou 2040, ou cerca de um terço do percurso até uma quota de 100 anos, por exemplo, para a conclusão da convergência [ver ponto 5 e imagens 1 e 2 a seguir] e [2] que seja acordado um calendário de C&C de um ano com base na população].
 - * As negociações para este fim no âmbito da UNFCCC devem ocorrer principalmente entre as regiões do mundo, deixando à partida as negociações entre os países dentro das suas regiões respectivas, tais como a União Europeia, a União Africana, os EUA, etc.
 - * A possibilidade de negociação inter-regional, internacional e intranacional destes créditos numa moeda adequada, tal como as International Energy Backed Currency Units [EBCUs] v deve ser incentivada.
 - * O conhecimento científico da relação entre uma economia livre de emissões e as concentrações está a desenvolver-se, pelo que as taxas de C&C podem evoluir com base numa revisão periódica.
3. Actualmente, a comunidade global continua a gerar alterações climáticas perigosas a um ritmo mais rápido do que aquele a que se organiza para evitá-las. O desafio da diplomacia internacional é o de inverter esta tendência. O objectivo da C&C é tornar isto possível, ao permitir que cenários para um clima mais seguro sejam calculados e partilhados através de negociações, de modo a que as políticas e medidas sejam organizadas a nível internacional a taxas que evitem alterações climáticas globais perigosas.
4. Até ao momento, as emissões de CFCs têm estado intimamente relacionadas com o desempenho económico. Até à data, este crescimento das economias e das emissões tem ocorrido maioritariamente nos países industrializados, tendo criado recentemente um padrão global cada vez maior de expansão e divergência [E&D] não económica, de desequilíbrio ambiental e de insegurança internacional.
5. A resposta C&C a esta situação é a longo prazo e constitucional e não a curto prazo e estocástica. Debruça-se sobre o argumento paralisante das “responsabilidades históricas” para o aumento das concentrações, reconhecendo esta como uma oportunidade de desenvolvimento para os países recém industrializados. A C&C permite uma distribuição internacional prévia destes créditos futuros negociáveis e, por conseguinte, valiosos para a emissão de CFCs, de forma a resultarem numa taxa de convergência que é deliberadamente acelerada em comparação com a taxa global de contração acordada [ver imagem 2].

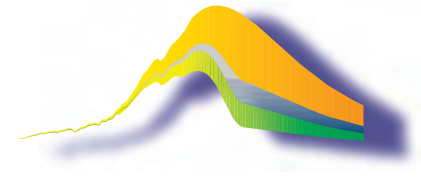
6. A Real Comissão sobre a Poluição Ambientalvi do Reino Unido e o Conselho sobre as Alterações Globaisvii da Alemanha fazem recomendações sobre as alterações climáticas aos respectivos governos em termos de C&C formais. Foram registados numerosas declarações individuais e institucionais apoiando a C&C.viii ix O Grupo de Nações Africanas propôs formalmente a C&C à UNFCCC em 1997.x Houve um acordo de princípio na COP-3 de Quioto de 1997.xi A C&C está em conformidade com os requisitos da Resolução Byrd Hagel do Senado dos Estados Unidos desse ano xii e o Parlamento Europeu votou uma resolução a favor da C&C em 1998.xiii
7. Esta síntese da C&C pode corrigir as alterações climáticas globais que provocam desequilíbrios cada vez mais perigosos. Baseado em direitos globais, conservação de recursos e sistemas sustentáveis, um sistema de C&C estável é agora necessário para conduzir a economia para um futuro seguro e equitativo para todos. Ganha força nos avanços e nas promessas da Convenção das Nações Unidas e estabelece uma abordagem suficientemente atractiva para galvanizar o apoio e a acção internacionais urgentes, estando o Protocolo de Quioto em vigor ou não.

- i <http://www.gci.org.uk>
- ii <http://www.gci.org.uk/model/dl.html>
- iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
- iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
- v <http://www.feasta.org>
- vi <http://www.rcep.org.uk/pdf/chp4.pdf>
- vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
- viii http://www.gci.org.uk/Archive/1989_2004
- ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
- x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
- xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
- xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
- xiii http://www.gci.org.uk/consolidation/UNFCCC&C_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

“Contraction and Convergence”



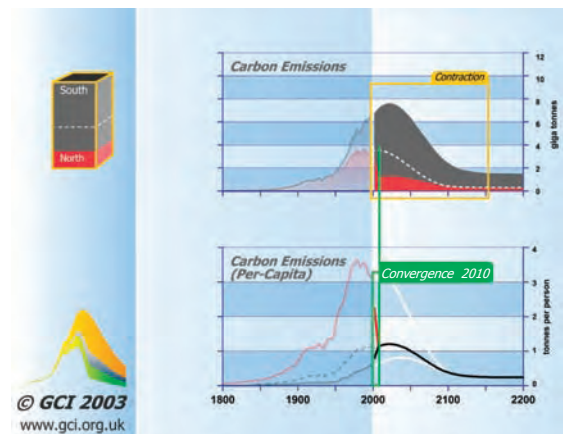
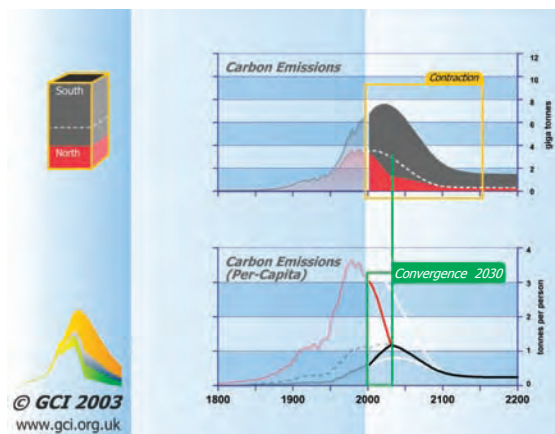
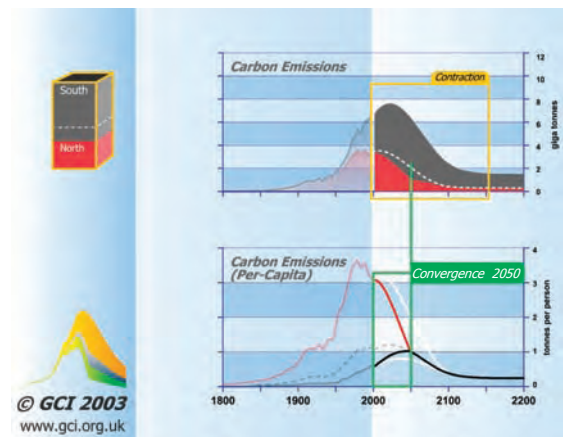
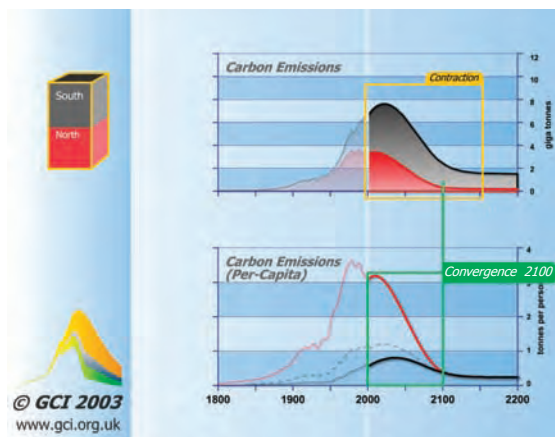
[ITALIAN TEXT]

[http://www.gci.org.uk/translations/CandC_Statement\(Italian\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Italian).pdf)

1. “Contração e Convergência” (C&C) è il quadro globale della politica sul clima, basata sulla scienza climatica, proposto alle Nazioni Unite dal 1990, dal Global Commons Institute (GCI). (i ii iii iv)
2. L’obiettivo di ottenere concentrazioni di gas serra sicure e stabili nell’atmosfera ed i principi di precauzionalità e di equità come già stabilito nella “Convenzione Quadro delle Nazioni Unite sul Cambiamento del Clima” (UNFCCC), forniscono la base di calcolo dello schema formale C&C, che propone:
 - * Un budget di contrazione completo per le emissioni globali, che sia compatibile con la stabilizzazione delle concentrazioni di gas serra (GHGs) nell’atmosfera a una concentrazione massima prestabilita e riconosciuta come sicura, in conformità con la modellizzazione del ciclo del carbonio IPCC WG1. [Il GCI considera livelli di CO2 superiori a 450 ppmv equivalenti ad uno standard “non-sicuro”].
 - * La ripartizione internazionale di questo budget come “assegnazioni” si ricava da un tasso negoziabile che converge linearmente ad assegnazioni pro capite uguali fra loro, entro una data convenuta fissata all’interno dei tempi previsti dall’accordo globale sulla contrazione [riduzione] delle concentrazioni di gas serra. [Il GCI suggerisce [1] l’anno 2030 oppure 2040, o a circa un terzo del tempo in un budget di una durata di 100 anni, [per esempio], affinché la convergenza sia raggiunta [vedi punto 5 e figure 1 & 2 sotto] e [2] che un anno di riferimento per il livello della popolazione mondiale sia concordato all’interno della tempistica C&C.
 - * I negoziati per raggiungere detti scopi presso la UNFCCC dovrebbero, principalmente, aver luogo tra le diverse regioni del mondo, lasciando le negoziazioni tra i paesi primariamente tra le loro rispettive regioni, come ad esempio: Unione Europea, Unione Africana, Stati Uniti, etc.
 - * La commerciabilità di dette assegnazioni interregionali, internazionali e domestiche in una appropriata valuta - come per esempio le Unità di Valuta Internazionali basate sull’Energia [EBCUs - Energy Backed Currency Units] v – dovrebbe essere incoraggiata.
 - * La comprensione scientifica della relazione tra una economia libera da emissioni e la concentrazione di gas serra è in pieno sviluppo, per cui i tassi di contrazione e convergenza possono evolvere sotto revisione periodica di appositi corpi sussidiari scientifici della Convenzione C&C.
3. Al momento, la comunità mondiale continua a causare cambiamenti climatici pericolosi più rapidamente di quanto fa per tentare di evitarli. “La sfida diplomatica internazionale è quella di rovesciare questa tendenza. L’obiettivo della C&C è di renderlo possibile. Lo schema C&C permette di calcolare scenari per un clima sicuro e di dividerli tramite negoziazione. In questa maniera azioni politiche e altre misure possono essere organizzate a livello internazionale a ritmi tali da evitare cambiamenti climatici globali pericolosi.
4. Le emissioni di gas serra (GHG) sono state finora messe in stretta correlazione con la crescita economica. A tutt’oggi, questo collegamento tra crescita economica ed emissioni avviene principalmente nei paesi industrializzati, causando negli ultimi decenni una “espansione e divergenza” (E&D) crescentemente antieconomica, uno squilibrio ambientale e un’insicurezza internazionale.
5. La risposta del C&C a ciò è completa e costituzionale, invece che di breve periodo e caotica. Si rivolge alla questione “inerziale” sulle “responsabilità storiche” per l’aumento delle concentrazioni, riconoscendo come la C&C permette una opportunità di sviluppo per i paesi di recente industrializzazione. La C&C permette una predistribuzione internazionale di queste assegnazioni di quote di emissioni future di gas serra commerciabili e quindi dotate di valore economico e preziose per il futuro. Tali assegnazioni di quote di emissione si calcolano da un tasso di convergenza che è deliberatamente accelerato rispetto al convenuto tasso globale di contrazione. [vedi figura 2 e 3].

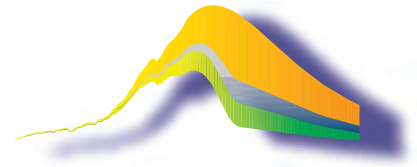
6. La Commissione Reale per l' Inquinamento Ambientale del Regno Unito vi e il Consiglio Consultivo del governo tedesco sui Cambiamenti Globali vii fanno entrambi le loro raccomandazioni ai governi riguardo ai cambiamenti climatici, seguendo proprio una schema di Contrazione e Convergenza. Numerose dichiarazioni individuali e di istituzioni sono state emesse a supporto del C&C.viii ix Il "gruppo delle Nazioni Africane" ha formalmente proposto queste azioni durante la Conferenza delle Parti (COP) UNFCCC del 1997.x Questo concetto è stato concordato come principio durante la COP3 di Kyoto 1997.xi La "C&C si conforma alle richieste della Risoluzione Byrd-Hagel"* del Senato statunitense nello stesso anno.xii II Parlamento Europeo "ha deliberato a favore del C&C nel 1998. xiii
7. Questa sintesi della C&C è in grado di rimediare alla tendenza pericolosamente in aumento di creare squilibri nel cambiamento climatico globale. Costituito sui diritti globali, sulla preservazione delle risorse e sui sistemi sostenibili, ora serve uno stabile sistema C&C per guidare l'economia verso un futuro sicuro e d'uguaglianza per tutti. Questo sistema viene costruito sui fondamenti e sulle promesse della Convenzione Climatica delle Nazioni Unite e stabilisce un approccio sufficientemente convincente a stimolare urgenti elementi di sostegno ed azioni internazionali, con o senza l'entrata in vigore del protocollo di Kyoto superando tra l'altro i suoi evidenti limiti temporali e l'estrema esiguità del suo intervento di riduzione delle emissioni. [C&C riduce le emissioni di almeno il 60% come richiesto dai calcoli scientifici della comunità scientifica internazionale, mentre Kyoto le riduce del solo 5% del soli paesi industrializzati].

- i <http://www.gci.org.uk>
- ii <http://www.gci.org.uk/model/dl.html>
- iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
- iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
- v <http://www.feasta.org>
- vi <http://www.rcep.org.uk/pdf/chp4.pdf>
- vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
- viii http://www.gci.org.uk/Archive/1989_2004
- ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
- x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
- xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
- xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
- xiii http://www.gci.org.uk/consolidation/UNFCCC&C_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

“Contraction and Convergence”



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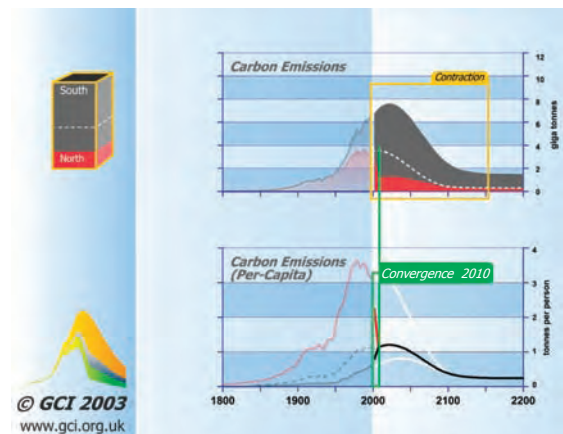
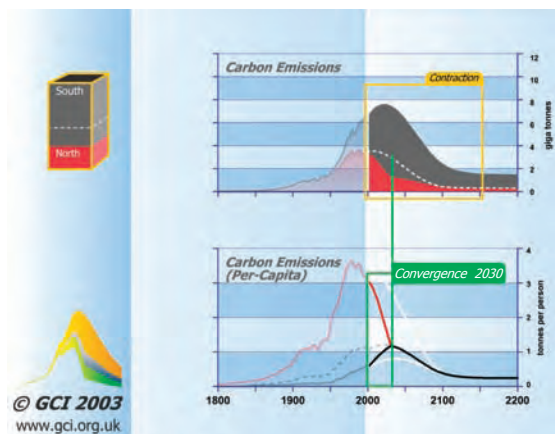
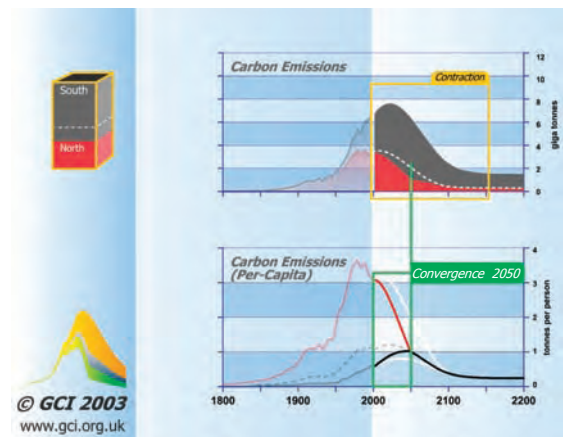
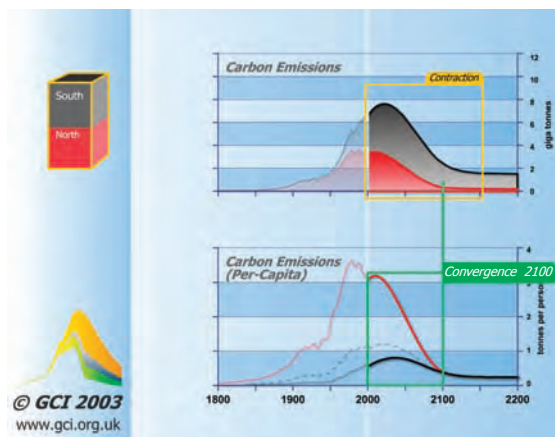
[FRENCH TEXT]

