FRESH AIR?

OPTIONS FOR THE FUTURE ARCHITECTURE OF INTERNATIONAL CLIMATE CHANGE POLICY

CONTENTS

INTRODUCTION

Beginning from the stroke of new year, as they sit down to their evening meal on January 2, a US family will have already used, per person, the equivalent in fossil fuels that a family in Tanzania will depend on for the whole year.

A decade after the UN Framework Convention on Climate Change (UNFCCC) was signed, ranging from the USA to Australia, Canada and across Europe, countries are per person pumping out more carbon dioxide than they were at the time of the Earth Summit. Even worse, Australia has followed the US rejection of the Kyoto Protocol and Canada has placed unacceptable terms on her continued support.

But now something new is in the air. Negotiating the Kyoto Protocol to the UNFCCC dominated the minds of environmentalists for years. But working out what comes next is taking climate policy specialists into uncomfortable new territory.

Global warming, once dominated by scientists and technocrats is spilling over into a larger debate about an emerging constitution for the global economy. Rich and poor countries are divided by fault lines running along the issues of trade, debt, aid, private finance and economic sovereignty.

These are centre stage at meetings of the World Bank and International Monetary Fund, the World Trade Organisation and Group of Seven nations.

Now two separate worlds of debate are starting to come together on one big issue. After years of inactive good intentions, the environment and development communities are being forced into each other's company by a changing climate.

How we share the global commons of the atmosphere and suffer the impacts of climate change will have such an impact on the global economy that it will dwarf orthodox economic development issues. But how should we reconcile the new international commitments to human development with the inescapable demand to stop dangerous climate change?

In this briefing published by the New Economics Foundation, Alex Evans produces the first comprehensive survey of the leading contenders to provide an answer to the greatest challenge faced by the international community.

He interrogates every proposal for whether it delivers 'environmental integrity' in terms of necessary cuts in greenhouse gas emissions, and political feasibility in terms of a getting a global deal before it is too late.

The briefing comes to a conclusion that now seems to resonate with everyone from the insurance industry, to governments and grass roots development organisations. That no solution is either morally acceptable, or practically workable if it fails to accept the logic that everyone has an equal claim to the global commons of the atmosphere.

This briefing takes the reader step-by-step through the various proposals and their strengths and weaknesses. Its conclusion is that equity is more than just a desirable aim – it is absolutely necessary for our survival.

Andrew Simms
Policy Director

EXECUTIVE SUMMARY

This report examines the question of what should follow the Kyoto Protocol in international policy to address climate change. It discusses what a successful climate policy would look like, and assesses eight leading policy proposals.

What makes for a successful climate policy?

Achieving an effective climate policy will require three consecutive steps, which we make a detailed case for in the main report. These are:

Fixed concentration targets: If it's going to be effective, global climate policy must be based on a formal atmospheric concentration target for greenhouse gases (GHGs) in the atmosphere. This is a prerequisite for successful implementation of the 1992 Convention's objective of stabilising atmospheric concentrations of GHGs, and has the added advantage of making the scientific basis for climate change policy explicit. Uncertainty over what is a 'safe' level of GHGs in the atmosphere is no reason not to implement a formal target: it is a rationale for making sure that the initial target level can be modified in the light of new scientific findings. Above all, environmental precaution must be the overriding priority of climate change policy.

Constitutional framework for convergence: Once a global carbon budget has been defined via an atmospheric concentration target, the next question is how to share emissions entitlements between countries. Normal values of 'fairness' are an inadequate guide for climate policy, since there are no objective criteria with which to assess them. Instead, the concept that logically arises is that of **convergence**. Convergence implies a phased coming together of per capita output of GHGs, ultimately reaching a point where the citizens of every country are allocated more or less equal rights of emissions, with total output falling within scientifically-determined sustainable limits. In a global framework of shrinking emissions, countries' shares will gradually converge anyway.

As we shall see, though, the real question is whether this convergence happens by accident or by design. In this report, we argue for the implementation of a global constitutional framework for convergence by an agreed date. This approach offers the best chance of getting developing countries to take part, which has long been one of the most difficult challenges in climate policy.

Agreed timescale: Delay in the implementation of a constitutional framework for climate policy – involving both a concentration target and convergence by an agreed date – is not an option. The urgency of tackling rising GHG concentrations in the atmosphere, and the consequent need to make sure developing countries take part, means that the world has no time to run an experiment on whether evolutionary policy approaches will work. Precaution must come first in such a hazardous situation.

THE PROPOSALS

There is a range of proposals already for tackling climate change. But using the three criteria given above, all but one of them fail to set out an adequate framework for dealing with the problem.

'Kyoto Plus' proposals – a continuation of the existing approach – lack a concentration target, any clear constitutional framework for developing country participation, and a clear idea of where the process ought to be going. They also lack the urgency we need, given an increasingly grim outlook by climate scientists. This approach therefore fails on all three counts.

The **Brazilian Historical Responsibility proposal** has no formal concentration target and excludes developing countries from quantified commitments. It also fails on all three counts.

The **Triptych** proposal could be used with a formal concentration target, although there is no guarantee that it would be used in this way, and it is also not clear how the target – and the emissions allocations that flow from it – would be revised in the light of new scientific findings. Although the approach could be used for full global participation, this is not an integral feature of the design, and in any case no provision is made for guaranteed convergence. Triptych thus passes only the concentration target test.

The **Multi-Sector Convergence approach** could also be used with a concentration target, although again with no guarantees of this happening. The proposal almost includes a constitutional framework for formal convergence in global allocations, but ultimately fails this test because of its provision for country-specific derogations. The MSC approach thus passes only the concentration target test.

David Victor's Price Cap proposal offers poor environmental performance because it has no concentration target and because of the immense potential for carbon 'leakage'. This arises because governments are allowed to print extra permits if the price of carbon goes above a certain level. The proposal also explicitly rules out developing countries taking part at an early stage, and so it fails on all three counts.

WRI's Carbon Intensity proposal has very low environmental credibility because aggregate emissions are so hard to predict. It also excludes developing countries from quantified entitlements. The proposal therefore fails all three tests of a successful climate policy.

Benito Müller's Preference Score proposal can use a formal atmospheric concentration target, and also tries to define a constitutional framework for the full term of climate policy. It would, however, be unlikely to be accepted by developing countries because it perpetuates unequal emission allocations.

The Global Commons Institute's Contraction and Convergence proposal is the only proposal assessed that offers environmental assurance of arriving at a defined atmospheric concentration, equitable allocations as developing countries have explicitly demanded, and the potential for immediate implementation of a full-term framework. It also meets all stated US criteria for participation, and its provisions for trading would accelerate the roll-out of zero emissions technologies and help developed countries to meet their commitments flexibly.

THE ELEMENTS OF CLIMATE CHANGE POLICY

The science of climate change
There is now no serious doubt that man-made climate change is a reality, and one that is going to continue to get worse, ever faster, until effective steps are taken against it.

From 1861 to 2000, global mean surface temperature increased by 0.6°C. Rainfall patterns have changed, with more frequent incidence of heavy precipitation. The El Nino weather phenomenon has also become more "frequent, persistent and intense". Sea levels increased by between 10 and 20 cm from 1900 to 2000.[i]

It is also an object of substantial scientific consensus that human activities are changing the concentrations of atmospheric green house gases (GHGs). These gases – which include carbon dioxide (CO_2), nitrous oxide (NOx), methane CH_4), tropospheric ozone (O_3) and water vapour – occur naturally and help make the planet habitable by trapping solar radiation in the earth's atmosphere. But as industrial output has intensified, so has our contribution to the concentration of GHGs in the atmosphere, trapping more radiation and warming the planet.

This is caused principally by burning fossil fuels, and also by land use patterns in agriculture and changes such as deforestation. There is "new and stronger evidence that most of the observed warming of the past 50 years is attributable to human activities".[ii] Modelling conducted by the UN Inter-governmental Panel on Climate Change suggests that mean annual surface temperature will increase by between 1.4°C and 5.8°C from 1990 to 2100. Sea levels are predicted to rise between 9 and 88 cm by 2100.[iii]

The objective of the 1992 Convention
The international response to climate change first took shape in 1992 with the UN Framework Convention on Climate Change. The Convention, which ultimately led to the Kyoto Protocol, was explicit about what needed to be done to address the problem of climate change. Article 2 of the treaty states that:

"The ultimate objective of this Convention and any related legal instruments … is to achieve, in accordance with the relevant provisions of the Convention, *stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic influence in the climate system."* [iv]

The crucial test of any climate policy – and specifically, the proposals assessed in this report – is therefore its environmental effectiveness, since this is, after all, the whole point of the UNFCCC process, Kyoto included.

Positive feedbacks
The global picture is already gloomy in the eyes of the scientific community. Yet this is before we even consider the potential for 'positive feedbacks' in the climate system: changes that serve to accelerate climate change rather than dampen it down, and hence raise the possibility of a chain reaction in the climate system that could effectively put the problem beyond human control.

As oceans warm, for example, circulation could slow down, undercutting the planet's ability to store heat in deep water. There are other positive feedbacks too.

Meanwhile, rising temperatures could also trigger widespread melting in Arctic tundra, creating wetlands that contribute to the oxidation of organic matter, releasing more CO_2 and CH_4 into the atmosphere.[v]

Another example of a potential positive feedback mechanism is provided by the Hadley Centre, which published findings in 1998 related to the dieback of vegetation in tropical rainforest areas. The study found that rising temperatures will mean that "many regions which currently support tropical forests are predicted to change to savannah, grassland or even desert".

