ASSESSING THE ALTERNATIVES

Financing climate change mitigation and adaptation in developing countries

A report for Stamp Out Poverty

by Dr Stephen Spratt
of the **new economics foundation**

STAMP OUT Poverty

nef

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Executive summary

The global climate is changing, fast. And this is the direct result of human activity. It is broadly accepted that we need to restrict global temperature increases to as far below 2°C as possible if we are to avoid triggering runaway, irreversible and catastrophic climate change. This is very probably the greatest challenge and danger that mankind has ever faced, and evidence is mounting that time is rapidly running out if we wish to "preserve a planet similar to that on which civilization developed and to which life on Earth is adapted." (Hansen, et al, 2008)

The science is clear: the process of industrialisation has caused the concentration of greenhouse gases in the atmosphere to steadily increase. By the middle of 2008 CO_2 equivalent concentration levels had reached 420 ppm and emissions continue to rise at a rate of 3% every year. Whatever else happens, we will need to adapt to the climate change that is already 'in the system'. At best this will be a 1.5–2.0°C increase, and the impacts will be felt hardest by the least able to cope: the poorest countries in the world and the poorest people within these countries.

Moreover, the tragic fact is that those who stand to lose most through the effects of climate change have little or no responsibility for creating it: it is the cumulative impact of industrial activity in the developed world that has created this problem, and it is these **developed** countries, therefore, that need to shoulder the burden of dealing with it.

Indeed, not only do developed countries face a clear moral obligation to finance the costs of adaptation in developing countries, they have already accepted this as signatories to the UN Framework Convention on Climate Change (UNFCCC) where this obligation is explicit.

The need to rapidly and urgently reduce CO_2 emissions also means that, particularly for the larger developing economies, fossil-fuelled development is a seriously questionable long term option. To ensure that their development is genuinely sustainable, countries ought to embark upon a low-carbon path. Unlike their developed country counterparts, who grew their economies generating energy at low cost and without particular environmental consideration, the responsible trajectory now asked of developing countries will require significantly greater investment. As with adaptation, there is therefore a degree of moral obligation for developed countries to finance this process. As well, there is practical necessity. Developing countries simply do not have the capacity to address poverty and human development while simultaneously adapting to and mitigating climate change.

In this paper we consider the framework required for mitigation to be achieved and examine proposals for how both mitigation and adaptation in developing countries could be financed. Although we conclude with a recommendation, it ought to be emphasised that the role of this paper is more to establish clear principles and criteria upon which current and future proposals can be assessed. Our intention is to develop a way of thinking about the issues inherent to climate change financing. We undertake this by assessing the prospective mechanisms on three occasions through different lenses. A broad scoring system is introduced to differentiate the financing instruments. We conclude with a suggestion of a cluster of mechanisms that could generate in the region of £80 billion a year to finance adaptation.

Responsibility and capacity to pay

It is essential that decisions on climate change financing be made on a **fair and equitable basis**, using clear principles, and that national contributions should vary to reflect responsibility and capacity to pay. One of the recognised systems by which to assess **which** developed countries ought to shoulder **what** proportion of financial responsibility, in respect of both mitigation and adaptation, is the **Greenhouse Development Rights** (GDR) framework[1]. Fundamental to the GDR approach is firstly the need for emergency measures to reduce global carbon emissions rapidly to avoid a global temperature rise of 2°C; and secondly the overriding need for poverty reduction in developing countries.

Under the framework[2], **Responsibility** is calculated by taking each country's total 'cumulative' emissions per capita, and **Capability** is calculated using per capita national income data, adjusted to reflect differences in purchasing power and inequality from one country to another. As well, the rights of poor people to develop are safeguarded through the use of an **income threshold**; the greater the proportion of a country's population that falls below this poverty line, the less that country is required to invest. Finally, proportionate responsibility can be determined through the use of a **Responsibility and Capacity Index**.

Mitigation

Estimates of the cost of mitigation vary hugely, but all the numbers are very large, running into the hundreds of billions of dollars every year for decades to come. That said, these figures are dwarfed by estimates of the cost of failing to act, both in economic and in human terms.

In developing countries alone, we are looking at costs in excess of the entire global aid budget today: we need to find 'new and additional' sources of funds, which ideally should be derived from a new framework to achieve mitigation financing at the global level.

In this regard there are two main options: quantity-based or price-based. That is, to shift to a sustainable, low-carbon trajectory we argue that either the **quantity** of global emissions can be **restricted**, or the **costs** of these emissions can be **increased** to achieve the same result. In policy terms these two options equate to a global limit, or 'cap', with national allocations and some form of trading; or to a global carbon tax with redistributive transfers.

From the perspective of pure economic theory these two options are equivalent. In practice this is not quite the case. In reality, we can either have certainty over quantity or over price. If we set a particular 'cap', we cannot say accurately what the price of carbon will be. Similarly, for any given tax rate, we cannot say what the reduction in physical emissions will actually be.

Partly for this reason, a global cap may be the best means of ensuring that global emissions remain within scientifically determined levels. An issue, however, is that developing countries are – quite rightly – extremely reluctant to sign up to a physical limit on their carbon emissions – indeed the Bali Action Plan only includes the notion of caps or "quantified emission limitation and reduction objectives" in the next commitment period for *developed* countries. While it is entirely possible to imagine an effective global cap that smaller developing countries – and those at low levels of development – are excluded from, it is likely that at least the larger middle-income countries would need to join this framework at some

1 The Greenhouse Development Rights Framework: The right to development in a climate constrained world. Paul Baer, Tom Athanasiou, Sivan Kartha, and Eric Kemp-Benedict. Published by the Heinrich Böll Foundation, Christian Aid, EcoEquity and the Stockholm Environment Institute. Revised second edition. Berlin, November 2008. Available at: www.ecoequity.org

2 The GDR framework is one option amongst a number of alternatives for assessing responsibility and capability while taking into account development needs. In this paper we do not seek to establish a definitive framework.

point during a later commitment period if the required reduction in global carbon emissions is to be achieved.

Part of the difficulty – and the devil really is in the detail here – turns on how national carbon 'budgets' would be allocated within any overall cap. At one extreme, this could be determined simply on the basis of current emissions – so called 'grandfathering'. This would be inherently unfair, however, and would lock in the huge current disparities of wealth around the world. At the other extreme, national allocations could be based on population size rather than wealth, with equal emission rights for every person on the planet.

A consequence of such an arrangement is that it would require rich countries, which were allocated far fewer permits than they needed, to purchase the surplus permits held by poorer countries, where current emissions would be below their allocations. As a result, much of the vast annual transfers needed to fund mitigation in developing countries would be 'hard-wired' into the system.

Emission rights could also be allocated according to **Responsibility** and **Capability** under the GDR framework described above, which would also bring about significant transfers from developed to developing countries as a result of the greater historic emissions and wealth of the former.

A further point in respect of a cap with national allocations and some form of trading is that we do not currently have a functioning international carbon market. What we have instead are a number of national and regional markets – with sub-optimal performance in terms of achieving substantial low-carbon transformation or reducing emissions – and the beginnings of an international market, which is far from universal in coverage. As well, if a cap and trade scheme of some kind were to be acceptable it would require the system to have scientifically determined caps – rather than be subject to lobby interests and exemptions. Moreover, it would have to ensure there was no leakage through offsetting.

Even if this could be achieved, however, developing countries might still argue that they should not be constrained by any global cap, as they should not be penalised for the problems created by the developed world (which should sharply reduce its own emissions before asking anything of the developing world). This is of course reasonable, and it is likely that today's developed economies would have to proceed with a post-2012 agreement in the first instance, with larger middle-income countries eventually joining such a scheme, but only if the terms were fair and compatible with development objectives, and that sufficient financing was committed and in place to enable this participation.

From a pure perspective of emissions reductions, a global cap could be the best outcome, but it is important not to make the perfect the enemy of the good. For a variety of reasons, it may be that neither developing nor even developed countries would accept such a framework, which would mean looking at other options.

For a comprehensive alternative to quantitative limits on emissions one would have to examine a global carbon tax of some kind. While this would not bring the same certainty as a cap, it may still be extremely effective. A problem, however, is that there are no North-South transfers 'hard-wired' into such a system, which would mean being reliant on the redistribution of tax revenues from the developed to the developing world to fund mitigation. There is a risk, therefore, of becoming entangled in domestic political cycles in developed economies. To accommodate this, it would be essential to establish a clear and binding (insofar as this would be possible) framework for redistribution. Furthermore, in order to remain equitable, this would have to evolve to reflect changing development outcomes over time.

Whether a cap and trade system or a carbon tax was used as the main means of achieving mitigation and financing the process in developing countries, it is unlikely that the level of transfers would either match what was required, or would reflect what was ethical in terms

of historical responsibility or contemporary capacity to pay. For this reason, additionally, a fund established along the lines of that proposed to the UNFCCC by the Mexican government is a good option. Contributions to this could come from the auctions of carbon permits in domestic or regional markets (such as the United States and European Union) augmented by direct national contributions. These national contributions could vary to reflect responsibility and capacity to pay, potentially using weightings such as those derived from the Greenhouse Development Rights (GDR) approach.

Adaptation

While it is important for any framework for mitigation to evolve over time to reflect changing national responsibilities and capacities, this is less true for adaptation financing. Here we are essentially talking about compensation payments for developing countries for the environmental damage caused by the process of industrialisation in the developed world.

A number of proposals have been submitted to the UNFCCC by national governments and other bodies regarding the funding of adaptation in developing countries. In this paper we review eleven of these propositions, as well as the Currency Transaction Tax that has been widely discussed as a substantial untapped revenue stream. The twelve proposals are:

- **The G-77+ China proposal (of more than 130 developing countries)** – developed countries provide funding of 0.5% of GDP mainly for mitigation.
- **The World Bank's Pilot Programme for Climate Resilience (PPCR)** – discretionary loans for adaptation given by developed countries as part of Official Development Assistance through the World Bank.
- **The Mexican Climate Change Fund (MCCF)** – countries are obliged to contribute to the fund on the basis of emissions, population and income, mainly for mitigation.
- **The US Auction Levy** – where a small proportion of the proceeds of auctioning carbon permits within the US are earmarked for funding adaptation activities in developing countries.
- **The EU Emission Trading Scheme (ETS) Auction Levy** – where a proportion of the proceeds of auctioning carbon permits within the countries of the European Union are earmarked for funding adaptation activities in developing countries.
- **The Swiss Carbon Tax proposal** – a global tax on all carbon emissions in all countries, but with a per capita exemption that would benefit some poorer countries.
- **The Global Capital Fund Mechanism (GCFM)** – bonds are issued on the international capital markets and the proceeds are invested in mitigation and adaptation.
- **The Norwegian 'Assigned Amount Units' (AAU) proposal** – the international auctioning of national carbon emission permits.
- **The Tuvalu Burden Sharing Mechanism (TBSM)** – a levy on air travel and freight shipping with different rates for developed and developing countries and exclusions for travel to and from Least Developed Countries.
- **The International Air Passenger Adaptation Levy (IAPAL)** – a levy on international air travel.
- **The International Maritime Emission Reduction Scheme (IMERS)** – a levy on international shipping.
- **The Currency Transaction Tax (CTT)** – a very small levy on international currency transactions as a long term funding stream for adaptation.

Initially the proposals are described then located on two spectrums:

- **INTERNATIONAL** → **DOMESTIC**
- **DIVERSE** → **CONCENTRATED**

In respect of the first spectrum, it is suggested that there is distinct advantage if a mechanism is broadly **international** in form thus avoiding the 'domestic revenue' problem noted by Müller (2008), where politicians face difficulties convincing their electorates that very large sums should be transferred out of the country rather than spent at home, for example, on hospitals or schools.

In respect of the second spectrum, it is suggested that a considerable advantage accrues if a mechanism is **diverse** in its 'incidence.'[3] That is, that the burden of payment of revenue is not concentrated on one particular group, and thus potentially subject to lobbying for repeal, but more economically spread out.

Following this stage, the proposals are assessed against two sets of criteria and indicative scores assigned. The sets of criteria are divided into first-order (deemed essential) and second-order (deemed desirable).

In identifying the appropriate criteria we here draw on the considerable work carried out in this area by official agencies, NGOs and policy-makers. The **additionality** criterion is particularly worthy of elaboration. There is already insufficient financing available to fund the investments needed to meet the Millennium Development Goals (MDGs), even before the impact of climate change has been taken into account. Moreover the nature of climate finance is fundamentally different to that of aid and other financing for development – adaptation finance is compensatory in nature, whilst mitigation finance is an obligation on the part of rich countries, following from their disproportionate exploitation of the environment, to provide developing countries with the resources they need to alleviate poverty without bringing about catastrophic climate change. It is an essential requirement that funding for climate change must be distinct from and additional to finance pledged for Official Development Assistance.