1. Le programme « Contraction et Convergence » (C&C) est le cadre d'action sur le climat mondial à fondement scientifique proposé aux Nations Unies depuis 1990 par le Global Commons Institute (GCI). i ii iii iv
2. La mise en place de concentrations inoffensives et stables de gaz à effet de serre dans l'atmosphère et les principes de précaution et d'équité tels qu'ils ont déjà été convenus dans la "Convention cadre des Nations Unies sur le changement climatique" (UNFCCC) servent de base de calcul officiel au programme C&C qui propose: -
 - * Un budget de contraction à long terme pour les émissions mondiales, qui stabiliserait les concentrations atmosphériques de gaz à effet de serre (GES) à une concentration maximum convenue à l'avance et considérée comme inoffensive, conformément à la modélisation du cycle du carbone IPCC WG1. [GCI considère qu'un taux dépassant l'équivalent de 450 ppmv de CO₂ va au-delà du seuil de sécurité].
 - * Le partage international de ce budget sous forme de « droits » provient d'un taux de convergence linéaire négociable correspondant à des parts égales par personne pour tous les individus du monde d'ici à une date convenue dans le calendrier de l'accord de contraction/concentration à long terme. [Le GCI suggère comme année de convergence [1] l'année 2030 ou 2040, ou une durée située à un tiers d'un budget de 100 ans par exemple [voir point 5 et images 1 & 2 ci-dessous] et [2] de convenir une année de référence pour la population dans le programme C&C].
 - * Les négociations à ce sujet à l'UNFCCC devraient avoir lieu principalement entre les régions du monde, laissant les négociations entre pays se dérouler essentiellement au sein de leurs régions respectives comme l'Union européenne, l'Union africaine, les USA, etc.
 - * La négociabilité inter-régionale, inter-nationale et intra-nationale de ces droits dans une devise appropriée comme les unités de devise internationales gagées sur l'énergie [EBCU] v devrait être encouragée.
 - * L'évolution des connaissances scientifiques sur les rapports entre une économie sans émissions et les concentrations permet de modifier les taux de C&C dans le cadre d'une révision périodique.
3. Actuellement, la communauté mondiale continue à générer des changements climatiques dangereux plus rapidement qu'elle s'organise pour les éviter. Le défi diplomatique international consiste à inverser cette tendance. L'objectif du programme C&C est d'y parvenir. Il permet de calculer et partager des scénarios pour un climat sans danger par le biais de la négociation afin de pouvoir organiser des politiques et mesures sur le plan international à des taux qui évitent les changements climatiques mondiaux dangereux.
4. Jusqu'ici les émissions de GES ont été associées de près aux performances économiques. A ce jour, cette croissance des économies et émissions a concerné essentiellement les pays industrialisés, créant récemment un schéma mondial d'expansion et de divergence [E&D] de moins en moins économique, un déséquilibre environnemental et une insécurité sur le plan international.
5. La réponse du programme C&C à ce problème est une solution constitutionnelle à long terme plutôt qu'une solution stochastique à court terme. Il adresse l'argument générateur d'inertie sur les « responsabilités historiques » auquel on a recours pour expliquer l'accroissement des concentrations en l'identifiant comme un coût d'opportunité de développement pour les pays nouvellement industrialisés. Le programme C&C permet à une redistribution internationale de ces droits futurs négociables et donc précieux d'émettre des GES, de résulter d'un taux de convergence qui est délibérément accéléré par rapport au taux de contraction mondial convenu [voir image 2].

6. La Royal Commission on Environmental Pollution vi (Commission royale sur la pollution environnementale) du Royaume-Uni et le Conseil consultatif allemand sur le Changement mondialvii ont tous deux faits leurs recommandations sur le changement climatique aux gouvernements sous forme d'un programme C&C formel. De nombreuses déclarations individuelles et institutionnelles en faveur du programme C&C ont été rendues publiques.viii ix L'Africa Group of Nations (le groupe africain des nations) l'a officiellement proposé à la UNFCCC en 1997.x Ses principes ont été acceptés à COP-3 à Kyoto en 1997.xi Le programme C&C est conforme aux exigences de la Byrd Hagel Resolution (Résolution Byrd Hagel) du Sénat américain de 1997 xii et le Parlement européen a voté une résolution en faveur du programme C&C en 1998.xiii

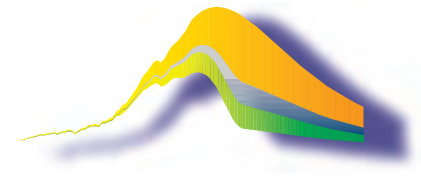
7. Cette synthèse de la C&C peut rectifier la tendance de plus en plus dangereuse aux déséquilibres dans le changement climatique mondial. Basé sur les droits mondiaux, la préservation des ressources et les systèmes durables, un système de C&C stable est maintenant nécessaire afin de guider l'économie vers un avenir sûr et équitable pour tous. Il met à profit les acquis et les promesses de la Convention de l'ONU et établit une démarche suffisamment attrayante pour stimuler une aide et une action internationales urgentes, que le Protocole de Kyoto entre ou non en vigueur.

- i <http://www.gci.org.uk>
- ii <http://www.gci.org.uk/model/dl.html>
- iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
- iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
- v <http://www.feasta.org>
- vi <http://www.rcep.org.uk/pdf/chp4.pdf>
- vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
- viii http://www.gci.org.uk/Archive/1989_2004
- ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
- x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
- xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
- xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
- xiii http://www.gci.org.uk/consolidation/UNFCC&C_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

„Contraction and Convergence“



[http://www.gci.org.uk/translations/CandC_Statement\(German\).pdf](http://www.gci.org.uk/translations/CandC_Statement(German).pdf)

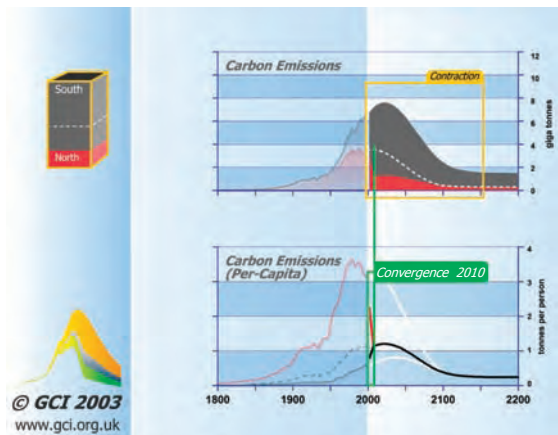
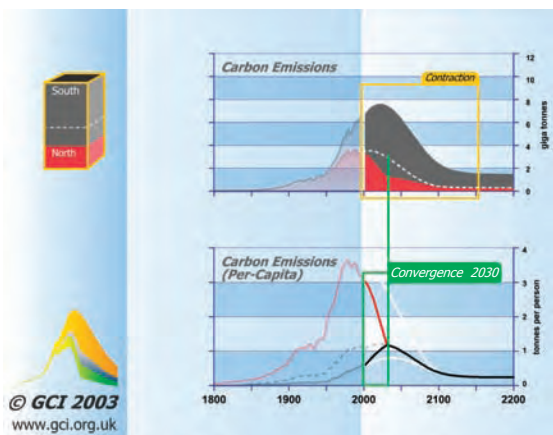
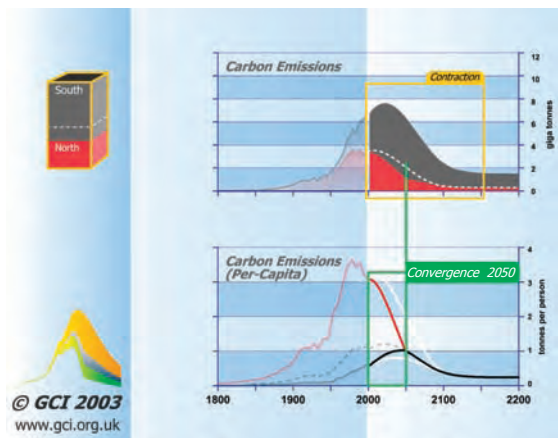
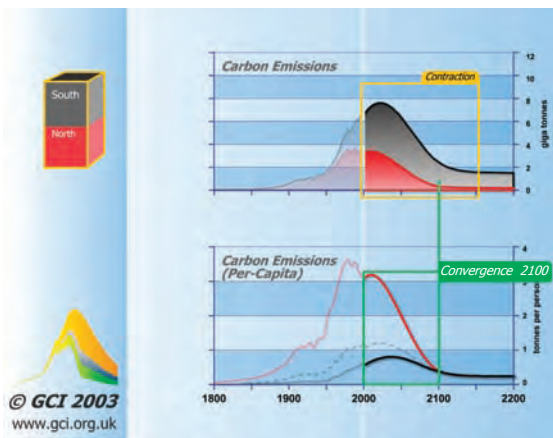
[GERMAN TEXT]

1. „Verringerung und Konvergenz“ (Contraction and Convergence = C&C) ist der naturwissenschaftlich begründete globale Klimapolitikrahmen, der den Vereinten Nationen erstmals 1990 vom Global Commons Institute (GCI) vorgelegt wurde. i ii iii iv
2. Das Ziel unschädlicher und stabiler Treibhausgaskonzentrationen in der Atmosphäre und die Prinzipien der Vorsorge und Gerechtigkeit, wie bereits in der Klimarahmenkonvention der Vereinten Nationen (United Nations Framework Convention of Climate Change = UNFCCC) vereinbart, liefern die formelle Berechnungsgrundlage des C & C-Rahmens, der Folgendes vorsieht:
 - * Ein Gesamtbudget für die Verringerung globaler Emissionen, die nach dem IPCC WG1 Karbonzyklusmodells der Stabilisierung atmosphärischer Konzentrationen von Treibhausgasen auf zuvor als unschädlich vereinbarten Maximalkonzentrationen entspricht. [GCI erachtet ein CO₂-Äquivalent von mehr als 450 ppm als ‚schädlich‘].
 - * Die internationale Aufteilung dieses Budgets in ‚Anrechte‘ (Entitlements) beruht auf einer auszuhandelnden Rate linearer Konvergenz zu gleichen Pro-Kopf-Anteilen in aller Welt bis zu einem abgesprochenen Datum innerhalb des Zeitrahmens der gesamten Verringerungs-/Konzentrations-Vereinbarung. [GCI schlägt vor, [1] dass die Konvergenz bis zum Jahr 2030 oder 2040 oder beispielsweise nach einem Drittel der Zeit eines 100-Jahres-Budgets abgeschlossen [siehe Punkt 5 und Abbildungen 1 & 2 unten] und [2] im C&C-Plan ein Bevölkerungsbasisjahr festgelegt werden sollte.]
 - * Die Verhandlungen hierzu im Rahmen der UNFCCC sollten hauptsächlich zwischen den Regionen der Welt stattfinden, während Verhandlungen zwischen einzelnen Ländern vorwiegend den jeweiligen Regionen (z.B. EU, Afrikanische Union, USA usw.) zu überlassen sind.
 - * Der inter-regionale, inter-nationale und intra-nationale Handel dieser Ansprüche in einer geeigneten Währung wie beispielsweise der International Energy Backed Currency Units [EBCUs] sollte gefördert werden.
 - * Die wissenschaftlichen Kenntnisse über die Beziehung zwischen einer emissionsfreien Wirtschaft und Konzentrationen entwickelt sich ständig weiter, die C&C-Raten können also periodisch revidiert und fortentwickelt werden.
3. Die globale Bevölkerung löst derzeit schneller gefährliche Klimaveränderungen aus als sie deren Vermeidung organisiert. Die Herausforderung für die internationale Diplomatie besteht darin, diesen Prozess umzukehren. C&C verfolgt den Zweck, dies möglich zu machen. So können Szenarien für unschädliche Klimabedingungen errechnet und ausgehandelt und Strategien und Maßnahmen zu Raten, die gefährliche globale Klimaveränderungen vermeiden, organisiert werden.
4. Die Treibhausgas-Emissionen, GHG-Emissionen (G[reen]H[ouse]G[as]) genannt, stehen bisher in enger Korrelation zur Wirtschaftsleistung. Bis heute hat dieses Wachstum der Volkswirtschaften vorwiegend in den industrialisierten Ländern stattgefunden, wodurch sich in letzter Zeit ein globales Muster von immer unökonomischer Expansion und Divergenz (E&D), von mangelndem Umweltgleichgewicht und von internationaler Unsicherheit herausgebildet hat.
5. Die C&C-Antwort hierauf ist nicht kurzfristig und stochastisch sondern langfristig und konstitutionell. Sie nimmt sich dem inertialen Argument der „historischen Verantwortung“ für steigende Konzentrationen an und sieht dies als Entwicklungs-Opportunitätskosten für sich neu industrialisierende Staaten. C&C ermöglicht eine internationale Vorverteilung dieser handelbaren und daher wertvollen künftigen Anrechte auf Emission von GHGs auf Grundlage einer im Verhältnis zur vereinbarten globalen Verringerungsrate absichtlich beschleunigten Konvergenzrate [siehe Abbildung 2].

6. Die britische Royal Commission on Environmental Pollution vi und der deutsche Wissenschaftliche Beirat der Bundesregierung Globale Umweltveränderungen (WBGU) vii haben beide ihre Klimaveränderungsempfehlungen an ihre Regierungen als formelle C&C zum Ausdruck gebracht. Zahlreiche C&C-unterstützende Erklärungen von Individuen und Institutionen sind vermerkt worden. viii ix Die Gruppe Afrikanischer Staaten hat der UNFCCC 1997 formell C&C vorgeschlagen. x C&C wurde 1997 auf der dritten Vertragsstaatenkonferenz (COP-3) in Kyoto im Prinzip angenommen. xi C&C entspricht den Anforderungen der Byrd Hagel Resolution des US-Senates desselben Jahres xii, und das Europäische Parlament sprach sich 1998 in einer Resolution für C&C aus. xiii

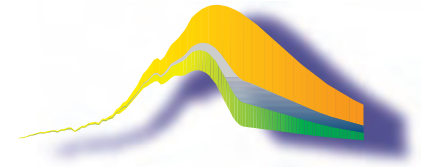
7. Diese Synthese von C&C kann den zunehmend gefährlichen Gleichgewichtsstörungen der globalen Klimaveränderung entgegenwirken. Ein auf globalen Rechten, Ressourcenkonservierung und nachhaltigen Systemen fußendes, stabiles C&C-System wird jetzt benötigt, um die Wirtschaft einer unbedenklichen und gerechten Zukunft für alle entgegenzuführen. Es baut auf den Besserungen und Versprechen der UNO-Konvention auf und begründet einen Ansatz, der bezwingend genug ist, um Auftrieb für dringend geforderte internationale Unterstützung und Aktionen zu geben – ungeachtet der Tatsache, ob das Kyoto-Protokoll in Kraft tritt oder nicht.