The atmospheric implications of such a change are immense. The Hadley Centre's research found that "vegetation will absorb CO_2 at the rate of some 2–3 GtC per year in the first half of the next century; this compares to current human-made emissions of about 7 GtC per year. After 2050, and as a result of vegetation dieback, this will become a source of about 2 GtC per year, thereby enhancing CO_2 build-up in the atmosphere. This enhancement is not yet included in climate predictions."[vi]

Of course, there are still major uncertainties about predicting positive feedback, which is why they have tended to be left out of the formal IPCC climate modelling process. But many of the individuals and institutions that sit on the IPCC, such as the Hadley Centre, are clear about the hazards posed by positive feedback mechanisms.

The policy implications of this scientific uncertainty are extensive. No scientist can say with any certainty when the atmospheric concentration of CO_2 or other greenhouse gases (GHGs) will tip the balance to induce further climate change. Yet we do know that human emissions of GHGs cause climate change. We also know that the problem is rapidly getting worse, and that it may spiral out of control without warning.

The need for a formal GHG atmospheric concentration target
One central question that arises out of Article 2 of the Convention is whether the objective of stabilising concentrations of GHGs means that a formal concentration target has to be negotiated. As we shall see, the eight policy proposals assessed in this report differ widely on this issue.

Some suggest that such a target should only be introduced later in the process, when there is greater scientific certainty about what level of GHGs would be dangerous. Then there are those who argue that an aspirational concentration target should be borne in mind throughout the process, but not used as a formal basis for policy.

But it is difficult to envisage how the 1992 Convention's objective of stabilising concentrations in the atmosphere stands any chance of being achieved without first going through the process of defining the level at which concentrations should be set. Stabilisation will not happen by accident. In this light, it may be concluded that a formal, binding concentration target is absolutely necessary. This is a position supported by former UNFCCC Executive Secretary Michael Zammit Cutajar, who said in an interview during the reconvened COP6 talks in Bonn that the most important task for policy-makers was to set a concentration target that would "give a sense of direction" to the process.

An atmospheric concentration target would also provide the additional benefit of making clear the scientific basis for climate change policy. With Kyoto, there is no scientific rationale for the reduction target of 5.2 per cent by 1990 levels – a major reason why it has been so easy for parties to dilute this in practice through concessions on carbon 'sinks' and other areas.

The stakes are simply too high to leave climate policy to chance. The longer countries delay implementation of a formal target, the higher concentrations will climb, until eventually the world will discover that stabilisation at 450ppmv or even 550ppmv is no longer a possibility. Kyoto does no more than slow the growth of emissions by a tiny amount. It does not begin to approach actual overall global reductions.

The only way forward is an approach predicated on retreating from carbon dependency. A political, rather than scientific, starting point will condemn the process to a continuation of the "beggar my neighbour" approach to national emissions reductions that typified the Kyoto negotiations.

The only sensible approach is to set an initial concentration target, but allow for annual review of the limit on the basis of the latest science. This could mean that a high initial target, such as 550 parts per million by volume (ppmv), could be ratcheted down in future if later scientific assessments show that the situation is worse than had been thought.

Environmental effectiveness – measured in terms of the ability of a policy to stabilise atmospheric concentrations of GHGs – is in this sense the overriding priority of international climate policy. Political considerations of equity, efficiency and so on must take second place to this priority: there would be little point in implementing a politically feasible approach that isn't up to the environmental job in hand.

The politics of climate change

From the start of the climate change process, the question of how to differentiate commitments between parties – deciding who gets to emit what – has been controversial, particularly when it came to the issue of developing countries taking part. On the one hand, it is difficult to escape the fact that, as IPCC Working Group I chair Sir John Houghton pointed out: "A global problem such as climate change requires a global solution".[vii] Full assurance of global emissions reductions will ultimately, and by definition, need all countries to accept quantitative limitations on their ability to emit GHGs.

At the same time, developing countries have justifiably argued that they have contributed far less to the problem of climate change than prosperous nations. Indeed, developing countries still have lower per capita emissions and lower standards of living, and stand to lose out most from climate change.

Some commentators have used these observations to argue that wealthy industrialised countries have accumulated an 'ecological debt', which is often contrasted with the issue of developing world financial debt.

But it is not only developing countries that have used the equity argument. On March 13 2001, U.S. President George Bush said that "I oppose the Kyoto Protocol because it exempts 80 per cent of the world, including major population centres such as China and India, from compliance, and would cause serious harm to the US economy … there is a clear consensus that the Kyoto Protocol is an unfair and ineffective means of addressing global climate change concerns".[viii]

Another dimension of the equity debate relates to the question of equity in damages for climate change. As IPCC chair Bob Watson recently pointed out: "Climate change is likely to impact disproportionately upon the poorest countries and the poorest persons within countries, and thereby exacerbate inequities in health status and access to adequate food, clean water and other resources."

Some commentators have even suggested that industrialised countries that fail to play an adequate role in climate change mitigation should be taken to court for their actions, although the legal basis for such a challenge is not yet clear.

Clearly, the vexing question of what is equitable is recognised by all sides as a key question in the climate debate. Indeed, equity is highlighted as a central element of climate change policy in the 1992 Convention, along with precaution in the form of stabilising atmospheric GHG concentrations, as we saw in the last chapter. Article 3 of the Convention, which deals with principles governing the process, states that parties should act "on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities".

The Convention also makes special provision for the "specific needs and circumstances of developing country parties" in Article 3.2 as well as for technology transfer and financial assistance in Article 4.

What do we mean by equity?

Equity is almost universally acknowledged as a key element of the debate, but there is much less consensus over what the term actually means. A good starting point is a typology developed by a team of researchers at CICERO in Norway, which includes no less than five different equity principles that might be used[ix]:

1. *Egalitarian:* people have equal rights to use the atmosphere.
2. *Sovereignty:* current emissions constitute a status quo right now.
3. *Horizontal:* actors under similar economic conditions have similar emissions reduction commitments.
4. *Vertical:* the greater the capacity to act or the ability to pay, the greater the economic burden.
5. *Polluter pays:* the greater the contribution to the problem, the greater the burden.

There is, therefore, a wide range of opinion on what constitutes equity in the context of climate change, and at times the entire discussion can seem like a rhetorical library of justifications for any position on how entitlements should be allocated between countries. Yet some general observations can still be made about equity.

One is that, whilst it is difficult to agree on what is equitable, it can be easier to agree about what is manifestly inequitable. This is a theme that will be returned to in the next chapter, when specific the equity dimensions of specific proposals are assessed.

Another is that equity should logically be subordinated in climate change policy to the more fundamental objective of environmental precaution. The over-riding objective of the UNFCCC is, as discussed in the previous section, to stabilise atmospheric concentrations of GHGs. Whilst equity is a crucially important consideration, it is second to environmental effectiveness: a treaty that is equitable but environmentally useless is not worth having.

Finally, there is a critically important dimension of realpolitik to the equity debate in climate change. There are many different versions of equity, none of which will ever be agreed as a universal moral norm. So the challenge is to find a workable equity that can in practice be agreed as a logical compromise between the various competing versions. This position will need to fall somewhere between historical responsibility and ecological debt on the one hand and pure equality of burden on the other.

In essence, climate change policy therefore boils down to the two challenges discussed above – what is a safe level of CO_2 in the atmosphere, and who gets to emit what? We now look at eight proposals that each try, in their own ways, to answer these two crucial questions.

KYOTO PLUS PROPOSALS

The concept

The Kyoto Protocol was agreed in 1997, five years after the original Climate Convention was signed, and following tortuous negotiations that had been underway since 1995. Like the Climate Convention before it, Kyoto mandated emissions reductions – but unlike the Convention, Kyoto's targets were to be legally binding.

The main outcome of Kyoto was that developed (or 'Annex I') countries agreed collectively to cut their emissions to 5.2 per cent below 1990 levels by 2010. But Annex I countries also agreed to share the burden of this reduction: so the European Union agreed a reduction of 8 per cent, the United States 7 per cent, and Japan 6 per cent, for example. Australia, meanwhile, successfully negotiated an increase in its allowed emissions, arguing that its high dependence on its coal industry meant that it deserved more lenient treatment.

Kyoto also left the way open for future emissions reductions beyond its First Commitment Period – the period up to 2010 – and agreed that there should be a review of 'adequacy of commitments' before 2008. At first glance, therefore, one of the most obvious ways to develop climate change policy after Kyoto's First Commitment Period would be simply to have a Second Commitment Period, and so on as envisaged in the original protocol.

One problem defining what is meant here by a 'Kyoto Plus' approach is that so many different options exist beneath that banner. In some scenarios, all developing countries could join for a Second Commitment Period. In others, only richer developing countries would take on quantified targets immediately after 2012. Some scenarios could use defined thresholds for participation where others would not. Some would use efficiency targets as an interim measure for some or all developing countries where others would not. Some approaches would use different typologies again such as the 'must act now / could act now / should act now, but differently' approach proposed by the Pew Centre in the United States.[x]

There is, then, a plethora of options within the 'Kyoto box'. Yet there are common features to all Kyoto Plus scenarios as defined here. One is increasing participation in quantified targets beyond just Annex I (rich industrialised) countries. Such targets would be expressed in terms of a baseline year of emissions, which could be 1990 (as under the Kyoto Protocol) or conceivably some other year – although this would make the process more complicated and this option has not been widely suggested.