The first-order criteria are:

- **SUFFICIENCY** – where the funds generated are equal to the scale of the task. We calculate this to be $100 billion per year based on the UNDP estimate of $86 billion (and recent evidence that actual costs are likely to exceed this).
- **PREDICTABILITY** – where funds are generated in as stable and predictable a way as possible.
- **EQUITY** – where contributions reflect both historical responsibility and capacity to pay.
- **ADDITIONALITY** – where funds are 'new and additional' to existing aid commitments.
- **VERIFIABILITY** – where funds are collected and disbursed in a transparent and verifiable manner.

Second-order:

- **EFFICIENCY** – where as much economic efficiency as possible should be achieved, but not to the extent that it conflicts with the first-order criteria, particularly that of **Equity**.
- **EASE OF IMPLEMENTATION** – where mechanisms that can be readily implemented are preferred, all other things being equal.
- **CO-BENEFITS** – where proposals are preferred that have positive developmental or environmental consequences.

3 'Incidence' is said to fall upon the group that, in the final analysis, bears the burden of a tax.

From the outset it is argued that a combination of mechanisms is preferable to one silver bullet solution and that various clusters of different instruments may be possible.

In conclusion, a permutation we recommend that could provide substantial funds for adaptation would be to apply the **Norwegian 'Assigned Amount Units' Levy** at 2%, raising around $14 billion pa, combined with the **International Air Passenger Adaptation Levy** raising $10 billion pa and the **IMERS levy on international shipping** raising $15 billion a year. All of these mechanisms score highly in our rankings and are 'international' and 'diverse'. Between them they would raise an annual total in the region of $39 billion. This is a considerable sum but short of the $100 billion target we have identified. However, adding in the **Currency Transaction Tax**, which could raise in the region of $40 billion pa, would increase the total generated from the four mechanisms to approximately $79 billion a year.

Closing remarks

In the final analysis, the main purpose of this paper is as a tool to better get to know the financing proposals currently on the table. We have set out, therefore, to assist in the navigation of what to many are still new and yet uncharted waters. However, the need to make advances in the field of mitigation and adaptation finance has reached a critical juncture. Time is not on our side. In the end, it will be political intention and feasibility that determine whether some or any of the instruments will be adopted. Yet the requirement is so great and the cost of failure so immense, that we hope there is a determination to agree a mix of mechanisms in Copenhagen and that this paper may in some way assist with that decision-making.

Introduction

Climate change is now an accepted reality to which we must all adapt. Regardless of how much and how quickly it is possible to reduce our greenhouse gas emissions, this is the stark reality. The greenhouse gases already in the atmosphere are likely to increase global temperatures by up to 2°C during this century. What will this mean?

Firstly, the impacts are being felt initially and hardest in some of the poorest countries in the world and, within these countries, will fall disproportionately on those least able to deal with the effects. By 2020, some countries in Africa are predicted to see crop yields from rain-fed agriculture fall by up to 50% and arid and semi-arid land in the continent is expected to rise by 5–8% by 2080 (WWF, 2008).

The densely populated Asian delta regions will experience increasing salination and flood risk by 2050, while increasing floods and droughts from changes to the hydrological cycle in East, South and South East Asia will have severe consequences for morbidity and mortality from diarrhoeal disease.

Globally, the majority of the world's ecosystems are under severe threat (MEP, 2006), and it is estimated that temperature rises of 1.5–2.5°C would leave 20–30% of species at threat of extinction (WWF, op cit).

Consensus has formed around the need to keep increases in temperature below 2°C, seen as the threshold beyond which feedback loops become increasingly likely to kick-in, leading to a rapid acceleration of the rate of climate change as it becomes 'catastrophic and irreversible'.

To have any chance of achieving this, we need to act urgently and without further delay. As well as developed economies rapidly and deeply reducing their emissions of greenhouse gases on a year-by-year basis, also required is the provision of finance[4] to enable developing countries who, through no fault of their own, see their development prospects fundamentally threatened by the reality of climate change. These financial transfers are needed to fund two key processes:

- **MITIGATION** – where all developing countries need to shift to a sustainable, low-carbon growth trajectory.
- **ADAPTATION** – where countries have to adapt to the climate change that is already 'in the system'.[5]

Both these practical necessities and the moral responsibility for dealing with them are clear, but the question remains of how this financing can be best achieved.

This paper sets out to provide some insight, and is organised into two main parts. The first section sets the context in terms of the volume of finance required, and explores the relationship between mitigation and adaptation. Part two develops criteria by which financing mechanisms can be assessed, and the paper concludes with a recommendation based on this analysis.

4 Although the transfer of technology is also a vital imperative, this paper focuses primarily on the issue of finance.

5 'Adaptation' in this context generally refers to measures to reduce impacts ex ante rather than to respond to them ex post as with disaster relief.

PART 1 The context

1.1 International institutions and commitments made by the developed economies

In 1990, the International Negotiating Committee (INC) was established by the UN General Assembly to create a Framework Convention on Climate Change (FCCC). The resulting Convention, which committed signatories to making voluntary cuts in their emissions, was signed at the Rio 'Earth Summit' by 154 states and the European Union and entered into force in March 1994. While developed economies – termed 'Annex I' countries – were expected to reduce their emissions, no such requirements were made of the developing economies.

In 1995, the INC was replaced by the Conference of Parties (COP), comprising all signatories to the Convention. (UNEP, 1999).

"The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."[6]

It is also explicit in the Convention that responsibility for dealing with the problem is not uniform, but should be a function of culpability (i.e. the 'polluter pays) and capacity (i.e. a country's level of development). This is described as 'common but differentiated responsibilities', where the developed economies are expected to take the lead:

"The developed country Parties ... shall ... assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects."[7]

It is also explicitly envisaged that financial assistance should be 'new and additional' in that it is distinct from – and should not count towards – a country's official development assistance (ODA) (Klein, 2008).

The Kyoto Protocol was adopted on 11 December 1997, but did not enter into force until February 2005. Under Annex B of the Protocol, developed countries committed to reduce total greenhouse gas emissions to below their 1990 level during the 'first commitment' period of 2008–2012.

Under the Kyoto Protocol, Annex I countries are allocated a certain level of permitted emissions – an 'assigned amount'. Where a country has a surplus of Assigned Amount Units (AAUs), perhaps due to a sharp reduction in domestic emission requirements, it can sell these to another Annex I country, which needs more AAUs than it has been allocated.

6 UNFCCC, Article 2.

7 UNFCCC, Article 4.

In addition to this evolving institutional framework, a second UNFCCC process began at the 13th Conference of the Parties (COP-13) meeting in Bali in December 2007. This second 'negotiating track' brought the United States and emerging economies into the process of mitigation negotiations. The resulting 'Bali Action Plan' established a framework for subsequent negotiations focusing on the four major pillars of climate policy that need to be addressed: mitigation; adaptation; technology development and transfer; and financing:[8]

Decides to launch a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, in order to reach an agreed outcome and adopt a decision at its fifteenth session, by addressing, inter alia: (b) Enhanced national/international action on mitigation of climate change, including, inter alia, consideration of: (ii) 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.[9]

Time is short. To have even a reasonable chance of not breaching the 2°C threshold, global greenhouse gas emissions need to peak within the next few years and then fall rapidly on a year-by-year basis so that a 90% global reduction is achieved by 2050.

1.2 Estimates of financing requirements

1.2.1 Mitigation

The first point to make when considering the estimated costs of funding climate change mitigation is the inherent uncertainty involved. Based on the need to keep atmospheric concentrations within the 450 – 550 ppm CO_2e range – assumed necessary to provide at least a chance to keep the temperature rise below 2°C – the Stern Review estimated annual mitigation costs at around 1% of global GDP (Stern, 2006).

The Intergovernmental Panel on Climate Change (IPCC) Synthesis Report estimated a range of $78bn to $1,141bn annual mitigation costs, or 0.2% to 3.5% of global GDP. (IPCC, 2007). These are very large numbers of course, but most striking is the range: $78bn to $1,141bn per year highlights the huge uncertainties involved.

The UNFCCC (2007) offers a figure of $200–$210bn that would be required in 2030 to fund mitigation, which is compatible with the previous estimates cited.

These very large costs need to be compared with the cost of failing to act. The Stern Review made the point that 'investing' today to move the economy onto a low-carbon footing would certainly be expensive, but far less so than would dealing with the economic consequences of the level of climate change resulting from 'business as usual'. This is estimated at between 5% and 20% of global GDP, 'now and forever'.

Also, the longer we delay the worse the problem becomes and the more expensive it will be to fix. Recent evidence on the link between atmospheric concentrations and climate change suggests that a) concentrations are accelerating faster than had previously been assumed, and b) the 'safe' threshold beyond which we risk catastrophic and irreversible climate change is well below the 450–550 range suggested by Stern.

8 Klein et al, op cit.

9 Bali Action Plan, paragraph: 1bii

Meinshausen (2006)[10] summarises the results from global climate models and finds that a concentration level of 550ppm CO_2e leads to an 82% probability of an increase in temperature of more than 2°C. To have a 93% chance of keeping temperature change below 2°C, in contrast, would require concentrations to be kept at no more than 350ppm CO_2e.

As well as these factors, Stern's original estimates now look over-optimistic, as the pace of global emissions has been far in excess of his projections in recent years. Anderson and Bows (2008) point out that while Stern assumes a mean annual growth in CO_2e emissions of 0.95% per year between 2000 and 2006, the actual rate of growth was 2.4%. Stern himself has accepted this and revised upwards his cost estimate from 1% to 2% of GDP, though it needs to be borne in mind that this would only keep concentrations below the 550ppm CO_2e level, which is unlikely to stop temperature rises breaching the 2°C level. To put this into context, we were already at 420ppm CO_2e by the middle of 2008 (i.e. well in excess of the 350ppm CO_2e level that would give a 93% chance of not breaching the 2°C threshold). Despite what we now know, CO_2 emissions continue to grow at a rate of 3% per year, so that within less than a decade – if current trends persist – a temperature rise of more than 2°C will become increasingly probable. The degree of threat should not be underestimated, recent research (Hansen et al, 2008) suggests that CO_2 concentration levels may have already passed critical thresholds required to "preserve a planet similar to that on which civilization developed and to which life on Earth is adapted".

Despite the inherent uncertainties involved, the situation is therefore (relatively) clear. If we are to avoid irreversible and catastrophic climate change we need to urgently change course and rapidly reduce CO_2e emissions at the global level so that by 2050 they are a fraction – less than 10% – of those last seen in 1990. Furthermore, we need to start this process in earnest within the next few years. This will cost hundreds of billions of dollars per year over the coming decades, but this is a fraction of the cost of failing to act, which would be incalculable in both economic and human terms. Finally it is clear that a significant proportion of these reductions will need to occur in developing countries, which have little or no responsibility for creating the problem in the first place.

Clearly, developing countries cannot and should not be expected to foot this bill – a 'global deal' of unprecedented proportions is needed if the development prospects of millions of the world's poorest people are to be safeguarded.

1.2.2 Adaptation

The global cost of adaptation to climate change is difficult to estimate, largely because climate change adaptation measures will be widespread and heterogeneous. More analysis of the costs of adaptation at the sectoral and regional levels is required to support the development of an effective and appropriate international response to the adverse impacts of climate change. Nevertheless it is clear that a large amount of new and additional investment and financial flows will be needed to address climate change adaptation. (UNFCCC, 2007:176)

As with mitigation, likely costs of funding adaptation are subject to huge uncertainties. First, the various agencies have considered different aspects of adaptation when making their estimates. Second, much uncertainty remains about the effects that climate change will have on local and regional weather patterns in different parts of the world.

10 Cited in Anderson and Bows (2008)

A final complicating factor relates to the mitigation of climate change. The extent of mitigation today will strongly influence the future trajectory of climate change: the more we mitigate now the less we will have to fund adaptation in the future.

As is shown in table 1, these uncertainties, contingencies and differences in emphases are reflected in the wide variations in estimates of adaptation funding requirements.

TABLE 1 **Estimates of annual funding requirements for adaptation needs in developing countries**

Agency	Annual financing requirements (US$)
UNDP	86bn
World Bank	9–41bn
UNFCCC	28–67bn
Oxfam	50bn +
Oxford Institute of Energy Studies (OIES)	28bn

Source: Müller (2008)

The UNDP arrives at its estimate of $86bn by combining the cost of 'climate proofing' development investment, adapting poverty reduction strategies to take account of climate change and strengthening the capacity of countries to respond to natural disasters.

The World Bank ($9–41bn) takes a different approach, looking at the influence of climate change on different forms of investment (foreign and domestic). In each case an estimate is generated of the proportion of the investment that is 'climate sensitive', which is then combined with an assessment of the costs of adjusting to take account of adaptation needs.