- i <http://www.gci.org.uk>
- ii <http://www.gci.org.uk/model/dl.html>
- iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
- iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
- v <http://www.feasta.org>
- vi <http://www.rcep.org.uk/pdf/chp4.pdf>
- vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
- viii http://www.gci.org.uk/Archive/1989_2004
- ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
- x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
- xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
- xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
- xiii http://www.gci.org.uk/consolidation/UNFCCC_A_Brief_History_to1998.pdf [pp 27 - 32]



C&C

“Contraction and Convergence”



[http://www.gci.org.uk/translations/CandC_Statement\(Spanish\).pdf](http://www.gci.org.uk/translations/CandC_Statement(Spanish).pdf)

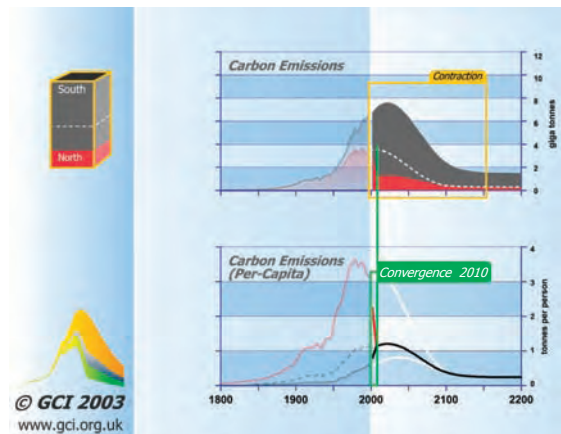
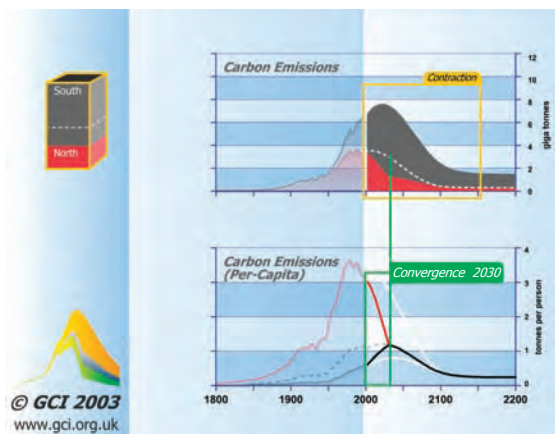
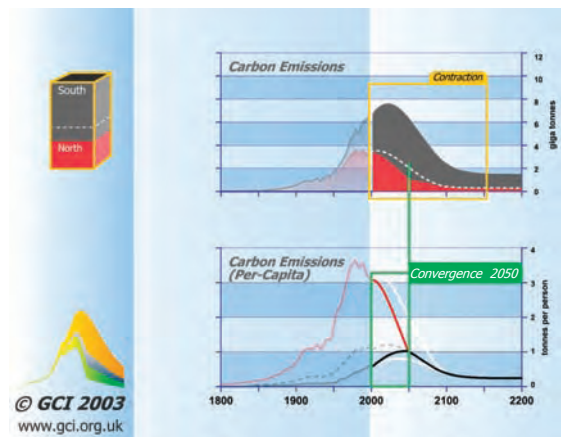
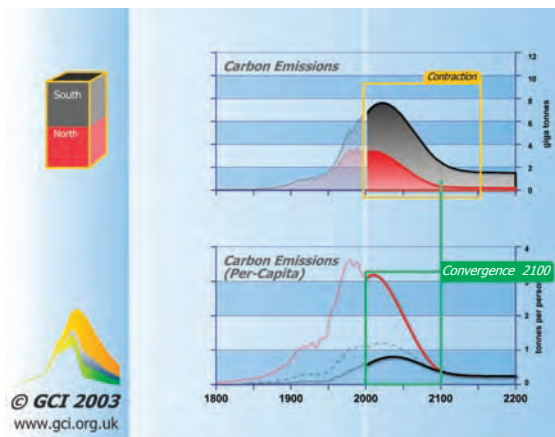
[SPANISH TEXT]

1. “Contracción y Convergencia” (C&C) es el marco con base científica para la política global sobre el clima propuesto en 1990 a las Naciones Unidas por el Global Commons Institute (GCI).i ii iii iv
2. El objetivo de conseguir unas concentraciones seguras y estables de gases de efecto invernadero en la atmósfera y los principios de precaución y equidad, tal como ya se ha acordado en la “Convención marco de las Naciones Unidas sobre el cambio climático” (cuyas siglas en inglés son UNFCCC), ofrece las bases para el cálculo formal del marco de la C&C que propone: -
 - * Un presupuesto de contracción a término para las emisiones globales coherente con la estabilización de las concentraciones atmosféricas de gases de efecto invernadero (GHGs) a una concentración máxima acordada previamente que se estime segura según el siguiente modelo de ciclo del carbono IPCC WG1. [GCI considera como “no-seguras” las concentraciones de CO₂ superiores a 450 ppmv].
 - * La distribución internacional de este presupuesto como “autorizaciones” resulta de una proporción negociable de convergencia lineal hacia cuotas iguales por persona globalmente alrededor de una fecha convenida dentro del plazo de tiempo del acuerdo de contracción/ concentración a término. [GCI sugiere [1] el año 2030 o 2040, o alrededor de un tercio de una estimación a 100 años, por ejemplo, para completar la convergencia [véanse más adelante el punto 5 y las imágenes 1 y 2] y [2] que se acuerde un año base para la población en el programa de C&C].
 - * Las negociaciones al respecto en el marco de la UNFCCC deberían llevarse a cabo principalmente entre regiones del mundo, dejando las negociaciones entre países fundamentalmente dentro de sus respectivas regiones, como la Unión Europea, la Unión Africana, Estados Unidos, etc.
 - * Debe impulsarse el canje de esas autorizaciones entre las regiones, entre los países y dentro de un mismo país en una divisa adecuada, como por ejemplo las unidades de divisas internacionales respaldadas por la energía [Energy Backed Currency Units - EBCUs] v .
 - * El conocimiento científico de la relación entre una economía sin emisiones y las concentraciones evoluciona y por consiguiente también pueden evolucionar, de acuerdo con revisiones periódicas, las proporciones de la C&C.
3. En la actualidad la comunidad mundial continúa generando un peligroso cambio climático más rápidamente de lo que se organiza para evitarlo. El desafío de la diplomacia internacional es invertir esa situación. El objetivo de la C&C es lograr que esto sea posible. Facilita argumentos para que la seguridad climática sea calculada y distribuida a través de la negociación a fin de que sea posible organizar internacionalmente las políticas y las medidas en proporciones que eviten el peligroso cambio climático global.
4. Hasta el día de hoy, las emisiones GHG han estado estrechamente vinculadas al rendimiento económico. Hasta la fecha, este crecimiento de las economías y de las emisiones se ha producido sobre todo en los países industrializados, creando recientemente una pauta global de expansión y divergencia [E&D] cada vez menos rentable, desequilibrio medioambiental e inseguridad internacional.
5. La respuesta de la C&C a esta situación es a término y constitucional, y no a corto plazo e hipotética. Aborda la polémica inercial sobre las “responsabilidades históricas” al plantear el tema de las concentraciones, reconociéndolo como un costo de oportunidad del desarrollo para los países de reciente industrialización. La C&C permite una redistribución internacional de esas futuras autorizaciones, canjeables y por lo tanto valiosas, para emitir GHGs que resulten de una proporción de convergencia que es deliberadamente acelerada en relación con la proporción global de contracción acordada [véase imagen 2].

6. La Comisión Real de Contaminación Medioambiental del Reino Unido y el Consejo Asesor Alemán sobre Cambio Global^{vii} han hecho sus recomendaciones a los gobiernos sobre el cambio climático en términos de C&C. Numerosas declaraciones individuales e institucionales sustentan lo señalado por la C&C.^{viii} ix El Grupo de Naciones de África la propuso formalmente a la UNFCCC en 1997.^x En principio, fue acordada en Kyoto (COP-3) en 1997.^{xi} La C&C cumple con los requisitos de la Resolución Byrd-Hagel del Senado de Estados Unidos de ese año^{xii} y en 1998 el Parlamento Europeo aprobó una resolución en favor de la C&C.^{xiii}

7. Esta síntesis de la C&C puede compensar la tendencia cada vez más peligrosa a los desequilibrios provocados por el cambio climático global. En estos momentos resulta necesario un método estable de C&C, desarrollado sobre el respeto a los derechos globales, la conservación de los recursos y sistemas sostenibles, para guiar a la economía hacia un futuro seguro y equitativo para todos. Se basa en las ventajas y promesas de la Convención de las Naciones Unidas y establece un enfoque que es lo suficientemente apremiante como para conseguir el apoyo y la acción urgentes de la comunidad internacional, con independencia de que el Protocolo de Kyoto sea o no de cumplimiento obligatorio.

- i <http://www.gci.org.uk>
- ii <http://www.gci.org.uk/model/dl.html>
- iii [http://www.gci.org.uk/images/CC_Demo\(pc\).exe](http://www.gci.org.uk/images/CC_Demo(pc).exe)
- iv http://www.gci.org.uk/images/C&C_Bubbles.pdf
- v <http://www.feasta.org>
- vi <http://www.rcep.org.uk/pdf/chp4.pdf>
- vii http://www.wbgu.de/wbgu_sn2003_engl.pdf
- viii http://www.gci.org.uk/Archive/1989_2004
- ix <http://www.gci.org.uk/consolidation/Sasakawa.pdf>
- x <http://www.gci.org.uk/papers/zew.pdf> [appendix C, page 16]
- xi http://www.gci.org.uk/temp/COP3_Transcript.pdf
- xii <http://www.gci.org.uk/briefings/C&C&ByrdHagel.pdf>
- xiii http://www.gci.org.uk/consolidation/UNFCCC&C_A_Brief_History_to1998.pdf [pp 27 - 32]



Martin Wright talks to the composer turned climate campaigner **Aubrey Meyer**, the man behind Contraction and Convergence.

Diminuendo

Most mavericks who plan global salvation from the upstairs room of a small terraced house in Walthamstow can reliably be written off as two bricks short of a load.

Not so Aubrey Meyer. A classical musician with a head for maths, he might easily be dismissed as the last of the gentleman amateurs, if he hadn't gradually built up a vast swell of support for his disarmingly simple plan to tackle climate change. Its converts include such unlikely bedfellows as Jacques Chirac, the archbishop of Canterbury and the government of China, and it's increasingly being seen as the much-needed 'Plan B' to succeed (or even rescue) the struggling Kyoto protocol.

All this, despite just about the ugliest name in the environmental lexicon. In a field rich in silky smooth soundbites – think Climate Care, Future Forests, Clear Skies – Aubrey has come up with... Contraction and Convergence. Not so much a clarion call to save the planet, as a rather technical description of giving birth to twins...

"Yes, and immediately I suggested it, everyone I knew said: 'Don't call it that, for

god's sake! It'll just kill it stone dead!' But the great advantage is that it does *exactly* what it says on the tin..." Which is the singular virtue of 'C&C', as it's known to its burgeoning array of fans. What it lacks as a soundbite, it more than makes up in beguiling simplicity. Like any great idea, it's tailor-made for an elevator pitch: you really can explain its essence in seconds.

So here goes: we need to cut carbon emissions to a level consistent with a liveable climate. That's the contraction bit. The fairest way to do this, and the one most likely to win the necessary support worldwide, is gradually to converge the amounts which people are allowed to emit, until every citizen of the world has an equal share.

In practice, that means we need to agree on a sustainable level of carbon in the atmosphere (around 450 parts per million by volume is the ceiling most commonly quoted), and a date by which we need to reach and hold that total (2050, maybe). Then we set national emissions ceilings according to population, so as to meet that goal on the basis of 'equal shares for all'.

It's as simple, and as challenging, as that.

There are some devils in the detail (what do you do about Trinidad – tiny population, but thanks to its oil industry, absurdly huge per capita emissions?), but nothing which can't be satisfactorily fudged. (You allocate by region, not state – so Trinidad's discrepancy could, for example, be swallowed up by an Africa-Caribbean group.)

The subtle beauty of C&C is the way it neatly addresses some of the squelchiest sticking points in the whole Kyoto process. For starters, it actually sets a specific, global goal on the basis of climate science – rather than relying on national carbon reduction targets which owe as much to diplomatic expediency as hard logic.

By bringing all countries into the equation, it deals with America's concerns that booming developing nations such as India and China have no incentive under Kyoto to curb their own carbon. By supporting full international emissions trading, it allows countries to reach their goals flexibly and at least cost. It encourages them to keep making cuts way beyond any agreed targets, since that will give them more carbon permits to sell – or fewer to

"I really wanted to write music; I got a real thrill from that. In one sense, I loathe doing this work...."



buy. Finally, by insisting on equity, it addresses the third world's objection to paying for the sins of the rich.

It's this one-plan-fits-all approach which has won C&C such eclectic support. The European Parliament has voiced its approval, so has the Red Cross, the Lib Dems, and the Royal Commission on Environmental Pollution. Some in business, too, are friendly: Adair Turner, ex-head of

"The discipline of C&C is right on the surface – the beauty, the ingenuity, is all hidden."

the CBI, now with Merrill Lynch, is a fan. The insurance industry is interested, and even some of the oil companies, claims Meyer, have made privately appreciative noises.

The government remains wary, although Tony Blair has cautiously praised its "intuitive appeal". Michael Meacher, by contrast, when still environment minister,

was unequivocal: "If ever there was an initiative that deserved support... it is this brilliant and relentless campaign waged by this fiercely independent, creative and apparently quite tireless individual."

After over three hours in Aubrey's front room, I can vouch for the 'tireless'. The man's just back from the States, but any traces of jet lag are swept away in a rolling wave of loquacious, almost intimidatingly erudite passion. C&C might be a tightly focused scheme, but its author's conversation ranges wide and wild across philosophy, maths, politics, music... A typical stream-of-consciousness might kick off with the nuances of climate politics, only to meander enthusiastically, if a little bafflingly, through yoga, Bach, Cantorian brackets and the musical stones of ancient China. He's not averse to picking up his viola, which looks suddenly tiny and fragile in his hefty paw, and plucking out fragments of a scale to illustrate a point.

In public, he's the director of the Global Commons Institute. But don't let that fool you into thinking he's serviced by an office full of support staff – or constrained by the spin-sensitive caution of most NGOs.

Aubrey is a soloist, and that 'fierce independence' so admired by Meacher is borne out by some unlikely sympathy for Washington's stance on Kyoto. "The deepest irony in the whole debate is that the US said from the word *go* that this *had* to be a worldwide agreement [and hence involve commitments from India and China]. But they were trashed by the NGOs just for saying that a global problem needs a global solution; that if we act unilaterally it won't solve the problem. And we said: 'You're absolutely right! Those are rhetorical, posturing protest arguments by people who want to be green, but don't think through the structural consequences of what they're saying.'"

This is not a man desperate to ingratiate himself with what might be thought of as his natural allies. But Meyer is blessed with an outsider's take on it all. Born in Bradford in 1947, he was brought up in South Africa, remaining more or less untroubled by the injustices of apartheid until he went to study music at the University of Cape Town. "I might have been ignorant of the situation before," he explains, in a soft, precise South African lilt

network photographers

mellowed by 20 years in London. “But you couldn’t exactly avoid it when the police turned up on campus with their truncheons and their guns, and started baton charging you. I wasn’t deeply involved, but I had friends who were, and just by associating with them, I too became a threatened species.”

Increasingly uneasy at the situation, he used music as a means of escaping military service, playing viola in orchestras in Europe, before returning to Cape Town in the mid-70s. There he shaped a living out of composing, playing and conducting, before apartheid’s realities came too close to home to ignore. Having befriended the (black) caretaker of his block of flats, he was horrified when the man was arrested on trumped-up charges of child abuse. He managed to have him freed, but “I realised then I had to either become really committed in the struggle, or get out. I got out.”

So it was back to Europe, to a life of conducting, composing, “to being paid for doing something I completely loved!” – and suddenly his face lights up, animation courses through him, more than at any other time in the interview... “I was writing ballets, I had royalty cheques landing on the doormat – it was like money for jam!” And then, one day in the late 80s, he was casting around for a subject for another ballet. He thought about Mandela, but by chance hit on Chico Mendes, the Brazilian rubber-tapper-turned-activist, murdered by ranchers intent on converting his rainforest home into pasture. Intrigued, Meyer started reading around issues that had scarcely touched him before – “and within three to four weeks, I was completely overwhelmed.”

The era’s wider surge of environmental concern trickled down to his four-year old daughter too. “I was putting her to bed one night, and out of the blue she asked: ‘Daddy, is the planet really dying?’

So I said: ‘I don’t think so, darling, but Daddy’ll find out, and if it is, I’ll put it right.’ And I thought, never in my youth, never in anybody’s youth, has a kid ever had to ask a question like that.”