Another precedent set by Kyoto is that emissions entitlements are not distributed according to some standard allocation formula – unlike either Contraction and Convergence or Müller's Preference Score approach, both assessed later in this report – but are instead the result of negotiations between countries. This is argued by many of Kyoto's proponents to be the most – or indeed the only – politically realistic way of carrying on with climate commitments.

Kyoto is also noteable for its various flexibility mechanisms, particularly emissions trading, Joint Implementation and the Clean Development Mechanism, as well as the 'bubbling' provisions that allowed the European Union to accept a single emissions reduction target and then share it out between member countries in regional negotiations.

Although efficiency targets could be included as an element of a 'Kyoto Plus' approach, they are not considered in detail in this section since they are generically discussed separately elsewhere in this report in the section on *WRI's Carbon Intensity Proposal.*

Can it work?

Environmental dimensions

Regardless of the precise shape of any Kyoto Plus scenario that might be implemented for the Second Commitment Period and beyond, a number of observations can be made about their environmental integrity.

Simply put, Kyoto's First Commitment Period is inadequate in environmental terms. Its target of 5.2 per cent GHG reductions against 1990 levels, for rich countries only, is a very long way from the cuts of 60 per cent called for by scientists. The discrepancy between these figures is evident even before the modest cuts agreed under Kyoto have been diluted by concessions made at the reconvened COP6 negotiations in Bonn, or the fact that the world's largest emitter has pulled out of the process.

This much is uncontroversial, for even the staunchest of Kyoto's proponents agree that it's no more than a first step. The corollary question is therefore whether cuts made under possible future Kyoto Plus approaches will begin to approach the scale the scientists say is necessary.

Perhaps there is no fundamental reason why the emissions reductions under a Kyoto Plus system might not be ratcheted up later to approach the scale needed for stabilisation of atmospheric concentrations of GHGs. To be sure, full global participation will ultimately be needed, as IPCC chair Sir John Houghton and others have repeatedly argued. But why should fuller participation not be achieved gradually as it becomes politically feasible for developing countries to come on board?

Leaving aside for the moment the issue of political feasibility, which is considered below, there are two compelling environmental reasons why the Kyoto Plus approach is unsatisfactory.

The first is that the cuts agreed under the Kyoto system are not related to the cuts mandated by environmental scientists, but instead represent the most that parties feel prepared to offer given political obstacles. There is no reason to assume that emission cuts agreed in future commitment periods would be any more demanding. Defenders of Kyoto tend to assume that cuts will become more palatable politically as time goes on – yet, as the section on political dimensions below shows, there is little reason to think so.

A science-based approach would start instead by working out the scale of emissions reductions required by using a formal concentration target, and only then turning to political questions of emissions entitlements.

The second critical flaw with gradually increasing participation is that the world hasn't enough time for an experiment to see whether developing countries will unexpectedly reverse their current and very clear opposition

to quantified targets.

It is highly unlikely that developing countries would regard their wealthy counterparts as having 'taken a lead' on combating climate change by the time of the Second Commitment Period, given the very low scale of emissions reductions in the preceding period and the fact that the USA has opted out of the process.

Meanwhile, emissions are continuing to grow globally, and atmospheric concentrations are increasing too. The longer the world pursues an approach of 'wait and see' about full participation in climate commitments, the higher concentrations will climb, until eventually stabilisation at 450ppmv or even 550ppmv is no longer a possibility.

Put simply, there is not enough time to waste on political machinations. It is already three years since the heads of the US National Ocean Atmosphere Administration and the UK Meteorological Office said that: "We are in a critical situation and must act soon."

Political dimensions

As mentioned above, the level of emissions reductions under the Kyoto system derive from political haggling rather than from science. Political feasibility is therefore traded off directly against environmental integrity: the higher cuts are for each country, the less likely the country is to agree. This is not a sound dynamic for the basis of policy in an area of such critical importance as climate change.

The negotiation of Article 3 targets at Kyoto was an undignified mess of horse-trading and racing for derogations. As the Bonn negotiations showed, this scramble for special exceptions did not end in Kyoto. Not only did negotiations revolve around reductions which were very modest indeed, they were also for developed countries only, and even this unremarkable effort may yet fall apart at COP7 when outstanding issues come up for discussion. It doesn't give confidence in a future under a Kyoto Plus system.

If 37 rich countries could barely agree a 5.2 per cent reduction, what evidence is there that more than 180 countries will be able to agree how to distribute cuts of 60 per cent or more in the absence of any clear constitutional framework?

The obvious conclusion to draw is that negotiations will remain in their complex morass of horse-trading unless concrete steps are taken to simplify negotiations, above all by using one standard allocation formula for entitlements. Otherwise every country will come to the table again armed with a comprehensive briefing paper on why it deserves special treatment and a lighter burden than everyone else.

The argument that 'developed countries taking a lead' represents the most politically feasible way towards involving developing countries also rests on flimsy assumptions. The longer their participation in quantified entitlements is delayed, the more of their carbon budget will be used up by the North – and the less surplus they will have to sell on the emissions trading market when they do take on quantified entitlements. Negotiators may try to bridge this difficulty by allowing developing countries to negotiate increases ('hot air') in order to encourage participation. Yet this hot air will come into circulation just as the need for real reductions in global emissions is more urgent than ever.

How much more sane it would be to avoid this situation ever arising by instead giving developing countries quantified entitlements at an earlier stage, with a surplus to sell, by using a standard allocation formula for entitlements derived from a formally defined concentration target. Political horse-trading can only be avoided by having one rule for all countries on how entitlements should be distributed.

For all the reasons outlined above, Kyoto cannot provide an effective framework for an effective climate policy. Its trade-off between environmental integrity and political feasibility is a framework for failure.

THE BRAZILIAN HISTORICAL RESPONSIBILITY PROPOSAL

The concept
Brazil's historical responsibility proposal, which it suggested in the run-up to Kyoto in 1997, would work by assigning entitlements to countries in proportion to their responsibility for past emissions.

The proposal retains the distinction between Annex I (developed) and Non-Annex I (developing) countries: the former would have quantified entitlements, whilst the latter would not. Annex I countries would between them face an overall 30 per cent reduction target against 1990 levels by 2020, with interim targets set at five yearly intervals in the period up to then.

The burden would then be shared between industrialised nations according to how much of the cumulative temperature change to date they are each responsible for. Countries with a longer history of industrialised development would bear a greater share of responsibility than those with shorter histories of industrialisation: so the UK would face a 63.3 per cent reduction by 2010 against 1990 levels whilst Japan's reduction would be just 9.5 per cent.[xi]

The standard unit in this system is not the tonnage of carbon emitted by each country, but instead a measure of the surface temperature change caused by emissions of carbon. Trading of temperature credits would be allowed in order to allow countries flexibility in meeting their targets. Countries that still exceed their entitlements after trading settlement would be liable to pay a penalty of US$3.33 for each additional tonne of carbon into a 'clean development fund' which would be used to finance mitigation and adaptation projects in the South.

Can it work?
Environmental dimensions
The Brazilian proposal uses units of temperature change rather than just carbon emissions, and this is unique among the eight proposals assessed in this report. Some commentators say this helps environmental integrity because it "makes deriving reduction targets from the acceptable level of climate change easy".[xii]

But the proposal also takes no account of the relative impact of other GHGs and the various climate system feedback mechanisms on global warming. Since scientific findings will inevitably have to be modified over time, this presents a problem for the system, which would be very difficult to revise in the light of new science.

The proposed reduction target for developed countries of 30 per cent by 2020 also seems arbitrary, with no obvious link to scientific assessment of the reductions that need to be made in order to avoid further climate change, and it is unclear what would happen after this date.

Above all, a question mark hangs over the proposal's environmental effectiveness because it has no quantified and binding limitations for developing countries, and hence no fully global framework for controlling atmospheric concentrations.

Without that, the proposal is environmentally incomplete: under a system like that, it would be impossible to predict with any certainty the net global emissions of each year or the ultimate endpoint in terms of atmospheric concentrations of CO2 and other GHGs.

Political dimensions
In one sense, the Brazilian proposal is an attractive model of equity that seems to epitomise the Polluter Pays Principle. It also appears address some of the dimensions of the 'ecological debt' argument referred to earlier, although not to the extent of actually compensating developing countries for damages suffered.

In other ways, though, the Brazilian proposal is also inequitable. First, it takes no account of current emission levels: the USA, with double the per capita emissions of the UK, would face only a third of the UK's reduction commitment because of the UK's longer historical process of industrialisation.[xiii]

Second, there are obvious methodological problems with assembling data on historical emissions, which could penalise Annex I countries unfairly. For example, one assessment points to the potentially very inflated figures for historical responsibility than can be arrived at through the technique of 'backcasting' 1950-1990 emissions.[xiv]

Perhaps most fundamentally, the Brazilian proposal assumes that the fairest and most beneficial course for developing countries is for them to stay out of quantified entitlements. Yet this is open to question. Equity in the Brazilian proposal is taken in the sense of punishment or justice for past misdeeds which, whilst perhaps morally appealing to many developing nations, would not give them an equitable share of the new tradable atmospheric assets created under the proposal.

