Fairness in Global Climate Change Finance

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March 2009

Institute for Public Policy Research

Challenging ideas – Changing policy

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This paper was first published in March 2009.

Acknowledgements

ippr would like to thank the Heinrich Böll Foundation for its kind funding and support for this project.

Executive summary

It is now well established that action to avoid dangerous climate change must take place according to the principles of 'responsibility and capability', and the UN's Framework Convention on Climate Change (UNFCCC) subscribes to this view. Morally and in political terms developed countries should lead global mitigation by making significant domestic emissions reductions. But in a world of limited finance, reductions arguably be undertaken wherever they can be made for the lowest cost.

Since emissions reductions in developed countries are insufficient to resolve the climate problem and are often more expensive to make than in developing countries, the principles of responsibility and capability might more productively be applied to the *financing* of global reductions: this would mean that the higher a country's level of responsibility and capability, the greater its share of global climate finance. Technically, developed countries are already obliged to transfer finance to developing countries, under the UNFCCC, which states that 'agreed full incremental' costs in developing countries should be met by finance and technology from developed countries (Article 4.3).

Whether and how that obligation should be fulfilled is at the heart of the current international negotiations aimed at reaching a global post-2012 deal at Copenhagen in late 2009. It is fraught with difficulty, largely because of the size of the potential financial liabilities involved and the unpopularity that will arise from asking taxpayers and consumers to meet them.

Estimating costs

The various estimates of incremental mitigation costs are unsatisfactory. While being based in many cases on rigorous analysis, especially of mitigation opportunities in different countries, there is a high degree of uncertainty over future factors that will have a significant influence on costs. In particular the behaviour of governments, officials and populations is deeply unpredictable; 'policy costs' may prove significant and the most cost-effective route to decarbonisation may not always be the one taken.

Nevertheless, there is a convergence in the most recent cost estimations at around US$100 billion to $200 billion for developing world costs and around $200 billion to $400 billion for global costs by 2020-2030. Adaptation costs will add significantly to these sums and are now unavoidable. It is perhaps significant that developing countries in the UN negotiations have called for between $200 billion and $400 billion per annum.

A more pragmatic and responsive approach may be to base estimates of future financing of mitigation in developing countries on plans for Nationally Appropriate Mitigation Actions (NAMAs), verified by an international approval process accountable to UNFCCC signatories.

Financing proposals

The sums quoted above are several times larger than current climate change finance. The largest existing pool is the $6.1 billion pledged in 2008 by ten developed countries to the World Bank's Climate Investment Funds (CIFs). From where would greater sums of finance capable of meeting the needs estimated above be drawn?

1. Offsetting

To increase the flow of offset finance through the Kyoto Protocol's Clean Development Mechanism (CDM), developed countries could relax any limits on the proportion of domestic reductions that can be offset by purchasing external credits or set more ambitious targets to drive a more aggressive offset market. The UNFCCC estimates that by 2020, offsetting could yield up to $40.8 billion. But developing countries are unlikely to accept an increase in offsets as a sole or even majority source of finance for low-carbon development.

2. Leveraged or compulsory additional offsetting

For every tonne of CO_2 offset in developed countries, several could be reduced in a developing country at a price related to the market price of carbon. Governments in developed countries would first have to agree to binding emissions reduction targets and then to a corresponding ratio at which to leverage offsets. If they took on an emissions reduction target of 40 per cent below 1990 levels by 2020 and offset around half at a 2:1 ratio, this could yield $130 billion per year. Such a mechanism would require developed countries either to accept deep domestic emissions reduction targets or to leverage offsets at higher ratios. It would replace rather than work within existing offset mechanisms.

3. Emissions Trading Scheme levies

There is currently a levy of 2 per cent on the sale of permits in the CDM, the proceeds of which go to the Adaptation Fund. The levy could raise $200 to $680 million annually in 2020. Bangladesh and Brazil have both proposed increases and at the UNFCCC COP 14 meeting in Poland, developing countries proposed that a CDM-type levy be applied to all emissions trading schemes. The proposal was blocked by developed countries.

4. Revenue from domestic permit auctions

Developed countries are increasingly auctioning permits to emit under cap-and-trade schemes up front, providing a revenue stream to governments. A proportion of these rents could be set aside to support developing country mitigation (and adaptation). If all Assigned Amount Units (AAUs) were subject to regimes in which they could be auctioned, then post-2012, upward of $300 billion could be raised. Revenues from auctioning, however, are uncertain because the price paid by polluters depends on demand. Revenues are also captured by national treasuries and may not be used to fund low-carbon activities in developing countries.

5. Upstream auction revenue (AAU hold-back)

Norway has proposed that 2 per cent of AAUs are held back at the international level rather than being assigned to countries and are auctioned to raise money for an international fund. This would raise $15-$25 billion per year. Others have proposed that higher percentages of AAUs are held back. The principle stands a high chance of becoming part of the EU's negotiating offer for Copenhagen. However, holding back higher percentages of AAUs or setting a reserve price may be resisted by developed countries because costs would be passed on to their consumers while rents would be captured internationally. US Congress views international expropriation of finance as unconstitutional.

6. Crediting Nationally Appropriate Mitigation Actions (NAMAs)

The Republic of Korea has proposed a system of carbon credits for NAMAs to allow for actions to be taken early and financed up front against a future sale of carbon credits on the international market. The credits would be purchased by developed countries, where deeper reduction targets would be agreed. Its potential value would depend on the scope and effectiveness of NAMA plans and on the availability of developed country financing. Crediting NAMAs, however, might assist with the politics of a post-2012 agreement as it could help finance already planned low-carbon strategies in developing countries.

7. Global taxation

Switzerland has proposed a levy of $2 per tonne at the national level in all countries with per capita levels above 1.5 tonnes, with countries retaining the funds depending on their level of development: 40 per cent in the case of developed countries and 85 per cent for the poorest. This would raise a predictable level of finance of $48.5 billion per year of which $18.4 billion would be deposited in an international fund. But the costs of a flat carbon levy would fall regressively.

8. Other levy-based proposals

Least developed countries (LDCs) have proposed an international levy on aviation which could raise between $4 and $10 billion annually and a levy on bunker fuels for aviation and shipping, which could raise between $4 and $15 billion. Brazil has hinted at a €100 billion climate fund involving a 10 per cent tax on revenues from the production and trading of oil and coal.

9. Non-climate-related funding sources

Other funding sources, such as increases in general overseas development assistance, a tax on currency transactions (Tobin Tax) or more broadly on financial transactions, revenue from untaxed income held offshore and the use of sovereign wealth funds, may all play a future role. For example, $11.5 trillion of private assets currently held in offshore finance centres would yield $225 billion annually if taxed at a conservative rate.

10. Frontloading finance

Frontloading finance using bonds raised against the guarantee of tax revenue in developed countries could leverage private sector finance into mitigation measures. Developing countries are understandably cautious but the European Commission has hinted at a proposition whereby developed countries guarantee lending for well-structured developing country projects and policies. This approach might also remove some of the short-term political pressure on developed country governments, whose contributions to global climate financing must otherwise be drawn from an increase in costs to today's taxpayers or consumers.

Building a North–South finance package

Within the current structure of the negotiations, agreed financing is likely to come primarily from Kyoto-type sources, especially while developed countries remain committed to putting in place and linking-up national or regional carbon markets. Therefore the choice is between different combinations or 'wedges' of measures that add up to an agreed sum. Measures such as the CDM and offset leveraging are incompatible (offset leveraging would replace the CDM). Others, such as AAU holdback, can be scaled up but appear politically less viable the larger they become.

Developed country governments face something of a Hobson's choice as the ultimate source of the financing is the same one: developed country populations. This may prove especially troublesome at a time of economic hardship. If the Kyoto-style approach continues to pervade, while a simpler approach of enhancing one mechanism may be preferable to a more complex collection of measures, it may prove politically more attractive to spread the cost across a number of measures.

Given the scale of financing required (and the likely unwillingness of taxpayers and consumers in developed countries to pay), *official* climate financing should also accommodate other financial flows, such as additional, climate-related overseas development assistance and the use of debt-based instruments such as frontloading.

There is also the equally politically charged discussion concerning the structure and mechanism by which the funding might be governed, allocated, channelled, monitored and verified. There are two choice. The first is a single World Climate Change Fund approach, as proposed by Mexico, to which all countries would contribute according to their level of cumulative emissions, population and ability to pay, but developing countries would be net recipients. It is supported by the European Commission but faces two political obstacles: it requires contributions from developing as well as developed countries, something the G77 has staunchly resisted, and developed countries are typically of the view that a new fund could be inefficient, wasteful and costly.

One possible alternative is a new international body to approve and verify developing country NAMAs and to monitor, report on and verify finance flows from developed countries. A body of this sort might build on the experience of the CDM board.

Allocating financial obligations

If developed countries are to fulfil their UNFCCC obligations and in a manner that is measurable, reportable and verifiable, sharing out financing commitments fairly and according to a clear, defensible methodology will be necessary. The concepts of 'responsibility' and 'capability' at the heart of the UNFCCC could form the basis of such an approach.

The Greenhouse Development Rights Framework (GDRs), an equity-based, burden-sharing proposal, is unique in that it quantifies 'responsibility' and 'capability'. GDRs allocates mitigation effort and adaptation cost according to a global responsibility and capability index (RCI). Responsibility is calculated by taking into account cumulative emissions per capita since 1990 and capability is measured as PPP-adjusted GDP per capita above an income threshold of $7,500. The two indicators are combined with equal value to arrive at a single index which, while currently applied to emissions allocations, could be used to determine financial obligations. Such an index might be used in one or more of the following ways:

1. Global fund

The RCI can be used to calculate fair shares in a Mexican-style World Climate Change Fund. Using GDRs, in a $250 billion per year global fund, the US's share would be $82.7 billion in 2010; China's contribution would be $13.75 billion; the EU15's share would be $57.4 billion; while India's share would be $1.3 billion. The dynamism of the RCI, taking into account changing shares of responsibility for the atmospheric stock of greenhouse gases and relative GDP growth, is an added advantage.