It was epiphany. “The penny went through the slot very hard in one go. I thought: ‘You ran away from it last time – where do you run to now?’” And suddenly music seemed completely pointless. I sold my viola, I sold my scores; for a while I just stopped playing completely.” He threw himself into the Green Party and Greenpeace, devoured The Ecologist and books like Jonathon Porritt’s Seeing Green, and started work on a scheme called ‘Equity and Survival’ – the precursor of C&C. It’s tempting to cast this as a mid-life crisis: a comfortable man in his early 40s seeking to recapture the energy and edge of youth. Not a bit of it, says Meyer. “I really wanted to write music; I got a real thrill from that. In one sense, I loathe doing this work....”

Since that burst of self-denial, he has taken up the viola again. Now, you can imagine a musician passionate about the environment using his art to touch people’s hearts – yet Aubrey spends most of his waking hours wrestling with the complexities of carbon diplomacy and the intricate maths of C&C. Don’t the constraints, the discipline of all that, chafe against his creativity? “Well music may be all beauty on the surface, but it’s all about discipline underneath.” He picks up the viola, plucks two notes, an octave apart. “Music is very mathematical. An octave is a precise doubling – if it wasn’t, you’d hear it as out of tune.... The discipline of C&C is right on the surface – the beauty, the ingenuity is all hidden. But it’s there.”

Meyer’s not without his critics. Some warn that C&C could turn people off by equating strategies to tackle climate change with sacrifice and denial. Others are sceptical of the insistence on equal

carbon quotas, arguing that this obsession with equity could in practice do little to improve the lot of the poorest, and instead detract from more creative, dynamic efforts to shift to a low carbon economy.

Well, life is all about living within limits, responds Meyer – and so, come to that, is music. “There’s an almost childish fear of being constrained by supposed lost opportunities – that unless you allow unlimited growth, you’re somehow missing out. It’s nonsense.”

He acknowledges that there’s an element of political persuasion for the South in the convergence element, but adds that this isn’t some kind of redistributive agenda: “It’s only entitlements; we’ll go on having emission rates that are different – that’s what the trading is for....” And convergence could win votes, too – especially if embodied in personal carbon budgets, as envisaged in the Domestic Tradeable Quotas bill.

“You’ll get paid for going by bike instead of by car. You’ll get paid for doing nothing, or doing less, or doing it differently.” Just as a small fraction of the populace owns most of the wealth, so the majority probably emit less than their ‘fair’ share of carbon. “So you won’t hit them with a carbon tax, you’ll be giving them a climate dividend! And that has to be an election winner!” But there’s still a strong moral argument for the equitable element of C&C – and as global inequalities grow, argues Meyer, it’s increasingly in our own interest to respond to it. “In economic terms, the last 50 years have actually been about ‘expansion and divergence’. Overall, we’re richer, but the majority have got poorer. We can’t keep doing that road. Even without climate change, that’s a social explosion waiting to happen – and one that will see a lot more mothers call their kids ‘Osama’....” “Angels are weeping; we’ve got to get in there, and do whatever it takes.”

LIVEABLE CITY AWARDS 2005 - 17th FEBRUARY 2005

On the day that the Kyoto Protocol came in effect, a Lifetime Achievement Award was made to Aubrey Meyer by the Corporation of London for his contributions to tackling climate change. The award was set up to honour the person from the world’s of academia, business, politics and lobbying who - in the judgement of the panel and the voters - had done more than any other individual to guide the climate change policy process at a strategic level. Aubrey, author of influential book “Contraction and Convergence - the Global Solution to Climate Change”, is widely recognised as providing a global framework within which to resolve policies and measures to avert climate change. The citation reads, “*in recognition of an outstanding personal contribution to combatting climate change at an international level through his efforts to enhance the understanding and adoption of the principle of Contraction and Convergence.*” Receiving his award Aubrey commented, “*I made the effort to establish Contraction and Convergence (C&C) because a fully international agreement to avert climate change is urgently needed. It is encouraging that C&C now gathers increasing international support. To discover there are people who also feel this effort deserves acknowledgement, is reward in itself. However, the Liveable City Award is a very welcome surprise as many eminent people were in this competition. I am grateful to them and the Corporation of London for all their efforts, and ask that we all advocate C&C together.*”

“Stabilization [of GHG concentrations] inevitably requires “contraction and convergence”.”

**COP 9, Milan - 4th December 2003
Secretariat to UNITED NATIONS FRAMEWORK
CLIMATE CHANGE CONVENTION**



“The idea of ‘Contraction and Convergence’ is destined to be one of the most important principles governing international relations in the 21st century.

It is a powerful ethic that incorporates global justice and sustainability and thereby bridges the dominant concerns of the last century and this one.

It is the only way to accommodate the interests, ethical and economic, of developing countries and rich countries in the struggle to find a solution to the most important environmental problem facing the world.”

**Dr Clive Hamilton;
One of Australia’s leading economists**



“ . . . to say - as a growing number of people now do - that the right to emit carbon dioxide should be considered a human right and that emissions permits should therefore be issued to all humankind on an equal basis. “Contraction and Convergence”, a surprisingly flexible plan is based on this idea.”

**Richard Douthwaite;
One of Ireland’s leading economists**



“The approach of contraction and convergence presents a new economic development paradigm for the twenty first century and beyond.”

**Mrs. Rungano Karimanzira
Chair, Africa Group**



“The government should press for a future global climate agreement based on the “Contraction and Convergence’ approach, combined with international trading in emission permits. These offer the best long-term prospect of securing equity, economy and international consensus.”

Sir Tom Blundell; Chairman, RCEP



Royal Commission On
Environmental Pollution

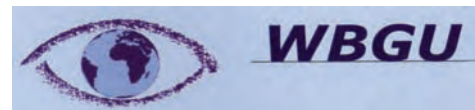
“The commission might have added that contraction and convergence is comprehensive, scientifically based and equitable, unlike the Kyoto Protocol, and that contraction and convergence meets every single objection raised by the United States to Kyoto.”

Lord Bishop of Hereford



“ . . . WGBGU recommends emission rights be allocated according to the ‘Contraction and Convergence’ approach.”

**Dr. John Schelnhuber;
Chairman, German Advisory Council on Global Change**



“ . . . a set of common principles will have to be based on agreement to have a worldwide binding limit on global emissions consistent with a maximum atmospheric concentration with progressive convergence towards an equitable distribution of emissions rights on a per capita basis by an agreed date with across-the-board reductions in emissions rights thereafter.”

European Parliament Resolution; 1998





“If we agree to equal per capita emissions allowances for all countries by 2030 in such a way that global emissions allow us to stay below the 2 degrees global temperature increase (equivalent to about 450 ppmv CO₂), then the assigned amounts for Annex B countries would be drastically reduced. However, because all countries would have assigned amounts, maximum use of global emissions trading would strongly reduce the cost of compliance. In such a scenario, industrialized countries would have to do more, but it would be cheaper and easier.”

Dutch Environment Minister, Jan Pronk, Chairman of COP-6, July 2000



“Equity should guide the route to global ecological recovery. Policy Instruments such as ‘Tradable Emissions Quotas’, ‘Carbon Taxes’ and ‘Joint Implementation’ may well serve to make matters worse unless they are properly referenced to targets and time-tables for equitable emissions reductions overall. This means devising and implementing a programme for convergence at equitable and sustainable per values for consumption on a per capita basis globally.”

Indian Environment Minister, Kamal Nath, COP 1, April 1995

“First, our per capita Green House Gas emissions are only a fraction of the world average, and an order of magnitude below that of many developed countries. This situation will not change for several decades to come. We do not believe that the ethos of democracy can support any norm other than equal per capita rights to global environmental resources.”

Indian Prime Minister, Shri Atal Bihari Vajpayee, October, COP-8, 2002



“When we ask the opinions of people from all circles, many people, in particular the scientists think that the emissions control standard should be formulated on a per capita basis. According to the UN Charter, everybody is born equal, and has inalienable rights to enjoy modern technological civilization.”

Chinese State Councillor Climate Change & Population, Dr Song Jian, Oct 1997



“Since 1992, we have fallen too far behind in the fight against global warming. We cannot afford any further delay. That is why, I can confirm to you here, Europe is resolved to act and has mobilized to fight the greenhouse effect.

Europe calls upon the other industrialized countries to join with it in this fight. And Europe proposes to the developing countries to join it in a partnership for sustainable development. Let us start thinking about the post-Kyoto period without further ado. Tomorrow, it will be up to us to set forth the rights and duties of each, and for a long time to come.

In order to move forward while respecting individual differences and special circumstances, France proposes that we set as our ultimate objective the convergence of per capita emissions. This principle would durably ensure the effectiveness, equity and solidarity of our efforts.”

French President, Jaques Chirac, COP6, November 2000



“On the issue of equity, Sweden strives for a global convergence, meaning that the long term objective of the international community should be a per capita emissions target equal for all countries. The work towards sustainability embraces the right for the poorest countries to continue their development and requires that the developed world contribute to this. In other words the industrialised countries must reduce their emissions in order to enable the least developed countries to develop.”

Swedish Minister of the Environment, Kjell Larsson, September 2000

“Emissions should converge towards a common international target, expressed as emissions per inhabitant.”

Sweden’s third national communication on Climate Change, 2001



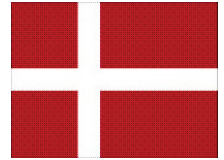
“We are conscious that in the end, we will have to inevitably evolve towards a more equitable partition between the north and south, of the capacity of our common atmosphere to support green house gases, by a gradual convergence of the levels of emissions on a per capita basis.”

Belgian Environment Minister, Olivier Delouze, COP6 November 2000

“The approach of “Contraction and Convergence” secures a regime that would allow all nations to join efforts to protect our global commons from being over-exploited, without the risk that any country would be deprived of its fair long-term share of the common environmental emission space.

It allows for consistent and efficient management of the global emissions that would enable us to strive for constraining global interference with the climate below fixed ceilings.

Danish Environment Minister, Svend Auken, April 1999



“It is now apparent that the world has to urgently agree to a more equitable method of reducing greenhouse gas emissions based on per capita emission rights allocations. This brings me to the concept of Contraction and Convergence. It embodies the principles of precaution (contraction of greenhouse emissions) and of equity (convergence at to equal share per head through a globally agreed date) in the reduction of greenhouse gas emissions between industrialized countries and developing countries.

The world must go an extra mile to avoid climate change, as it is cheaper than adapting to the damages. This in no way under-estimates what the Kyoto Protocol aims to achieve from the flexible mechanisms. Kyoto should continue but due to the increasing and unbearable negative impacts of climate change on developing country economies, in particular Africa, the world must begin to evaluate other globally equitable approaches.

The concept of Contraction and Convergence therefore needs to be assessed and evaluated by the United Nations Framework Convention on Climate Change particularly, its Subsidiary Body for Scientific and Technical Advice or the Intergovernmental Panel on Climate Change.

I am certain that our Ministers for Environment here present will see the need to bring this agenda very urgently to the attention of the Climate Change Secretariat.”

Kenyan Planning & Development Minister, Anyang Nyongo, April 2004

“Avoiding dangerous rates of climate-change from fossil fuel dependency must be strategically guaranteed with appropriate structural adjustment of the international system.

The Contraction and Convergence” (C&C) scheme presented by the Africa Group at COP-3 in Kyoto, is the basis of this. Combined with international currency arrangements, C&C determined carbon shares create an inclusive global standard for sustainable resource use.

The full rent for the use of the environmental and atmospheric space of Developing Countries, can be paid by the Developed Countries, helping the world move from uneconomic growth to sustainable development for all.”

Kenya, Director General of the ruling NARC, Alex K Muriithi, April 2004

The UK Government should commit itself to Contraction and Convergence as the framework within which future international agreements to tackle climate change are negotiated; and it should actively seek to engage support for this position during 2005 in advance of the next Conference of the Parties.

We do not see any credible alternative and none was suggested in evidence to our inquiry.

We therefore recommend that the UK Government should formally adopt and promote Contraction and Convergence as the basis for future international agreements to reduce emissions.

UK House of Commons Environmental Audit Committee, April 2005

While technology will be an important part of the solution, we do not believe that recent attempts to focus exclusively on this area (for example, the Asia-Pacific Partnership on Clean Development and Climate) stand any major chance of success. A framework involving technology together with social, political and economic change – importantly with quantifiable targets – is in our opinion the only way forward.

This is why we support the well-known concept of “Contraction and Convergence” (C&C) as proposed by the Global Commons Institute as the basis for an agreement which is both effective and fair. It would satisfy both developing countries’ demands for equity and US demands that major developing countries such as China and India be involved in any targets.

Scientists for Global Responsibility, October 2005





“Contraction and Convergence - and its mechanism for financing sustainable development is the only proposal so far which is global, equitable and growth-oriented.”

Congressman John Porter
Chair, GLOBE USA



“The assiduous campaigning over the last decade by the Global Commons Institute - based on its idea of ‘contract and converge’ - under which the rich nations undertake to reduce emissions even as developing nations are permitted to grow their emissions until such time as per capita emissions converge at the same level, has given this kind of approach some real credibility. So, too, has the readiness of developing countries such as China, Brazil, Indonesia and Argentina to accept emissions targets for their own countries - not least because they are already beginning to feel the impacts of climate change. The real strength of this approach is that it is based upon a trading system, with rich nations needing to purchase additional carbon credits from poorer nations. This appeals a lot to those campaigning for global economic justice: a global trading system in carbon would begin to shift substantial resources from rich countries to poor countries as nations with wasteful, carbon-intensive lifestyles had to purchase additional carbon credits from nations with low-carbon economies.”

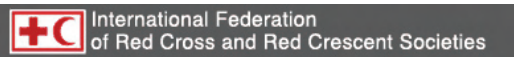
Jonathon Porritt
Programme Director, Forum for the Future



THE CHARTERED
INSURANCE INSTITUTE

“The most realistic way to bring about the required reduction in ghg emissions (which will have the combined effect of reducing the damage imposed on the insurance industry and encouraging the transition to renewable energy) is that proposed in the concept of Contraction and Convergence.”

UK Chartered Insurance Institute



“Any political solution to climate change will need to be based on reductions in emissions, otherwise known as contraction. As the climate is owned by no one and needed by everyone, we will also have to move towards equally sharing the atmosphere, known as convergence. Collective survival depends on addressing both.”

World Disasters Report 2000
International Red Cross/Crescent

“The vision of “Contraction and Convergence” combines ecology and equity most elegantly.”

Heinrich Boell Foundation



“Further and more ambitious emissions reductions targets should be agreed for the second and subsequent commitment periods, based on the principle of ‘contraction and convergence’ with the long-term goal of equalising per capita emissions across the world.”

UK Liberal Democrats
Proposals on Energy Policy



“I support the concept of ‘Contraction and Convergence’, as does the Environment Agency.”

Sir John Harman; Chairman, UK EA



LAMBETH PALACE

“Contraction and Convergence appears Utopian only if we refuse to contemplate the alternatives honestly.”

Dr. Rowan Williams; The Archbishop of Canterbury

"The Green party of England and Wales strongly endorses the GCI/GLOBE campaign for Contraction and Convergence as the key ingredient in a global political solution to the problem of Climate Change."

UK Green Party



"A formulation that carries the rights-based approach to its logical conclusion is that of contraction and convergence."

Intergovernmental Panel on Climate Change, TAR WG3



"A fair distribution, establishing the concept of per capita emission rights for all countries, as proposed in the 'Contraction and Convergence' scheme."

David Hallman, World Council of Churches



world council of churches

"For the long-term, policy makers should reach consensus on a global framework for climate stability based on the principles of precaution and equity such as Contraction and Convergence which would aim to achieve equal per capita emissions for all nations by an agreed date."

UNEP Finance Initiatives



"Admiration is frequently expressed, regarding the elegance and simple logic of Contraction and Convergence and it has been widely supported by policy makers as a basis that should underlie the next stage of policy formulation."

Sir John Houghton, Former Chair IPCC Working Group One

THE JOHN RAY INITIATIVE
promoting environmental sustainability

"Many governments around the world have accepted the concept of Contraction and Convergence as the only equitable response mechanism to the threat of climate change."

Grace Akumu

Director, Climate Network Africa



"I not only support the C&C concept, I find it inconceivable that we will avert climate catastrophe without a regime built on some variation of this approach. In the debate about climate change, an impression has been created that the problem is too daunting and complex to prevent. Contraction and Convergence provides a way forward that is both fair and feasible."

John Rich; World Nuclear Association



"It is absolutely remarkable that the idea of Contraction and Convergence has taken such a firm hold worldwide in such a short space of time."