The UNFCCC takes a sectoral approach projected forward to 2030. This gives a total range of $49–171bn at the global level, which is broken down by sector, and specifies the proportions required in developing countries.

Figures from the OIES ($28bn) extrapolate from estimates produced for the 'NAPA'[11] process by countries such as Bangladesh, Bhutan, Malawi, Mauritania, and Samoa. These focus on 'urgent and immediate' needs and therefore do not fully consider long term costs.

Oxfam extends this approach to all developing countries, increasing annual costs to at least $50bn. An upper limit is not set due to the presence of hidden costs, not least as the underlying calculations are also based upon 'urgent and immediate' adaptation needs.

What is clear from these varying approaches and differing estimates is that the annual costs of funding adaptation to climate change in developing countries will be very large on an annual basis for the foreseeable future. The ultimate extent of these requirements will, as has been pointed out, be strongly influenced by the extent to which climate change is mitigated today.

11 "NAPAs (national adaptation programmes of action) provide a process for Least Developed Countries (LDCs) to identify priority activities that respond to their urgent and immediate needs with regard to adaptation to climate change. The rationale for NAPAs rests on the limited ability of LDCs to adapt to the adverse effects of climate change. In order to address the urgent adaptation needs of LDCs, a new approach was needed that would focus on enhancing adaptive capacity to climate variability, which itself would help address the adverse effects of climate change. The NAPA takes into account existing coping strategies at the grassroots level, and builds upon that to identify priority activities, rather than focusing on scenario-based modeling to assess future vulnerability and long-term policy at state level. In the NAPA process, prominence is given to community-level input as an important source of information, recognizing that grassroots communities are the main stakeholders." (UNFCCC, 2008)

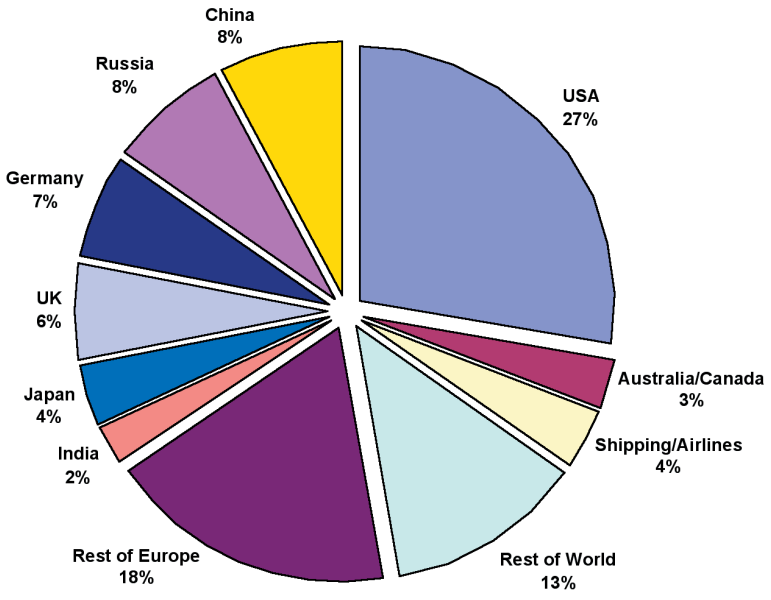
Given recent evidence on a) the rate of increase of CO_2e concentration levels, b) the possibility of our breaching the 2°C level, and c) the impact that this is likely to have on the global climate, the amount required to fund ongoing adaptation costs is likely to be at the upper end of the range: $50–100 billion a year.

1.3 Responsibility and capacity to pay

The Stern Review examines the issue of adaptation funding by looking at the cumulative historical responsibility for CO_2 emissions, the results of which are shown in chart 1 below. As we can see, the greatest responsibility lies with the United States, with 27%. This is followed by Europe (excluding the UK and Germany[12]) with 18% and the 'rest of the world' with 13%. The next individual countries are China and Russia with 8% each, Germany (7%), the UK (6%), Japan (4%), Australia and Canada (3% combined) and India (2%). Stern allocates the remaining 4% to shipping and air transport.

While this might seem reasonable from the polluter pays perspective, it takes no account of ability to pay. For example, while Japan is responsible for half the level of cumulative emissions as China in these estimates, its level of development and ability to meet financial commitments ought to exceed that of China's. Similarly, no account is taken of the fact that a sizeable proportion of China's carbon emissions (roughly a quarter) are the result of exports to developed countries.

CHART 1 **Cumulative emissions to 2005**



Source: Stern Report (2006)

An important point is that Stern does not take account of population size. When we consider cumulative emissions on a per capita basis, as in table 2, for example, a very different picture emerges on cumulative responsibilities.

12 Europe's total responsibility including the UK and Germany is 31% greater than that of the United States.

TABLE 2 **Per capita cumulative emissions 1751–2006**

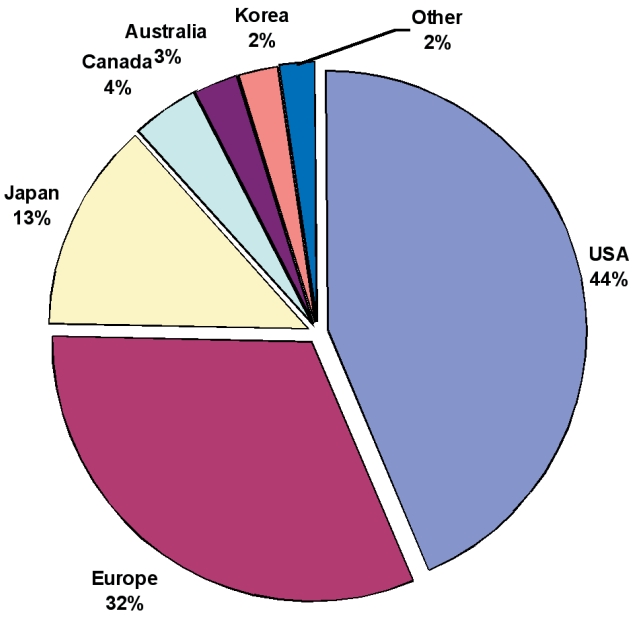
UK	23%
USA	21%
Germany	15%
Canada	15%
Russia	13%
Japan	7%
China	1%
India	1%

Source: Hansen (2007)

These issues were addressed by Oxfam through the development of an 'Adaptation Financing Index' (AFI). The AFI, takes into account cumulative CO_2 emissions since 1992 (when the UNFCCC was signed) above a 'sustainable' per capita threshold. When viewed on a per capita basis, the cumulative responsibility looks very different to that produced by Stern, even when only recent years are considered. Between 1992 and 2003, China's total CO_2 emissions were more than 40,000 million tonnes, compared to 14,447 for Japan. On a per capita basis, however, the figures are 2.74 tonnes for China and 9.6 tonnes for Japan.[13]

In terms of capability, the AFI only includes countries scoring more than 0.90 in the Human Development Index, thus excluding large developing economies such as China, India, Brazil and Russia.

CHART 2 **Adaptation financing index**



Source: Oxfam (2007)

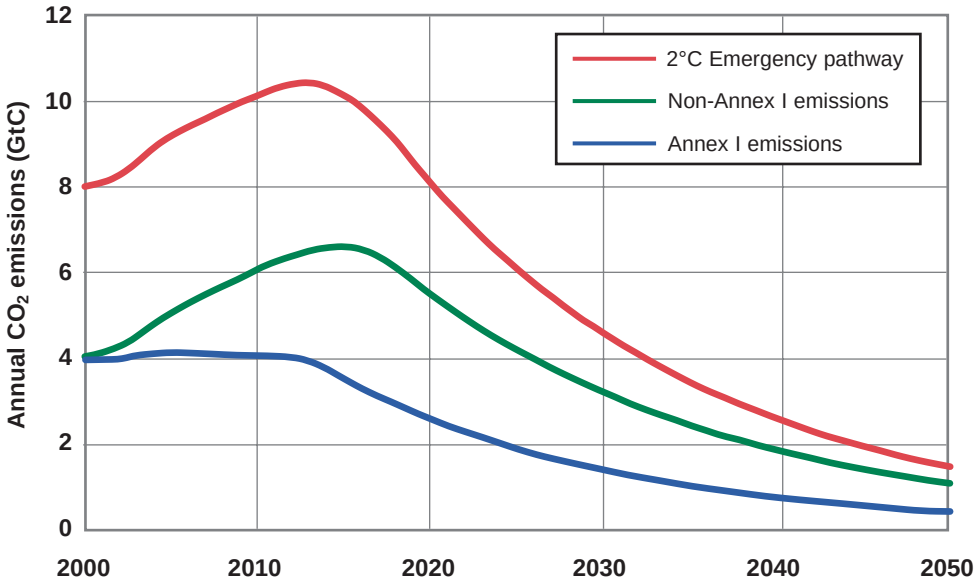
13 It is important to note that there are various measures of responsibility. In this paper we do not seek to establish a definitive framework. See Müller et al (2007) for a good review of this subject.

Chart 2 shows the distribution of responsibility based on the AFI. As we can see, the United States remains the most responsible individual country, though its share increases from 27% to 44%. Interestingly, Europe's combined position is broadly the same, being 32% in the AFI and 31% in the Stern Report. Japan sees a sharp rise in responsibility under the AFI, with the other major change being the removal of China, Russia and India.

A similar mechanism to the AFI is the Greenhouse Development Rights (GDR) approach, proposed by EcoEquity.[14]

This starts from the perspective that keeping temperature change below the 2°C threshold is essential. Assuming CO_2 concentrations need to be kept below 420 ppm (which only reduces the chances of overshooting the 2°C threshold by 15–30%) the figure shown below gives a clear indication of the reductions in greenhouse gas emissions that this would entail. As we can see, even if developed countries (i.e. Annex I) start to reduce their emissions rapidly from 2012 and continue this process to 2050, the total level of global emissions considered to be sustainable is such that the space for developing countries to expand their own emissions is inherently limited.

CHART 3 **Required trajectory of global carbon emissions to reach sustainability by 2050**



Source: EcoEquity (2008)

Indeed, emissions from developed countries would have to peak around 2015 and also fall rapidly thereafter. To put this into context, the total level of global CO_2 emissions considered to be sustainable by 2050 is roughly equivalent to that produced by China alone today. What this makes clear is that effective mitigation over the longer term will not be possible unless it ultimately includes both developed and (the larger) middle-income economies as part of a 'global deal'.

14 http://www.ecoequity.org/docs/TheGDRsFramework.pdf

However, any deal that requires developing countries to sacrifice human development in order to reduce carbon emissions is simply unacceptable:

The real issue is sustainable human development, and the right to such development must be acknowledged and protected by any climate regime that hopes for even a chance of success. The bottom line in this very complicated tale is that the South is neither willing nor able to prioritize rapid emissions reductions, not while it must also seek an acceptable level of improvement in the lives of its people. And that the key to climate protection is the establishment of a global burden-sharing regime in which it is not required to do so. (EcoEquity, 2008: 3)

The GDR approach is explicitly designed to square this circle by developing weightings for what different countries could be expected to contribute, based on both responsibility and capacity:

TABLE 3 **Responsibility Capacity Index for selected countries and income groups**

	2010					2020	2030
	Population	*GDP*	*Capacity*	*Responsibility*	***RCI***	***RCI***	***RCI***
United States	4.5	20.9	29.7	36.4	33.1	29.1	25.4
Germany	1.2	4.2	5.6	5.3	5.5	4.7	4.0
China	19.7	11.7	5.8	5.2	5.5	10.4	15.3
India	17.2	4.9	0.7	0.3	0.5	1.2	2.3
South Africa	0.7	0.7	0.6	1.3	1.0	1.1	1.2
LDCs	11.7	1.5	0.11	0.04	0.07	0.1	0.12
Annex I	18.7	58.3	75.8	78	76.9	69.0	60.9
Non-Annex I	81.3	41.7	24.2	22	23.1	31.0	39.1
High Income	15.5	56.9	76.9	77.9	77.4	69.3	61.1
Mid Income	63.3	39.7	22.9	21.9	22.4	30.4	38.5
Low Income	21.2	3.4	0.2	0.2	0.2	0.3	0.5
Global Total	100%	100%	100%	100%	100%	100%	100%

Source: EcoEquity (2008)

In table 3 the first RCI column gives the scores for 2010. The US has 33.1% of the total index, which is roughly halfway between that allocated by Stern and the AFI. Unlike the AFI, however, China is allocated 5.5% of the total index, reflecting its sheer size and total CO_2 emissions.

Perhaps the most interesting feature is the predicted trajectory of RCI scores to 2030. Here we see China's score increase rapidly, reflecting its predicted growth. When we look at the bottom half of the table that breaks things down in terms of income groups we see a similar trajectory for middle-income countries. In contrast, low-income countries share of the RCI remains very low, reflecting their relatively small share of the global economy and historically low rates of growth.