2. Article 4.3 (Annex II) fund

The RCI could also be used to distribute the financial burden around Kyoto Annex II countries only, were developing countries successful in negotiating the full implementation of the UNFCCC's Article 4. For a developing world financing fund of $100 billion, the EU15 and the US are clearly liable for the lion's share: $33.9 billion and $47.7 billion respectively.

3. AAU auction or offset aggregator

The RCI could also be applied to a scaled up version of Norway's proposal to hold back developed countries' AAUs. Were an overall hold-back target of 10 per cent of AAUs agreed, rather than each country sacrificing a flat 10 per cent of its AAUs, each would be given a different proportion relative to its RCI ranking. Countries higher up the RCI would have more than 10 per cent held back and vice-versa. The RCI could also be applied to a leveraged offset to weight the degree of leveraging required according to the different RCI rankings of developed countries.

4. RCI as the basis for a global inventory

The politics of a financing system that relies heavily on a single mechanism may prove prohibitive not least because it would involve conspicuously large sums of finance flowing to developing countries from a handful of developed ones. A more eclectic, multi-channel approach to climate financing might be the quid-pro-quo for developed countries' fulfilment of agreed financing obligations, with a COP-accountable executive body to keep the finance-mitigation global balance sheet. An RCI could be used as the accounting methodology.

Conclusion

The costs of reducing global emissions are likely to be met (if they are met at all), for sound economic and inescapable political reasons, from a variety of different sources and via different mechanisms and channels; this may be especially true during a deep, global recession. Such an eclectic picture of global climate finance points to the need for an international arbiter of fairness and good practice: a formally mandated body that would set the standards for and verify mitigation actions, policies and plans, keep an inventory of developed–developing country financial flows, developed best practice, make policy recommendations, and report back to the Committee of the Parties to the UNFCCC.

Designing a climate finance regime that is demonstrably fair and based on clear indicators of equity can help both during this year's negotiations and in post-Copenhagen domestic debates in developed and developing countries alike. An index of responsibility and capability of the type used in the Greenhouse Development Rights framework can provide a reference for observers and negotiators, a substantive basis for negotiation and a real-world methodology for sharing out agreed financial obligations.

List of abbreviations

AAU	Assigned Amount Units
BAU	Business as usual
CDM	Clean Development Mechanism
CER	Certified Emissions Reductions
CIF	Climate Investment Fund
COP	Conference of Parties
CO_2e	Carbon dioxide equivalent
Gt	Gigatonne
REDD	Reduced Emissions from Deforestation and Degradation
ETS	Emissions trading scheme
EUA	EU emission allowance
GDP	Gross Domestic Product
GDRs	Greenhouse Development Rights framework
GEF	Global Environment Facility
GNP	Gross National Product
IPCC	Intergovernmental Panel on Climate Change
LDCs	Least developed countries
NAMA	Nationally Appropriate Mitigation Action
OECD	Organisation for Economic Cooperation and Development
ODA	Official/overseas development assistance
ppm	Parts per million
QUELROs	Quantified Emission Limitation and Reduction Obligations
RCI	Responsibility and capability index
UNFCCC	United Nations Framework Convention on Climate Change

Introduction

It is now well established – in political rhetoric, in the campaigns of developing world-focused organisations and in the United Nation's Framework Convention on Climate Change – that action to avoid dangerous climate change must take place according to the principles of 'responsibility and capability'. This rule has hitherto typically been applied to mitigation action, suggesting that the burden of global reductions in emissions should fall on the shoulders of those countries most liable in terms of contribution to the atmospheric stock of greenhouse gases and most able to pay.

However, with every passing day, as global levels of emissions increase (Sheehan 2008, Anderson and Bows 2008), this argument becomes more difficult to implement as developed world emissions are proportionately less than those from the developing world whose rate is increasing rapidly. The emissions of those countries in Annex 1 of the Kyoto Protocol (developed countries) and even the total emissions from the OECD (Organisation for Economic Cooperation and Development) could be eliminated entirely and dangerous climate change would not be avoided (EcoEquity 2008). Absolute emissions reductions must now take place in developing countries too; emissions reductions must be global if dangerous climate change is to be avoided.

Morally and in political terms developed countries should lead global mitigation with significant domestic emissions reductions and developing countries often state their desire to see low-carbon approaches demonstrated first. But in a world of limited (and waning) finance, reductions arguably should be undertaken wherever they can be made for the lowest cost. This suggests that, since emissions reductions in developed countries are insufficient in quantity to resolve the climate problem and are often more expensive, the principles of responsibility and capability might more productively be applied to the *financing* of global reductions.

In the technical and legal debate surrounding the current UN negotiations, developed countries also find themselves obliged to transfer finance to developing countries. Article 4.3 of the UNFCCC (1992), to which all negotiating countries are signatories, states that '…agreed full incremental…' *costs* in developing countries should be met by finance and technology from developed countries. If this commitment is to be fulfilled, or at least a developed to developing country financial package of some sort is to be agreed, then the cost burden ought to fall progressively between (and within) developed countries (as the UNFCCC also states).

While conceptually simple – the higher a country's level of responsibility and capability, the greater its share of global climate finance – applying the UNFCCC's equity principles to finance is, in practice, fraught with difficulty. Such a concept assumes the levels of finance necessary, measured in hundreds of billions of dollars per year, are readily available; they are manifestly not. Even if they were, what methodology would be used for determining who pays what amount? Were resources available and a methodology agreed, past attempts large and small to transfer such resources from developed to developing countries have often proven unpopular with one or other party and arguably also ineffective.[1]

Setting aside some of these pernicious problems, it is clear from the current state of international climate change negotiations that a financial package of some sort will be necessary if the way forward post-2012 is to be mapped out at the forthcoming Copenhagen

1. There is a sizeable literature on the effectiveness or otherwise of aid and on aid 'conditionality' and its effects. Efforts in recent years by donor countries to coordinate better, to untie aid from donor country goods and services and to support recipient country government budgets directly have all been intended to increase 'aid effectiveness'.

COP (Conference of the Parties). As China's recent submission to the UNFCCC secretariat said, 'Developed country Parties shall take substantive action to provide financial resources mainly from their public finance on grant and concessional basis for developing country parties, in accordance with Article 4.3, 4.4, 4.5, 4.8, 4.9 and Article 11 of the UNFCCC' (FCCC/AWGLCA/2008/MISC.5).

Mitigation costs, though highly complex to forecast because of huge economic, social and political uncertainties, are simply the difference between carbon-intensive energy, industrial and land use practices and their low-carbon alternative.[2] In addition, mitigation in many cases demands large, upfront capital expenditures common to and in many cases no greater than comparable infrastructural endeavours and a strong focus on the development of new technology, which requires a constant flow of finance.

Countries both developed and developing have been reluctant and slow to pursue low carbon approaches, in part because of this incremental cost barrier.[3] In lieu of any mechanism to reduce this differential, governments have been understandably reluctant to visit higher costs – especially for energy supply – on their people and industries to stave of what appears to most a distant and intangible threat.

Focusing on the financial cost of emissions reductions, rather than the emissions reductions themselves, also opens up the important debate about who pays. Developing countries will not commit themselves to emissions reductions because doing so exposes them to significant financial liabilities; this is also the reason why developed countries have been reluctant to extend their emissions reduction commitments in a further phase of the Kyoto Protocol. Especially while market-based mechanisms – cap-and-trade or carbon taxation – are favoured by policymakers, costs will ultimately fall to taxpayers and consumers, which is likely to prove unpopular.[4]

Aims of the paper

This paper looks at fairness in meeting costs associated with mitigating and adapting to climate change. It examines various assessments of cost and proposals for how to raise and channel international climate change finance. It also uses the best available methodology – the index of responsibility and capability in the Greenhouse Development Rights Framework – to analyse how the financial burden should fall in principle. It then discusses some of the political and policy implications of the sharing out of the global financial burden and the raising and channelling of finance.

2. This paper also considers adaptation costs and makes passing mention of reducing emissions from deforestation and degradation (REDD), but its focus is mitigation because its core thesis is that burden sharing of mitigation effort can be transferred easily to burden sharing of mitigation cost – indeed it could be argued that the burden of mitigation is a cost burden.
3. There are many other barriers to the deployment of low-carbon technologies, such as a lack of regulatory measures and a shortage of skills and technical know-how.
4. Carbon cap-and-trade schemes, such as the Emissions Trading Scheme in the EU, will increasingly operate by auctioning emissions up front (rather than 'grandfathering' – allocating them to polluters for free). This auctioning process is a *de facto* tax on polluters, the cost of which is passed on to consumers through increased prices, especially of energy.

1. Estimating costs

Lord Nicholas Stern in his review of the economic costs of climate change was one of the first to attempt a comprehensive, global economic analysis of the costs of decarbonisation (HM Goverment 2006). The now famous Stern Review estimated that the annual economic cost of stabilising atmospheric concentration of CO_2e (carbon dioxide equivalent) at 550 parts per million (ppm) would be around 1 per cent of global GDP. Stern has since doubled this estimate to 2 per cent of global GDP for 500ppm stabilisation, principally in light of the UN Intergovernmental Panel on Climate Change's *Fourth Assessment Report* (IPCC 2007) and because stabilisation at 550ppm now lacks credibility as a level low enough to avoid dangerous climate change (London School of Economics 2008). 2 per cent of global GDP at 2007 levels is around US$1.3 trillion.[5, 6]

The IPCC in its fourth assessment report assessment surveyed different mitigation cost estimations of atmospheric stabilisation between 445ppm and 710ppm CO_2e (IPCC 2007). The costs associated with this ranged from around 3 per cent of global GDP to around -1.2 per cent (so a small increase in global GDP) between 2012 and 2030. Therefore, stabilisation at 445ppm would, in the IPCC's view, cost around $2 trillion at 2007 levels (ibid).[7]

There are, as the IPCC observes, major methodological differences between top-down, whole economy studies such as the *Stern Review* and studies based on a bottom-up assessment of the mitigation potential in different countries of a range of technologies.[8] A recent bottom-up study by McKinsey and Company finds that annual *incremental* economic costs could be between €200 billion and €350 billion ($273 to $478 billion) and in 2030 for a 35 per cent reduction in global emissions: less than 1 per cent of projected global GDP. Up front financing (capital expenditure) costs could be €530 billion per year in 2020 and €810 billion per year in 2030 (McKinsey and Company 2009).