Tessa Tennant, Chair

Association for Sustainable & Responsible Investment in Asia



"We regard Contraction and Convergence as no less than the logical starting point for any sustainable future."

Ed Mayo, New Economics Foundation



The solution to climate change is not to restrict the growth of newly industrialising nations so that we can carry on polluting. A globally equitable model of emissions reductions is required. The contraction and convergence model calls for already large polluting countries to cut their missions, while newly industrialising countries increase theirs, up to the point that we converge at a sustainable level. That, I hope, will be the ethos that will guide cities around the world.

Ken Livingstone, Mayor of London

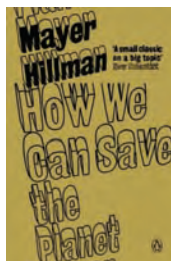
MAYOR OF LONDON



THE WORLD BANK

“... an approach receiving significant attention is Contraction and Convergence [C&C] - a science-based global framework whereby total global emissions are reduced (contraction) to meet a specific agreed target, and the per capita emissions of industrialized and the developing countries converge over a suitably long time period, with the rate and magnitude of contraction and convergence being determined through the UNFCCC negotiating process. It applies principles of precaution and equity; principles identified as important in the UNFCCC but not defined.”

World Bank on Contraction and Convergence



“A brilliant, imaginative and simple means of reaching a just global agreement on emission reductions is called Contraction and Convergence (C&C). It was first proposed by the Global Commons Institute (GCI) in 1990. Recognition of its unique qualities as a framework for combating climate change has grown at an astonishing rate since that date.”

Mayer Hillman on C&C

“In the light of the long-term perspective two basic requirements must be met:

- 1. Stabilisation of greenhouse gases in the atmosphere at a level in accordance with the overall objective of the Climate Change Convention.*
- 2. A fair distribution of rights and obligations, by establishing the concept of percapita emission rights for all countries, as proposed in the ‘Contraction and Convergence’ scheme.”*

David Hallman WCC on C&C

“The Scientific Case for Setting a Long-Term Emission Reduction Target. The framework of this study builds on the RCEP work which uses a contraction and convergence methodology. Contraction and convergence is an international policy framework for dealing with global climate change developed by the London-based Global Commons Institute.”

DEFRA on C&C



CEOs of the 23 largest corporations in the Davos World Economic Forum made a joint statement to the G8 leaders - governments must define an atmospheric greenhouse gas concentration that is stable and safe, and create a common global framework to enable investment in markets that operate effectively to this purpose from now on.

WEF CEOs on need for Common Climate Framework



UK building industry leaders wrote to Mr Blair saying this framework-based market is contraction and convergence. “We highlight the point made by the Corporate Leaders Group on Climate Change that getting the right global climate change framework in place is the most urgent action. The Contraction and Convergence Framework, accepted by the UN and by the Royal Commission on Environmental Pollution (amongst others) could well provide a fair structure for the engagement of all nations.”

CIBSE and ICE on C&C



Tearfund wrote to Mr Blair saying this framework-based market is contraction and convergence. “The C&C framework is global, long-term, effective, and, importantly, equitable, without which it would stand no chance of being agreed. From the outset developing countries have a guarantee of equitable allocations and assurance as to when this would happen.”

TEARFUND on C&C

Contraction & Convergence (C&C) provides a simple framework for globally allocating the right to emit carbon in a way that is consistent with the physical constraints of the biosphere.

The approach rests on two simple principles:

- *contraction: reducing humanity's emissions to a rate that the biosphere can absorb*
- *convergence: distributing total emissions so that each person ultimately gets the same portion of the "global budget".*

The extension of C&C to all demands on the biosphere is referred to as Shrink & Share.

GFN - WWF on C&C

The global framework develops so that CO2 concentration in the atmosphere is held at or below 400 ppm, this long-term climate objective is met by ensuring that short-term targets are linked to and consistent with it, with a gradual transition towards a system of equal per capita rights to use the absorptive capacity of the atmosphere.

Byers Report on Global Framework

*"To minimise the danger of global temperature rises exceeding 2°C, a level considered dangerous, a concentration of no more than 400ppm of CO2 in the atmosphere is recommended [Byers Report] . . . and the EU's burden of responsibility to meet *this science-based cap should be apportioned on the basis of equal global rights to carbon consumption*."*

Greenpeace on Byers Report

"A recommendation in the Byers report is to build on the global climate change framework of both the United Nations framework convention on climate change. It refers to a new basis of equity and common, but differentiated, responsibilities. We need environmental equity with a cap and trade programme. Contraction and convergence is the name that we must give to it. We must link that battle with the battle against poverty."

Colin Challen MP - Byers Report is C&C

"If the world is to stabilise concentrations of greenhouse gases at a safe level, a 'global emissions budget' consistent with the target concentration will need to be implemented. This raises questions about how to allocate this global emissions budget in a manner that is fair and reflects developing country concerns that they have adequate room for their economies to grow. Agreeing emission limits on a 'per capita basis' would, as a guiding principle, ensure that every person is entitled to release into the atmosphere the same quantity of greenhouse gas emissions. Without a long term guarantee of equitable emission entitlements, developing countries are likely to continue to refuse to participate in international action on climate change thus providing an excuse for further procrastination by the US. An immediate per capita allocation of emissions would not stand much chance as it would mean that industrialised countries would have to cut their emissions by far more, while many developing countries could increase theirs. There will have to be an adjustment period in which nations' quotas converge on the same per capita level. This transitional framework is known as 'Contraction and Convergence' and was first proposed by the London based Global Commons Institute."

Tony Juniper Director of Friends of the Earth on C&C



C&C AT THE CLIMAX OF THE KYOTO [COP3] UN CLIMATE NEGOTIATION, 10 12 1997

For full transcript of final COP-3 Kyoto negotiation, see: -
http://www.gci.org.uk/temp/COP3_Transcript.pdf



THE AFRICA GROUP [Rungano Karimanzira]:

“ we do support the amendment that is proposed by the distinguished delegation from India, and just to emphasise the point of the issues that still need a lot of clarification, would like to propose in that paragraph the inclusion, after “entitlements” that is the proposal by the delegation of India, the following wording.

After “entitlements, the global ceiling date and time for Contraction and Convergence of global emissions because we do think that you cannot talk about trading if there are not entitlements, also there is a question of Contraction and Convergence of global emissions that comes into play when you talk about the issue of equity ”

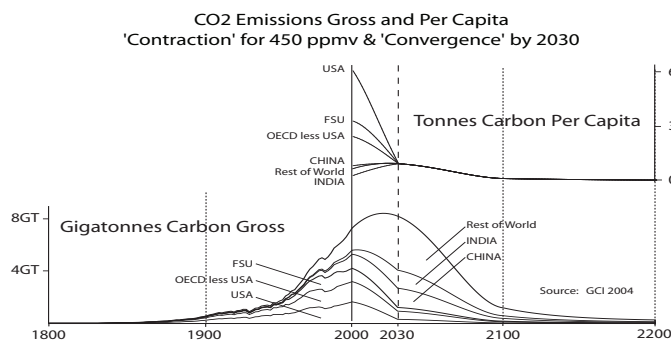
CHAIRMAN [Raul Estrada Oyuela]:

“I thank you very much. May I ask again the distinguished delegate of the USA if they have another suggestion to propose in connection with the proposals made by the distinguished delegate of India he does ”



UNITED STATES OF AMERICA [Jonathon Pershing]:

“ It does seem to us that the proposals by for example India and perhaps by others who speak to Contraction and Convergence are elements for the future, elements perhaps for a next agreement that we may ultimately all seek to engage in ”



For details of widespread support for C&C, see: -

http://www.gci.org.uk/briefings/EAC_document_3.pdf

http://www.gci.org.uk/events/City_of_London_Award_Sheet_03.pdf

http://www.gci.org.uk/Archive/Mega_Doc_1989_2004.pdf

A Recalculation of the Social Costs of Climate Change

Aubrey Meyer and Tony Cooper
Global Commons Institute (GCI)^a
September 1995

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BACKGROUND

If governments agree to slow the pace of global warming during the next decade, it will largely be due to the efforts of the Intergovernmental Panel on Climate Change (IPCC). The IPCC was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) to assess the science of climate change in order to provide a basis for international and national policy-making. The IPCC's First Assessment Report (1990) defined cuts in greenhouse gas emissions of between 60% and 80% as immediately necessary to stabilise greenhouse gas concentrations in the atmosphere with a view to halting global warming.

Since 1990 the IPCC has been preparing a Second Assessment Report (SAR) which it hopes to publish by the end of this year. The report is authored by three working groups.

- Working Group I is reviewing the science of how the earth's climate system functions and how this might change as a result of human activities.
- Working Group II is assessing published work on the health and other effects of climate change and on the measures which could be adopted in sectors such as agriculture, energy production, industry and transportation to minimise those effects.
- Working Group III is preparing a technical assessment of the state of knowledge of the “*socio-economics of climate change mitigation*” and “*other cross-cutting issues*”, a phrase which was intended to signal a full sociological assessment of the issues at hand.

Working Groups I and II are well advanced with their reports, drafts of which have been circulated for comment in academic circles and in part on the Internet. There have been no major disagreements about these drafts' content and conclusions. The draft report by Working Group III (WG3), however, ran into severe criticism when its section on the “Social Costs” of climate change was discussed at a WG3 meeting in Geneva in July 1995.

In this paper we outline the concerns raised about WG3's social costs assessment and recalculate those social costs in the light of these criticisms.

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GCI is an independent group of people, mostly based in the UK. GCI's aim is the protection of the Global Commons. The group is currently working on the economic and political aspects of global climate change.

A FLAWED REPORT

The difficulties of placing a monetary value on the damage which is likely to be caused by global warming are legion. The costs are long-term, highly uncertain and in some cases unknowable in advance, even in principle. For many types of damage such as species extinction, the assignment of a monetary value makes little sense, and some economists go part way to acknowledging this by distinguishing between 'tangible' and 'intangible' costs.

In spite of this, the WG3 team for the "Social Costs" of climate change attempted to put a cost figure on the damage global warming might do, basing their estimates largely the work of Fankhauser¹ and Tol,² - both members of the group - who built on earlier work by two other members of the group - Cline³ and Pearce⁴ - together with that by Nordhaus⁵ and Titus.⁶

The team's summary assessment of the global damages consequent on climate change is that monetary losses will equal to 1.5% to 2% of Gross World Product (GWP).^b This is an estimate for a single, unspecified, year - the year when CO₂ equivalent^c concentrations will have doubled. They assume that this doubling will happen in around 2050 or 2060.^d

The team also make the following assumptions: -

1. the global economy will have progressed from the present to the year 2050 on a "business-as-usual" path;
2. global mean temperature will have risen by the "mean" figure of 2.5°C by that year,
3. it is useful to give policy-makers a "snap-shot" of that single year's damages, ie one divorced from a cumulative assessment of damages for the period between the present and 2050.

This figure of 1.5% to 2% of GWP is significantly lower than that reached by some other analysts - most notably Hohmeyer and Gaertner in their 1992 report to the European Union.⁷ Their study estimated *accumulated* damage costs of potentially \$900 trillion by 2030; that is, well beyond 100% of GWP by that year and therefore up to two orders of magnitude greater than the figures reported in the WG3 draft.

WG3 also estimated regional damage costs as being equivalent to 1% to 1.5% of GNP in OECD countries and between 2% and 9% of GNP in countries outside the OECD. These regional losses were derived exclusively from the work of Fankhauser and Tol.

In our view, both the global and regional ranges of damage figures currently drafted in WG3 contain errors, are unjustified and should be replaced. Using Fankhauser's raw damage figures as the starting point for developing our arguments, we conclude that the expected extent of global damage for the year 2050 as a result of warming is highly uncertain but probably lies in a range between 12% and 130% of GWP. Within this, for the OECD region, the range is from 0.6% to 17% of Gross Regional Product (GRP), while for the Rest of World (RoW) (those countries outside the OECD) it is from 25% to 250% of GRP. This represents *accumulated* losses between 1990 and 2050 of between \$50 and \$600 trillion. We consider even these estimates are on the low side, as we have made many conservative assumptions and made only very limited allowance for surprises.

To address the range of temperatures which may plausibly obtain in 2050, we have made assumptions about how damage costs vary with temperature change. Clearly such variation will not be *linear* and we have assumed an S-shaped relationship, so that costs rise very slowly with the first increment of temperature change and approach a limiting value at temperature rises above 30°C. We do not consider that the present state of knowledge justifies building a more complex model. Details are given in Appendix A.

^b "Gross World Product" (GWP) is defined as the market value of all the goods and services sold throughout the world.

^c "equivalent" means other greenhouse gases counted as well, but with their global warming effect converted to "CO₂ equivalence" - see IPCC WG1, the 1990 Assessment Report.

^d For the sake of being definite, we focus on the specific year 2050 - see later for a more detailed rationale.

A PRELIMINARY SUMMARY OF CONTESTED ASSUMPTIONS

The gulf between our figures and those in WG3's current draft report can be explained in large part by our having employed different assumptions and methods to those used by WG3. The areas of dispute are summarised below and then in more detail in subsequent sections.

1 - "Willingness To Pay" versus "Willingness To Accept Compensation"

WG3 assumes "Willingness-To-Pay" (WTP) as an acceptable method of assessing damages costs. We argue that "Willingness-To-Accept Compensation" (WTAC) is a more sensible method.

2 - 2050 equals CO₂ doubling?

WG3 compute damages for the single year of CO₂ doubling, that is the year in which global mean temperatures will be 2.5°C higher than pre-industrial. We argue that it is most useful to policy makers to focus the assessment on a particular year and the period leading up to that year. This is more useful than focusing on the "moving target" of when CO₂ doubling may or may not occur. We suggest that 2050 should be used, a date within the range expected by the IPCC. However, we also argue that by 2050, various factors may well have increased CO₂ and equivalent greenhouse gas concentrations in the atmosphere to more than double the pre-industrial levels and that global mean temperature is consequently likely to be higher than the stated 2.5°C.

3 - IPCC must not publish wrong arithmetic

WG3 authors calculated regional GNP losses by dividing damages corrected for "Purchasing Power Parity" (PPP) by GDP figures which have not be corrected for PPP. We argue that this procedure is arithmetically wrong and also now seen to be wrong. Even in terms of the authors' own assumptions, it seriously misrepresents the proportional damages *in* and *between* different regions of the world. Results based on this procedure must not be published by the IPCC, and regional losses must be recalculated using sound methods.

4 - No "climate sensitivity", "feedbacks" or "uncertainties" allowed for in stated bottom-line result for damages

WG3 assumes that neither "climate sensitivity",^e "feedbacks" or other uncertainties need be portrayed in its bottom-line results. We argue that the IPCC WG3 must reflect the full range of "uncertainties" and "sensitivity" in the bottom-line figures it publishes in its final report, and in its Summary for Policy-Makers (SPM).

5 - Uncertainties should not equal zero

WG3 also assumes that in key areas where there are uncertainties over the complexity of imminent warming factors (such as positive feedbacks and sulphate aerosol removal) these can be given a value of zero in the assessed damages. We argue that they must be represented by numbers greater than zero.

6 - Significant damage categories should not be omitted

Deaths due to malaria and malnutrition have unrealistically been omitted from the WG3 draft assessment. We argue that these must be assessed and included in the report.

What follows sets out these arguments in more detail.

^e "Climate Sensitivity" is the IPCC's 1990 range of temperature outcomes at 'CO₂ doubling' ie 1.5°C to 4.5°C, with a 'best-guess' mean of 2.5°C. But a number of "positive feedbacks" - while mentioned in this report - were omitted from the numerical assessments of temperature rise and climate sensitivity.

1 - “WILLINGNESS-TO-PAY” VERSUS “WILLINGNESS-TO-ACCEPT COMPENSATION”

Working Group Three’s damage estimates are based on the “Willingness-To-Pay” (WTP) method of assessing damage costs. WTP leads to discriminatory differential estimates in cost rates between the OECD and the rest of the world, most notably differential estimates of the value of a “statistical life”. It would have been more correct to use the “Willingness-To-Accept Compensation” (WTAC) method.