1.4 Current mechanisms for adaptation and mitigation

The primary mechanisms to deal with mitigation derive from the Kyoto Protocol, where Annex I signatory countries have committed to specified reductions in CO_2 emissions.

TABLE 4 **Current mechanisms and revenues generated for mitigation and adaptation**

Sources	Amounts (US$ billion)	Notes
Mitigation		
Clean Development Mechanism (CDM)	$5.3	Value of trades (2006)
Joint Implementation (JI)	$0.14	Value of trades (2006)
Carbon Funds	$6.9	Subscribed capital (2006)
Global Environmental Facility (GEF)	$3.3	Cumulative funding allocation since GEF inception.
Adaptation		
GEF Strategic Priority 'Piloting an Operational Approach to Adaptation (SPA)'	$0.05 (over three years)	Pilot to be evaluated
Least Developed Country Fund (LDCF)	$0.16 (pledged)	
Special Climate Funds	$0.067 (pledged)	Adaptation component only
Adaptation Fund	$0.08–$0.3	Estimated annual revenue 2008–2012 from 2% CDM levy

Source: UNFCCC (2007)

Table 4 describes the main mechanisms in terms of both mitigation and adaptation. For mitigation we see that the Clean Development Mechanism (CDM)[15] and Joint Implementation (JI)[16] projects organised under the Kyoto Protocol are important and growing sources of finance, as are the carbon funds established to operate within the evolving carbon market. The Global Environmental Facility (GEF) has a slightly longer history, being launched in 1991 by the World Bank as a mechanism to attract and channel donor funding for environmental issues. The Rio Earth Summit in 1994 saw the GEF moved from the World Bank to become a free-standing institution, linked to the UNFCCC. As well as various UN agencies – UNDP and UNEP, for example – the GEF is also used by the multilateral and regional development banks to support environmental projects.

For adaptation mechanisms, the first listed is the GEF 'Pilot' fund and then a number of other funds associated with the Kyoto Protocol. An important point to bear in mind is that all of these are dependent upon voluntary contributions from donors, with the exception of the Adaptation Fund. This is financed through a 2% levy on CDM transactions and, as such, is not dependent on the donor funding cycle and shifting priorities.

15 The CDM is a mechanism where Annex I countries can fund emission reductions in developing economies, which can count towards their own reductions. Trades under the CDM are growing at a rapid rate. In 2008 value of trades exceeded $10 billion, almost double the level seen in 2006 and reported above.

16 A related mechanism to the CDM is termed Joint Implementation (JI), where Annex I countries can contribute toward their reduction target by investing in carbon-reducing projects in other Annex I countries.

As we have seen, estimates of the annual costs of funding adaptation vary significantly from $28bn (the bottom of the UNFCCC range) to $86bn (the UNDP estimate). However, it is also the case that recent evidence suggests that even these figures may underestimate the real costs. As a result, we assume a figure of $100 billion per annum as the target for adaptation financing. The figure for mitigation is likely to be at least double this. There is, therefore, a paramount requirement to locate substantial new financing flows and bring them on stream in the very near future.

PART 2 The assessment

2.1 Defining the criteria

In the first part of this paper we give a figure of $100 billion per annum as the target for adaptation financing, with the figure required for mitigation likely to be at least double this amount.

When considering possible financing mechanisms, it is important to identify the appropriate criteria by which to assess them. There has been considerable work carried out in this area by official agencies, NGOs and policy-makers, which we draw on here. In particular, we have sought to ensure that the criteria are compatible with those originating from developing countries, not least those set out by the G-77.

2.1.1 Mitigation

It is highly likely that effective mitigation of climate change can only happen as part of a global deal that all large economies that are or will become major CO_2 emitters can sign up to, and where finance has already been adequately committed under the framing of the Bali Action Plan. The 'public good' nature of mitigation is such that a partial deal which leaves key players outside encourages 'free riding' on the mitigating efforts of others, preventing a global limit for greenhouse gas emissions from being maintained.

Therefore, two primary criteria are particularly relevant. First, do the proposed mechanisms move us towards an effective global deal and, second, is the nature of this deal acceptable? Clearly, this second question can only be answered with reference to a further criteria set – what constitutes 'acceptability'?

2.1.2 Adaptation and mitigation criteria

The most basic criterion is that the revenue raised is **sufficient** to meet the requirements, though this need not necessarily rule out mechanisms that raise smaller quantities if these are part of a larger package that provides sufficient finance.

The second criterion is **predictability**, the importance of which is well illustrated by the great difficulties in turning development donors' pledges into actual disbursements. In practice, Official Development Assistance (ODA) has proven to be no less volatile than private capital flows in recent decades.[17]

A third criterion is no less important, though on ethical rather than technical grounds. To be acceptable any mechanism(s) must be **equitable** in that the 'polluter pays' principle is upheld, but also take account of ability or capacity to pay and how this changes over time.

17 UN DESA (2006)

The fourth criterion is **additionality** – there is already insufficient financing available to fund the investments needed to meet the Millennium Development Goals (MDGs), even before the impact of climate change has been taken into account. Moreover the nature of climate finance is fundamentally different to that of aid and other financing for development – adaptation finance is compensatory in nature, whilst mitigation finance is an obligation on the part of rich countries, following from their disproportionate exploitation of the environment, to provide developing countries with the resources they need to alleviate poverty without bringing about catastrophic climate change. It is an essential requirement that funding for climate change must be distinct from and additional to finance pledged for ODA.

A final criterion is that the funds raised (and disbursed) should be **verifiable**, in that it is possible for independent sources to monitor and report on the process accurately and in a timely fashion.

We describe this set as the 'first-order' criteria, which are considered essential for any mechanism. When assessing the different proposals we will first consider them against this set, with those that pass these hurdles then being considered in relation to a set of 'second-order' criteria.

The first of these is economic **efficiency**. Some might argue that this should be in the first grouping, deeming it to be essential. However, while it is certainly desirable that the required finance should be raised in the most economically efficient way possible this does not mean that only 'optimal' efficiency will suffice. For both mitigation and adaptation, it may be that there is no mechanism that would be considered fully efficient in economic terms but that would also meet the other criteria set out above – in particular, there is the prospect that efficiency could conflict with equity considerations. In these instances we take the position that efficiency is the less fundamental of the criteria and therefore place it in the second-order set.

A second is **ease of implementation**, which takes into account a) whether a mechanism builds on existing institutions and infrastructure, b) whether it builds on existing international agreements or requires fresh negotiations, and c) the speed with which the mechanism could be introduced. Since the latter aspect encompasses political factors some might consider that this should also be in the first grouping. However, it can be argued that achieving a broad political consensus to make progress on a particular financing mechanism is a variable factor which will depend greatly on diverse external circumstances, whereas criteria such as **sufficiency** and **predictability** differentiate themselves as first order criteria because they are simply required attributes for any potential funding instrument to be successful.

Our final second-order criterion is **co-benefits** (or absence of co-costs). While the focus here is on funding to meet mitigation and adaptation needs, any mechanism employed will have side-effects, which may be positive or negative from a development or environmental perspective. As well, mitigation proposals need to be assessed on the extent to which they lay the foundations for an acceptable and effective global deal.

Our complete set of criteria is therefore as follows.

First order:

- **SUFFICIENCY**
- **PREDICTABILITY**
- **EQUITY**
- **ADDITIONALITY**
- **VERIFIABILITY**

Second order:

- **EFFICIENCY**
- **EASE OF IMPLEMENTATION**
- **CO-BENEFITS** (or lack of co-costs)

2.2 A typology of proposals

In this paper it has been argued that mechanisms to fund mitigation in developing countries should be judged on the extent to which they move us towards an acceptable global deal. The question this raises is what this 'deal' needs to achieve?

We can now say with a reasonable degree of accuracy how the trajectory of global emissions needs to change if we are to a) restrict atmospheric concentrations to a level compatible with the 2°C threshold, and b) move to a level of emissions that is sustainable in the sense that it is within the Earth's 'carrying capacity'.

Given these factors, it is clearly essential that we are able to ensure that the quantity of global emissions follows this scientifically determined trajectory with as much accuracy as possible. From now – or at least starting within a very few years – we therefore need to know what total global emissions will be in any given year, and to have a robust framework for ensuring that we can control this level with some degree of certainty.

From a mitigation perspective, therefore, we can consider a spectrum from quantitative certainty to uncertainty in terms of total emissions. A global deal to achieve and finance climate change mitigation therefore needs to be situated firmly at the **certainty** end of this spectrum.

No less important is the need to safeguard the development prospects of the global South. On both moral and practical grounds a global deal that fails this test cannot succeed. But this is a dynamic rather than a static process: as countries develop and move to a sustainable, low-carbon development path their external financing needs will change, as will their responsibility and capacity to contribute. Any global mitigation package needs to be flexible and dynamic enough to evolve as these factors change.

Again, if we think in terms of a spectrum from **dynamic** to static, a global deal to ensure that the process of climate change mitigation supports real and sustainable development needs to be located at the **dynamic** end of this spectrum.

Turning to adaptation proposals, Müller (2008) makes an important distinction between their **'international'** and **'domestic'** nature. By **domestic** is meant those mechanisms where revenues can be identified as national resources in some way, which would then be transferred either directly or via an international body charged with distributing these national contributions. In contrast, international options are where a dedicated international body collects the money directly from a source outside the purview of any national jurisdiction.

The argument is that international mechanisms are inherently preferable because of the 'domestic revenue' problem. Democratically elected politicians face difficulties convincing their electorates that very large sums should be transferred out of the country for whatever purpose, rather than spent, for example, on hospitals or schools at home. Where the sums are not too large, this may not be an insurmountable problem, but as they increase in size the difficulties mount, with the result that pledges are reneged upon or politicians seek to row back on previous commitments. A spectrum of **International** versus **Domestic** is therefore identified.

A further category concerns where the burden of the revenue raising falls – or its 'incidence'. When considering issues of equity, commentators generally focus upon what is fair at the level of the nation state. However, even if the mechanism raises revenue in a way that reflects international responsibility (for creating the problem) and capacity (ability to pay) this leaves open the question of how the burden is shared within each country. For example, national contributions could be raised by levying a tax on one particular sector – oil companies, say – or even to disproportionately targeting particular groups of the population. Regardless

of whether this appears reasonable on the basis of 'ability to pay' as well as responsibility, this level of concentration raises difficulties.

Where revenue is raised entirely – or disproportionately – from one particular group or sector, there is a real risk that it could be undermined over time, either through lobbying efforts or through a decline in profitability in that area, for example. This is particularly so when the ultimate incidence falls on a small group. On the other hand, in some sectors of the economy a modest increase in costs (through the levying of a tax, for example) would be widely diffused and so would not necessarily create an effective lobby against it. The spectrum identified is therefore that of **diversity** versus **concentration**.

We posit therefore the following spectrums upon which the financing mechanisms can be located:

Mitigation

- (QUANTITATIVE) **CERTAINTY** → (QUANTITATIVE) **UNCERTAINTY**
- **DYNAMIC** DEVELOPMENT → **STATIC** DEVELOPMENT

Adaptation

- **INTERNATIONAL** → **DOMESTIC**
- **DIVERSE** → **CONCENTRATED**

Ideally, we would seek to find mechanisms that both meet our criteria sets and which are **dynamic** in terms of development and provide as much **certainty** as possible in terms of total emissions in the case of mitigation, and are both **international** and **diverse** for adaptation.

Before considering the available proposals within this framework it should be noted that no one mechanism may pass all of these tests. This is not necessarily an insurmountable obstacle, however. What is needed is for the final package of mechanisms to do so, and this could be achieved in a 'portfolio' sense – i.e. where different mechanisms bring together different attributes.

2.3 Organising the proposals into the typology

2.3.1 A typology for mitigation proposals

It has been argued in this paper that, in the end, effective climate change mitigation can only be achieved within the framework of an acceptable global 'deal'.[18] From a straight economics perspective, there are only two possible forms that such a 'deal' could take: quantity-based or price-based.

An alternative framework of approaching this would be through regulation, or Sustainable Development 'Policies and Measures' (SD-PAMs). Such approaches include the use of taxes, the creation of markets, the application of codes and standards, and mandatory or voluntary requirements and commitments. Many countries have implemented some combination of these approaches, and no doubt will continue to do so. However, in this paper we are concerned with achieving the needed mitigation at the global rather than the national level. Of course, it is entirely feasible that a global limit is determined, national allocations set and countries then seek to achieve these through a combination of 'policies and measures'. Alternatively, in the absence of any global agreement on a cap, such approaches could continue to be used to a greater or lesser extent by individual countries.