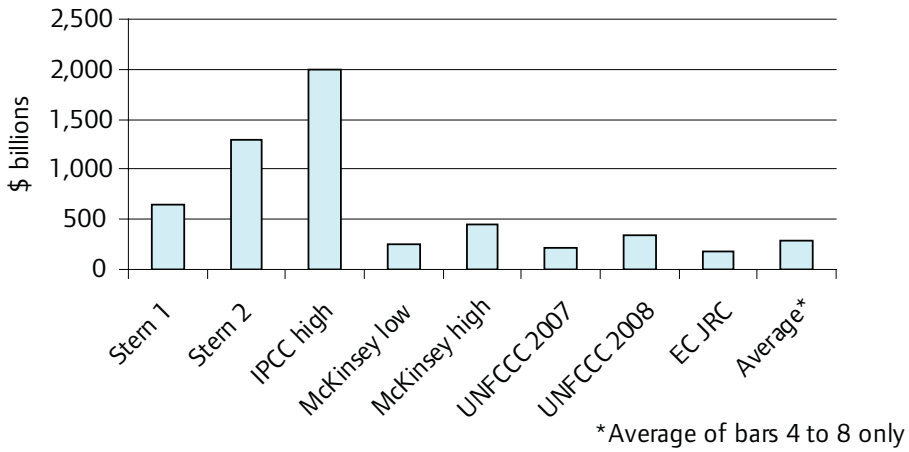
Estimates by the UNFCCC suggest that in 2030, additional mitigation financing and investment flows of $200 to $210 would be needed to reduce global emissions by more than 30 gigatonnes CO_2e, with $76 to $77 billion of the costs falling in developing countries (UNFCCC 2007). This has subsequently been revised up 'due to higher projected capital costs, especially in the energy sector' in a further report, requested by the Ad-Hoc Working Group on Long Term Cooperation at COP 13 in Bali (UNFCCC 2008). Its new mitigation cost estimates are 170 per cent higher as a result; around $350 globally per year in 2030, approximately $130 of which would fall in developing countries.

To support its recent Communication on the Copenhagen negotiations, the European Commission's Joint Research Centre has also completed a global costs analysis using its POLES model. It concludes that the annual cost of abatement reaches €152 billion ($207 billion) in 2020 in energy and industry (€81 in developed countries and €71 in developing countries) or €175 billion ($239 billion) if agriculture and avoided deforestation are included. This is based on developed countries reducing emissions by 30 per cent in 2020 compared to 1990 levels and an increase in developing countries of 20 per cent in the same period (a significant reduction against business as usual [BAU]).

5. According to the World Bank's World Development Indicators, September 2008, global GDP adjusted for purchasing power parity in 2007 was US$65.5 trillion.
6. The Economist Intelligence Unit's Foresight 2020 (2006) suggested global PPP-adjusted GDP would increase at an average annual rate of 3.5 per cent between 2005 and 2020, total growth of two-thirds. According to the World Bank, global GDP was around $60 trillion in 2005.
7. ibid, World Bank 2008
8. For a full discussion of the differences and similarities between top-down and bottom-up studies, see IPCC 2007, although the IPCC's assessment of the various cost studies does not include many of the recent studies mentioned in this paper.

Comparing cost estimates is difficult due to the many different sets of assumptions that underlie them (different technical data, different mitigation targets and baselines, different time-sets, global versus developed and developing world, and so on). The average – although more or less meaningless because of the mixed methodologies and varying assumptions – falls at around $670 billion per annum. Figure 1 shows instead an average of three recent studies: Mckinsey and Company; UNFCCC; and EC JRC which sums $289 billion per year (in 2020 to 2030).

Figure 1. Global cost estimates



The Catalyst Project[9] estimates that for a 450ppm CO_2e stabilisation[10], global emissions need to have been reduced by 17 $GtCO_2e$ in 2020 against BAU projects: 5 $GtCO_2e$ in the developed world and 12 $GtCO_2e$ in the developing world. Estimates by its Carbon Finance Working Group suggest the developing world cost will total an average of between €80 and €115 billion ($109 to $157 billion) per year between now and 2020. However, this breaks down further to mitigation costs of between €55 and €80 billion, €10 billion for R&D and €15 to €25 billion for adaptation.

Developing countries, through the G77 and individually, have proposed that to fulfil their obligations under Article 4.3 of the UNFCCC developed countries should commit financing in developing countries equivalent to between 0.5 and 1 per cent of their GNP – $200–400 billion.[11] This is likely intended only as an indication of scale rather than to imply any link to the long-promised and largely unmet OECD overseas development assistance target of 0.7 per cent of GNP.

Adaptation cost estimates also vary widely. The World Bank's (2006) often quoted estimate of $10 to $40 billion in 2020 has been joined more recently by Oxfam's (2007) estimate of more than $50 billion annually and the UN Development Programme's (2007) estimate of annual adaptation investment of $86 billion per year in 2015.

Even though cost assessments such as these have been useful thus far in showing governments the value of early action (even if not to persuade them to act)[12], each is based

9. The Catalyst Project has been established by the Climate Works Foundation to provide technical advice and expertise to negotiators in the UNFCCC process. See www.catalystproject.info/
10. Under the Catalyst Project's working scenario, atmospheric emissions concentration would in fact peak at 510ppm, returning to or dipping below 450ppm later.
11. According to the UN Statistics Division, the combined GDP of Annex I Parties in 2007 was $40,217 billion.
12. Governments in some developed countries, such as the UK, have built their own models to weigh up the costs of different options as they evolve in negotiations. Developing tools of this nature on an open access basis, for instance through open source software, to allow all countries to make such judgements may assist negotiators from countries with fewer resources to better judge options.

on a range of potentially highly variable assumptions. For instance, mitigation cost estimates use oil price projections. Oil prices, as recent experience has shown, are prone to high volatility. Each also assumes that climate change policy – especially that which relies heavily on market mechanisms – will plot the cheapest route to abatement. For instance, in its executive summary, the McKinsey reports prefixes its cost estimates by stating that its assumptions would hold '…if the most economically rational abatement opportunities are pursued to their full potential' (McKinsey and Company 2009).

However, in a recent critique of climate change policy to date, economist Dieter Helm identifies 'policy costs' as a major potential flaw in the economic logic of marginal abatement. Helm suggests that 'government failure, regulatory capture, and the impact of rent-seeking behaviour within the policy process' are likely to lead to an increase in costs when the abatement is undertaken in the real world (Helm 2008).[13] Costs are therefore likely to be higher, although by how much it is difficult to say because 'policy costs' are driven by political and not economic factors.

There is a wealth of literature exploring the reasons why low, neutral or negative cost abatement opportunities (no-regrets or win-win) are not taken up (for instance, see Sorrell et al 2004). Much of what has been written to date explores the problems of lack of take-up of win-win opportunities in industrialised economies, often at the household level (for instance, see NERA Economic Consulting 2007). But it is clear that it would be a mistake to assume that even negative-cost (money-saving) abatement happens automatically: such opportunities are by no means fully exploited even in developed countries with proactive approaches already in train.

The conclusion, therefore, of a brief scan of the existing estimates of the costs of mitigating climate change is that all are at best only broadly indicative and each different from the last or the next. A further problem is that mitigation potential – most adequately surveyed in McKinsey and Co (2009) – is in itself a dynamic concept. For instance, if more attention were paid early on to low-carbon innovation, mitigation potential in the future may increase. Similarly, if finance were frontloaded (and probably significantly scaled-up) to accelerate large-scale deployment of available or near market technology, in addition to a gradual pressure on the financial accelerator through cap-and-trade, future deployment might be cheaper sooner.

Future financing by developed countries of mitigation in developing countries, necessary in order to secure global action in the next decade or two, might therefore be built upon developing country plans for Nationally Appropriate Mitigation Actions (NAMAs). These could include decarbonisation projects, low-carbon development policies and measures and national (or regional) sectoral approaches and could pass through an international approval process – perhaps a technical body or set of regional panels accountable to the COP (that is, all UNFCCC signatories) – and be periodically reviewed to take account of the dynamic nature of decarbonisation. This could be viewed as being in keeping with the Bali Decision (UNFCCC 2007), which calls for:

> '…nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner.'

NAMA plans could then be financed either through a new, global fund or by using a range of channels monitored and evaluated by a new expert or technical body (see Section 4 below).

13. For instance, national treasuries in EU member countries are currently unwilling to earmark all, or in some cases any, of the money captured from the auctioning of emissions trading permits for spending on low-carbon measures. So while they will spend this money on something – the overall economic cost of auctioning should be zero – it may not be climate change mitigation measures that benefit.

2. Financing proposals

Where all the above estimates converge is on the notion that as a proportion of future wealth, mitigation costs will be trivial. However, viewed in absolute terms and on an annual basis, they are anything but. Article 4.3 of the UNFCCC notwithstanding, any reasonable measure of fairness in the distribution of these costs would see the lion's share likely to be borne by developed countries. However, the sums concerned are at least as big as current flows of official development assistance (ODA).[14]

The sums quoted above are also several times larger than current climate change finance. The largest existing pool is the $6.1+ billion pledged last year by 10 developed countries to the World Bank's brace of financing mechanisms known as the Climate Investment Funds (CIFs). While developing countries may yet cooperate with and participate in the governance of these funds, the G77 maintains that they cannot be counted as a fulfilment of Annex 1 (Annex II[15]) Article 4.3 obligations since they were not agreed under or channelled through the UNFCCC.

In addition, there are several funds for adaptation, three of which are under the governance of the Global Environment Facility, a World Bank trust fund, and the other – the Adaptation Fund – governed by a newly-established Board under the COP. The Adaptation Fund is financed by a levy on Clean Development Mechanism transactions and other contributions (see below). The GEF adaptation funds are drawn from voluntary contributions by developed countries and collectively amount to around $300 million (UNFCCC 2008) (as at October 2008).