THE UNIVERSITY OF UTRECHT'S TRIPTYCH PROPOSAL

The concept

The Triptych approach, developed by a team at the University of Utrecht and used by the European Union to help decide EU countries' commitments under Kyoto, is a sector-based approach that "accounts for differences in national circumstances such as population size and growth, standard of living, economic structure and fuel mix in power generation".[xv]

The approach can be used in conjunction with a specific overall emissions reduction target. It was used by the EU to allocate their 8 per cent Kyoto reduction target between member countries.

The Triptych approach distinguishes between three discrete sectors in allocating emissions reductions. The three sectors included in the Triptych approach are energy-intensive industry, power generation, and domestic sectors – which as well as household energy use also includes "the commercial sector, transportation, light industry and agriculture". The sectoral analysis is emphasised as "only a tool" to determine national allowances, with no intention actually to establish sectoral commitments. Triptych's treatment of each of these sectors is set out briefly below.

Energy intensive industry

For this sector, the reduction target would take the form of a commitment to reduce the carbon intensity of heavy industry. An illustrative example cut proposed by the authors is that "all countries [would] reduce their specific CO_2 emission (CO_2 emissions per unit of physical product) by 1.5 per cent per year".

The power-producing sector

In this sector, targets would take the form of decarbonisation requirements within fuel mix. The illustrative assumption here is that "all countries reduce their electricity output generated with solid and liquid fossil fuels by 30 per cent each".

The domestic sector

In this sector, the authors believe an approach of per capita convergence would be most suitable. Their illustrative assumption in this case is that 1990 per capita emission levels for all countries would converge to equal per capita rights by 2030, with a convergence level of 3.44 tonnes of CO_2 (or 0.94 tonnes of carbon) per capita.

The aggregate global reductions in the heavy industry and power generation sectors do not imply flat rate reductions that are the same for all countries. The targets for these sectors differ from country to country, and derive from standard mechanisms that take account of growth assumptions, assessments about national development of different generation sources, and so on.

As with many of the other proposals examined in this report, Triptych would allow emissions trading so that countries with 'spare' emissions beneath their targets could sell them to countries in need of extra permits.

Can it work?

Environmental dimensions

As Triptych was originally used in the EU to distribute commitments as a result of a particular emissions reduction target, it could theoretically be used to distribute entitlements that derive from a global concentration target. But there is a potential problem here in that, even if the initial allocation of entitlements is derived from a global concentration target, the system would be slow to revise these entitlements in the light of newly emerging science.

Whilst carbon intensity targets can be problematic in environmental terms (see the later section on the World Resources Institute's carbon intensity proposal), Triptych uses them as part of an analytical mechanism to determine overall national entitlements that are absolute.

The Triptych approach could be used in conjunction with a global concentration target, although it is far from clear how national entitlements would be revised if the science assessment worsened over time.

Political dimensions

The Triptych methodology does try to implement a standard allocation mechanism for entitlements, which might avoid some of the horse-trading and 'race for derogations' that have bedevilled negotiations to date. But it fails because the sector-based allocation system locks in favourable treatment for those countries with larger heavy industry sectors.

This in turn means that, in a global allocation of finite atmospheric property rights, some countries will receive higher per capita rights than others – specifically because Triptych relies not just on per capita allocations, but also on carbon intensity based 'dollar allocations' arising in the heavy industry and power generation sectors.

Triptych's political failure arises from the failure to make adequate distinctions between per capita efficiency and dollar efficiency. Allocations are made not just according to how many people a country has, but also according to how rich it is reinforcing status quo ante inequalities through the creation of a wholly new property right.

It is difficult to see that such an approach would, in a global context, stand a high chance of acceptance by developing countries. Triptych may have fared well in the context of the EU, but global allocations are very different.

ECN AND CICERO'S MULTI-SECTOR CONVERGENCE PROPOSAL

The concept
The Multi-Sector Convergence approach (MSC) is based on three organising principles, according to its authors at two European research institutes (ECN in the Netherlands and CICERO in Norway).[xvi] These are that:

1. It is based on a sectoral analysis of the national economy.
2. It assumes the need for eventual global convergence.
3. It allows for additional allowances to be given to "countries facing specific circumstances".

These principles are then used to define a four-stage approach to defining national entitlements:

1. Distinguishing between different sectors
2. Setting global emission norms
3. Deciding national emission mitigation targets
4. Including allowance factors

The MSC approach aims to be flexible and transparent, but also leaves "ample space for adjustment as a result of prospective climate change negotiations and evolving scientific findings".[xvii] Thus the convergence level, as well as the date, can be open for political negotiation, as well as "country-specific emission factors".

In essence, the approach works as follows. CO_2 equivalent emissions (for CO_2, CH_4 and N_{20}) are calculated for seven sectors: power, industry, transport, households, services, agriculture and waste. It starts from 1990 data and then applies specific mitigation rates to each sector to work out emission allowances – for both sectoral and national levels – for the next budget period. This approach also means at this stage that allowances can be adjusted to take account of specific conditions, and for mitigation rates in rolling over commitments from one budget period to the next.

Can it work?
Environmental dimensions
As with Triptych, it would be possible to arrive at emissions cuts based on a specific, defined atmospheric concentration target. But targeting an atmospheric concentration of GHGs is just one potential application of the MSC approach: it is not an integral design feature of the approach. This implies that it would be equally possible to use the MSC in a manner that did not guarantee environmental integrity, by starting with whatever bottom up cuts and country-specific allowances seemed politically feasible, and working out what sort of atmospheric concentration this would lead to. This might mean a failure to hold environmental integrity as the overriding priority of climate change policy.

Political dimensions
The MSC approach comes closer than most of the other proposals assessed in this report to delivering a politically feasible policy framework for addressing climate change. The system would use a formal framework to define targets, reducing the potential for political horse-trading. Also, as noted earlier in this section, it would 'in principle' set an ultimate objective of convergence at equal per capita rights to the atmosphere.

But although the MSC approach reduces the potential for horse-trading, it doesn't get rid of it altogether. The system's overriding political problem is that – like Triptych – it allows for potential derogations and 'special exemptions' within the formal allocation framework.

In this sense, the MSC approach comes painfully close to managing to close Pandora's Box, only to open it again with a get-out clause for any country that might object to a straightforward convergence by a set date at equal per capita entitlements. Every country could hence be expected to begin an assiduous search for special circumstances that would allow it more advantageous treatment.

The MSC approach is thoughtful, well-intentioned and clearly the result of meticulous research. Yet despite its intention of creating a standard allocation framework for all countries, the approach ultimately fails by trying to make the approach more flexible through provisions for sectoral or national derogations.

DAVID VICTOR'S PRICE CAPS PROPOSAL

The concept

David Victor, a senior fellow at the Council on Foreign Relations in New York, sets out his proposal for a price cap-based approach to international climate change policy in his book *The Collapse of the Kyoto Protocol*.[xviii]

Victor's critique of Kyoto is centred on the institutional architecture of the treaty, and particularly its inclusion of an emissions trading scheme. The problem with such a scheme, he says, is that it is almost impossible to solve the political problem of how emissions entitlements should be allocated between countries. He also argues that emissions entitlements should not be given to developing world countries, and should instead be limited to OECD countries. At the centre of his argument is the assertion that Kyoto's fatal flaw is its failure to address the problem of cost control, a prime concern for many industrialised countries.

Victor's alternative is to propose a system of quantified targets for developed countries that includes emissions trading but also, crucially, sets a cap on the price of emissions permits on the international market:

> "Governments would set targets for emission quantities and create an emissions trading system. At the same time, they would also agree on a maximum price for the tradable permits. Any government that participates in the system could issue and sell new emission permits at the agreed price. If the trading price rises above the target price then firms could purchase new permits from governments at the target price. If the trading price dips below the target price then firms could simply purchase less costly permits on the open market. In effect, the target price would cap the cost of acquiring permits and thus also give firms greater surety about the cost of compliance."

Can it work?

Environmental dimensions

As any economist can attest, price caps tend to create distortions in the normal operation of supply and demand within a market, and something has to give. Unfortunately, in the case of David Victor's proposal, the factor that 'gives' is the scheme's environmental effectiveness.

It is impossible to see how a scheme can be effective if it gives governments the right to print additional emissions permits just at the moment when meeting targets becomes more challenging.

Victor does not duck the issue of concentration targets. He argues that:

> "[T]he Kyoto approach of capping emissions at particular quantities makes sense only if the objective of international efforts to slow global warming is to avert a catastrophe that would be triggered by a certain accumulation of emissions in the atmosphere. Governments would identify the dangerous threshold, cap emissions below the level, and allow trading so that firms could meet the cap at the lowest cost."

This, he allows, was precisely the approach envisaged by the 1992 Convention. Yet, he continues, this approach is unworkable:

> "It is not (yet) possible to identify particular thresholds that would trigger horrible climate changes. Worse, if governments set short-term emission caps too tightly they may force their economies to bear extremely high costs of cutting emissions more rapidly than can be achieved with the orderly turnover of capital stock."

But, as we discussed earlier, this is no reason to avoid setting a concentration target. Indeed, it makes a concentration target all the more necessary – and one that can be revised annually in line with newly emerging science assessments. Victor does not deny that there is a dangerous level of concentrations in the atmosphere – he merely says that we don't know what this level is. This situation calls for a precautionary approach involving the initial definition of a 'best guess' ceiling, not by ducking the issue altogether.