18 Granting that this would need to incorporate elements such as NAMAs (Nationally Appropriate Mitigation Actions) and MRV (Measurable, Reportable and Verifiable) actions.

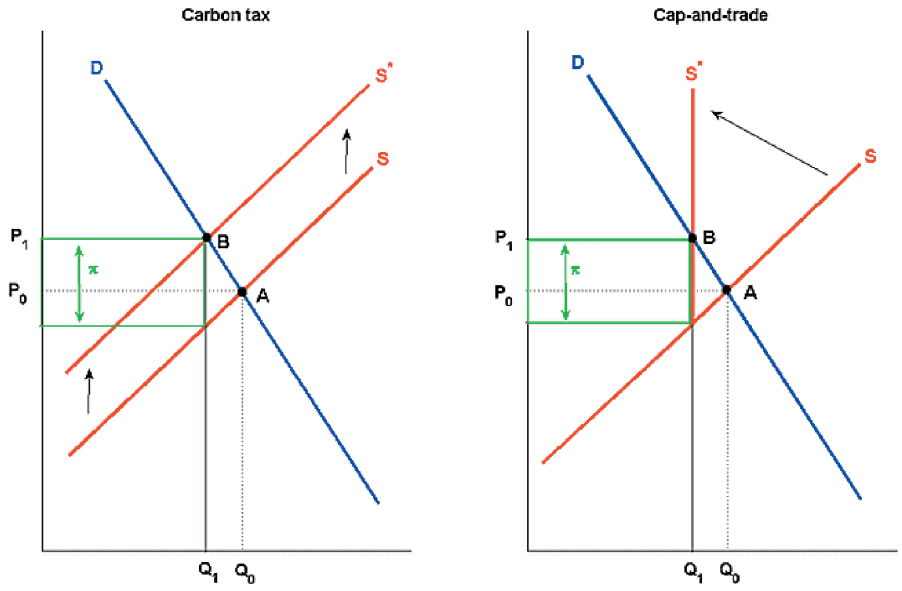
In this paper, however, we are concerned with international mechanisms to achieve mitigation (globally) and finance mitigation in developing countries. We have argued that to be effective and predictable, this financing needs to be part of a comprehensive global deal – while in no way incompatible with the use of a variety of 'policies and measures', it is difficult to see how a framework based on such an approach would be sufficiently coherent.

We therefore focus on quantity versus price-based approaches. The first sets a limit on the overall level of global carbon emissions within a given period, with prices moving in relation to this limit. The second, sets a price for carbon emissions, and then lets the quantity of emissions move in response. When thinking about the mitigation of climate change (i.e. the reduction of global carbon emissions to a level that has been scientifically determined to be compatible with restricting global temperature increases to a given level – say, 2°C) these two mechanisms equate to a) a global carbon tax, and b) a global cap on the quantity of emissions. From the perspective of pure economic theory both forms are essentially identical, as illustrated in the figure below.

We start at equilibrium point A on the graphs, where quantity Q0 of carbon is emitted, equating to an implicit 'price' of P0 for a ton of carbon. The aim is to reduce the level of carbon emissions from Q0 to Q1 – i.e. the level deemed to be sustainable. If a carbon tax is applied at the level π, this has the effect of shifting the supply curve upwards so that the equilibrium point is now B rather than A. This has the desired effect of reducing emissions from Q0 to Q1, with the price rising from P0 to P1. The ultimate price rise is less than the tax increase due to the slope of the demand curve – the steeper the slope the closer the price rise comes to the tax increase.

The graph on the right-hand side shows how a cap and trade approach would achieve an equivalent result. Here, it is the quantity rather than the price which is directly determined. Knowing that an emission level of Q0 is required, a cap is set at this level, and the supply curve thus becomes fixed and vertical at this point – i.e. this is the maximum level of supply regardless of what happens to the price. As with a carbon tax, the new equilibrium is therefore B and the price also rises to P1 as the demand curve is identical.

FIGURE 1 **Carbon taxes vs. cap & trade**



Source: Gordon (2008)

As pointed out by Gordon (2008), however, the only difference between the two is what happens to π:

"...the difference between the price the consumers pay at B and what it costs suppliers to produce at Q1. In the case of the carbon tax, the money goes to the government. But if output is capped at Q1, that difference is pure profit: a permit to produce one unit of output allows its owner to collect a rent equal to the difference between the selling price and the cost of production. If permits are traded, their price will be bid up so that their price will be equal to π. So where that money goes depends on how the permits are allocated in the first place. If the permits are simply given to existing emitters, then those profits are pocketed by the firms. If the permits are auctioned off, the price will be bid up to π, and the government gets the money."

Therefore, in terms of economic theory, a cap and trade scheme where permits are auctioned and a carbon tax scheme are identical. In terms of our example, a reduction of carbon emissions from Q0 to Q1 could be achieved with a carbon tax of π. Alternatively, if a quantity cap were to be set at Q0 within a cap and trade system where permits were auctioned, then the price of the permits would move to π. In both cases, therefore, the desired emission reductions would be achieved, ultimate consumers would see prices rise to P1 and governments would receive revenues equal to the green rectangle in both graphs above.[19] Furthermore, governments could then redistribute these revenues on an equitable basis – for example, this could be done internationally according to the weightings calculated in the Greenhouse Development Rights framework described above.

Theoretically, therefore, the choice between adopting a price or quantity based system to achieve sustainable mitigation simply turns on factors such as practicality and political feasibility. However, unfortunately there is a wide gulf between the world of theory and that of practice. Going back to our example, the equivalence between the two approaches requires a number of quite large assumptions.

The most fundamental of these is that the government or governments in question know the shape of both the supply and demand curves. While it is true that whether a carbon tax or a cap and trade system were to be introduced these curves would be identical, this does not mean that we know what they are. This has very important consequences. In particular, without a very precise idea of the shape of these curves, it is impossible to say that setting a carbon tax at level π would result in a reduction in emissions to the level required – i.e. Q0. Similarly, if a cap were set at this level of emissions, it is not possible to say that what the resulting price increase would be, either to the consumer or in terms of the traded permits.

We therefore can have either certainty of price (as with a tax) or certainty of quantity (as with a cap), but we cannot have both. In debating these approaches the following points are useful to consider:

- Given the overwhelming need to constrain carbon emissions within scientifically specified limits, and the fact that we can have certainty of price (with a tax) or certainty of quantity of emissions (with a cap), which is the more important?
- Both a cap and trade system or a carbon tax could be implemented globally in a way that is completely inequitable:
  - A cap and trade system where allocation rights were based on the pattern of current emissions (i.e. 'grandfathering') would bind in existing global inequalities for the foreseeable future.
  - A straight global tax with no redistribution would be extremely regressive – disproportionately affecting the poorest, both within and between countries.

19 See http://worthwhile.typepad.com/worthwhile_canadian_initi/2008/06/carbon-taxes-vs-cap-and-trade.html.

- Neither would take any account of historical emissions and the responsibility of those that have created the problem to resolve it.

- Both systems could be implemented in ways that are completely equitable:
  - A cap and trade system with allocation rights based on an equal per capita entitlement for all the people of the world, wherever they happen to live and whatever their current level of wealth, would necessitate vast annual transfers from the global North to the global South as poorer countries sold their surplus permits to rich countries. This would be ethical in its own terms – as it would recognise the equal worth of all human beings – but would also provide the funding for poor countries to finance and make the transition to a sustainable, low-carbon development path. Similarly, the GDR framework described earlier could be used to allocate emissions rights based on **Responsibility** and **Capability**, which would also necessitate significant transfers of wealth from North to South as a result of developed countries greater historic emissions and wealth.
  - The proceeds of a global carbon tax could be redistributed globally according to a formula considered equitable – perhaps based on GDR weightings. This too could provide the North-South transfers described above, though the process would not be 'hard-wired' into the system as with cap and trade. As the tax would have to be collected nationally and therefore pass through national budgets, it would inevitably be more discretionary and so subject to national political factors.

- The factors determining the chances of achieving an adequate and equitable outcome with a cap and trade system are:
  - The willingness of developed **and** developing countries to sign up to a global cap in the first place, and for such a mechanism to be operational and effective before necessary peak and decline (i.e. 2015). Given that, under the Bali Action Plan, developing countries are not required to take on quantified emission limitation and reduction objectives in the next commitment period, this is only conceivable if developed countries agree a truly equitable allocation of emission rights which would bring about massive wealth transfers from North to South.
  - Therefore the willingness of developed countries to accept such an equitable allocation of emission rights within this overall cap (or a binding agreement to move rapidly to such an allocation) is also critical.
  - The ability of countries to accurately monitor and maintain national emissions within their allocated carbon 'budget', without offsetting emissions reductions to uncapped countries.

- The same factors with respect to a carbon tax are:
  - The willingness of all countries to accept the implementation of a uniform carbon tax.
  - The ability of all countries to monitor carbon emissions within their jurisdictions and to levy and enforce the carbon tax.
  - The willingness of developed countries to commit to redistribute the proceeds of their national carbon taxes internationally in line with a predetermined equitable formula.

- In respect of both approaches, practical considerations include:
  - Developing countries are extremely unlikely to sign up to a global cap at the next commitment period if national allocations within this are not equitable, particularly as this was not agreed in the Bali Action Plan. Nor are they likely to sign up to a carbon tax unless the proceeds were redistributed internationally in an equitable way.
  - Conversely, it may be that developed countries would take the complete opposite position, refusing to sign up to a global cap unless national allocations were based on current emissions; or to implement a carbon tax unless they could retain the proceeds within their jurisdictions.

From a direct environmental perspective, a global cap theoretically provides **certainty** that emissions remain within set limits, and is therefore to be preferred on the basis of the 'spectrum' set out in the previous section. Furthermore, if emission rights were allocated equitably on the basis of population size rather than national income, the transfer of vast sums from North to South would be hard-wired into the system. Finally, the transfers within this system would be **dynamic**, in that they would change to reflect changing relative levels of development. That is, as poor countries develop they may well need to use more of their carbon 'budgets', so would sell fewer to developed countries and receive lower levels of annual financing. On the other hand, as richer countries are able to reduce their emissions by making the transition to a low-carbon economy, they will need to purchase fewer additional emission permits. Again, on the basis of the 'spectrum' developed in the previous section, this suggests a global cap is to be preferred.

While a carbon tax does not have these advantages, this does not mean it should be rejected out of hand. Either a carbon tax or a cap and trade system would be far preferable to doing nothing and could achieve similar results in practice. The priority is to achieve the level of carbon emissions needed to "preserve a planet similar to that on which civilization developed and to which life on Earth is adapted,"[20] and to do so in a way that is equitable and safeguards the development prospects of the global South.

If both could be optimally designed a cap and trade system may be preferable. This would however require a cap and trade system to have scientifically determined caps – rather than be subject to lobby interests and exemptions, and ensure there was no leakage through offsetting. However, a carbon tax with equitable and binding redistribution would be preferable to a cap and trade system that was inequitable. The question, therefore, turns on which is the more likely to be achievable in a way that is as equitable as possible, and that is an essentially political question that is beyond the scope of this paper to answer.

Whether or when an effective global deal can be achieved, mitigation activities will obviously continue in different countries to a greater or lesser extent. Sustainable Development 'Policies and Measures' (SD-PAMS) link developmental and environmental objectives in a positive way to influence future development trajectories significantly through delivery of large-scale projects.

Initiatives of this kind are already very important in many non-Annex I countries, and this looks likely to increase. However, there are limitations. First, it is certainly not always the case that policies with positive environmental outcomes necessarily have positive developmental effects, and vice versa. For example, many developing economies are heavily dependent upon coal reserves for their energy supplies. While moving to the widespread use of carbon capture and storage (CCS) would be one way of squaring this with the pressing need to reduce carbon emissions (were technical obstacles to be overcome), there are no clear developmental benefits to this – indeed the opposite may be true. (Bradley, 2005).

Thus while SD-PAMS need to be encouraged and supported, they are limited to 'win-win' situations. Particularly for the larger developing countries, it is difficult to see how the exploitation of such opportunities alone will be sufficient to achieve and maintain the reduction of global carbon emissions that is needed. A transition to a sustainable, low-carbon economy will inevitably involve real costs and these need to be paid for. We therefore need a mechanism to both achieve the carbon reductions required and to finance the changes needed to achieve this in developing countries.

The SD-PAMS approach is achieving real results in many countries and this needs to be supported and increased. For many smaller countries at low levels of development this approach alone may well be compatible with the reduction of global carbon emissions

20 Hansen at al (2008)

required. For the larger economies – particularly the 'BRICs'[21] – this is less likely to be the case. This brings us back to the need for a global deal that would be acceptable to these countries.