From where would greater sums of finance capable of meeting the needs estimated above be drawn? Post-Kyoto Protocol, the answer is a family of financing proposals related to the allocation of emissions reduction commitments to Protocol countries (presumably including the United States – see below), the offsetting of these reductions elsewhere in the world and the sale of these emissions allowances by governments or at the international level to polluters.

Thus most post-2012 financing proposals to date presuppose a Kyoto Protocol-style system with expanded developed country cap-and-trade schemes as the principle instruments of climate change policy. It is worth noting, however, that this is a significant presupposition. The US, though rapidly changing direction on climate change policy after eight years of isolationism, and likely to introduce domestic cap-and-trade legislation soon if not this year, is by no means certain to ratify a future international agreement.

Moreover, the presumption that Kyoto-related mechanisms should be those from which finance to support global mitigation and adaptation is sourced is also contestable. Other sources of finance, mechanisms and approaches are open to policymakers and the biggest fillip for climate change mitigation hitherto is likely to come not from mechanisms related to international climate agreements but either from governments' domestic fiscal stimulus programmes, which are primarily designed to increase economic production in the face of recession, or from regulation, such as that used successfully in California.

14. According to the OECD's Development Assistance Committee, ODA in 2007 stood at $103.5 billion. *See Aid Targets Slipping Out of Reach?* (OECD 2008). The same report also observes how OECD countries are off track in meeting targets set in 2005 for increasing ODA from $80 billion in 2004 to $130 billion in 2010.

15. Annex II of the UNFCCC lists those Annex 1 countries – generally OECD excluding the transition economies – to which Article 4 applies. See http://unfccc.int/essential_background/convention/background/items/1348.php

Potential sources of financing

Below is a brief survey of potential financing sources, beginning with the Kyoto Protocol-related family, then considering a range of other funding proposals and sources and finishing with a brief discussion of frontloading or debt-based financing.

1. Offsetting

The principle of offsetting is well established in the current Kyoto Protocol through the Clean Development Mechanism. As it stands – although highly likely to be reformed in any post-2012 agreement – the CDM is project based, allowing industry in countries operating under Kyoto emissions limitation and reduction obligations (QUELROs) to purchase credits issued against abatement projects in developing countries.

Some emissions trading schemes (the EU's and Australia's) limit the proportion of domestic reductions that can be offset by purchasing external credits. To increase the flow of offset finance, schemes could either relax or remove this limit or set more ambitious targets with the aim of driving a more aggressive offset market.

Offsetting has already provided a steady if small (relative to the above cost estimates) stream of finance from developed to developing countries that has brought about some significant greenhouse gas abatement. While cap-and-trade schemes remain popular and indeed proliferate as a policy instrument for reducing emissions in developed countries, offsetting will provide a reliable stream of finance to developing countries and a similarly reliable supply of cheap reductions to developed countries.

In environmental terms, offsetting does not provide additional mitigation. Unless there were deeper reduction targets in developed countries, in effect deep enough to incorporate both developed and developing country reductions over a given period, then offsets would not drive mitigation in addition to that agreed by developed country reductions. And yet the avoidance of dangerous climate change now relies on mitigation in both developed and developing countries (Global Climate Network 2008).

Developed countries will argue they need to offset, especially as they deepen targets in second and third Kyoto commitment periods; offsetting is inevitable while market mechanisms persist. Developing countries are unlikely to accept an increase in offsets as a sole or even majority source of finance for low-carbon development.

Potential value: It depends on the depth of developed country emissions reduction targets, but the UNFCCC estimates that by 2020, offsetting of 0.4 to 1.4 $GtCO_2e$ at an average price of $24 per tonne of CO_2e could yield between $9.6 and $40.8 billion. With the carbon price currently depressed through oversupply, CERs have recently been trading at less than half this price.[16]

2. Leveraged or compulsory additional offsetting

The Catalyst Project's finance working group has suggested that offsets could be leveraged; for every one tonne of CO_2e offset in developed countries, several would be reduced in a developing country at a price related to the market price of carbon. Governments in developed countries would, in effect, be obliged to buy an agreed number of these high-priced offsets to make up the difference between their post-2012 obligations and their actual domestic emissions reductions. Similar proposals have been made that, for instance, suggest developed countries should procure agreed quantities of CERs from developing countries and retire them, rather than use them to offset domestic emissions (Müller and Ghosh 2008).

16. EU emission allowance (EUA) prices have been consistently below €10 per tonne since Autumn 2008. The CER price is necessarily below the EUA price. See www.pointcarbon.com

Such a mechanism has the potential to deliver greater emissions reductions and significant financing to developing nations. It is also similar in nature to some market-based Reduced Emissions from Deforestation and Degradation (REDD) proposals.[17] It would, however, require agreement from developed countries either to accepting deeper domestic emissions reduction targets or to leveraging offsets at higher ratios.

The appeal of offsetting is access to cheaper means of achieving gross domestic reductions, so this proposal may suffer from diminished political appeal. It would also replace rather than work within existing offset mechanisms, with the CDM perhaps operating only in least developed countries.

Potential value: Project Catalyst calculates that if developed countries were to take on an emissions reduction target of 40 per cent below 1990 levels by 2020 – a total of 11 $GtCO_2e$ – and offset around half at a 2:1 ratio (that is, for every tonne offset in a developed country, two would be reduced in a developing country), this would yield financial flows to developing countries of €95 billion per year, which would in turn pay for reductions of a further 6 $GtCO_2e$.[18]

3. Emission trading scheme levies

There is currently a levy of 2 per cent on the sale of permits (CERs) in the CDM, the proceeds of which go to the Adaptation Fund. This is likely to continue if the design of the CDM remains the same, and at COP 14 in Poland, in December 2008, developing countries proposed that a CDM-type levy be applied to all ETSs. The proposal was blocked by developed countries.

Potential value: The CDM levy could raise between $200 and $680 million annually in 2020. Bangladesh has proposed that it be increased to between 3 and 5 per cent, which could raise up to $1.7 billion. Brazil has recently hinted at a financing proposal that would see the levy on CDM trades being raised to 10 per cent (see Point Carbon 2009).

4. Domestic auction revenue

Rather than grandfathering emissions allocations in a cap-and-trade scheme, developed countries are increasingly auctioning permits up front, which both helps establish the price of carbon and provides a revenue stream to governments; it is a *de facto* carbon tax (although one whereby the revenue stream is determined by the market rather than by a government-set rate). Although the rents from auctioning are captured by developed country governments, it is argued[19] that a proportion of these could be set aside to support developing country mitigation (and adaptation).

Auction revenues can be used to purchase mitigation measures in excess of those taken on by developed countries. Also, governments are showing an increased appetite for auctioning permits in schemes, for instance the EU recently agreed to auction the majority, although not all permits in Phase 3 of its Emissions Trading Scheme.

Revenues from auctioning are, however, uncertain because the price paid by polluters will depend on whether demand for permits is high[20], which in turn is dependent on a series of

17. For instance, see Greenpeace's Tropical Deforestation Emissions Reduction Mechanism (Hare and Macey 2007) and Johann Eliasch's report for the UK Government (Eliasch 2008)

18. Project Catalyst estimates that to stay on track for a stabilisation at 450ppm CO_2e, the 2020 global mitigation target should be 17 $GtCO_2e$, 5 in developed and 12 in developing countries.

19. For instance by the Climate Institute in Australia, which proposed that 10 per cent of auction revenues from the country's cap-and-trade scheme should be directed to support mitigation in developing countries.

20. European governments are permitted to establish a reserve price for permits at auction. In the UK's case, for instance, this is determined by 'applying a discount rate and markdown to the prevalent secondary market price before the close of the bidding window.' See DEFRA (2009)

other factors. For instance, since Autumn 2008, the carbon price in Europe has fallen due to weak economic output. Revenues are also captured by national treasuries and may not be used to fund low-carbon activities let alone those activities in developing countries.

Potential value: If all Assigned Amount Units (AAUs) – circa 16 billion – were subject to regimes in which they could be auctioned, then post-2012, depending on the carbon price, upward of $300 billion could be raised by national governments. However, as an indication that full auctioning of all permits is some way away, the EU will not auction 100 per cent of its ETS permits (which in turn is only a proportion of its total AAUs) until 2027. In 2020 the ETS auction is expected to raise €30 billion annually, much of which is likely to be retained by national governments and used for general expenditure, with perhaps 50 per cent used to cover mitigation costs (Buchan 2008). Only a proportion, if any, of this is likely to go to support action in developing countries.

5. Upstream auction revenue (AAU hold-back)

Norway has proposed that 2 per cent of AAUs are held back at the international level rather than being assigned to countries (with QUELROs) and are auctioned to raise money for an international fund, primarily for adaptation and avoided deforestation. Others have proposed similar schemes with higher percentages of AAUs held back at the international level for more general mitigation and adaptation financing (Spratt 2009) or proposed similar principles but without specifying the quantity of AAUs to be held back (EC 2009).

AAU hold-back offers the potential for capture of a proportion of the rents from auctioning at the international level, yielding a flow of finance to the developing world (as opposed to leaving this to the discretion of individual governments). Indeed, it could be argued that to avoid capture of rents by national governments, all AAUs should be auctioned at the international level rather than at the regional or national level.

The volume of finance this would yield would remain uncertain as the price paid for the AAUs held back would be determined by the international carbon market. To overcome this flaw, a reserve price could be set using a methodology similar to that used by some national governments in auctions of ETS permits in order to guarantee a minimum level of finance.

The principle of AAU hold-back is included in the recent EC Communication and stands a good chance of becoming part of the EU's negotiating offer for Copenhagen. However, reserve prices or higher percentages of AAUs held back to yield greater and/or more predictable levels of finance will be resisted by developed country governments because costs would be passed on to their consumers while rents would be captured elsewhere.

Potential value: The UNFCCC estimates Norway's proposed auction of 2 per cent of AAUs would raise $15-$25 billion per year (UNFCCC 2007). Stamp Out Poverty, a UK development finance campaigning group, proposes the auction of 8 per cent of AAUs to raise $56 billion per year (Spratt 2009). The Catalyst Project has calculated that either selling 13 per cent of AAUs at €30 per tonne or levying a €4 per tonne charge on 100 per cent of AAUs would yield €70 billion (Catalyst Project 2009).