Political dimensions

Victor's solution might well prove politically feasible to implement in the short term, given the indulgent terms that it would offer to those countries accepting targets. Yet there would be no point in implementing a framework that might be politically feasible but could not achieve the environmental objective set by the 1992 Climate Convention.

The longer-term political feasibility of Victor's proposal is also dubious. As outlined above, the framework excludes developing countries from commitments at this stage. Yet this approach merely stores up problems for the future. As discussed in earlier, developing countries have to accept quantified commitments in order to guarantee the environmental integrity of any policy framework: a global problem needs a global solution.

As a final word on the 'allocations issue', it is interesting to note that at one point in his book Victor observes that "in a crisis these problems [of allocations] might be solved". Quite what Victor would term a 'crisis' is not entirely clear, least of all to the people of the South Pacific island state of Tuvalu, who due to rising sea levels have already had to begin planning the evacuation of the entire population to another country. But the unwitting effect of Victor's observation is to add weight to the argument for the political and environmental need for a standard allocation mechanism.

THE WORLD RESOURCES INSTITUTE'S CARBON INTENSITY PROPOSAL

The concept

The World Resources Institute in Washington DC has devised a proposal for voluntary developing country participation based not on absolute caps an GHG emissions, but on targets related to the carbon intensity of national economies – the amount of emissions produced per unit of gross domestic product. The climate policy that President Bush controversially announced for the United States in February 2002 is a variation on WRI's proposal.

WRI's starting point for this proposal is that absolute caps on developing countries' emissions are problematic for a number of reasons, mainly because accurate data on national emissions often doesn't exist, and also because absolute caps on emissions – of the kind accepted by Annex I countries under the Kyoto Protocol – may not be appropriate for countries "experiencing high or volatile rates of economic growth".[xix]

WRI suggest instead the "more realistic and practical framework" of basing participation not on absolute caps but instead on "the emissions that an economy generates per unit of output" – in other words, the economy's carbon intensity. This would avoid the allocation problems of the Kyoto Protocol and the potential for developing country 'hot air' to undermine the integrity of Annex I targets by emissions trading.

Can it work?

Environmental dimensions

Carbon intensity based targets are, according to WRI, "a possible next step, but not the last step". This "possible next step" would "help address the real climate challenge in developing countries, namely decoupling economic development and GHG emissions growth". The case of China, with its declining emissions intensity, is cited as a proof that such a decoupling is possible, together with the observation that as countries develop they tend to move more into lower-emitting service industries more than manufacturing.

But this argument has serious flaws. It is probably true that countries tend to move into service industries and lower their GHG intensity, but this doesn't imply any reduction of net emissions, which is of course the point of any climate change process. It just implies a proportionately larger service sector, and does not even necessarily imply increased energy efficiency in the manufacturing sector. If net emissions continue to rise, then the problem gets worse. This raises the question of why WRI proposed a carbon intensity approach as a 'next step' rather than simply going without further delay to the 'last step' of a concentration target and absolute caps for all countries.

But using environmental integrity arguments about hot air to arrive at a conclusion about carbon intensity targets is profoundly flawed. Even if developing country targets did result in generous hot air allowances, we could at least still predict the aggregate level of global emissions – a factor conspicuously lacking from carbon intensity targets.

Political dimensions

WRI is correct that 'hot air' can be a problem in the absence of a clear allocation formula – as Australia's allowed increase in emissions under the Kyoto Protocol shows clearly. They are also right that adequate incentives must be provided for developing countries to take on quantified entitlements. Yet a better solution to this dilemma would be to have one clear rule for all about how entitlements are pre-distributed.

WRI's approach is also politically problematic because it doesn't solve the problem of the level at which developing country intensity targets should be set. In the absence of any guiding principles, there is every chance that negotiations on the level of intensity targets would themselves be beset by horse-trading and a race for derogations as much as Kyoto, which would dilute an already weak proposal.

Most of all, though, WRI's proposal is problematic politically. Like Kyoto, it would restrict ownership of tradable emissions entitlements to developed countries. Whilst this might seem politically easier in the short term, it will undoubtedly result in huge political difficulties in the longer term when developing countries finally do take on emissions. By that point, a worsening climate outlook could mean that developing countries would have minimal, if any, surplus emissions to sell, drastically lowering incentives for taking part just when it would be environmentally most urgent that they should. In this sense, 'stopgap' options that put off the date when developing countries take part are as problematic politically as they are environmentally.

BENITO MÜLLER'S PREFERENCE SCORE PROPOSAL

The concept

Benito Müller, a senior research fellow at the Oxford Institute for Energy Studies, proposes a policy framework that is proportionate to the status quo (known as 'grandfathered'), and also uses per capita allocations – using ratios to decide on emissions allocations.[xx]

Müller's preference score approach tries to reach a compromise between the two antithetical positions of grandfathering and per capita through a 'voting system' for each of the two allocation proposals.

Once countries have voted for which allocation mechanism they prefer, a weighted arithmetic mean of the accepted base-proposals is used to decide final allocations. An example is shown below.

As the table shows, the system allocates each country a vote – to be cast for either grandfathering or per capita – which is then weighted according to the country's population. The resulting ratio of population 'votes' for each proposal is then used to define the slices of the global carbon 'cake' received by each country.

Under a **pure per capita** system, with this methodology, Non-Annex I countries would receive an allocation of 78 per cent of permits, compared to 22 per cent for Annex I. Under a **pure grandfathered** system, Non-Annex I countries would get 39 per cent of permits whilst Annex I countries would get 61 per cent.

The **synthesis** preference score outcome is produced by weighing Non-Annex I preferences (with 75 per cent of the votes) for a per capita system against Annex I preferences (with 25 per cent of the votes) for a grandfathered system to produce a final allocation of 31 per cent of permits for Annex I countries and 69 per cent for Non-Annex I countries as a compromise option (which is 'three quarters per capita and one quarter grandfathered').

Can it work?

Environmental dimensions

This approach is about allocating a finite global carbon 'cake', so it is reasonable to assume that it could use a formal atmospheric concentration target as the starting point for a definition of total global emissions. Given a concentration target, the preference score achieves the requisite environmental integrity: it addresses the objective of the 1992 Convention of stabilising atmospheric concentrations by deriving allocation from an atmospheric concentration target, thus guaranteeing that an overall global 'contraction curve' is in place – no matter what the starting distribution is or the trading that follows.

Political dimensions

The preference score proposal performs well on environmental integrity, but its political dimensions are more complicated. Müller's proposal achieves compromise through the weighted voting system outlined above. But there is no ultimate end point at which the per capita rights of developed and developing countries converge. Rather, the hybrid compromise situated somewhere between grandfathered and per capita allocations would be maintained indefinitely, which means that inequity would be a permanent feature of the system.

The question then becomes whether this indefinite lock-in of an expedient political deal would be acceptable to developing countries. It may well not be. Status quo emissions reflect current inequalities in international political economy, after all.

This implies that Müller's proposal would lock into atmospheric property rights forever when they may just reflect a passing inequality between North and South. Developing countries have already shown they are very concerned about long-term allocations, so it seems unlikely that they would accept any new atmospheric property rights derived from locking in existing inequalities, even in a slightly watered down form.

Table 1:
'Global Compromise' scenario
Source: Müller 2001a

Annex Ia	**2005 Population** (millions)	**Preference Scores** Per Capita	**Preference Scores** Grandfathering
USA	292	0	292
Japan	127	0	127
EU	378	0	378
EIT	391	0	391
Rest	12	0	12
Non-Annex I			
China	1,304	1,304	0
India	1,082	1,082	0
LDCs	1,569	1,569	0
Rest	944	944	0
Mid. East / N Africa	335	0	335
Total	**6,491**	**4,900**	**1,591**
Preference Score Weights		**0.75**	**0.25**

GCI'S CONTRACTION AND CONVERGENCE PROPOSAL

The concept

The Contraction and Convergence approach was designed by the Global Commons Institute, a London-based think tank.[xxi] Under Contraction and Convergence, all countries would collectively agree a target for a stable atmospheric concentration of carbon dioxide in the atmosphere, such as 450 parts per million. A 'global emissions budget' would then be calculated, derived from the target atmospheric concentration figure. The target would be reviewed annually so that it could be revised with new scientific findings.

Once the 'contraction budget' has been decided, the next question would become how to distribute the entitlements arising within this carbon 'cake' between countries. Under Contraction and Convergence, the allocations of emissions entitlements between countries would converge by a specific date. By that year, entitlements would be allocated in proportion to national population as it was in a specified baseline year. Full emissions trading is also stipulated as a design feature of the concept.

Contraction and Convergence would reduce the complexity of negotiations to two simple variables that would need to be agreed: the target atmospheric concentration of CO_2, and the date at which entitlements would converge at equal per capita allocations. The illustrative figures quoted in this example are shown in the graph on page 17.

Can it work?

Environmental dimensions

As explained above, Contraction and Convergence stipulates an atmospheric concentration target, which as noted throughout the report, is a prerequisite for meeting the 1992 Convention's Article 2 objective of stabilising atmospheric concentrations of CO_2. Contraction and Convergence also stipulates full global participation from the start, which means that all emissions will be covered in a global framework. This is a prerequisite for an atmospheric concentration target to work.

This makes for unquestionable environmental effectiveness, and is in marked contrast to Kyoto's approach of deciding what emissions reductions countries feel able to commit to and only then how much of a cut has thereby been achieved.