“Willingness to Accept Compensation” is regarded as the “*conceptually correct*”⁸ procedure in Cost-Benefit Analysis - that is, it assesses costs in terms of what losers are willing to accept as compensation for any inflicted disbenefit. Willingness to Pay (WTP) is appropriate only for benefits. By describing potential payments for the avoidance of climate-change damage costs as “benefits”, the WG3 authors give dubious plausibility to the use of WTP. In reality, however, there will be in a broad view no benefits from climate change, only different kinds of costs or disbenefits borne by different groups of people.^f

WTA naturally results in very much higher damage costs than WTP, since the amount that people are willing to accept as compensation for major losses is not constrained by their income and - most people being poor - is many times greater than what they are willing and able to pay to prevent undesirable impacts on their lives. The use of WTP also leads naturally to the adoption of *differential* 'statistical' life evaluation, sometimes known as “Values of Statistical Lives” (VOSLs). This has been the subject of much heated debate. We state here our position.

Valuing Life and Statistical Lives

There is an extensive literature on whether it is admissible to give human life a monetary value, and, if admissible, what value life has. Some reject the idea out of hand. Nonetheless, in certain industries, it has become an accepted management tool. A good overview from the perspective of the oil industry can be found in Fleishman⁹ who concludes that a valuation in the range of £500,000 to £5 million is appropriate (approximately \$750,000 to \$7.5 million).

The concept of “statistical” life has been introduced into the debate *not* because person A is being asked how much he or she is willing to pay or to accept for himself/herself or for person B to be definitely killed, but because of attempts to place a value on how much to pay or accept for a relatively low probability - normally less than 1% - of any particular individual being killed. To do this, one essentially values the life at, say, \$1.5 million, and multiplies by the (low) probability of an individual dying as well as by the total population size involved. If the probability of an individual being killed reaches a sufficiently high level, the whole process of valuation is rejected and the life is effectively regarded as having infinite value. According to Fleishman, there is little agreement as to how great a risk is acceptable in this sense, because it all depends on society’s perception of the value of the risk-creating activity.

Major problems arise when one life is valued at more than another,¹⁰ as is done by Fankhauser and Tol. Following Hohmeyer and Gaertner, we argue that no differentiation by nationality, race or gender should be adopted, on grounds both of straight forward ethics and of practical international politics. This is regardless of whether the life is “statistical” or not. If differential values arise logically from a theory such as WTP, that merely demonstrates the inapplicability of the theory.

The ethical argument suggests a method of valuation based on how much someone is willing to pay can only be used as an input to some kind of averaging process. The highest value we might consider is Tol’s OECD value of \$3 million, the lowest Fankhauser’s world average of \$350,000. Advocates of differential statistical life evaluation seem to think that because the risk of death is being costed rather than the certainty of death, the equity argument is nullified. We disagree strongly. In addition, using WTP, they find a single global value unrealistic. Thinking in terms of WTA, however, makes such a value quite plausible, provided that an OECD-derived value is used.¹¹ Following Fankhauser, we use \$1.5 million.

Differential discount rates by region have also been advanced to make the “present value” - that is, the “discounted” value of future lives - different. This too is unethical and unacceptable. The “present value” of a Chinese life in 2050 must be treated as the same as the “present value” of an American life in 2050.

^f This is not to deny that some areas may benefit from a more benign local climate, but such effects are minor in the regional and global view.

Parity-Unit-Damage-Valuation (PUDV)

If one accepts the equal life valuation argument above, the next step is to extend the same principle to the rates for valuing all the other kinds of damage costs. In the Hohmeyer and Gaertner analysis, this was done explicitly for agricultural land values and implicitly for most other impacts. The case for doing so is presented below. While we feel the case is strong, it admittedly lacks the absolutely imperative character of equal life valuation. It can be justified prescriptively or descriptively.

Prescriptive Justification

For every identified cause of damage, a lower figure is given by Fankhauser for the impact on the Third World. To take but one example: the loss of a hectare of Chinese wetland is assessed as bearing a cost of just 10% of that of an OECD hectare. One of the stated reasons for differentiation, in this case, is the assigning of a much higher value to the loss of recreational use in the OECD than in the South. We find this ethically indefensible. Once wetland has gone, it has probably gone for many decades or centuries, if not for ever. Why should the future Chinese be assumed not to need wetlands as much as future Americans, whether for recreation or for livelihoods? Clearly from an ethical standpoint, one country's hectare of wetland should be treated as worth the same as any other country's, and similarly for all the other damage categories. (We list the categories in Appendix C).

This leads to the question of whether to value all hectares of wetland, and other resources at risk, at a rate calculated on the basis of first-world damage costs, or on some global average basis. We argue that the former could be considered the appropriate basis on the following grounds:

1. Working to a WTA-based assessment could be expected to give results much nearer to the OECD norms than to the values assumed by Fankhauser.
2. Costs assessed for the First World are more easily available than those for the Third World, because of the wider availability of statistical data. This is apparent in Fankhauser's book, where there are extensive references to academic costing estimates of First World damages, but very few of Third World ones
3. The differences within the areas OECD and Less Developed Countries (LDCs) - even within Fankhauser's breakdown of each of these into 3 sub-regions - are of the same order of magnitude as those between them. There are many groups outside the OECD, probably numbering some hundreds of millions of people in total, who are at or above the median OECD standard of living. The OECD excludes the entire Pacific rim, excepting Japan. And within the OECD itself, there is probably even greater diversity, with both large countries (e.g. Turkey) and large groups of the people (e.g. southern Italians, Native Americans) probably living at a standard not far from the Third World mean.
4. The damage in question is mostly being caused by past and present First World consumption patterns, so use of First World compensation rates is appropriate.¹²

Descriptive Justification

Fankhauser uses a methodology which effectively assumes that in the year 2050 the international breakdown of world GWP will be the same as it was in 1988. By definition, this means that the existing average income disparity between the OECD and the LDCs will remain unaltered. Others, including Nordhaus¹³ and Greenpeace,¹⁴ posit a significant degree of income convergence between the OECD and the LDCs. Such convergence is also a widely-shared policy goal. On this latter view, damage valuation, even on a WTP basis, would likewise converge and adoption of the current OECD values as a world average for 2050 becomes more plausible.

2 - 2050 EQUALS CO₂-DOUBLING?

Fankhauser's damage costs are calculated for a single year - which could be 2050 or 2060 - when it is assumed that the levels of CO₂ and equivalents will have doubled in the atmosphere and global mean temperature will be 2.5°C above pre-industrial. Using this date as a reference point, he then expresses the damages in 1988 monetary values, thus giving a "snapshot" of potential future damage costs due to global warming for one year only.

"The time of CO₂ doubling" has become an accepted benchmark for discussions in the climate-change field; apparently for reasons of ease of computation and comparison. However, this approach *de-emphasises* those factors, both natural and anthropogenic, that might well speed up or retard the time of doubling. It also diverts the focus of attention from the much more serious longer-term hazards, as was noted by Cline.¹⁵

The IPCC in its reference scenarios IS92 a,b,e and f forecast dates of doubling between 2050 and 2075.¹⁶ Fankhauser has assumed that the instant of doubling would probably be around 2050 to 2060; Cline and Hohmeyer and Gaertner assumed around 2030. The latest results from the Hadley Centre¹⁷ forecast a 0.2°C (approximately) per decade rise in temperature, reaching 1.8°C above pre-industrial levels by 2050, the end date of their published charts. Extrapolating from these figures would suggest 2085 as the date by which CO₂ levels will have doubled, with 2.5°C the most likely temperature rise due to CO₂ doubling. However the Hadley Centre forecasts that doubling will be reached at 2050 assuming there is no further increase in sulphur emissions.

These sulphur emissions come mainly from power stations, and we suggest that it is only prudent to make the stronger assumption that they decrease, rather than merely fail to increase. There are already international agreements to cut back on these emissions to check acid rain, and such action is quite likely to intensify. We suggest therefore, that it is advisable for climate change impact planning to expect that the existing aerosol cooling effect will in fact be further reduced.

Thus the fashion for concentrating on a time of CO₂ doubling of about 2050 or 2060 seriously misleads the debate. On current trends, there is a real risk that CO₂ concentrations may double much earlier. With rigorous policy measures, CO₂ doubling could perhaps be avoided.

To face this very considerable policy challenge of averting climate change, what policy makers need to know is not just the range of best-guess damage estimates for the year of CO₂ doubling from a group of Cost/Benefit Analysts. What policy makers need to know is what the range of *accumulated* damage is that is likely to occur across a firmly defined period of time. In other words, 2050 is only a suitable calendar reference point for policy makers, if the intention is to assess damages up to and including that point, recognising the non-linearity of climate change in its evolution to this point (and beyond) and the consequently vast unpredictability of damages within this time-frame.

The present "snap-shot" of 1.5% to 2.0% of GWP possibly being adopted into the Social Costs chapter of IPCC WG3 is spuriously precise and more generally, raises questions about the appropriateness of cost-benefit-analysis (CBA) as a policy tool for making decisions about climate change (see below).

3 - WRONG ARITHMETIC

The distribution of the cost estimates between the OECD and the rest of the world is unsound. Crucially, the method adopted by Fankhauser and Tol for calculating these estimates expressed as percents of GDP likely to occur in the LDCs, is based on what we and many others see as a basic arithmetical error. This error has a substantial influence on the present distributional results in the Social Costs assessment.

Because the Gross National Product (GDP) of individual countries is measured in the country's own currency, international comparisons require the use of a set of conversion factors. The set used universally, until very recently, was the Trading Exchange Rates (TERs).[§] This rates an Indian rupee at the number of dollars that it can buy on the *international* money exchanges. However, the TER typically fails to reflect, by a wide margin, the *local* purchasing power of that rupee.

For an average basket of goods and services, the bulk of which are produced locally, most LDC currencies are worth double the TER values. Some are worth five times more. So in the last few years tables have been

[§] our terminology.

published and adopted by among others the World Bank and the IMF giving Purchasing Power Parity (PPP) values for countries' currencies and for their GDPs.

These tables were perhaps not available to Nordhaus, Titus and Cline when they did their pioneering costings of climate change some years ago. They were, however, available to WG3 and, according to Fankhauser, Tol and Pearce, the damage costs - at least for the LDCs - are indeed corrected for PPP.

The arithmetic mistake then arises when PPP-corrected damage costs for the non-OECD countries are divided by their uncorrected TER GDP totals to deduce the percentage of GRP losses which are quoted. Although we have been told that this is the procedure adopted, it is nowhere explained in the text, though there is a footnote now in Summary for Policy-Makers (SPM) which refers to this. The effect of the erroneous arithmetic is to give quotable LDC damage percentages of GRP up to five times higher than they should have been. This gives a false credibility to the WTP-based assessment where in the figures currently quoted in the draft in billions of dollars are \$180 for the OECD and \$89 for the Rest of World (ROW). When the arithmetic is done correctly, the LDC percentage losses as a whole are approximately halved.^h In our judgement it would be wholly inappropriate for IPCC to agree to the publication - in its name - of data which is derived from a method which is known - and admitted - to be wrong.ⁱ

4 - CLIMATE SENSITIVITY, AEROSOLS AND FEEDBACKS

Some potential positive feedback effects (including several identified by another IPCC working group, Working Group I - see Appendix C) were not taken into account in the literature reviewed by WG3, largely because they were not represented in most or all of the climate models. We argue that an allowance for the feedback mechanisms identified in WG1 must be made. In addition, the effects of removing certain pollutants from the atmosphere must also be taken into account. For example, an additional warming effect will occur if human-made sulphate aerosols are no longer present in the atmosphere in their present concentrations as a result of necessary efforts to curtail acid rain. Sulphate aerosols have a cooling effect and thus represent latent, committed warming, which will become actual very quickly once they are removed from the atmosphere. The effect of these aerosols is now being built into global circulation models; but this was not done in sufficient detail in the earlier models on which Fankhauser's and the others' cost estimates were based, because the WG1 report¹⁸ quantifying the effect was only published recently. This could also bring forward the time of CO₂ and equivalent doubling.

Also, the uncertainty described by IPCC Working Group 1 for the temperature rise to be expected from a given CO₂ increase - normally referred to as the "climate sensitivity" - is seriously underplayed in the

^h Just how big a difference the erroneous calculation can make is shown by the following example. Dr Fankhauser, calculated the damage likely to be done by global warming in China at CO₂ doubling expressed in 1988 local purchasing power terms as \$16,700,000,000 which he (and the chapter) said are equivalent to 4.7% GDP losses. China's GDP in 1988 was \$356,359,000,000 at current international exchange rates but \$2,431,222,000,000 in terms of domestic purchasing power. In other words, if both damage and GDP are both expressed in domestic purchasing power, (the correct procedure) the losses are only 0.7% of China's 1988 GDP. Our estimates of LDC damages are summarised in Table A and are vastly higher.

ⁱ Before the Geneva meeting, GCI asked the IPCC Bureau that the error be acknowledged and that the authors correct it. The authors refused to do this, and still refuse. However, after the Geneva meeting in a posting to ecol-econ (the internet conference where much of this has been debated), Dr Tol (one of the economists who authored the mistake) made the following comment. *"The PPP correction reflects a slip in the literature which amazingly survived many reviews, including the IPCC's."* But he went on to say, *"IPCC cannot correct the literature, but in the present wording the slip is clear for all to see."* GCI asserts that: 1. We are talking about a major error, not a slip. 2. It is not clear for all to see with or without the footnote. 3. The data in question is exclusively in the IPCC-assessed literature of the three authors Tol, Fankhauser and Pearce who are also lead authors for the IPCC: it is therefore completely within their power to correct. 4. It is not IPCC's role to knowingly reproduce wrong data of any kind. Paul Ekins (economist at Birkbeck College) comments as follows. *"Of course, you can divide anything you like by anything you like The question is what you then call the resulting ratio. If you divide PPP damage by non-PPP GDP, then you get 'PPP damages per unit of non-PPP GDP'. This does not seem to me to pass his test of a sensible ratio. What you do not get is a percentage damage, which is the ratio I would have thought one was looking for, and the one which is most often quoted."*

present WG3 results. *The crucial summaries and tables ignore it.* In addition, there are many other significant sources of uncertainty - indeed every factor under consideration is uncertain. Nonetheless, the costings are presented as point estimates, with no quantifiable indication by error bars, confidence intervals or otherwise of the range of uncertainty that accompanies them, although the text stresses the uncertainty *qualitatively*. It is stressed in the text of the SAR that the estimate of 1.5% to 2.0% of GWP is not an *uncertainty* estimate but simply a *range*, comprising the “best guesses” of the various authors. *This distinction is likely to be lost on many readers and policymakers.*

5 - FOCUS ON UNCERTAINTY

Every aspect of potential climate change impacts is beset with uncertainty. We feel it is of the greatest importance to represent this adequately within any summary results. There are different types of uncertainty, which can be classified as follows:

a. Uncertainty about base conditions:

For example, economic growth rates; CO₂, SO_x and other emissions; population growth rates. In our own analysis we assume that economic growth and CO₂ emissions follow a trajectory along the lines of the IPCC's IS92a scenario. CO₂ emissions are very closely linked to economic growth, as so much economic activity is dependent on fossil fuels. However, sulphur emissions come from point sources and are therefore separately controllable. And we consider it is now important to explicitly take account of that, independently of IS92a.

b. Uncertainty about how much emitted CO₂ stays in the atmosphere.

There is no guarantee current carbon sinks will continue to absorb, as they do now, about half of worldwide CO₂ emissions. There is also great uncertainty about sources, sinks and atmospheric concentration changes in the minor greenhouse gases such as methane and nitrous oxide. We do not address these points here, though there is certainly scope for unpleasant surprises.

c. Uncertainty about the impact of increased CO₂

There is uncertainty about the impact of increased CO₂ (and other greenhouse gas) concentrations in the atmosphere on the climate. This is the climate sensitivity, identified by the IPCC in 1990 and confirmed by their 1992 and 1994 reports. It is the proposition that the global average warming to be expected from CO₂ and equivalent doubling is most likely to be 2.5°C, but might be between 1.5°C and 4.5°C.

d. Uncertainty greater about the impact of sulphate emissions on the climate.

Since the effects of sulphate emissions are localised, they are much harder for climatologists to model. Only recently, in 1995 publications by the Hadley research Centre and others, have they have been quantified in any useful way.

e. Positive Feedback.

Several positive feedback mechanisms are likely to exist which could mean that, once temperatures begin to rise, factors will come into play beyond those which have been explicitly modelled and this will cause temperature to rise faster than the GCMs (General Circulation Models) predict. These factors bring forward in time the expected instant of CO₂ doubling and therefore bring forward the time of the expected temperature rise or damages. And they do increase the damages we should expect at our chosen time of 2050, and the damages to be expected per tonne of emitted CO₂. Just because they are not well understood or quantified does not mean that the positive feedbacks should be ignored, as the almost universal focus on costs at the time of doubling has ensured.^j

f. Damage Costs.