If it proves to be the case that developing countries are unwilling to sign up to such a deal it would be important for the resulting framework to be constructed in such a way that such an outcome was possible in the longer term. One solution would be for Annex I countries to proceed with the establishment of a cap and trade system, with a strict scientific and equitable determined cap and without access to compliance through offsetting emissions into uncapped sources, and for other countries to exploit the potential of SD-PAMS but join the system as they reached a certain development threshold and/or level of carbon emissions. There would, however, need to be a clear and transparent process in place for this to occur, and strong incentives for all parties to adhere to it.

Returning to our two major potential global frameworks of carbon taxes and cap and trade, numerous proposals have been put forward.

For carbon taxes, a number of countries have already taken steps to implement, or are in the process of doing so. For example, Sweden, Finland, Norway and the Netherlands all introduced taxes on carbon of one form or another in the 1990s. In the UK the 'fuel price escalator', which progressively increases the tax on petrol sales was also introduced in the 1990s and can be seen as a carbon tax of sorts. Elsewhere, a number of prominent US politicians (for example, Al Gore) and scientists (such as James Hansen of Nasa) are proponents of carbon taxes.

A carbon tax can be designed in various ways, and could be levied on major industrial emitters (i.e. 'upstream') or on the ultimate end-users (i.e. 'downstream'). This is more a question of practicality than principle, however, as the costs of an upstream tax would inevitably be passed onto consumers leading to higher end prices anyway. Similarly, a downstream tax would reduce demand by raising prices, with the impact feeding back up the supply chain to producers.

Supporters argue that a major advantage of carbon taxes is that no dedicated infrastructure is required. That is, a carbon tax would be levied and collected by national tax agencies, just as with all other taxes. Opponents argue in turn that the logistics of accurately assessing the carbon content of products are daunting, which is likely to make tax avoidance a real problem. There is certainly something in this argument, though the same could be argued for many forms of tax, where collecting agencies are continually playing 'catch-up' with those seeking to avoid payment.

A key problem with carbon taxes is that they are inherently regressive in that they disproportionately affect the poorest. This is true both globally and nationally. Some proponents – such as James Hansen of Nasa, for example – have argued that the entire proceeds of the tax should be returned to taxpayers, which has been termed the 'tax and dividend' approach. While this could be used for redistribution at the national level, this is not so internationally. For a global carbon tax to be acceptable as the primary framework to mitigate climate change internationally, this redistribution would have to cross borders, and entail large transfers from North to South, based on a formula deemed to be equitable, and requiring a financial infrastructure created for the purpose.

In the next section we explore these issues with respect to a specific proposal made to the UNFCCC by the Swiss government for a global carbon tax.

21 BRICs: Brazil, Russia, India and China – it is estimated that 20% of the world's wealth will soon reside in these four countries.

Turning to quantity-based mechanisms, it is widely – and somewhat blithely – assumed that the International Carbon Market will be the framework used to achieve climate change mitigation.

An important point to bear in mind is that we do not currently have a functioning international carbon market. What we have instead are a number of national and regional markets – with sub-optimal performance in terms of achieving substantial low-carbon transformation or reducing emissions – and the beginnings of an international market, which is far from universal in coverage. It should also be noted that the EU's recent Copenhagen Communication optimistically sets out its goal for a global carbon market to extend to 'economically more advanced developing countries by 2020'. Even this optimistic position would almost certainly be beyond what is considered as a safe peak and decline date.

The International Emissions Trading (IET) system, which was established under the Kyoto Protocol is described by the UNFCCC as follows:

Parties with commitments under the Kyoto Protocol.. have accepted targets for limiting or reducing emissions. These targets are expressed as levels of allowed emissions, or "assigned amounts," over the 2008-2012 commitment period. The allowed emissions are divided into "assigned amount units" (AAUs). Emissions trading... allows countries that have emission units to spare – emissions permitted them but not "used" – to sell this excess capacity to countries that are over their targets. Thus, a new commodity was created in the form of emission reductions or removals. Since carbon dioxide is the principal greenhouse gas, people speak simply of trading in carbon. Carbon is now tracked and traded like any other commodity. This is known as the "carbon market."[22]

The market is not restricted to the trading of AAUs, however. Emission Reduction Units (ERUs) and Certified Emission Reductions (CERs) are generated through Joint Implementation and the Clean Development Mechanism respectively and may be brought and sold in the secondary carbon market. The same is true of Removal Units (RMUs) where land use is earmarked for activities such as reforestation.

Purchases and sales of these various units are recorded in national registry systems established under the Kyoto Protocol, with an international transaction log enabling transfers of emission reduction units between countries. In operation however, the quality of such units are extremely questionable with regards to both additionality of the supposed emissions reductions and through any sustainable development benefits (See WWF's *Emission Impossible*[23] for a good analysis of this issue).

As well as this emerging international market, a number of national or regional carbon markets have been developed. By far the most significant currently is the European Trading System (ETS), with national versions in Norway and Australia. The US is also preparing to introduce a trading system. Although the Bill to pave the way for this was defeated in Congress in 2008, President Obama is an open advocate of the system, and it is highly likely that the Bill – or one like it – will return. More generally, it has been assumed that most developed economies and regions will employ some form of trading system to meet any future international emission obligations.

A number of proposals have been made for comprehensive global frameworks, which generally are 'cap & something'. Cap & Trade, is the generic term for any system that sets a quantitative limit but allows trading between parties within this budget. Variants on this scheme differ primarily in how emission rights are allocated. The most straightforward approach is 'grandfathering', where permits are allocated on the basis of current emissions.

22 http://unfccc.int/kyoto_protocol/mechanisms/emissions_trading/items/2731.php

23 Emission Impossible: access to JI/CDM credits in phase II of the EU Emissions Trading Scheme – WWF-UK, June 2007

At the other end of the possible spectrum, the 'Cap & Share' proposal, developed by the Foundation for the Economics of Sustainability (FEASTA)[24], allocates emission rights equally on an individual basis globally. Trading then takes place within the system, resulting in huge transfers from (relatively high polluting) rich people and rich economies, to (relatively low polluting) poorer people and poorer economies.

Between the two is the 'Contraction & Convergence' proposal, developed by the Global Commons Institute (GCI)[25]. Initially Contraction & Convergence looks identical to Cap & Trade where an overall budget is set and allocations are 'grandfathered' within this to nations on the basis of current emissions. 'Contraction' refers to the progressive reductions in the overall global 'budget', while 'convergence' describes the process where allocations move from allocations based on current emissions to those based on an equal per capita share of emission rights. Unlike Cap & Share, however, these remain at the level of the nation state – which then has to determine how the national 'budget' is allocated within their own borders – rather than with the individual citizen.

Thus, while the IET system is quantity-based, it is not yet universal in the sense that these proposed mechanisms are and so would not provide quantitative **certainty** in terms of total global emissions. The question, therefore, is the extent to which it moves us in this direction and, if so, will the final 'package' that results be acceptable – in particular would it be **equitable**?

Distinct from these criteria, the second requirement for a 'global deal' to address mitigation financing is that it should be **dynamic** in a development sense, which is entirely determined by how emission rights are allocated over time. That is, a straight Cap & Trade system has allocations based on actual emissions and so is only **dynamic** to the extent that these change. Contraction and Convergence is clearly **dynamic** in nature, moving from the status quo to what could be considered an equitable international allocation. However, the proposal does not stipulate the speed with which this process should take place, which is clearly the central question to be answered. Cap & Share is not **dynamic** at all in terms of emission rights, as these are set at the outset – only changing population sizes would alter this. The **dynamic** effects here will be felt in the level and distribution of payments to purchase emission rights and the changes in behaviour that this induces.

What is clear is that the devil is very much in the detail with all these potential 'global deals' based on emission caps. In principle, each could effectively resolve the mitigation problem, by establishing and reducing the total global budget for greenhouse gas emissions. They are also **dynamic** in different ways, but the precise nature of this depends crucially on how emission rights are initially allocated and how these evolve over time.

2.3.2 A typology for adaptation proposals

In this section we take each of the proposals in turn, describing them and then locating them on the two spectrums:

- **INTERNATIONAL** → **DOMESTIC**
- **DIVERSE** → **CONCENTRATED**

We also consider the **certainty** and **dynamic** spectrums from a mitigation perspective for proposals where these apply.

24 http://www.capandshare.org

25 http://www.gci.org.uk.

The G-77+ China Proposal (of more than 130 developing countries) – *developed countries provide funding of 0.5% of GDP mainly for mitigation*

The Chinese submission to the UNFCCC Secretariat – which has been adopted by the G-77 in a modified form[26] – is the most straightforward and, in some ways, the most intuitively appealing of the options available. The G-77+ China group have argued that developed countries should fund adaptation (and mitigation) in developing countries via central government budget support equivalent to 0.5% of GDP. The proposal has the political backing of more than 130 developing countries.

While details remain sketchy, more than the US$200 billion would be raised annually (based on 2008 figures) targeted to mitigation – including technology transfer – and general capacity building. Müller (op cit) suggests that around a quarter (US$46bn.) would fund adaptation activities.

With the bulk of financing therefore available for mitigation (and technology transfer) the question is how this would relate to the main mitigation options, particularly as related to the international carbon market. The first point is that there is no set **quantity** element of the proposal in that it is not part of a global deal to set and reduce global greenhouse gas emissions.

In terms of the **international**–**domestic** spectrum for adaptation, the proposal is firmly in the latter camp and very much subject to the domestic revenue issues described above. Secondly, by funding the mechanism through a general levy on central government budgets the incidence of the proposal falls in the same proportion as does the national taxation system – it is therefore **diverse**.

Using the adaptation typology introduced above, the G-77+ China proposal is therefore:

- **DOMESTIC**
- **DIVERSE**

The World Bank's Pilot Programme for Climate Resilience (PPCR) – *discretionary loans for adaptation given by developed countries as part of Official Development Assistance (ODA) through the World Bank*

The PPCR is funded in a similar way to the G-77+ China proposal – i.e. through central government budgets – but differs in some fundamental respects. Firstly, it is funded on a discretionary rather than mandatory basis. Secondly, payments take the form of loans rather than grants (or indeed compensation payments as developing countries might expect). Thirdly, these loans are viewed as ODA and so can be counted towards a country's 0.7% of GDP target (though it should be acknowledged that countries are not obliged to count the amounts as ODA). A final point is that the PPCR is very much a 'pilot' programme designed to increase understanding of funding of the process of adaptation – this needs to be borne in mind by critics who rightly point to inherent problems with the mechanism were it to be used as a major channel for funding adaptation.

Despite these major differences, which will be explored in the following section where the first-order criteria are applied, the PPCR has the same composition with respect to our two spectrums:

- **DOMESTIC**
- **DIVERSE**

26 This elaboration of the proposal by the Philippines government on behalf of the G-77 has considerably more detail than the original, including suggestions of how the finance would be managed through the Financial Mechanism.

The Mexican Climate Change Fund (MCCF) – ***countries are obliged to contribute to the fund on the basis of emissions, population and income, mainly for mitigation***

The MCCF proposal is focused primarily on funding global mitigation of climate change, but with a small proportion of the revenues raised being earmarked for adaptation spending. The proposal resembles that of the G-77+ China more than the World Bank's PPCR in that payments into the fund are not discretionary, with national commitments being a function of greenhouse gas emissions, population size and national income. It is therefore potentially **dynamic** with respect to mitigation.

In this it has similarities with the Greenhouse Development Rights' proposal – indeed, contributions to the fund could be accorded in relation to a country's RCI weighting.

Another similarity with the GDR approach is that contributions are not restricted to the developed countries. Emerging middle income countries are also expected to contribute (although they can then withdraw a multiple of this contribution dependent on economic circumstances).

As with both the preceding proposals, the MCCF is to be funded through central government budgets, with the difference being that a part of the funding may be supplied through a levy on the auctioning of national carbon permits. Were a genuinely comprehensive International Emissions Trading (IET) system to be in place, the MCCF could be a good mechanism for generating and then distributing funds relating to climate change.

The mechanism is **domestic** in terms of financing, as with the preceding options. The incidence of the mechanism also remains firmly at the **diverse** rather than **concentrated** end of the spectrum. The incidence of this mechanism will fall, in the first instance, on those companies and state agencies that buy carbon permits. However, the costs will then be passed onto consumers, diversifying the incidence, but also incentivising behaviour change in a manner that is not erosive of the financing base.

The MCCF is therefore also situated as:

- **DOMESTIC**
- **DIVERSE**

Other carbon auction tax proposals:

i) The US Auction Levy – ***where a small proportion of the proceeds of auctioning carbon permits within the US are earmarked for funding adaptation activities in developing countries***

ii) The EU Emission Trading Scheme (ETS) Auction Levy – ***where a proportion of the proceeds of auctioning carbon permits within the countries of the European Union are earmarked for funding adaptation activities in developing countries***

The first proposal is the **US Auction Levy**, where 1% of the proceeds initially (rising to 7% by 2050) would form the basis of an 'International Climate Change Adaptation and National Security Fund'. A proportion of this would then be earmarked for the funding of adaptation in developing countries.