Political dimensions

Contraction and Convergence also scores highly on its political dimensions. First, it has the advantage of having one standard allocation formula – the convergence by a specific date at equal per capita emission entitlements for all countries – for defining national emission commitments. This avoids the horse-trading and derogations that have made the Kyoto reductions so inadequate.

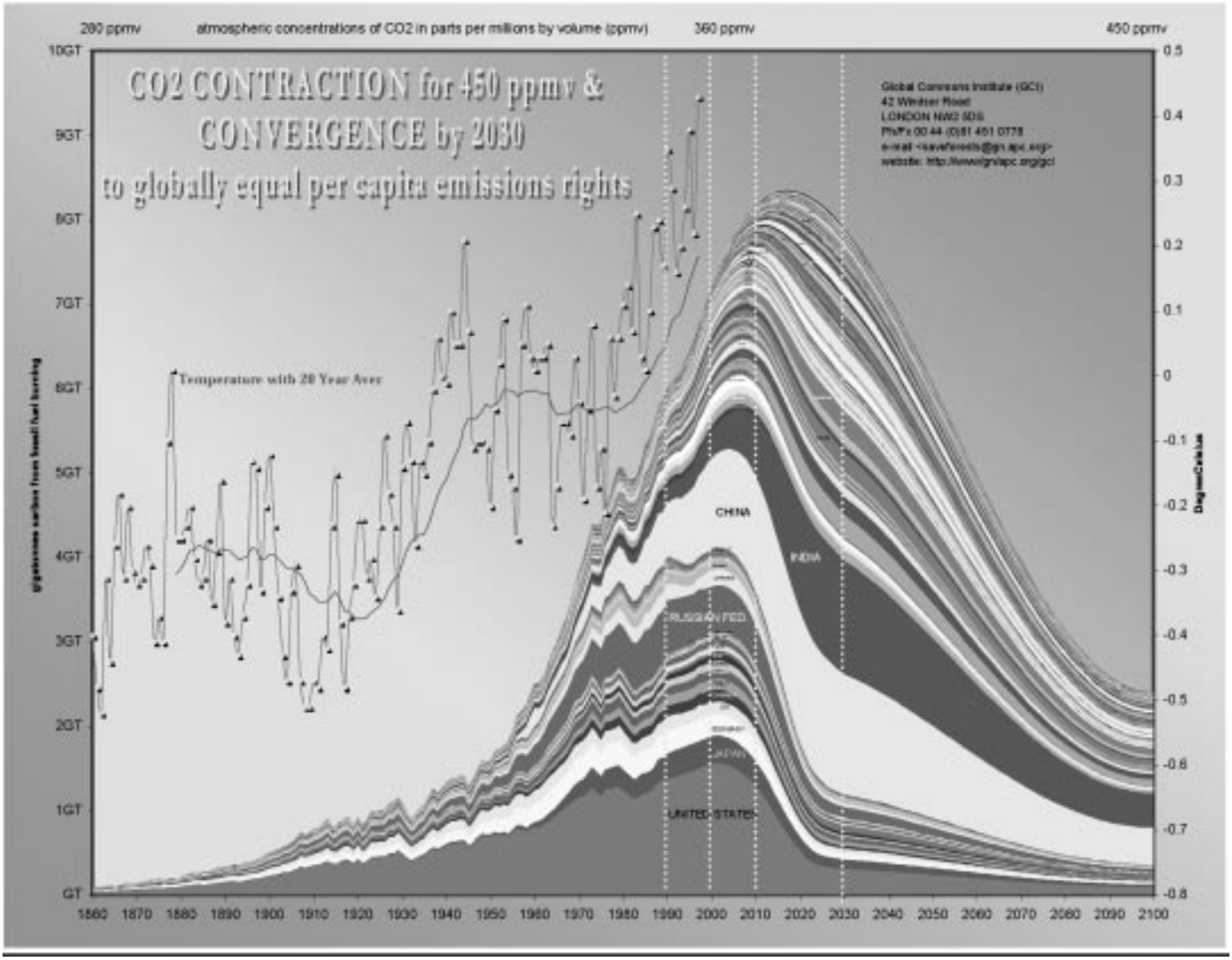
Second, Contraction and Convergence offers clear incentives for involving developing countries early. As explained above, environmental integrity demands a global problem for a global solution. Yet, as discussed earlier, developing countries have consistently refused to take part in a framework that pre-allocates the property rights to this finite carbon budget in a manifestly inequitable way.

By specifying a set date for convergence at equal per capita rights, this approach would give developing countries surplus emission allocations that they could then sell to countries that need extra permits – most of them developed. The problem of 'hot air' would not arise because all trading would take place within the confines of the globally defined carbon budget. The revenue flow from the sale of surplus permits would give developing countries an income flow from climate change policy, which would encourage participation, and would also give these countries an incentive to invest in clean technologies.

Contraction and Convergence and the USA

Interestingly, Contraction & Convergence would also fit with the stated position of the United States. In his statements on climate change, President Bush has consistently set out specific criteria for what sort of treaty the USA would be willing to sign up to, especially emission targets for developing countries and the need for a science-based approach. Contraction and Convergence, with its global participation design and formal greenhouse gas concentration target, is exactly such an approach.

Contraction and Convergence is also fully consistent with the famous 1997 US Senate resolution that stipulated that the USA would not sign up to any treaty that did not include developing countries.



CO_2 Contraction for 450ppmv and convergence by 2030

References: www.gci.org.uk for the model and, www.gci.org.uk/consolidation for current support.

CONCLUSION: TOWARDS A WORKABLE POLITICAL COMPROMISE

International climate change policy can seem hopelessly confusing, with its endless abbreviations, its complex science and its galaxy of arguments about why each country's circumstances are different, and why they should have a lighter burden. Yet it needn't be so.

Once climate policy is led by a formal atmospheric concentration target – which, as concluded earlier, is environmentally indispensable – then it is by definition necessary for all nations, developed and developing, to accept quantified commitments on their emissions. A global concentration target will never be reached unless all parties are on board.

Another inescapable conclusion is that a standard mechanism is needed for distributing emissions entitlements between countries. Kyoto acts as a cautionary tale of what happens without one: negotiations quickly slide into horse-trading and a scramble for special exemptions.

If these two initial assertions are accepted, then it quickly becomes apparent that a Contraction and Convergence approach is the only real option. To see why, consider three different ways in which a global carbon budget can be shared out between the world's countries.

Figure 1 shows one end of the spectrum of possibilities for different commitments beneath a global contraction curve. In this case, convergence is specifically ruled out so that emissions are effectively allocated on a per dollar rather than a per capita basis: in other words, the status quo is deliberately maintained indefinitely. Figure 2 shows the opposite end of the spectrum: entitlements under the contraction curve are allocated on an equal per capita basis as soon as the system goes live: convergence is therefore 'overnight', with no transfer period.

Now, a practical assessment suggests that the developing countries in Non-Annex I would never agree to lock present disparities in emissions into the pre-allocation of tradable emissions entitlements, and do so forever. By the same token, though, it would obviously be equally unacceptable to Annex I countries that they should be expected to converge overnight, with no period of time to implement appropriate policies at the national level. Logic therefore dictates that the political solution lies somewhere between these two polar positions of no convergence or immediate convergence. A compromise is required.

Figure 3 shows one basis on which this compromise could be achieved. In this scenario, national emissions entitlements do indeed converge, but with the compromise element that the convergence takes place not immediately, but over a defined period of time – in this example, by 2030. Negotiators from all countries can therefore work out a compromise based on the date at which eventual convergence will take place.

It might be possible to reach a compromise in a more or less infinite number of ways other than negotiating a formal, binding convergence date. Indeed, the various alternative policy proposals assessed in this report are all examples – to a greater or lesser extent – of other ways of reaching compromise on the allocations issue.

But here Kyoto acts as a cautionary tale. The negotiations revolved around reductions that were very modest indeed. They were for developed countries only, and even this unremarkable effort may yet fall apart at COP7 when outstanding issues come up for discussion, so it doesn't suggest hope for the future under a similar format for negotiations. If 37 rich countries could barely agree a 5.2 per cent reduction, what evidence is there that more than 180 countries will be able to agree how to distribute cuts of 60 per cent or more in the absence of any clear constitutional framework?

The obvious conclusion to draw from this is that negotiations will remain in their current morass unless concrete steps are taken to simplify them, above all by using one standard allocation formula for entitlements. Otherwise each country will come to the table again armed with a comprehensive briefing paper on why they deserve special treatment.

In this sense, there are compelling logical arguments for tackling the problem of different commitments by negotiating just one variable: the date of convergence. The over-riding objective of Contraction and Convergence is not to be 'fair' in itself, or to 'put the world to rights'. It is to set up a constitutional framework to negotiate climate targets that offer some reasonable chance of success, simplifying negotiations to help countries agree. To try to reach compromise instead by allowing country-specific derogations or special exemptions would immediately re-open the Pandora's Box of political squabbles, and effectively condemn the process to failure.

Why delay is not an option

The decision to undertake Contraction and Convergence will require a level of political resolve which hasn't been seen so far in multilateral environmental negotiations. Many will argue that while international policy will in the end need to rest on the principles of Contraction and Convergence, a climate policy like that is unrealistic in the short-term. Would it not be better to opt for an evolutionary approach in the meantime, perhaps along Kyoto lines? Even if such proposals are not the definitive answer to climate change, aren't they at least a step in the right direction?