6. Crediting Nationally Appropriate Mitigation Actions (NAMAs)

A proposal by the Republic of Korea calls for a system of carbon credits for NAMAs to allow for actions to be taken early (UNFCCC 2008) and financed up front against a future sale of carbon credits on the international market. The credits would be purchased by developed countries, where deeper reduction targets would be agreed (so driving greater offsetting activity).

Korea's crediting NAMAs proposal fits well in principle with the Project Catalyst proposal above for leveraging offsets (in effect, creating deeper developing country mitigation targets through creating an offset ratio of greater than 1:1). However, NAMAs could in theory be credited by any stream of finance and even by debt-based mechanisms.

As well as providing an incentive for early action and keeping the global costs of mitigation low, crediting NAMAs might assist with the politics of a post-2012 agreement as it could help finance already planned low-carbon strategies in developing countries.

Potential value: This would depend very much on the scope and effectiveness of NAMA plans drawn up by developing countries and on the availability of developed country financing through a deepening of mitigation commitment.

7. Global taxation

Switzerland has proposed a levy of $2 per tonne of CO_2e at the national level in all countries with per capita levels above 1.5 tonnes, with countries retaining different proportions of the funds depending on their level of development; 40 per cent in the case of developed countries and 85 per cent for the poorest.

The appeal of a global carbon tax of this sort is that it would lead to a predictable level of finance, which could be deposited in an international fund. Notwithstanding the per capita threshold in the Swiss proposal, the costs of a flat carbon levy would fall regressively, although clearly, developing countries would retain a greater proportion of the rents collected than would developed countries. This could be addressed by building in further measures of development and therefore excluding from the levy a proportion of some countries' emissions below a given per capita level (in other words, a threshold methodology could be introduced for all countries or the taxable rate could be higher in developed countries).

Potential value: $2 per tonne levy on emissions of all countries with per capita levels above 1.5 tonnes would raise $48.5 billion per year of which $18.4 billion would be passed on to an international fund, according to the Government of Switzerland (2008).

8. Other levy-based proposals

There are several proposals for levies on emissions.

Least developed countries (LDCs) have proposed an international levy on aviation (IATAL), which could raise between $4 and $10 billion annually (UNFCCC 2008).

LDCs have also proposed a levy on bunker fuels for aviation and shipping, which could raise between $4 and $15 billion annually (UNFCCC 2008).

The Pacific nation of Tuvalu has proposed that permits for the emissions of international aviation and shipping are auctioned, raising $28 billion per year (UNFCCC 2008).

Brazil has also recently hinted at a €100 billion climate fund proposal involving an increase in the CDM levy and a 10 per cent tax on revenues from the production and trading of oil and coal (Point Carbon 2009).

9. Non-climate-related funding sources

Other funding sources, such as general overseas development assistance (ODA), a tax on currency transactions (Tobin Tax) or more broadly on financial transactions, revenue from untaxed income held offshore and the use of sovereign wealth, may all play a future role in climate change mitigation. For instance, the Tax Justice Network estimates that $11.5 trillion of private assets are currently held in offshore finance centres, which would yield an annual income of $225 billion if taxed at a conservative annual rate (Tax Justice Network 2005). Sovereign wealth funds worldwide currently hold almost $3.2 trillion (Balin 2008) as a result of taxing natural resource extraction, transferring foreign exchange reserves and sovereign debt disbursement.

Developed countries may prefer a financing arrangement that would see them channel climate financing through general development assistance programmes, targeted at the

poorest countries. For the negotiations, aside from the political difficulties associated with perpetuating what developing countries perceive as a donor-recipient relationship, working our precisely what is 'additional' to ODA is difficult when developed countries have yet to reach their 0.7 per cent of GNP target and will not do so for some years.

Recent stimulus packages announced in upward of 15 countries worth almost $2.8 trillion have an estimated climate change-related content of $430 billion (HSBC 2009).[21] The United Nations Environment Programme has proposed that one-third of stimulus packages be spent on climate change mitigation or environment-related activities. Most if not all stimulus package finance will be spent domestically by the governments concerned, although the World Bank has proposed a 'vulnerability fund' into which countries would pay 0.7 per cent of their value (World Bank News & Broadcast 2009).

10. Frontloading finance

The EC in its recent Communication has proposed a Global Climate Financing Mechanism, which would be designed to frontload climate financing, especially for adaptation measures. It is similar to the International Finance Facility for immunization, in which developed countries issue bonds against future development (ODA) spending in order to frontload financing.[22]

Although in the Commission's words 'These funds would in particular allow for an immediate reaction to urgent adaptation needs', frontloading using bonds raised against the guarantee of tax revenue in developed countries could be a very useful means of leveraging private sector finance into a whole range of mitigation measures and into REDD, too.[23] Indeed whereas adaptation measures may offer a limited prospect of returns on investments and so government borrowing would be repaid by taxpayers, mitigation measures – especially energy saving and energy efficiency investments, but also energy infrastructure – could prove profitable.

Developing countries are understandably cautious about debt-based financing instruments; a hangover perhaps from past debt crises. However, the EC's Global Climate Financing Mechanism hints at an interesting proposition whereby developed countries guarantee lending for well structured developing country projects and policies. This approach could provide another – perhaps significant – increment towards the fulfilment of developed country obligations.

The cost of finance through government bonds is determined by the credit rating of the issuing government, governments or organisation. If the bond is issued by the World Bank, which has an AAA rating, or by AAA-rated governments only, then financing is cheaper because it is judged by investors to be less risky (in other words, robust public finances guarantee that even if a project fails, investors will not lose their money). However, even an EU-wide bond would be more expensive; in practice, there are only a handful of governments and the development banks that could issue such bonds.

Also, were any significant funds built up at the international level through any or a combination of the above mechanisms (that is, AAU or permit auctions, levies or taxes), the fund could be used to supply concessional lending in addition to grants-based finance. Again, this approach would be particularly appropriate for financing the negative cost measures developing countries might take.

21. Some of the measures included in the $430 billion figure, such as spending on improvements to railways – a large proportion of China's stimulus package – would not necessarily be counted as low-carbon activity in, for instance, McKinsey and Company 2009.
22. See www.iff-immunisation.org/01_about_iffim.html
23. The Prince's Rainforest Project argues that most deforestation will take place before global carbon markets are fully functioning and therefore frontloaded finance will be necessary to ensure early action to reduce deforestation emissions takes place. See Prince's Rainforest Project (2008).

Another appeal is that debt-based mechanisms essentially borrow long term from future, presumably wealthier, generations who might be glad to see climate change mitigation measures taken now.[24] This might remove some of the short-term political pressure on developed country governments, whose contributions to global climate financing must otherwise be drawn from an increase in costs to today's taxpayers or consumers (Foley 2007), measures that are likely to prove increasingly unpopular domestically (Lockwood and Pendleton 2009).

24. Current finance crisis notwithstanding, global GDP is projected to grow beyond $100 trillion annually by 2020.

3. Building a North–South finance package

Breaking the impasse at the heart of the ongoing UNFCCC negotiations relies on the fulfilment of two areas of the Convention that are of particular importance to developing countries, whose participation in 'long-term cooperative action' is essential if the overall objective of the Convention is to be realised. These are equity, and the obligations of developed countries, as listed in Article 4.

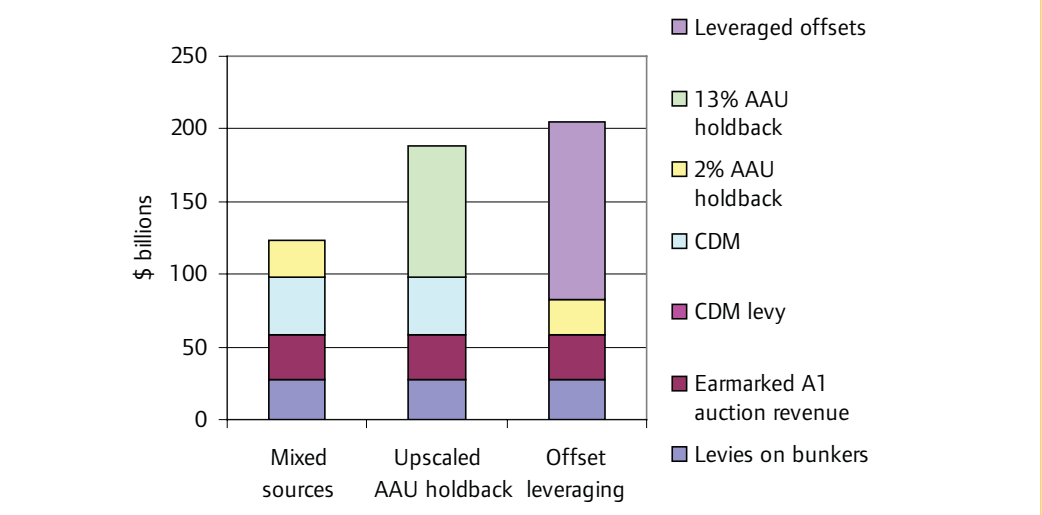
The preamble of the Convention calls for '…the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions.' There is currently no agreed means at the Convention level by which to quantify and therefore differentiate between levels of action beyond a crude division of developed or 'Annex 1' countries and developing or 'non-Annex 1' countries.[25]

Related to this, the second important area of the Convention for developing countries is its Article 4, which lists the obligations of developed countries. In particular, Article 4.3 states that developed countries '…shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations…'. The key words are 'agreed full costs' as it states that the full incremental costs of mitigation and adaptation in developing countries should be paid by developed countries but also implies that the volume of these must be agreed.

While developing country mitigation costs are, by all estimations, a small fraction of current and future developed country wealth, the bill – the same or more than the current sum of OECD countries' ODA outlay – is large and, while the Kyoto-type approach predominates, must be paid by consumers and taxpayers in developed countries. There is a very real threat of a political backlash from developed country populations should governments commit them to international as well as national incremental costs (Lockwood and Pendleton 2009). This may prove especially troublesome at a time of economic hardship.