The second proposal is the **EU Emissions Trading Scheme (ETS)**, now including aviation, where EU member states have expressed a 'willingness to use' at least 50% of auction

proceeds 'to enable and finance actions to mitigate and adapt to climate change in developing countries.'[27]

Both schemes may be important elements in a future carbon market and are therefore potentially relevant to the question of a mitigation 'deal'. While both are quantity-based, neither is comprehensive by definition.

In terms of our two adaptation spectrums: both of these schemes like the preceding options are **domestic** – under the ETS carbon permits are auctioned nationally rather than at the EU level); and **diverse** – in that the impacts will be widely dispersed through the US and EU economies as purchasers of carbon permits pass on the cost to customers. These proposals are therefore also:

- **DOMESTIC**
- **DIVERSE**

The Swiss Carbon Tax proposal – *a global tax on all carbon emissions in all countries, but with a per capita exemption that would benefit some poorer countries*

The proposal made by the Swiss government in 2006 is for a global tax on all carbon emissions, which would be universally applied to both developed and developing countries. The incorporation of an 'exemption' to the tax of US$1.5/$tCO_2$ per capita means that, in practice, the tax would not be applied uniformly. Particularly for LDCs, the per capita exemption would be above current emission levels so that no tax would be paid, though it is estimated that more than half of total revenues would be provided by developing countries.

Above it has been argued that a tax of this form is not ideal as the basis for a global mitigation deal as it is not quantity-based. That said, if it could be combined with an equitable redistribution of revenues (and it were not possible to achieve an effective and equitable system based on a global cap and 'hard-wired' equitable transfers) then it has the potential to greatly improve the current situation.

The Swiss proposal is also **diverse** rather than **concentrated**, being diffused globally among consumers of products with a carbon component. The tax would be collected domestically, thus also:

- **DOMESTIC**
- **DIVERSE**

The Global Capital Fund Mechanism – *bonds are issued on the international capital markets and the proceeds are invested in mitigation and adaptation*

The GCFM is very similar in concept to the UK's International Financing Facility (IFF), wherein money for development is 'frontloaded' by issuing bonds on the international capital markets and using the proceeds to invest in development. The structure therefore allows payments to be spread over the lifetime of the bond thus reducing the 'domestic revenue problem'.

27 Note of Council of European Union, Brussels, 12 December 2008 (re:17215/08) clause 8 on **voluntary pre-allocation of part of auctioning revenues** acknowledges with respect to member states: "their willingness to use at least half of [auction revenues] for actions to reduce greenhouse gas emissions, mitigate and adapt to climate change, for measures to avoid deforestation, to develop renewable energies, energy efficiency as well as other technologies contributing to the transition to a safe and sustainable low-carbon economy, including through capacity building, technology transfers, research and development…In the context of an international agreement on climate change in Copenhagen in 2009, and for those that wish to do so, part of this amount will be used to enable and finance actions to mitigate and adapt to climate change in developing countries…"

Proposed in 2008, the GCFM would adopt the same approach, with the proceeds being channelled to developing countries to fund mitigation and adaptation activities. In simple terms, if the UK government wishes to provide £10 billion as its contribution to a mitigation or adaptation fund in a given year, it can issue GCFM bonds to this value on the international capital markets. That is, it borrows the £10 billion from private investors and repays this figure at a rate of interest over the term of the bond, which could be anything from 1 to 30 years. The scale of the resulting fund would be determined by the willingness of governments to commit credibly to meeting the annual payments and the appetite for this instrument in international capital markets.

As mentioned above, the proposal is not purely domestic in that the upfront money is provided by the international financial markets, though it is domestic in that the payments are met by national agencies. That said, the fact that these annual payments would be of relatively moderate size – depending on the scale of the issuance – would at the very least take the heat out of the domestic revenue issue. The GCFM is neither purely **international** nor purely **domestic**, but a hybrid of these two forms.

The incidence of the mechanism is also **diverse** rather than **concentrated**, in that the ultimate sources of revenues are central government budgets and their taxpayers. We, therefore, have:

- **INTERNATIONAL / DOMESTIC**
- **DIVERSE**

The Norwegian 'Assigned Amount Units' (AAU) proposal – *the international auctioning of national carbon emission permits*

A number of proposals have been made for a levy on the international trade of emission permits. The Norwegian government has suggested that a proportion of AAUs should be withheld and auctioned by either a dedicated or existing international body, with the proceeds forming the basis of a fund to finance adaptation-type activities in the developing world.

If we imagine a post-2012 world where countries have signed up to internationally binding emission targets and have been allocated AAUs as their share of this global total, the Norwegian proposal is that a proportion of national AAUs should not be issued to national governments, but sold at auction internationally.

From a mitigation perspective, the Norwegian proposal is clearly compatible with a global mitigation deal based on a genuinely international carbon market. Furthermore, it is possible to imagine both mitigation and adaptation being funded through this mechanism, with the former being driven by purchases of developing country AAUs by developed economies (as well as further funding, perhaps based on Greenhouse Development Rights weightings) and the latter funded through a distinct mechanism where AAUs are withheld from issuance in the primary market and later auctioned.

The proposal is one of the very few that is truly **international** in form; and **diverse** for the same reasons as with the previous mechanisms considered. We therefore have:

- **INTERNATIONAL**
- **DIVERSE**

The Tuvalu Burden Sharing Mechanism (TBSM) – *a levy on air travel and freight shipping with different rates for developed and developing countries and exclusions for travel to and from Least Developed Countries (LDCs)*

The TBSM is in fact a combination of two different levies. The first entails a 0.01% levy on international air travel and freight shipping of developed countries as defined as Annex I under the Kyoto Protocol. The second applies the same levy to developing country operators and travellers but at a lower rate of 0.001%. Flights and shipping to and from LDCs would be exempt from the charge.

While the proposal is **international** in that a dedicated international body would collect the levy directly from operators, a **domestic** component is introduced by the distinction between developed and developing countries. Although the proposal is **concentrated** in that it affects only two sectors, its incidence is actually highly **diverse** as it falls on individual passengers and is widely diffused through those using the international shipping and aviation sectors. This leads to:

- **INTERNATIONAL / DOMESTIC**
- **DIVERSE**

The International Air Passenger Adaptation Levy (IAPAL)[28] – *a levy on international air travel*

The IAPAL was submitted to the UNFCCC by the Maldives government on behalf of the Least Developed Countries in December 2008. The proposal, which is similar to the use of aviation levies to fund UNITAID[29], would apply a levy of $6 for all international economy flights, and $62 for business class flights. The levy would be charged by the airlines at the point of sale.

In their UNFCCC proposal, the Maldives government argue convincingly that the international nature of air travel is such that emissions cannot be readily assigned to particular countries. As a result, they suggest that it is both valid and equitable for the levy to be charged at the individual level: those choosing to take international flights have a direct responsibility for a share of the resulting emissions – those able to afford to take these flights have the capability to pay the levy.

The proposal is clearly **international** rather than **domestic**. As with the TBSM, the proposal has a **concentrated** aspect in terms of sector, but is **diverse** in that the incidence falls on individual passengers internationally, and only impacts on the airline industry in terms of the effect on demand for air travel.[30] This gives:

- **INTERNATIONAL**
- **DIVERSE**

28 The IAPAL evolved from the IATAL, the International Air Travel Adaptation Levy, launched in 2006, in order to place greater emphasis on the aspect of individual responsibility – see Müller, April 2009. www.oxfordclimatepolicy.org/publications/ecbiBrief-IAPAL13Q&As.pdf

29 UNITAID, launched in September 2006, is an international drug purchase facility to supply (and reduce the cost of) drug treatments for HIV/AIDS, TB and malaria, funded by aviation levies from a number of countries, notably France, pooled together into a 'solidarity fund', which to date has raised approximately $700 million.

30 The UNFCCC submission by the Maldives on behalf of the LDCs suggests that, given elasticities of demand for air travel, the IAPAL at the proposed rate would reduce demand by 0.52% for short flights and 0.47% for long-haul flights. This is compared to the projected annual growth of air travel of 5.1% per annum to highlight the fact that the impact on the industry would be negligible.

The International Maritime Emission Reduction Scheme (IMERS) – *a levy on international shipping*

This proposal essentially applies the air travel levy concept to international shipping. The proposal would see an emission charge applying to shipping to all Annex I countries for ships above a certain size, with the charge based on an overall cap on emissions and the forward price of carbon. It is therefore a 'cap and charge' scheme.

In terms of our spectrums, the proposal is again **international**. However, unlike the IAPAL proposal, it is more **concentrated** than **diverse**, in that the cost falls on the industry directly rather than on individual passengers, as with the IAPAL. We therefore categorise the IMERS proposal as a mixture of **concentrated** and **diverse**.

- **INTERNATIONAL**
- **CONCENTRATED / DIVERSE**

There are two variants of the IMERS scheme. The original proposal was purely international in that the financing would be collected through the International Maritime Organisation (IMO), bypassing national governments. A more recent version proposed by the Danish government, however, sees revenues collected at the national level.

For the purposes of this paper we term the international version IMERSi and the national IMERSn.

The Currency Transaction Tax (CTT) – *a very small levy on international currency transactions as a long term funding stream for adaptation*

A proposal that has gained in recognition over recent years as a potential source of substantial new finance is a small tax on international currency trades. The foreign exchange market is the largest in the world with a turnover of more than $3.2 trillion per day[31]. It has never been subject to a tax, unlike other financial transactions such as shares. It is not surprising, therefore, that it has attracted the attention of those looking to tap unharnessed revenue streams, particularly when the need is for large quantities of funds.

Although the UNFCCC (2007) lists the CTT as a potential financing option for climate change adaptation, as do Fujiwara et al (2008) in a paper presented at the European Climate Platform seminar, the proposal has not to date been widely considered. In part, this is because of its historical association with additional 'development' finance. As well, because it is not directly linked to carbon emissions in the way that other proposals are. For the purposes of this paper, however, this is not viewed as a problem since the sole consideration here is to assess the suitability of potential mechanisms to tap new income streams. While there are arguments in favour of such mechanisms being directly linked to the curbing of carbon emissions, this need not be so. Indeed, there are also reasons why having no link – for at least a part of the total financing package – would be positive. Predictability of revenues is an important criterion and so a diversity of sources, where different drivers influence the volatility of different annual revenue streams, could be seen as a positive factor. A final point is that untapped sources of finance of the scale required are not numerous. A CTT levied at a rate of 0.005% could generate in the region of $40 billion a year if it captured the world's most traded currencies.[32]

31 Annual daily turnover: $3.2 trillion per day. *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity 2007 – Preliminary global results*, Bank for International Settlements, September, 2007. www.bis.org/publ/rpfx07.htm

32 See Stamp Out Poverty, www.stampoutpoverty.org, for a series of papers describing how the CTT could be implemented and potential revenue generated, particularly the report by Professor Rodney Schmidt of the North-South Institute for the UN University: www.stampoutpoverty.org/reports

While such a mechanism might seem to be **international** in nature, this is not in fact the case. Currency transactions are ultimately settled through accounts held in national central banks, where the CTT would have to be collected before it could be passed onto an international body for disbursement. It is therefore, according to our typology, **domestic**.

The incidence of a CTT would also be **diverse** rather than **concentrated**, with the impact being widely diffused amongst financial institutions, corporations, public agencies and individuals who buy or sell foreign exchange.

- **DOMESTIC**
- **DIVERSE**

2.4 Applying the first-order criteria set

The scoring approach developed in this section is designed to enable different proposals to be broadly compared. There is inevitably a subjective element involved in any such scoring system, and this is no less true here. Complex numerical evaluation of each criterion has been deliberately avoided, indeed criteria, such a **sufficiency** and **predictability**, are all assessed as equal with no weighting in relation to possible relative importance. As a result the final scores are plainly indicative. More important is the process of assessing the financing mechanisms against the criteria in order to better familiarise ourselves with their strengths and weaknesses.

It should be noted that the use of scoring has here been applied only to adaptation proposals. Given the very different nature of the possible mitigation mechanisms, particularly the fact that the attractiveness of each is, to a large extent, dependent upon the details of any 'global deal', means that such an approach is not suitable.