But this 'softly softly' approach is increasingly untenable. First, atmospheric concentrations of greenhouse gases are rising inexorably, and so is the damage caused by climate change. The longer a fixed target is delayed, the higher atmospheric concentrations will climb. There is therefore a high risk that carrying on prevaricating will rule out any possibility of stabilising concentrations at 450 or even 550ppmv.

Second, positive feedbacks in the climate system could start any time,

Figure 1: Global emissions contraction with entitlements reduced always proportional to initial GDP

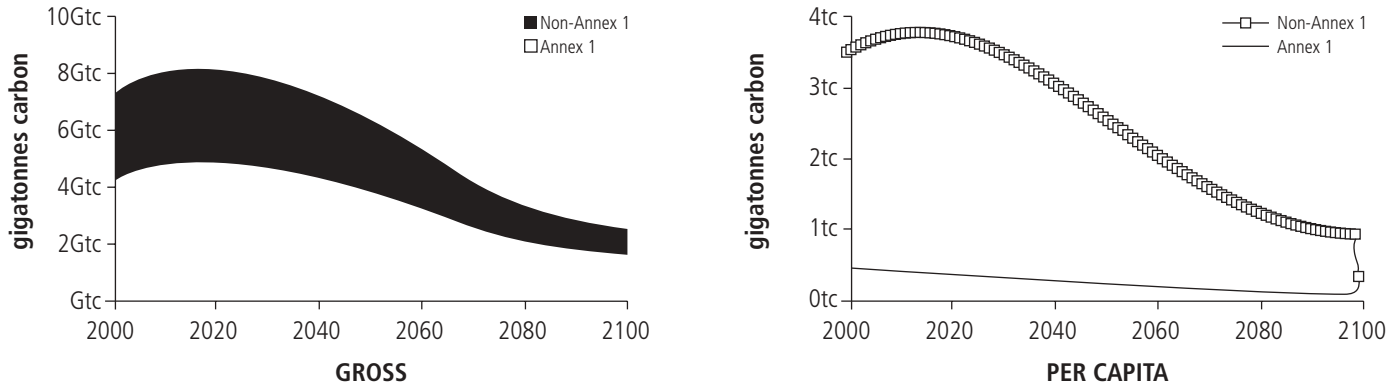


Figure 2: Global contraction with entitlements reduced always proportional to initial population

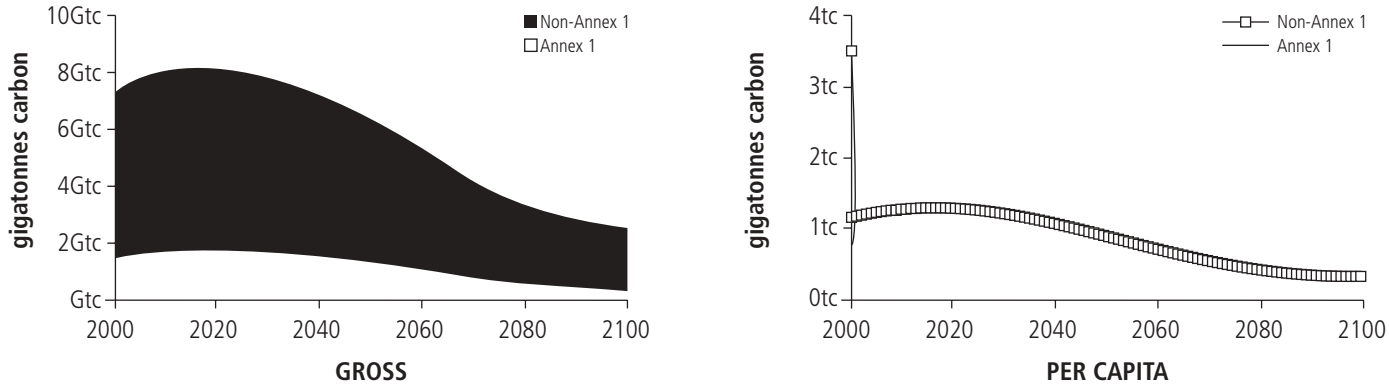
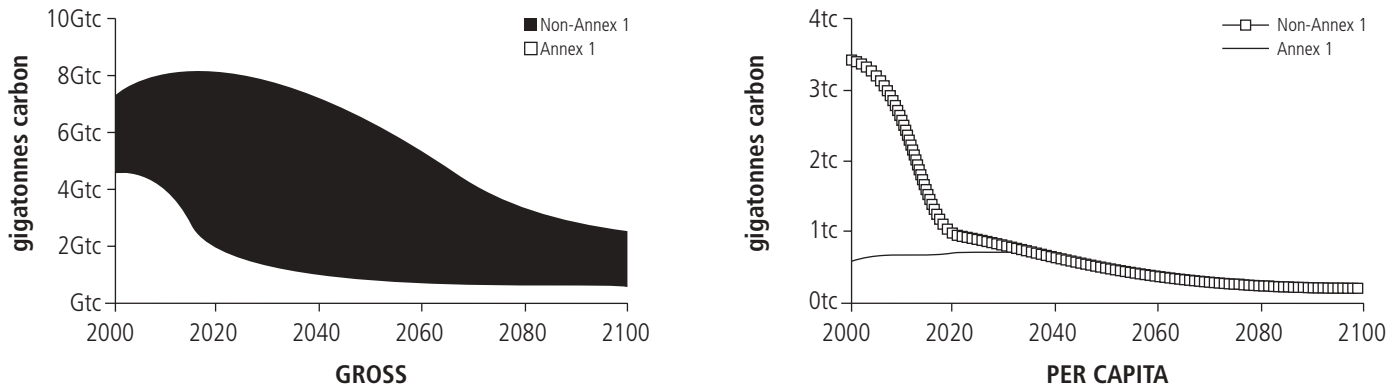


Figure 3: Contraction and Convergence with convergence date of 2030



with the potential for a catastrophe 'runaway greenhouse effect' scenario. Third, we don't know what atmospheric concentration these positive feedbacks will start at. Despite the fact that scientists' understanding of these dynamics is improving all the time, we are still essentially working without a clock, and no-one knows how much time we have left.

The political need for urgency

Environmental drivers are not the only reason why delay is no longer an option. There is also a strong political basis for proceeding with Non-Annex I participation on the terms outlined above sooner rather than later, and for distrusting evolutionary approaches.

As we saw in the discussion on equity earlier, it is often argued that developed countries should take a lead in combating climate change, to be joined in due course by developing countries accepting quantified targets. But, whilst many G77 countries may be happy enough with such an approach for now, the ever-increasing risk of catastrophic climatic events means that they have to take part sooner or later.

Despite all of the uncertainties about climate science, there is every chance that the projections will become worse as the decades go by. As time goes by, it will probably become necessary to make faster and deeper reductions. In other words, the downward slope of the contraction curve will become steeper – and the size of the global carbon budget diminish – just when participation by developing countries in quantified commitments would be most urgent.

In this scenario, therefore, the diminished carbon budget would mean that developing countries would have far lower entitlements – even under an immediate convergence scenario – than they would have done had they been allocated quantified commitments at an earlier stage. A climate policy based from the outset on a constitutional framework for formal convergence would provide the additional benefit of offering developing countries a surplus that could be sold on the international emissions market. In a late participation scenario, on the other hand, the smaller carbon budget would mean that any surplus for developing countries would be far lower – if indeed there was one at all.

The reaction of developing countries to such a situation would be fairly predictable. The surplus emissions they could have owned and sold had, in effect, been used up by Annex I countries, without any payment. Developing countries might reasonably feel that Annex I countries were doing precisely what they had said throughout the climate process that they would not do – 'pulling the ladder up after them'.

The irony of such a scenario would be painful. By persevering with a strategy geared towards making sure developing countries take part, the climate process would have lost any chance of 'taking the lead' after all.

This is the central reason why we have to implement both a managed contraction curve, aimed from its inception at a specific CO_2 concentration in the atmosphere, and a convergence date within this that is capable of being accelerated. The alternative means waiting until feedback kicks in and then having to make sudden, sharp adjustments in the overall emissions profile and dealing with the distributional chaos that would result.

The world has no time to waste on short-term palliatives offered for purposes of political expediency. As the EU Commissioner for the Environment, Margot Wallstrom, said before this year's Bonn talks: "We can negotiate with each other, but we cannot negotiate with the weather." The people of Tuvalu know this truth better than most. Whether the rest of humanity realises it early enough is ultimately a simple matter of choice.

BIBLIOGRAPHY

Agarwal, A. and Narain, S., 1991. *Global Warming in an Unequal World, a case of colonialism* (Delhi: Centre for Science and Environment).

Anderson, D., Clark, C., Foxon, T., Gross, R. and Jacobs, M., 2001. *Innovation and the Environment: Challenges and Policy Options for the UK* (London: Imperial College Centre for Energy Policy and Technology & the Fabian Society).

Axelrod, R., 1997. *The Complexity of Cooperation: Agent-Based Models of Competition and Collaboration.* (Princeton: Princeton University Press).

Baumert, K., Bhandari, R. and Kete, N., 1999. *What might a Developing Country Commitment Look Like?* (Washington DC: World Resources Institute).