Nevertheless, within the current structure of the negotiations, the *agreed* financing is likely to come primarily from Kyoto-type sources, especially while developed countries remain committed to putting in place and linking up national or regional carbon markets. Therefore, the choice is between a number of different combinations or 'wedges' of measures that add up to an *agreed* sum (see Figure 2 below). Some, such as the CDM and offset leveraging,

Figure 2. Financing 'wedges'



26. Developed countries bound by the Kyoto Protocol have differentiated targets as laid out in its Annex B. Differentiation in terms of mitigation effort has also taken place inside the European 'bubble'. Further differentiation between European nations according to levels of emissions, GDP, population and abatement efforts to date is proposed in the Commission's recent Communication.

are incompatible (offset leveraging would replace the CDM). Others, such as AAU hold-back, can be scaled up but begin to appear politically less viable the larger they become.

What this illustrates is that a more significant sum is possible by emphasising one type of financing within the mix. However, the choice presented in Figure 2 is something of a Hobson's choice for developed country governments as the ultimate source of the financing is the same one, as argued above. Given this, developed country governments may decide the simpler approach of enhancing one mechanism is preferable to a more complex collection of measures.

Mexico[26] has proposed that a World Climate Change Fund be established. All countries would contribute to the fund according to their level of cumulative emissions, population and ability to pay, but developing countries would be net recipients. The EC's Communication (2009) also contains a proposal based on Mexico's, with countries contributing to a fund according to an agreed formula.

These proposals are more structural and institutional than concerning the source of finance but, linked to other funding proposals, could provide a means by which finance is channelled and could be linked to equity principles. The money channelled through such a fund could then be spent on both developed and developing country actions, with a weighting towards the latter. In addition, Mexico's proposal contains an inherent incentive for contributors (which is stronger in the case of developing than developed countries); if countries chose to opt out of making contributions to the fund, they would not receive finance.

The Mexican proposal faces two political obstacles. The first is that it requires contributions from developing as well as developed countries, something the G77 en masse has staunchly resisted, citing Article 4.3 of the UNFCCC.[27] The second is the ambivalence of developed countries towards the establishment of a new fund. Typically their view is that it could be inefficient and wasteful and risks incurring transaction costs, diminishing the value of the finance raised.

Given this, and the sheer scale of financing required (and the unwillingness of taxpayers and consumers in developed countries to effectively more than double the amount of financial assistance they give to developing countries), official climate financing – what is counted as a fulfilment of developed country financing obligations – should accommodate a variety of *agreed* financial flows. This might include additional, climate-related ODA, such as that currently flowing through the World Bank's Climate Investment Funds[28]. It might also include the use of debt-based instruments such as frontloading through a climate-related finance facility and government backed climate bonds.

Entangled with the decision about *how* to finance climate change mitigation internationally is the equally politically charged discussion concerning the structure and mechanism by which the funding might be governed, allocated, channelled, monitored and verified (which has so far dogged the setting up of the Adaptation Fund). This discussion also centres on a choice between two different models: the single Mexican- or G77-fund approach versus a more eclectic system with some form of clear international verification of finance flows and of the projects, policies and measures implemented in developing countries.

26. Note that Mexico is a non-Annex 1 country but that it is an OECD and not a G77 member
27. Article 4.3 states that developed countries should meet the '…agreed full costs incurred by developing countries…'
28. However, there has been a heated debate concerning whether or not that finance is additional, since much of it comes from countries that are yet to meet their promised ODA level of 0.7 per cent of national wealth.

While developed countries are likely to be cautious in their approach to the establishment of a new, global fund, the European Commission in its recent communication (EC 2009) has highlighted an approach in the style of the Mexican proposal. There are also precedents for international funds that are not wholly within the development bank structures:

- The Global Environment Facility, taken out of World Bank governance in 1994, administers financial flows under existing environmental treaties, such as the Convention on Biodiversity and existing UNFCCC monies. Further changes would be required to its governance, but it is a proven operator of environmental financial transfers. (See www.gefweb.org)
- The Global Fund to fight AIDS, TB and Malaria has disbursed $11.4 billion since 2002, but its structure, which uses the World Bank as a trustee only, establishes a useful precedent. The Global Fund has a board made up of donors, recipients, NGOs and representatives from affected communities and an independent technical review panel that guides the board on funding decisions. (See www.theglobalfund.org)

One of the reasons why the European Commission may favour a 'Mexican-style' fund is because European member states currently pay into the European Structural and Cohesion Funds, which are conceptually similar. The purpose of the funds is to assist poorer regions and member states and to better integrate European infrastructure; they account for more than one-third of the EU's budget. Most notably, while all member states contribute to the funds, some receive more assistance than others.

The alternative to a global fund is a new international body[29] to approve and verify developing country NAMAs and to monitor, report on and verify finance flows from developed countries. Such an authority would keep a global inventory of measurable, reportable and verifiable (MRV) developed country finance and developing country mitigation actions. There is no precedent for a body of this sort, but it might build on the experience of the CDM board. However, it would also need teeth and it is not at all clear what sanctions would be sufficient to ensure developed countries met agreed financing obligations. The global fund model also suffers from this problem.

29. Although the global fund model would also need a body to apply standards to mitigation.

4. Allocating financial obligations

Fairness (or equity, in the words of the UNFCCC) will be a key component of climate change policy and of a framework at the international level, as well as in national policy. It is arguably easier to apportion costs progressively, especially at the national level, than it is to share out remaining greenhouse gas emissions.[30] At the international level, the concepts of 'responsibility' – current and past contributions to the atmospheric stock of emissions – and 'capability' – the capacity of a nation to contribute towards the mitigation of future emissions – at the heart of the UNFCCC could form the basis of a methodological approach to fairness.

While these principles have been applied to determine fair shares of mitigation effort (through effort sharing, such as currently in Annex B of the Kyoto Protocol or within the European Union Kyoto 'bubble'), they are yet to be used to determine fair shares in terms of the costs of mitigation. However, such principles – especially those concerning ability to pay – are applicable to financial effort-sharing, too.[31] Further, if developed countries are to fulfil their UNFCCC obligations and to do so in a manner that is measurable, reportable and verifiable, as the Bali Decision states (UNFCCC 2007), then sharing out Article 4.3 financing commitments according to a clear, defensible methodology will be necessary.

A variety of existing proposals for post-2012 climate frameworks or regimes take into account measures of equity. For instance, the recent Carbon Budgeting proposal developed by the Chinese Academy of Social Sciences adjusts per capita emissions to take cumulative past and future emissions, natural resource endowment and other factors into account. Other frameworks, such as Kyoto 2, which is a proposal for upstream carbon trading, and other market-based proposals deal with equity ex-post, by distributing the proceeds of trades in a progressive fashion (see www.kyoto2.org).

The Greenhouse Development Rights Framework ('GDRs' – see EcoEquity 2008), a well-known, equity-based, burden-sharing climate change framework proposal, is perhaps unique in that it quantifies 'responsibility' and 'capability', the Convention's equity principles. GDRs allocates mitigation effort and adaptation cost according to a global responsibility and capability index (RCI). Responsibility is calculated by taking into account cumulative emissions per capita since 1990 and capability is measured as PPP-adjusted GDP per capita above an income threshold of $7,500. The two indicators are combined with equal value (1:1) to arrive at a single index.[32]

Table 1 shows the shares of global mitigation effort (in percentage terms) countries and groups of countries are assigned once 'flat' national shares are adjusted to take into account responsibility and capability. Note that while Annex 1 countries have a less than one-fifth share of global population (and now emit less than half of gross annual emissions) they are assigned 77 per cent of the global mitigation burden in 2010 declining, because of assumed increased wealth and rising emissions in the developing world, to 69 per cent in 2030 and 61 per cent in 2030.

30. For instance, it has been noted that poorer people in developed countries may have high emissions but may also face greater barriers to reducing them. Equally, poorer people in developing countries do not need access to a growing emissions budget if they have access to low-carbon energy technology.

31. The costs of mitigation globally vary significantly from country to country and so mitigation cost allocation is not a direct proxy for emissions allocation. However, this paper largely focuses on mitigation costs in developing countries only (aside from in the sections focusing on global fund-based proposals) and therefore assumes the GDRs burden-sharing approach would be adequate without significant revision.

32. RCI = aC + bR where a and b sum 1 and each have a 0.5 value.

Table 1. GDRs results for representative countries and groups

Year	2010					2020	2030
	Population (% of global)	GDP per cap. (US$ PPP)	Capacity (% of global)	Responsibility (% of global)	RCI [1] (% of global)	RCI (% of global)	RCI (% of global)
EU 27	7.3	30,472	28.8	22.6	25.7	22.9	19.6
EU15 [2]	5.8	33,754	26.1	19.8	22.9	19.9	16.7
EU12 [3]	1.5	17,708	2.7	2.8	2.7	3.0	3.0
United States	4.5	45,640	29.7	36.4	33.1	29.1	25.5
Japan	1.9	33,422	8.3	7.3	7.8	6.6	5.5
Russia	2.0	15,031	2.7	4.9	3.8	4.3	4.6
China	19.7	5,899	5.8	5.2	5.5	10.4	15.2
India	17.2	2,818	0.7	0.3	0.5	1.2	2.3
Brazil	2.9	9,442	2.3	1.1	1.7	1.7	1.7
South Africa	0.7	10,117	0.6	1.3	1.0	1.1	1.2
Mexico	1.6	12,408	1.8	1.4	1.6	1.5	1.5
LDCs [4]	11.7	1,274	0.1	0.04	0.1	0.1	0.1
Annex I	18.7	30,924	75.8	78.0	77	69	61
Non-Annex I	81.3	5,096	24.2	22.0	23	31	39
High income	15.5	36,488	76.9	77.9	77	69	61
Middle income	63.3	6,226	22.9	21.9	22	30	38
Low income	21.2	1,599	0.2	0.2	0.2	0.3	0.5
World	100	9,929	100%	100%	100%	100%	100%

Notes: [1] Responsibility and capability index; [2] The 15 countries that made up the EU before May 2004; [3] The 12 countries that joined the EU in 2004 and 2007; [4] Least developed countries

Since the RCI is sensitive to national per-capita wealth it can be considered indicative of the capacity of a country to contribute to the global costs of mitigating (and adapting to) climate change. It therefore lends itself well to financial burden sharing. However, in order to apply the RCI to the financial obligations of developed countries under Article 4.3 of the UNFCCC, it is useful also to consider how financing would be shared among only developed countries with obligations under the Convention (that is, Annex II) and to remove from the index non-Annex 1 and transition economies and redistribute the RCI around Annex II countries.