Finally, there is uncertainty in the magnitude of each of the damage categories identified by Fankhauser. Most significantly, the damage costs are extremely sensitive to the surmised death

^j There are similarly possible negative feedbacks, but the biggest of these, the carbon fertilisation effect, is allowed for in most or all GCMs.

rate, which has been predicted largely on the basis of a study by Kalkstein¹⁹ into the effects of a 4°C rise on the inhabitants of fifteen US cities, and a series of extrapolations.

We combine these uncertainties using simple statistical methods, also explained in Appendix A. The main effect of the excessive simplicity in our statistics is likely to be to lead us to state incorrectly low combined uncertainty values, due to the assumptions of independence which we make.

6 - ADDITIONAL DAMAGE CATEGORIES

Fankhauser does not assume that the dozen or so damage categories he uses (see Appendix C) are a reliable guide to all the untoward impacts of climate change. Nevertheless that is how his work and that of WG3 may well be interpreted. Many areas of expected damage are omitted - i.e. costed at zero - due to inadequate knowledge. For example, he only costs deaths due to heat stress and storms, not to disease or other indirect effects, though the text of Chapter 6 of the SAR asserts that indirect health effects "*could far exceed direct effects*". The very considerable "*costs of acclimatisation*" are not obviously quantified even though they are identified. In particular cost estimates were given in 1992 by Hohmeyer and Gaertner for the increased incidence of malnutrition and of malaria which far exceeded the direct costs.

As reported in *New Scientist* (13th May 1995), recent research by scientists at the Tropical Vegetation Monitoring Unit of the European Commission's Joint Research Centre at Ispra, Italy strongly supports the view that malaria will spread far beyond its present range. Widespread debilitation and increased mortality would result across much of the densely inhabited northern temperate zones whose populations have no natural immunity.

Hohmeyer and Gaertner have suggested 10 million extra cases of malaria worldwide by the time of doubling, (which they expect in 2030). We translate this to be a rate of 500,000 extra cases per year. In the absence of evidence to hand, we split this between the OECD and the LDCs in proportion to their population. Hopefully better estimates will become available shortly. To estimate a suitable WTA-based cost, we asked a small sample of UK citizens unconnected with GCI or other environmental group what lump-sum compensation they would be willing to accept for the increased risk of malaria and received replies ranging from £5,000 to £1,000,000, with the most often chosen value being £50,000 and the median somewhat higher. To be conservative, we have used the figure of £50,000 (i.e. \$75,000). At 5% of the value ascribed to a life this seems consistent. In addition, Hohmeyer and Gaertner suggest 0.5% mortality is likely (of the 10 million total cases, not of the 500,000 annual increase), that is another 50,000 deaths per year.

Another extra cost which we feel it is important to incorporate is an estimate of the cost of forced migration to the migrant. Tol does include such a cost in his work - at a rate of three times the migrant's average annual income - but Fankhauser does not, costing migration only insofar as it induces costs in the host nation. We use a rather smaller figure than for malaria, \$50,000 or 3% of the value of a life. This is approximately consistent with Tol for OECD countries.

Finally we add in the largest cost identified by Hohmeyer and Gaertner - death through malnutrition, a factor not quantified by Fankhauser. Hohmeyer and Gaertner forecast at least 10 million deaths per year - a very high number but only a doubling, according to them, of the present level. Remaining conservative, we use half this figure as our best guess, so that the high end of our forecast range will be their figure of 10 million.

We do not claim that these extra damage categories are all -- there will be others which are even harder to quantify or have simply not been thought of: remember that no-one forecast polar ozone holes when the debate on CFCs and ozone depletion was starting. So this means that our estimate, like all others, is more of a lower bound than a forecast.

OUR QUANTITATIVE CONCLUSIONS

Our re-analysis of data on costs is set out in Table A. We show the effect of our differing assumptions on Fankhauser's costings in a series of stages, represented by the columns of the table. We also show the costs in PPP (1988) US dollars and as a proportion of Gross Regional Product (GRP)^k and of Gross World Product (GWP).^l

Column F of Table A gives our estimates of damage costs, which range up to over 130% of GWP, many times higher than the costs estimated by Fankhauser. The discrepancy results from the extra cost categories (based largely on Hohmeyer and Gaertner's work) which we have taken into account, in particular malnutrition-related deaths. Even if these deaths are not incorporated into the calculations, however, our damage costs range up to 37% of GWP (see Column E). For the LDC region, high-end costs go up to over 250% of GRP reflecting the high impact of deaths costed at OECD rates. At the low end of our overall uncertainty range, on the other hand, global costs could be as little as 1.3% of GWP without the allowance for malnutrition-related deaths or 12.5% with it.

			TABLE A - Cost Estimates on different bases					
			A	B	C	D	E	F
\$ (1988) Billions	OECD	low		\$32	\$55	\$55	\$55	\$72
		medium	\$181	\$181	\$325	\$325	\$325	\$387
		high		\$1,100	\$1,741	\$1,741	\$1,741	\$1,916
	LDCs	low		\$16	\$27	\$58	\$221	\$2,365
		medium	\$89	\$89	\$160	\$514	\$1,217	\$10,830
		high		\$546	\$868	\$3,724	\$6,098	\$25,614
	WORLD	low		\$48	\$82	\$114	\$276	\$2,437
		medium	\$270	\$270	\$485	\$838	\$1,542	\$11,217
		high		\$1,646	\$2,609	\$5,465	\$7,839	\$27,530
%s Regional (PPP) GNP	OECD	low		0.3	0.5	0.5	0.5	0.6
		medium	1.6	1.6	2.9	2.9	2.9	3
		high		10	15	15	15	17
	LDCs	low		0.2	0.3	0.6	2.3	24
		medium	0.9	0.9	1.6	5	12	111
		high		6	9	38	63	263
	WORLD	low		0.2	0.4	0.5	1.3	12
		medium	1.3	1.3	2.3	4.0	7	53
		high		8	12	26	37	131
%s Global (PPP) GNP	OECD	low		0.2	0.3	0.3	0.3	0.3
		medium	0.9	0.9	1.5	1.5	1.5	2
		high		5.2	8	8	8	9
	LDCs	low		0.1	0.1	0.3	1.0	11
		medium	0.4	0.4	0.8	2.4	6	51
		high		2.6	4	18	29	122
	WORLD	low		0.2	0.4	0.5	1.3	12
		medium	1.3	1.3	2.3	4	7	53
		high		8	12	26	37	131
A	Fankhauser							
B	plus allowance for IPCC climate sensitivity							
C	plus allowance for feedbacks and sulphur emission reductions							
D	plus allowance for VOSLs @OECD value							
E	plus allowance for parity-unit-damage-valuation at OECD values							
F	plus allowance for GCI estimates for malaria and migration costs							

CBA AND CLIMATE CHANGE

The critique we have made in this paper raises wider questions about the validity of using CBA and related techniques as tools for policy making. When WG3 was restructured in 1992, its terms of reference were broad, stressing the need for the assessment to be set in the context of "Sustainable Development" and even to take account of the "cross-cutting economic and other issues".

^k Corrected for Purchasing Power Parity (PPP).

^l Corrected for Purchasing Power Parity (PPP).

The bulk of the work of WG3 since then has however, been carried out by economists with relatively little input from other disciplines. Thus little attention is paid to the 'other issues'.

As events unfolded, the original proposal broad discussion in WG3 "Assessing the Benefits of Responses to Climate Change" was transformed into an overwhelmingly market-valuation based assessment of global GDP losses, following the earlier work of Nordhaus, Cline, Pearce, Titus, Tol and Fankhauser.

Indeed, much of WG3's effort has been in practice an attempt to apply the technique of Cost-Benefit Analysis (CBA). CBA works very well in microeconomic decision-making, and comes naturally to economists and businessmen, but is generally very unsuitable in national and international affairs. It has not featured, for example, in the fairly successful negotiations, starting at Montreal, on ozone depletion and CFCs. CBA methods are inevitably biased towards the rich, and there is a well-documented history of conflict aggravation (rather than resolution) between winners and losers assessed with it. An excellent summary of this is given by Adams.²⁰ Here we summarise some of the major problems with CBA, particularly with regard to the climate debate.

1. The whole exercise of "global costing" assumes that varying - and often contradictory - values can be commensurated along a single monetary yardstick. In reality, there are still many social groups in the world (living in both monetarised and non-monetarised societies) who would reject, and in practice at present do their best to reject, attempts to value the environment and ways of living in monetary terms. Using WTP in such cases is meaningless. Likewise, to use WTAC properly involves asking them to assimilate and properly comprehend a completely different culture. Why should they have to? Indeed, "Global Cost Benefit Analysis" is attempting an impossible task. Even WTP cannot be reliably estimated in practice. In actual interview situations it is normal for 30% or more of people to refuse to reply to WTP questions or to register 'protest' answers. And of those who do reply, the values will differ hugely. WTAC values for potential climate change damage can only be assigned by (normally OECD-based) "experts" rather than the people who are supposed to be willing to accept compensation.
2. CBA neatly side-steps questions of liability for past activity, an area of potential conflict in climate change negotiations which cannot be ducked. In the WG3 negotiations LDC representatives from India and elsewhere have continually stressed the fundamental importance of understanding the effect of disparate global consumption patterns on the causation of and response to climate change, and of integrating these into the assessments being undertaken.
3. CBA focuses attention solely on what is measurably marketable, rather than what is most important to people in their daily lives, and side-steps the key issue of who decides what is valuable and how it should be valued. It thus attempts to de-politicise what is a deeply political debate.
4. CBA leads generally to unrealistically confident, unsafe and dangerous conclusions. In the case of the IPCC process, it has led WG3 to the contested conclusion that by the time CO₂ concentrations have doubled in 2050 or whenever, we will experience between 1.5% -2.0% GDP-losses per annum globally.

If not CBA, then what? The techniques of multicriteria analysis (MCA) and decision analysis, mentioned in the text of the SAR but ignored in the conclusions, might help. MCA however in practice usually, and as described in the SAR, ends up by combining the different criteria into a single weighted value, and so seems essentially equivalent to CBA. Tol uses Decision Analysis,²¹ but his use of advanced statistical techniques but the conclusions of this part of his work do not appear to be reflected in the SAR. Funtowicz and Ravetz²² call for ethics-based methods that do not rely on monetary valuations. Adams says, and we agree, that *'We are stuck with the messy and protracted process of argument, discussion, negotiation and compromise. The skills in shortest supply are not economic, but scientific and diplomatic'*. In effect, CBA needs to be abandoned. Instead we need to revert to old-fashioned, if difficult, political negotiations based on a proper use of the precautionary principle and on a realistic assessment of a range of possible futures .

APPENDIX A - STATISTICAL ANALYSIS

We bring together here the quantitative derivation of the numerical results presented in the main text. The principal matter is the addressing of uncertainty.

Firstly we address the various factors influencing the mean global temperature expected in 2050. Our starting point is a business-as-usual future broadly in line with IPCC's IS92a scenario, but with 50% reduction in anthropogenic sulphur emissions from power stations.

We assume the climate sensitivity range of 1.5°C to 4.5°C can be treated as a 95% confidence interval. We focus first on a number of different kinds of feedback that have been identified by the IPCC and others, but not taken account of in climate models, such as the co-feedback with stratospheric ozone and Antarctic plankton depletion. The feedback mechanisms are listed in Appendix B below. Being feedbacks, these effects are inherently nonlinear. We have taken a simple approach of assuming that the combined effect of the feedbacks induces an increase in the temperature, above that taken from the GCMs, which is proportional to a power function of the temperature rise since pre-industrial. i.e. we assume that:

$$\Delta\Delta T = k(\Delta T)^r.$$

where $\Delta\Delta T$ is the extra temperature increase due to the feedbacks and k and r are parameters. We choose $r=1.3$ to give a modest acceleration of the feedback effect as the temperature rises and we choose k so that a 10% extra temperature rise at $\Delta T=2.5^\circ\text{C}$ is triggered. This approach amounts to a perturbation of the GCMs and only makes sense for small values of $\Delta\Delta T/\Delta T$, and it assumes that meaningful results can be obtained by small perturbations to a GCM. It results in a temperature range for 2050 of 1.5° to 5.0°, with a central estimate of 2.75°. Note that this amounts to saying that CO₂ doubling is likely to occur rather earlier than 2050 given the influence of these feedbacks.

At this stage we add in the aerosol effect. The WG1 view is that sulphate/biomass aerosols now contribute a cooling effect that is substantial though highly uncertain in magnitude. The Hadley Centre's latest forecast²³ suggests that a 0.7°C extra cooling, globally averaged, can be expected by 2050 given the extra amount of sulphur emissions expected under the IS92a scenario. WG1 also stress that the aerosol cooling cannot simply be considered as a partial countereffect to greenhouse-gas warming, as the aerosols are concentrated over industrial zones. We are unable to take account of this uneven global distribution, but since the magnitude of the effect is so uncertain, this need not affect our somewhat crude calculations.

We have suggested that it is prudent build policy on the basis that, principally due to measures to address acid rain damage, but also to a lesser extent due to general pollution avoidance measures, aerosol emissions will decline drastically, rather than increase. IPCC94 figures suggest that this is capable of producing a warming pulse of up to 0.5°C; and the effect would be immediate as aerosols, unlike most greenhouse gases, have a very short residence time in the atmosphere (measured in days rather than years). We take as our best estimate of the temperature increase due to the atmospheric aerosol decline by 2050 to be half of the maximum possible, i.e. 0.25°C, and estimate the uncertainty by assuming that we are 97.5% certain that this figure is positive, and that it is independent of the GCM/feedback range of 1.5°C to 5.0°C. The overall effect is to produce a best-estimate temperature rise of 3.0°C at 2050, with an uncertainty range from 1.8°C to 5.3°C.

If sulphate emissions, rather than being reduced, are in fact increased as assumed in IS92a, then the expected rise is much lower. But the extra rise of 1°C or more is then latent, and will happen relatively quickly if or when sulphate emissions are eventually reduced.

Temperature/damage relationship

At this stage we need an estimate for this relationship. It appears to be generally agreed that the relationship is not linear, and in practice of course it would be extremely complex, with a different structure for each different kind of damage. Tol [3] has produced such an estimate. What we seek to do here is to give a crude, simple, apparently new but hopefully transparent approach, by looking at how damages would hypothetically grow for temperature increase ranging from the few °C expected in 2050 up to several tens of degrees. Using such a method avoids having to input arbitrarily the very significant exponent in a power-law relationship.

We have built a number of simple models to assess possible damage effects of different temperature rises under the different damage cost evaluation cases that we address. These are of the form:-

$$\text{Damage} = (\text{Limiting value})(1 - \exp(-a\Delta T))^b \quad \text{-- where } a \text{ and } b \text{ are positive constants, } b > 1.$$

This class of equations has the property of yielding 0 damages for ΔT (temperature rise above pre-industrial)=0, zero rate of change of damages at $\Delta T=0$, of being S-shaped, and having the damages rise towards a limiting value representing near-total destruction of society as the temperature increases to very high levels.

For the range of cases we consider, the results are similar to a simple power-law relationship for the temperature damage function with an exponent varying between 1.5 and 3.5. This is a steeper increase than that considered by Cline or Tol, though within the range discussed by Fankhauser and Pearce [18].

We have done this exercise separately for the OECD and the LDCs, for the several models of costing described above. For the limiting value we have used the sum of gross regional product, (PPP version) and an estimate of the annual increment in human capital. This latter we have computed as the value of a life (\$1.5 million in most cases) multiplied by the regional 1988 population and divided by seventy (average lifespan estimate) to convert from a 'stock' value to an annual rate.

We have six models in total to compute the results shown in Table A. The parameters for each are calculated by setting the damage costs at a 30°C rise to be 90% of the limiting value, and the damage costs at 2.5° to be the values the values discussed in the main text. There are two cases for the OECD--with and without our additional damage category estimates, and four for the LDCs--Fankhauser's figures unmodified, and with the VOSL, PUDV and extra damage additions applied successively.