Berk, M. and Elzen, M. den, 2001. Options for differentiation of future commitments in climate policy: insights from the FAIR model. Submitted to *Climate Policy.*

Berk, M., Gupta, J. and Jansen, J., 2001. *Options for Differentiation of Future Commitments under the Climate Convention – examples of a comprehensive approach* (Bilthoven: Dutch National Institute of Public Health and Environment (RIVM)).

Böhringer, C. and Welsch, H., 1999. *Contraction & Convergence – Contraction and Convergence of Carbon Emission: The Economic Implications of Permit Trading* (Mannheim: Centre for European Economic Research (ZEW)).

Böhringer, C., 2000. *Contraction and Convergence of Carbon Emissions: An Analysis of the Economic Implications* (Mannheim: Centre for European Economic Research (ZEW)).

Christian Aid, 2000. *The Kyoto Climate Fraud. What's wrong with the Kyoto Protocol? A developing country perspective* (London: Christian Aid).

Claussen, E. and McNeilly, L., 1998. *Equity and Global Climate Change: the complex elements of global fairness* (Arlington: Pew Center on Global Climate Change).

Cooper R., 1998. Toward a Real Global Warming Treaty (The Case for a Carbon Tax). *Foreign Affairs,* March/April 1998.

Corner House, 2001. *Democracy or Carbocracy?* Corner House Briefing 24, September 2001.

Elzen, M. den, Berk, M., Shaeffer, M., Olivier, J., Hendriks, C. and Metz, B., 1999. *The Brazilian Proposal and other Options for International Burden Sharing: an evaluation of methodological and policy aspects using the FAIR model* (Bilthoven: Dutch National Institute of Public Health and Environment (RIVM)).

Evans, A., 2001a. Climate Change: The Way Ahead. *(Paper presented to Pew Center "Equity and Global Climate Change" conference,* Washington DC, 17 April 2001, http://www.pewclimate.org)

Evans, A., 2001b. Why Contraction & Convergence is the Framework to Solve Global Climate Change. Submitted to *Journal of the Commonwealth Human Ecology Council.*

Fromm, E., 1974. *The Anatomy of Human Destructiveness* (London: Pimlico Books).

Groenenberg, H., Phylipsen, D. and Blok, K., 2000. *Differentiating the burden world wide: global burden differentiation of GHG emissions reductions based on the Triptych approach* (Utrecht: University of Utrecht).

Groenenberg, H., 2001. *Differentiation of Commitments.* In Tiempo 38-39, June 2001.

Grubb, M., Vrolijk, C. and Brack, D., 1999. *The Kyoto Protocol: a Guide and Assessment* (London: Royal Institute of International Affairs).

Grubb, M., 2001. A Constructive Scheme Unravelled? – review of The Collapse of the Kyoto Protocol and the Struggle to Slow Global Warming by David Victor. In *Nature* 410, 12 April 2001.

Hadley Centre, 1998. *Climate Change and its Impacts: some highlights from the UK research programme – a first look at results from the Hadley Centre's new climate model.* Hadley Centre paper (www.metoffice.gov.uk/sec5/sec5pg1).

Holden, B. (ed.), 2000. *Global Democracy: Key Debates* (London: Routledge).

Houghton, J., 2001. Global problems require global solutions. *Royal Society News,* May 2001.

Intergovernmental Panel on Climate Change, 2001. *Third Assessment Report* (Cambridge: Cambridge University Press).

Jansen., J., Battjes, J., Sijm, J., Volkers, C. and Ybema, J., 2000. *The Multi-Sector Convergence Approach: a flexible framework for negotiating global rules for national greenhouse gas emission mitigation targets* (Oslo: Center for International Climate and Environmental Research (CICERO)).

Jansen, J., Battjes, J., Ormal, F., Sijm, J., Volkers, C., Ybema, J., Torvanger, A., Ringius, L. and Underdal, A., 2001. *Sharing the Burden of Greenhouse Gas Mitigation: final report of the joint CICERO-ECN project on the global differentiation of emission mitigation targets among countries.* (Oslo: CICERO Working Paper 2001-05.)

Keohane, R., 1984. *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton: Princeton University Press).

Kete, N., 2001. What's Fair? (*Paper presented to Pew Center "Equity and Global Climate Change" conference,* Washington DC, 17 April 2001, http://www.pewclimate.org).

Lammi, H. and Tynkkynen, O., 2001. *The Whole Climate: Climate equity and its implications for the North* (Turku: Friends of the Earth Finland).

Leggett, J., 1999. *The Carbon War: Global Warming and the End of the Oil Era* (London: Penguin Books).

Meira Filho, Luiz Gylvan and Gonzalez Miguez, Jose Domingos, 2000. *Note on the time-dependent relationship between emissions of greenhouse gases and climate change.* (Technical Note. Ministry of Science and Technology, Federative Republic of Brazil, January 2000.)

Meyer, A., 2000. *Contraction & Convergence: the global solution to climate change* (Bristol: Green Books).

Mintzer, I. and Leonard, J. (eds.), 1994. *Negotiating Climate Change: The Inside Story of the Rio Convention* (Cambridge: Cambridge University Press).

Muller, B., 2001a. Fair Compromise in a Morally Complex World. (*Paper presented to Pew Center "Equity and Global Climate Change" conference,* Washington DC, 17 April 2001, http://www.pewclimate.org).

Muller, B., 2001b. *Rejecting Kyoto: A Study of Proposed Alternatives to the Kyoto Protocol* (London: Climate Strategies).

Nath, K. [then Indian Environment Minister], 1995. Letter to heads of delegation prior to COP1. *In litt.,* Global Commons Institute.

Pearce, F., 2001. Climate talks resume amid gloom. *New Scientist,* 16 June 2001.

Philibert, C. and Pershing, J., 2001. Considering the Options: Climate Targets for All Countries. *Submitted to Climate Policy.*

Phylipsen, G., Groenenberg, H. and Blok, K., 1998. *The EU burden sharing after Kyoto: renewed Triptych calculations* (Utrecht: University of Utrecht).

Ringius, L., Torvanger, A., Holtsmark, B., 1998. *Can multi-criteria rules fairly distribute climate burdens? OECD results from three burden-sharing rules.* CICERO working paper 1998:6, Oslo.

Rose, A., Stevens, B. and Edmonds, J, 1997. *International Equity and Differentiation in Global Warming Policy,* Mimeo, Pennsylvania State University, California Energy Commission and Pacific Northwest Laboratory, 31 July.

Sijm, J., Jansen, J., Battjes, J., Volkers, C. and Ybema, J., 2000. *The Multi-Sector Convergence Approach of Burden Sharing: an analysis of its cost implications* (Oslo: Center for International Climate and Environmental Research (CICERO)).

Simms, A., 1999. *Who Owes Who? Climate change, debt, equity and survival* (London: Christian Aid).

Simms, A., 2001. Global Warming: Sue the US now (*The Guardian,* London, July 25; initially published with author erroneously cited as Stephen Timms)

UNFCCC, 1997. Paper no. 1: Brazil; Proposed

Elements of a Protocol to the United Nations Framework Convention on Climate Change, presented by Brazil in response to the Berlin Mandate, UNFCCC/AGBM/1997/MISC.1/Add.3 GE.97-, Bonn.

UNFCCC, 1998. The Kyoto Protocol to the Convention on Climate Change. Climate Change Secretariat/UNEP, UNEP/IUC/98/2, June 1998.

Victor, D., 2001. *The Collapse of the Kyoto Protocol and the Struggle to Slow Global Warming* (Princeton: Princeton University Press / Council on Foreign Relations).

Watson, R., 2001. Equity and Global Climate Change. *(Paper presented to Pew Center "Equity and Global Climate Change" conference,* Washington DC, 17 April 2001, http://www.pewclimate.org

Appendix: Glossary of Abbreviations

AGBM	Ad-Hoc Group on the Berlin Mandate
Annex I	Developed countries with Kyoto Article 3 targets
Non-Annex I	Developing countries without Kyoto targets
CDM	Clean Development Mechanism
COP	Conference of the Parties (to the UNFCCC)
EITs	Economies in Transition (e.g. Russia, Ukraine)
GCI	Global Commons Institute
GHG	Greenhouse gas
GtC	Gigatonnes of carbon
IEA	International Energy Agency
IPCC	International Panel on Climate Change
JI	Joint Implementation
JUSSCANNZ	Country group including Japan, United States, Switzerland, Canada, Australia, Norway and New Zealand
OECD	Organization for Economic Co-operation and Development
SBSTA	Subsidiary Body for Scientific and Technical Advice
UNFCCC	UN Framework Convention on Climate Change
WRI	World Resources Institute

References

i	Watson 2001; IPCC 2001
ii	Watson 2001
iii	IPCC 2001; Watson 2001
iv	UNFCCC 1993
v	Leggett 1999
vi	Hadley Centre 1998
vii	Houghton 2001
viii	Müller 2001b
ix	Ringius et. al. 1998
x	Claussen & McNeilly 1998
xi	UNFCCC 1997; see also Lammi & Tynkkynen 2001
xii	Lammi & Tynkkynen 2001
xiii	Lammi & Tynkkynen 2001
xiv	Lammi & Tynkkynen 2001
xv	Groenenberg et. al. 2000
xvi	Jansen et. al. 2001
xvii	Berk et. al. 2001
xiiii	Victor 2001
xix	Baumert et. al. 1999
xx	Müller 2001a
xxi	Meyer 2000

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Tel: ++ 44 (0)20 7089 2800 Fax: ++ 44 (0)20 7407 6473
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