Table 2. RCI For Annex II only (AII countries provide 100% of finance between 2010 and 2020)

Year	2010		
	Pop'n (% of global)	GDP per cap. ($US PPP)	RCI (% of aII)
EU15 [1]	5.8	33,754	32.9
Germany	1.20	34,812	7.8
UK	0.9	34,953	5.3
France	0.91	33,953	4.6
United States	4.5	45,640	47.7
Japan	1.9	33,422	11.2
Others	1.0	38,149	8.2
Annex II	13.2	30,924	100

Note: [1] The EU's 12 accession countries are not listed in Annex II but probably exposed to Article 4.3 obligations as a result of their EU membership. However, because of their relatively marginal impact on the big picture in this table, they are not included in the calculation.

The RCI in Table 2, adjusted from the original in the GDRs framework, therefore provides a progressive (equitable) formula that can be used to share out Annex II countries' Article 4.3 obligations (that is, where countries listed in Annex II pay for all agreed new and additional developing country costs). As an indication of the sums involved, the right-hand RCI column also serves as the relative shares of a $100 billion developing world financing package (the same numbers representing billions of US dollars rather than percentage shares of the RCI).

In the original GDRs framework the RCI is used to divide emissions reductions. This of course implies that developed countries finance mitigation beyond their own borders, since adjusting obligations according to the RCI creates developed country targets that probably go beyond technical feasibility and, at some point, may amount to more than 100 per cent of their emissions. A GDRs financing framework would make this explicit; the RCI would apply to financing *by* developed countries *in* developing countries, in effect as a proxy for emissions reductions.

Ways of using a responsibility and capability index

An RCI of this sort – either an all-country or Annex II-only index – could be used in different ways:

1. Global fund

The RCI in Table 1 can be used to calculate fair shares in a Mexican-style World Climate Change Fund or something along those lines (a global climate change structural fund, perhaps). As with the EU, all countries contribute to such a fund with their contributions being set on the basis of RCI shares. All countries would also receive finance from the fund[33], but those with a lower RCI would receive more, with developing countries being net recipients and least developed countries receiving several times the sum they contribute.

The RCI in Table 1 illustrates the relative scale of different countries' annual contributions. For instance, in a $250 billion global fund[34], the US's share would be $82.7 billion in 2010 and would fall to $72.75 billion in 2020. China's contribution, on the other hand, would be $13.75 billion in 2010 and would increase to $26 billion in 2020. Similarly, the EU15's share in 2010 would be $57.4 billion, falling to $48.8 billion in 2020 while India's share in 2010 would be $1.3 billion, increasing to $3 billion in 2020. The dynamism of the RCI, taking into account changing shares of responsibility for the atmospheric stock of greenhouse gases and relative GDP growth, is an added advantage.

However, financial flows *into* the fund are only half the story. Countries could also receive financing on the basis of the RCI. Unlike the inflows, the fund's disbursement would be based on a range of factors, including nationally appropriate policies, programmes and projects in national action plans, mitigation potential and cost per tonne of abatement. However, the RCI would also be required to guide disbursement and would need to be broadly indicative of the net levels of funding a country would receive, with countries at different levels of development being placed in disbursement 'bands'.

It is significant that this model has been included in the European Commission's recent Communication on its Copenhagen negotiating position (EC 2009). The EC proposed, as one of two alternatives for innovative financing, a fund to which contributions are 'based on a combination of the polluter pays principle (i.e. total amount of allowed emissions) and its

33. Mexico's submission to the UNFCCC regarding its World Climate Change Fund proposal states that 'In principle, all countries, developed and developing, could benefit from the Fund.'
34. Estimates of the incremental costs of global mitigation suggest that a minimum of around $250 billion per year would be required, notably McKinsey and Co 2009. See Section 1 of this paper.

ability to pay (i.e. GDP/capita)'. Further, the EC Communication uses four indicators to arrive at a burden-sharing formula for Annex 1 country mitigation. These four indicators – GDP per capita, emissions intensity relative to GDP, early action on emissions abatement, and population growth – could conceivably also be used, along with a clearer 'responsibility' measure, as the basis of weighted contributions to a fund.

2. Article 4.3 (Annex II) fund

Table 2 illustrates how the RCI would distribute the financial burden around Annex II countries only, were developing countries successful in negotiating the full implementation of the Convention's Article 4. The RCI shows the fair shares contributions that would be required from different Annex II countries towards a developing world financing total of $100 billion.

The EU15 (that is, the Union without its newest entrants) and the US, under this version of a global fund, are clearly liable for the lion's share of contributions: $33.9 billion and $47.7 billion respectively. These sums represent a net transfer from developed to developing countries as under this model contributing countries themselves would receive nothing from the fund.

Disbursements from a fund to which only Annex II countries contributed could still be made according to a set of criteria, including nationally appropriate actions and plans, mitigation potential and cost per tonne of abatement and recipient countries could still be banded according to their RCI, which would determine the approximate overall level of funding they would receive.

3. Assigned Amount Units (AAUs) auction or offset aggregator

The RCI could also be applied to Annex B countries, in practice the same as Annex 1.[35] Annex B countries, however, have quantified targets to reduce emissions and whether they have ratified the Kyoto Protocol or not (the US has not), each is assigned a quantity of reductions over a period of time, in theory if not in practice. Current targets expire in 2012; Protocol signatories are currently discussing post-2012 targets.

Norway has proposed the hold-back of 2 per cent of the Annex B AAUs at the international level (see Section 2 above). As already discussed, this relatively small AAU hold-back would not raise a sufficiently large sum alone. However, were this proposal scaled up, as some have suggested it should be, then it could raise sufficient finance to supply a global fund.

Since with AAU hold-back, countries would not be providing direct finance, but sacrificing a proportion of the permits they would otherwise auction at the national level for international auction, the RCI could be applied once the overall target for hold-back was agreed. So were an overall hold-back target agreed of 10 per cent of AAUs, then rather than each country sacrificing a flat 10 per cent of its AAUs, each would be given a different proportion relative to its RCI ranking and so countries higher up the RCI would have more than 10 per cent of their AAUs held back and vice-versa.[36] A proposal by Aprodev (2009) proposes holding back 25 per cent of AAUs overall and using the GDRs RCI to decide which Annex 1 countries sacrifice what proportion of their AAUs.

35. Annex B of the Kyoto Protocol lists countries' quantified emissions reduction and limitation obligations. In practice, an RCI for Annex B includes all Annex 1 countries except Belarus and Turkey. See http://unfccc.int/kyoto_protocol/items/3145.php

36. A precise calculation of this is difficult because the proportion of AAUs countries would sacrifice relative to the headline Annex 1 percentage held-back would depend on how comparability of effort was agreed among Annex 1 countries. Arguably, the RCI could be deployed both for a fair Annex mitigation burden share and then to determine each countries' proportionate AAU sacrifice.

Allied to, but structurally different from, the AAU hold-back proposal is the notion of leveraging offsets, also discussed above. The RCI could also be applied to a leveraged offset to weight the degree of leveraging required according to the different RCI rankings of Annex 1 countries, particularly if Annex 1 country reduction targets did not adequately reflect inequities from one to another. For instance, project catalyst calculates that if Annex 1 countries collectively share a 2020 reduction target of 40 per cent relative to 1990 and offset around half – 6 $GtCO_2e$ – then they would need to leverage at a ratio of 2:1 to ensure developing world reductions of 12 $GtCO_2e$.

Thus, as with AAU hold-back, beneath a headline agreement by Annex 1 countries to purchase 2 tonnes of developing world reductions for each tonne offset (thus achieving developing world reductions in addition to, rather than instead of, developed world reductions) some, such as those in the EU15 or the US, might be required to leverage at 4:1 and others might merely offset.

4. Responsibility and capability index as the basis for a global inventory

The politics of a financing system that relies heavily on a single mechanism, such as AAU hold-back or offset leveraging, and on an RCI to provide its orientation may prove prohibitive, not least because it would involve – by definition – conspicuously large sums of finance flowing to developing countries from a handful of developed countries. This is in part the point: climate equity by any reasonable measure involves the commitment of significant financial support on the part of those most responsible and most able to pay.

But if a grand bargain is to be struck against the backdrop of extreme financial constraint, then the mechanics may need to be more complex in order to accommodate a range of sources and exploit a range of channels, existing and new. And while it might be seen as unsatisfactory by some negotiators and observers, a more eclectic, multi-channel approach to climate financing – significantly one that is more comprehensive and robust than the EC's proposed Facilitative Mechanism for Mitigation Support – might be the quid-pro-quo for developed countries' fulfilment of *agreed* financing obligations.