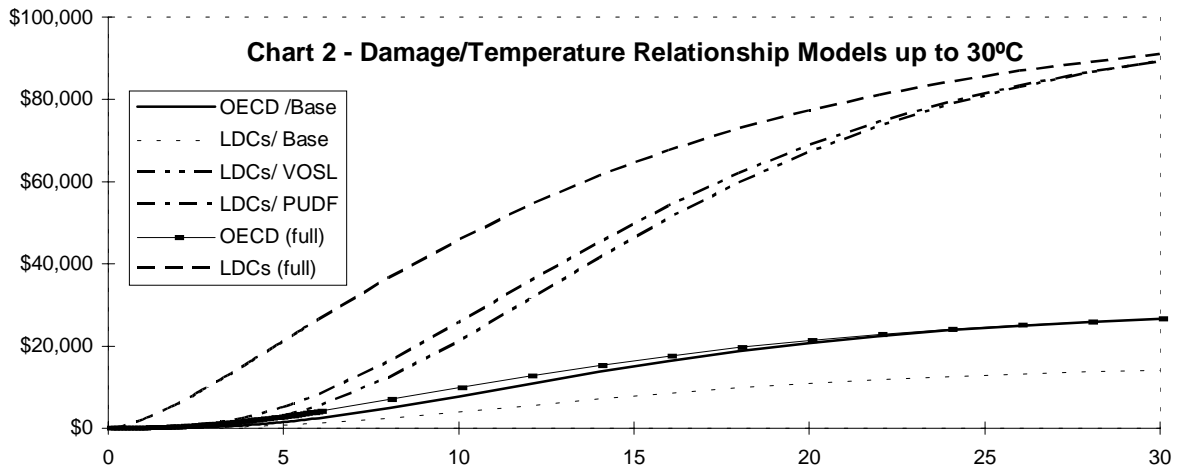
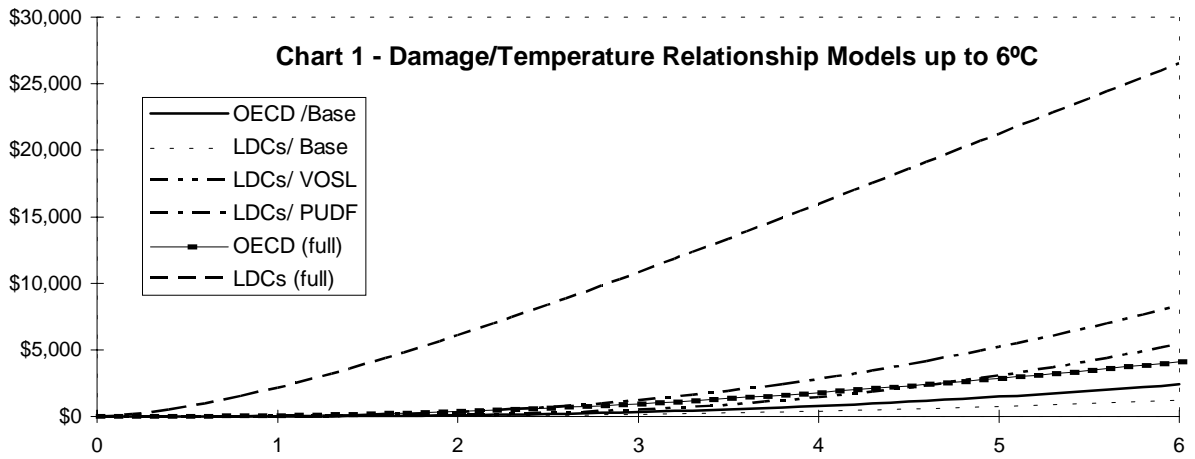
As a sanity check we report on the damages expected at a 0.5° rise--i.e. at around now. They look plausible--as there is no consensus as to what if any current costs on society are attributable to greenhouse warming, it is impossible to say whether they are 'correct' or not.

Table B shows the models we have derived and the damage values in \$Billions they yield for the temperature rises of most interest. Charts 1 and 2 show the six S-curves for temperature ranges from 0°-6°C and from 0°-30°C respectively.

Adding in Damage Uncertainties

The last stage in the process is to add in the uncertainty due to the assorted different kinds of impact for a given temperature. The damage costs quoted for wetland destruction, water shortages, deaths and the rest can be no more than educated guesses. We assume that the different effects are all independent--for a given temperature or sea-level rise--and associate with each a standard deviation of half the estimate value, signifying that we are 97.5% confident that there is at least some effect of the kind estimated. We then add variances to deduce a combined uncertainty. Note that if the assumption of independence is invalid, the effect would be to increase our uncertainty estimates. The final step of deducing a 95% confidence interval assumes an overall normal distribution of damages. Given that these are a sum of assumedly independent variates, this is not as strong an assumption as it sounds; but it does of course ignore the positive skewness, which has been identified by many authors, and which is almost certainly significant. But again the effect of such skewness would only be to increase our uncertainty estimates.

TABLE B - Model Damage Costs in \$ Billions							
		OECD /Base	LDCs/ Base	LDCs/ VOSL	LDCs/ PUDF	OECD (full)	LDCs (full)
Expected damages at 2.5deg rise		\$181	\$89	\$258	\$697	\$222	\$8,391
Asymptotic damages at very large rise		\$29,405	\$15,760	\$99,960	\$99,960	\$29,405	\$99,960
Target damages at 30deg rise		\$26,465	\$14,184	\$89,964	\$89,964	\$26,465	\$89,964
Temp. range for climate sensitivity only	1.5	\$32	\$16	\$34	\$135	\$43	\$3,990
	2.5	\$181	\$89	\$258	\$697	\$222	\$8,391
	4.5	\$1,100	\$546	\$2,168	\$3,918	\$1,236	\$18,600
Temp range for c-s +feedbacks+aerosols	1.8	\$58	\$28	\$67	\$234	\$75	\$5,114
	3.0	\$325	\$160	\$514	\$1,217	\$398	\$10,830
	5.3	\$1,738	\$867	\$3,715	\$6,084	\$1,913	\$22,866
Approximate present-day 'forecast'	0.5	\$1	\$0	\$0	\$3	\$1.0	\$742
Model parameters	a	0.1	0.1	0.1	0.1	0.1	0.1
	b	3.8	3.8	4.5	3.6	2.7	1.6



APPENDIX B: - TEMPERATURE/GREENHOUSE GAS FEEDBACK MECHANISMS

The following sources of positive feedback are identified by the IPCC 94 WG1 report and not apparently addressed by GCMs:-

1. Temperature causes drying of soils causes outgassing of CO₂.
2. Methane emissions from northern wetlands, permafrost areas and continental shelf clathrates are expected to be stimulated by increased temperatures. Recent evidence suggests this effect may be greater than has been assumed before (New Scientist, July 8th, 1995).
3. Climate change causes dieback of vegetation, especially forests, releasing CO₂.
4. A recent study by Greenpeace²⁴ documents the way in which this last process is being augmented by large, globally significant, fires in boreal forests.

The main negative feedback the IPCC identify is the stimulation of photosynthesis through increased CO₂ concentrations.

Other studies have identified a positive feedback loop with stratospheric ozone depletion. 'Global' i.e. surface/tropospheric warming is associated with stratospheric cooling. Colder conditions in the stratosphere increase the catalytic decomposition of ozone by chlorine compounds. The resulting increased UV flux has been observed to decrease planktonic biomass; i.e. to reduce planktonic fixing of CO₂. (Not referred to by the IPCC)

Other sources of feedback are referred to in the IPCC reports and in accounts of GCMs in ways which makes it unclear whether they are held to be adequately addressed by the GCMs or not:-

1. Climate change will have a big influence on the nature and extent of cloud cover, but even the sign of the effect is unclear, so this feedback could be positive or negative.
2. Climate change warms sea surfaces and may modify ocean circulation and up/down-welling patterns which may affect the net uptake/release of CO₂ by the oceans.

Finally we note that it is entirely possible that there are unidentified sources of positive feedback, and indeed of negative feedback. The evidence of sudden climate changes in the epoch prior to the present post-ice-age era suggests that positive feedback processes were significant in the climate some tens and hundreds of thousands of years ago. Applying the precautionary principle, in this case recognising that we probably do not know all relevant processes, should lead one to allow for extra possible effects--just as in budgeting it is common practice to add in provision for unforeseen contingencies.

Appendix C - Basic Damage Categories Used	
Category	Brief Description of Costs
Sea Level Rise	Annuitised costs of preventing capital loss by building defences.
Dryland (Lost Benefits/yr)	Loss of area of land with commercial or other value
Wetlands (Lost Benefits/yr)	Loss of area of land with commercial or other value.
Value of Lost Ecosystems	Estimated by what people are willing to pay to preserve them
Costs to Agriculture	Lost production
Damage to the Forestry Sector	Production loss due to reduced area
Reduction in Fish Harvests	Covered by wetland valuation
Cost of Increased Energy Demand	Mainly for extra cooling of buildings.
Commercial & domestic water supply	Value loss due to reduced runoff
Mortality	Deaths from heat stress
Increased Air Pollution	Costs due to increased NO _x and SO _x .
Migration Costs	Costs of absorption into host economy.
Increased Tropical Storms	Extra deaths and damage to property

Derived from: Fankhauser.²⁵ Note the above table is a very cursory summary to indicate the general nature of the damage cost categories. For a proper understanding of what is covered and what is not, and why, please refer to Fankhauser's book.

APPENDIX D: A RECALCULATION OF THE SOCIAL COST OF CLIMATE CHANGE; A COMMENT BY SAMUEL FANKHAUSER AND RICHARD TOL

Meyer and Cooper have written an interesting article, which points out many important issues in the economic assessment of the impact of climate change. On several fronts we agree with the authors, and the criticised IPCC chapter often makes the same points as Meyer and Cooper (e.g. on the importance of uncertainty and extreme events, and the limitations of the 2xCO₂ benchmark). In some other aspects, however, we fundamentally disagree. We would like to thank the editors of *The Ecologist* for giving us the opportunity to react, make clarifications on the IPCC Social Cost chapter, and point the reader to a number of misconceptions in the paper by Meyer and Cooper.

IPCC

The IPCC was established by the World Meteorological Organisation and the United Nations Environment Programme to provide sound scientific analysis that can assist policy makers in deciding on the appropriate course in climate policy. The IPCC is a scientific panel, which critically assesses the relevant literature. The IPCC does not carry out its own research, take position, or give advice. The IPCC merely reflects the literature, and presents it in a comprehensive and accessible way. IPCC reports are written by teams of internationally leading experts, carefully balanced between the geopolitical regions. The reports go through an extensive peer and government review. Non-governmental organisations are also admitted to the review procedure, and many have taken up this opportunity. Meyer and Cooper mainly comment on Chapter 6 of the Second Assessment Report of Working Group III: 'The Social Costs of Climate Change'. The chapter was written in 1994 by a team of seven researchers, headed by Prof. David Pearce of University College London. The team members are from Europe, India and the United States, and have backgrounds in economics, biology, statistics, civil engineering and anthropology. The chapter went through the IPCC review process in 1995 and was revised in the light of many helpful comments. The revision included a literature update, so that the chapter reflects the state of the art in early 1995. No later publications are taken into account. The chapter is now finalised and awaits official adoption by the governments of the United Nations.

Comparison of Estimates

Meyer and Cooper list a series of issues - willingness to pay versus willingness to accept, regional differentiation, aggregation, cost benefit analysis, timing, market exchange rates versus purchasing power parity, uncertainty and omitted damage categories - and we address the major ones. Lumping everything together, Meyer and Cooper derive damage estimates of 12-130% of Gross World Product (GWP) for 2xCO₂, compared to the 1.5-2% best guess of IPCC Chapter 6.

But the two sets of estimates are based on different assumptions, and are therefore not comparable. The studies underlying Chapter 6 estimate the impact of a climate change induced by 2xCO₂ on the present economy. In line with IPCC Working Group 1 we assumed 2.5°C warming. Since the analysis is static, issues such as the timing of 2xCO₂, feedback effects, and aerosols, which Meyer and Cooper cover in some depth, are irrelevant for 2xCO₂ damage estimation. Currently, research is being undertaken on the impact of other-than-2xCO₂-climate-change on other-than-the-present-economy. The results are too premature to be taken up in the IPCC, given the explicit requirements laid down by IPCC to authors.

Meyer and Cooper analyse different scenarios with warming mostly greater than 2.5°C. Calculating different scenarios is useful. However, for a reasonable comparison we have to compare like with like. Their estimate closest to the 2.5°C warming scenario of IPCC would probably be in the order of 30% of GWP (given that the move from their scenario B to C increases medium damage by 175%). The discrepancy is thus much smaller, although theirs is still a much larger figure. The difference is mainly due to two reasons. The first is the inclusion of malnutrition and malaria damages. This is a useful extension, although the Hohmeyer and Gaertner estimates adopted by Meyer and Cooper appear to be huge overestimates in the light of the much more sophisticated work by Rosenzweig and Parry (on malnutrition) and Martens et al. (on malaria). The second reason is the uniform valuation approach taken by Meyer and Cooper. This is the issue where we most fundamentally disagree with the authors.

Uniform Unit Values

Meyer and Cooper frame the issue of uniform valuation in the context of the debate on willingness to pay (WTP) and willingness to accept compensation (WTAC). This is wrong. The choice between WTP and WTAC has no relationship with the question of regionally diversified value estimates, contrary to the suggestion of Meyer and Cooper. WTAC, like WTP, depends on income (even though bids are not constrained by income). A rich person will require a higher monetary compensation than a poor person, because his marginal utility of income is lower (a compensation of, say, \$1,000 compensation is less interesting to a rich person than to a poor person). WTAC estimates might lead to higher damages, but they would still differ between regions. WTAC can therefore not be used to justify uniform values at the OECD level. But the concept of uniform values at OECD levels for all (market and non-market) damages is itself flawed. Meyer and Cooper fail to give a good reason for using it other than quoting other authors who have themselves failed to give a good reason. The whole purpose of regional damage analysis is to capture the regional diversity and assess differences in vulnerability. Regions differ in many respects, not the least in price and income levels. Using uniform unit damages defies this. It makes very little sense to estimate the costs of building a sea wall in India at US prices. Even if the US would fund the project, it would still be built in India using local workers and material paid at local rates. The same argument holds for intangible goods and services. Environmental commodities may serve different functions in different regions. To assess local vulnerability, it is the regional value that counts.

The Value of Statistical Lives

The concept of uniform values was conceived in the context of the value of a statistical life (VOSL). In this context, it is sometimes argued that for equity reasons all statistical lives should be valued equally. This may be appealing at first sight, but the case is far less obvious once the difference between VOSL and the 'value of life' as such is understood. Besides, it would point in the direction of using an average uniform value, not the OECD value. We have no problems with using a global average value to assess world damages. In fact, estimates of local environmental damages are commonly based on regionally averaged unit values. This is both convenient and in line with the approach usually taken by national governments. However, as we have pointed out there, using average values does not change the global results of IPCC Chapter 6.

Aggregation

Equity considerations are important in climate change policy, and to the extent WTP/WTAC estimates reflect the unfairness in the income distribution, this has to be corrected for. However, the way to do this is not by tinkering with the value system, but by giving different weights to different regions in the aggregation process. Comparison and aggregation are difficult, and cannot be done in an unambiguous manner. Ethical choices are required. Chapter 6 shows how these can be depicted.

PPP-Correction

The matter of market versus purchasing power parity exchange rates was not corrected because this issue is rather more complicated, although less far-reaching than Meyer and Cooper suggest. To us, there is no 'right' answer to the question of how absolute figures should best be expressed. Damages include both market and non-market impacts, while GDP (corrected or not) is restricted to market transactions. No division by a GDP-related figure therefore produces the 'clean' percentage ratio Meyer and Cooper aspire to. Nevertheless, PPP corrected figures are in preparation to illustrate the significance of this point, and will be published shortly.

Cost-Benefit Analysis

Being a scientific panel, Working Group 3 of the IPCC does not advocate cost benefit analysis as the appropriate tool for decision making, either at the global or the regional level. It does discuss its advantages and disadvantages compared to other tools, such as the precautionary principle. Monetary estimates of the impacts of climate change do facilitate, but do not imply cost-benefit analysis, and are equally useful in other approaches to decision making. It is certainly true that CBA will not replace 'argument, discussion, negotiation and compromise', as Meyer and Cooper say (nor does Chapter 6 or any part of Working Group III suggest any such view). But it is equally true that argument, discussion or negotiation uninformed by data on the costs and benefits involved is unlikely to produce a good compromise.

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