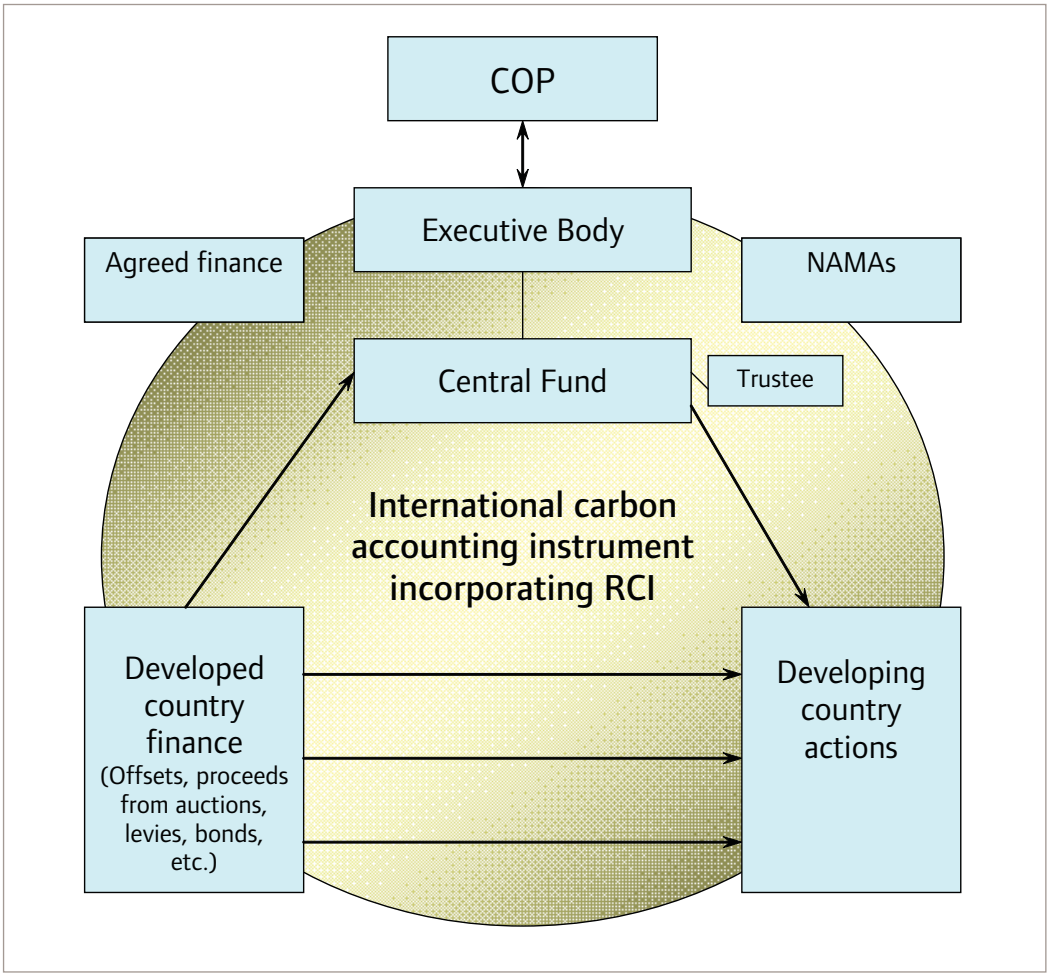
Rather than a single fund for climate finance or the scaling up of mechanisms explored above, negotiators could instead focus on developing an institutional structure capable of measuring, reporting and verifying financial flows from a variety of developed country sources. This could take the form of a COP-accountable executive body to keep the finance-mitigation global balance sheet. Such a body could: measure, report on and verify financial flows through a variety of agreed channels; measure, report on and verify reductions made in developing countries as a result of finance; agree policy and act as a focal point for the development of best practice; report frequently to the COP on compliance; and make recommendations for policy development.

Such a body would need to capture and record all *agreed* (i.e. that which is listed as admissible in a future agreement) within the bilateral and multilateral financing of climate change mitigation. This might include: CDM or its successor (the COP already has oversight through the Executive Board); additional bilateral or multilateral ODA for climate change mitigation; auction revenues channelled overseas; flows from levies and taxes; government-backed international climate bonds; other debt-based flows. It would also support the development of and approve non-Annex 1 country NAMA plans, monitor their implementation and help match up different flows of finance and different mitigation actions.

In such a system, an RCI would be used as the accounting methodology. Agreed finance in the spirit of Article 4.3 of the UNFCCC would therefore not only apply to an overall sum but also to developed country national financing targets whose volume (i.e. as a proportion of the overall agreed volume) would be determined by an RCI. Agreement would also be

needed over what types of finance would qualify; only these would then be measured, reported on and verified by the new international body.

A more eclectic financing system tolerant of a wide variety of finance flows and with COP oversight via an executive body might also fit well with other suggested bodies, such as a Technology Development Executive (E3G 2008) and proposals for REDD. Both of these areas – each also critical to a post-2012 agreement – require finance and might therefore be accounted for and verified through the executive body. Indeed, a more eclectic system that aggregated finance from a variety of sources and was capable of monitoring and verifying a number of financing channels might be better equipped than a single source or fund at responding to the variety of challenges within the UNFCCC negotiating mandate. The diagram below outlines how such a body might fit within an agreed, multi source-multi channel financing arrangement.



Conclusions

Finance will play a critical role in the mitigation of and adaptation to climate change. Without flows of additional finance, the upfront costs of new investments, in deployment of low-carbon technology and in R&D and the ongoing incremental cost difference between carbon-intensive and low-carbon approaches will not be met.

The various estimates of incremental costs are unsatisfactory. While being based in many cases on rigorous analysis, especially of mitigation opportunities in different countries, there is a high degree of uncertainty over future factors that will have a significant influence on costs. In particular the behaviour of governments, officials and populations is deeply unpredictable; 'policy costs' may prove significant and the most cost-effective route to decarbonisation may not be the one taken.

Nevertheless, there is a convergence in cost estimations around $100 billion to $200 billion for developing world costs and around $200 billion to $400 billion for global costs. Adaptation costs will add significantly to these sums and are now unavoidable regardless of the pace and depth of mitigation.

A plethora of funding proposals, each meretricious in its own right, masks what is essentially a choice between Kyoto Protocol-style mechanisms reliant on the development of the existing regime on the one hand and proposals that tap into other types of finance on the other. The most developed of these proposals – leveraging offsets, AAU hold-back and up- and downstream auctioning – appear the most relevant because they dock with existing international climate policy. However, these are all based on the assumption of an expansion of carbon trading, which may prove optimistic. Profound problems with the European Emissions Trading Scheme, the only developed world scheme currently up and running, have proved difficult to address.

The cost burden in Kyoto Protocol-related mechanisms essentially falls on the shoulders of consumers in developed countries. Already, as a result of volatile energy prices and existing policies to reduce emissions and increase low-carbon energy use, consumers are sensitive to further levies on consumption. Increased costs as a result of meeting international obligations, on top of domestic efforts to decarbonise, may prove difficult for developed country governments to justify in domestic politics.

Nevertheless, the UNFCCC in letter demands that agreement be reached on the scale of new and additional costs and that these are met by developed country – specifically Annex II – parties. It remains to be seen whether developed countries will acquiesce to this. If they do, then for political sustainability policymakers might do well to consider a blend of financing options both related to existing mechanisms and that are innovative. This could involve a balance between mechanisms that impose costs on today's consumers and taxpayers and frontloading finance through the use of bonds and other debt instruments to depreciate costs over time. Government-led debt finance may also help attract greater participation in developing country low-carbon finance by private-sector investors.

Developing countries clearly favour a new, global fund under the COP, but baulk at the notion that they should also contribute to these funds. There is evidence that developed countries might accommodate a Mexican-style fund, but will want developing countries to finance low-cost mitigation themselves (EC 2009). They may also want to use existing channels, such as the World Bank, and continue to pin most of their hopes on the expansion and development of carbon markets as the principle source of finance. In the absence of developing country commitments or measures to leverage offsetting, financial flows would be through offsets, achieving no mitigation additionality.

Almost regardless of the approach taken to financing, the RCI in the Greenhouse Development Rights Framework can provide a good basis for determining or measuring the proportion of

total finance different countries should be committing. The RCI was designed to allocate mitigation effort but can, with little if any modification, be used to allocate financial effort.

In the case of a global fund, the RCI is the ideal indicator for the contribution levels of all countries and indicates that some, larger developing economies would be donors as well as recipients of finance. The RCI can equally be used as a means to determine the sum that different developed countries would be obliged to provide to such a fund to meet their existing UNFCCC obligations.

In the case of an expanded single mechanism, such as holding back and auctioning a proportion of developed countries' AAUs at the international level or leveraging offsets, the RCI could also be used or adapted to illustrate relative levels of financing required from different countries. For instance, an adapted RCI could be used to determine what percentage of a country's AAUs was held back internationally.

The RCI can also be used as the methodology for a global accounting mechanism. Rather than mandating a global fund, this approach would require the COP to establish a new executive body, or perhaps expand the CDM Executive Board's mandate, to measure, report on and verify developed countries compliance with agreed levels of finance, keeping track of a variety of *agreed* parallel financing channels. The same body could also monitor, report on and verify nationally appropriate mitigation actions by developing countries and could operate alongside or oversee technology and REDD mechanisms.

As ever, the political challenges are the most profound. If there was an appetite to transfer finance from developed to developing countries before the finance crisis and resulting recession, it is likely to have been lost amid bank bailouts and the underwriting of toxic assets. However, it is difficult to conceive of agreement in Copenhagen without such finance flows; if developed countries are to agree then what will they demand in return? It could be that the US might want to see other, non-climate measures, such as a revaluation of the Chinese Yuan against the US dollar.[37] Such measures may indeed be necessary to dress up a new climate agreement in other clothes to help improve its domestic political acceptability in developed countries. Thus other forums, such as the G8 and G20 processes, are important.

Similarly, what will be developing countries' price and will volume of finance be more important than the mechanisms and channels by which it is transferred and the governance of the institutions that are given oversight? The debate concerning the Adaptation Fund and its governance has illustrated that the latter is at least as important as the former.

This paper therefore concludes that it is important to balance the obvious practical and political need for finance flows from developed to developing countries and the concern of developed countries surrounding use of finance and the costs such approaches may impose on developed populations. This suggests an eclectic approach coupled with a robust system of standardisation and accounting is needed. For such a system to form a viable part of a future climate change framework it would need the full agreement of developed and developing countries. While tolerant of a variety of sources and channels of finance and of a range of mitigation actions, it would also need to be demonstrably fair, transparent and robust in its methods and to have recourse to the Committee of Parties to the UNFCCC for enforcement.

Whatever political considerations dominate negotiations and shape the final outcome, designing a climate finance regime that meets these criteria – especially one that is based on clear indicators of equity – can help both during this year's negotiations and in post-Copenhagen domestic debates in developed and developing countries alike. An index of responsibility and capability of the type used in the Greenhouse Development Rights framework is quite clearly capable of providing a reference for observers and negotiators and a substantive basis for negotiation.

37. On the new US administration's second day in office, Tim Geithner, Obama's Treasury Secretary, indicated his concern over the valuation of the Yuan in relation to the Dollar in a written statement to the Senate's Finance Committee.

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