In order to compare the proposals, a broad scoring system is employed. For each criterion mechanisms are assigned to one of three points on a scale of 0.0 to 1.0: 0.0 (negative score), 0.5 (neutral score) and 1.0 (positive score). For some criteria this is straightforward: we assume a figure of US$100 billion[33] to be 'sufficient' so that a mechanism that generates at least this level annually receives a score of 1.0. For mechanisms with very little revenue raising potential a zero score is assigned, while proposals that would generate a meaningful but insufficient quantity – or where the actual figure is uncertain – receive a neutral score of 0.5. A similar approach is applied to the equitable criteria. For these purposes we assess the extent to which the national allocation of financing matches the Adaptation Financing Index (AFI) discussed in part 1 of the paper with a score of 1.0 denoting a fully equitable approach, 0.0 for proposals that would be inequitable, and neutral 0.5 scores for intermediate mechanisms. Where the mechanism is entirely discretionary we apply a negative score of 0.0, as any approximation to an equitable outcome would be largely accidental rather than inherent.

For predictability, a 0.0 score represents complete unpredictability, 1.0 for full predictability and 0.5 for intermediate or uncertain outcomes. Here we assume a neutral score of 0.5 for mechanisms subject to the 'domestic revenue problem', reflecting the fact that no more than 50% of ODA pledged may actually be disbursed. This may be conservative in practice however: while Uganda discounts half of pledged ODA when planning for the fiscal year, Ethiopia discounts as much as 80%.[34] Internationally focused mechanisms, in contrast, receive a positive score of 1.0.

33 This is based on the UNDP estimate of $86 billion, revised upwards in the light of recent evidence that adaptation needs are very likely to be in excess of what has previously been thought.

34 See, Ngin (2007) for a good overview of the relationship between pledges and disbursements.

The approach to scoring the other criterion is similar. A funding source that is clearly new and additional receives a positive score of 1.0, while those that would be based on existing ODA budgets, for example, would receive a 0.0 score. Where there is some uncertainty in this respect, a neutral 0.5 score results. For verifiability we assume that mechanisms administered by dedicated international agencies are fully verifiable (i.e. 1.0) while those channelled through national budgets are less so (0.5).

2.4.1 Assessing the mechanisms against the first-order criteria set

The Norwegian 'Assigned Amount Units' (AAU) proposal

SUFFICIENCY[35] The Norwegian proposal suggests a rate of 2%, which would generate around $14 billion per year. This is short of the $100 billion needed, but is a meaningful sum. Furthermore, the 2% rate could be increased to raise the revenue generated, though there are limits to how far this process could go while remaining politically feasible. The AAU levy receives a neutral score of 0.5 on this criterion.

PREDICTABILITY As one of the few purely international mechanisms, where revenue collection is not dependent upon national agencies, the AAU proposal receives a positive score of 1.0 for predictability.

EQUITY A levy applied to Annex I countries subject to international emission reduction targets would be broadly equitable, assuming that national allocations approximated to acceptable notions of international responsibility and capacity. For this to be the case, however, all major developed nations – particularly the United States – would need to be participants. Therefore, while the AAU levy receives a positive score of 1.0, this is italicised to reflect this contingency.

ADDITIONALITY This revenue source is clearly new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY As a pure international mechanism, a positive score of 1.0 is assigned. This is not to say that such a mechanism would, in principle, be verifiable – this would depend on the institutional framework in which it was situated. However, there is no reason why this should not be the case if the mechanism was well designed.

Mexican Climate Change Fund (MCCF)

SUFFICIENCY The MCCF is a mechanism through which nations would channel funds for mitigation and adaptation. The proposal to date is that this should be a combination of direct national budget contributions (i.e. central tax revenues) and revenues from the auction proceeds of national or regional carbon trading schemes. Assuming that the target of the fund was established at the right level, there is thus no reason why the finance generated should not be fully sufficient. That said, this is not inherent in the proposed mechanism, so the positive score of *1.0* is italicised to reflect this.

PREDICTABILITY As a mechanism that is subject to the 'domestic revenue' problem described in this paper, the MCCF receives a neutral score of 0.5 on the predictability criterion.

EQUITY As with the AAU levy, the MCCF could, in principle, accord with acceptable notions of equity. However, this would be entirely dependent upon the basis upon which national contributions to the Fund were determined. Again, therefore, the positive score of *0.1* is italicised.

35 Figures for revenue in this paper are based on Müller (2008).

ADDITIONALITY As currently proposed, much of the revenues for the MCCF would come from national budgets. Consequently, this could have direct implications for existing ODA flows – i.e. contributions to the MCCF might be viewed as ODA, leading to a reduction in other aid flows. To reflect the uncertainty of this possibility, the proposal is assigned a neutral score of 0.5.

VERIFIABILITY As a framework for collecting and channelling national contributions, the MCCF would not be as inherently verifiable as a purely international mechanism such as the AAU Levy. Accordingly the proposal is given a neutral score of 0.5.

International Air Passenger Adaptation Levy (IAPAL)

SUFFICIENCY The IAPAL at the rate currently proposed would raise around $10 billion per year. As with the AAU Levy, this is well short of the target level of $100 billion, but is a significant sum. The rate at which it is applied could also be increased – it thus receives a neutral score of 0.5.

PREDICTABILITY As a purely international mechanism, where revenue collection is not dependent upon national agencies, the IAPAL proposal receives a positive score of 1.0 for predictability.

EQUITY While the IAPAL does not relate to national responsibilities for emission reductions, it can be seen as highly equitable. As the Maldives government points out in its submission to the UNFCCC on behalf of the LDC group, emissions from international air travel cannot be readily assigned to particular countries with respect to responsibility. Levying the tax on individuals who choose to take international flights and can afford to do so, would seem the most equitable means of assigning responsibility for addressing this issue. The proposal therefore receives a positive score of 1.0.

ADDITIONALITY This revenue source is clearly new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY Revenues for the IAPAL would be collected from airline passengers at the point of sale and transferred to an international body, thus avoiding domestic budgetary implications. A positive score of 1.0 is therefore assigned.

International Maritime Emission Reduction Scheme (international version – IMERSi)

SUFFICIENCY The IMERSi at the rate currently proposed would raise around $15 billion per year by 2020. As with the previous proposals, this is well short of the target level of $100 billion, but is a significant sum. Again, as with the AAU Levy and IAPAL, the rate at which it is applied could also be increased – the proposal thus receives the same neutral score of 0.5.

PREDICTABILITY As an international mechanism, where revenue collection is not dependent upon national agencies, the IMERSi proposal receives a positive score of 1.0 for predictability.

EQUITY The IMERSi receives a positive score of 1.0 on equity grounds, for the same reason as does the IAPAL proposal. As emissions resulting from both international air and shipping cannot be assigned to national jurisdictions in a clear manner, the most equitable means of assigning both 'responsibility' and 'capacity' is to levy a charge on those willing and able to use international air or sea transportation.

ADDITIONALITY This revenue source is clearly new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY Revenues for the IMERSi would be collected from shipping agencies, with payments based on a 'cap and charge' framework. Unlike the IAPAL, therefore, the tax is not levied directly upon end users, though they will of course ultimately bear the costs, which would be passed on as higher carrying charges. Like the IAPAL, however, the proposal is international in nature and therefore attracts a positive score of 1.0 on the grounds of verifiability.

The Currency Transaction Tax (CTT)

SUFFICIENCY The CTT at the rate currently proposed would raise around $40 billion per year. This is almost half of the total figure required, however, and again the rate could be increased over time. The proposal therefore receives a neutral score of 0.5.

PREDICTABILITY While the foreign exchange market is clearly international, settlement of trades actually takes place through national central banks. The tax would therefore be channelled through national budget agencies and so subject to the 'domestic revenue' problem. As a result a neutral score of 0.5 is assigned for predictability.

EQUITY A strong feature of the CTT is its equitable features. Market shares of national currencies traded in the FX market, map very closely onto frameworks such as the AFI and GDR. The CTT therefore receives a positive score of 1.0 for equity.

ADDITIONALITY This revenue source is clearly new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY Revenues for the CTT would be channelled through national budgetary agencies, and so not as inherently verifiable as international mechanisms. Consequently the CTT is assigned a neutral score of 0.5 for verifiability.

The G-77+ China proposal

SUFFICIENCY The Chinese proposal to earmark 0.5% of developed country GDP for adaptation and mitigation would raise more than $200 billion (based on 2008 figures). Consequently, the proposal has the potential to match the target $100 billion adaptation figure, assuming a high enough proportion of funds were allocated to these purposes. It therefore receives a positive score of 1.0.

PREDICTABILITY Revenues would be channelled through national budget agencies and so subject to the 'domestic revenue' problem. As a result a neutral score of 0.5 is assigned for predictability.

EQUITY As with the CTT, a strong feature of this proposal is its equitable nature. Like market shares of domestic currencies, a country's GDP is a good indicator of both its responsibility for creating carbon emissions and its capacity to meet international obligations. Consequently, a positive score of 1.0 is assigned.

ADDITIONALITY In a similar way to the MCCF, it is possible that transfers under the Chinese proposal could affect existing ODA flows, and so may not necessarily be additional finance. However, the proposal explicitly states that these funds should be new and additional therefore we assign a score of *1.0*. This has been italicised to reflect the uncertainties of the domestic revenue problem.

VERIFIABILITY Revenues would be channelled through national budgetary agencies, and so, again, not as inherently verifiable as international mechanisms. Consequently, a neutral score of 0.5 for verifiability is assigned.

The Tuvalu Burden Sharing Mechanism (TBSM)

SUFFICIENCY the TBSM at the rate and within the framework currently proposed would raise around $40 million per year. Given this very low level of revenue, the proposal receives the lowest score of 0.0 for sufficiency.

PREDICTABILITY As an international mechanism like the IAPAL and IMERSi, where revenue collection is not dependent upon national agencies, the TBSM proposal receives a positive score of *1.0* for predictability. However, the proposal is not universally applied, as different rates are applied to travel to and from different jurisdictions. This introduces a 'domestic element' to the proposal – to take account of this, the predictability score is italicised.

EQUITY The TBSM receives a positive score of 1.0 on equity grounds, for the same reason as do the IAPAL and IMERSi proposals. As emissions resulting from both international air and shipping cannot be assigned to national jurisdictions in a clear manner, the most equitable means of assigning both 'responsibility' and 'capacity' is to levy a charge on those willing and able to use international air or sea transportation.

ADDITIONALITY This revenue source is clearly new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY Revenues for the TBSM would be collected internationally according a positive score of *1.0*. However, due to the introduction of complexity through the developed/ developing country distinction, this score is italicised to reflect the 'domestic' issues this would introduce.

International Maritime Emission Reduction Scheme (national version – IMERSn)

SUFFICIENCY Like its international counterpart, the IMERSn at the rate currently proposed would raise around $15 billion per year by 2020. For the same reasons as with IMERSi, the proposal receives the same neutral score of 0.5.

PREDICTABILITY Under the Danish governments version of the IMERS proposal, revenues would be collected and transferred by national government. The proposal is therefore subject to the 'domestic revenue' problem and receives a neutral score of 0.5 for predictability.

EQUITY The IMERSn receives a positive score of 1.0 on equity grounds, for the same reason as do the IMERSi and IAPAL proposals.

ADDITIONALITY This revenue source is clearly new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY While the IMERSi was assigned a positive 1.0 score for verifiability, the fact that the IMERSn would see revenues channelled through national tax agencies, reduces this to a neutral 0.5.

EU Emission Trading Scheme (ETS) Auction Levy

SUFFICIENCY The ETS Levy could raise up to $25 billion for adaptation purposes by 2020. The proposal therefore receives a neutral score of 0.5. As with some previous proposals, the rate at which this is applied – as well as the proportion being earmarked for adaptation – could potentially rise over time.

PREDICTABILITY The ETS Levy would be collected by national agencies and therefore receives a neutral score of 0.5.

EQUITY A levy applied to auctioning carbon permits in the EU is equitable in the sense that European countries have considerable responsibility for historical emissions, and the capacity to meet these obligations. That said, in the absence of similarly equitable contributions from other parties – particularly the United States – this is at best partial. The proposal therefore receives a neutral score of *0.5*, though this is italicised to reflect the fact that a higher equity score would be achieved if the ETS tax were part of a broader, more equitable framework.

ADDITIONALITY This revenue source is clearly new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY As an essentially national funding mechanism, the ETS Levy receives a neutral 0.5 score for this criterion.

US Auction Tax

SUFFICIENCY The US auction tax could raise up to $6 billion for adaptation purposes by 2030, though this could be considerably higher depending on the rate used and the proportion earmarked for adaptation funding in developing countries. The proposal therefore receives a neutral score of 0.5.

PREDICTABILITY The tax would be collected by national agencies and therefore receives a neutral score of 0.5.

EQUITY As with the ETS proposal, a tax applied to auctioning carbon permits in the US is equitable in the sense that the country has considerable responsibility for historical emissions, and the capacity to meet these obligations. However, this is only one aspect of a genuinely equitable package, so the assigned neutral score of *0.5* is also italicised to reflect the fact that a higher equity score would be achieved if the tax were part of a broader, more equitable framework.

ADDITIONALITY This revenue source is clearly new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY As an essentially national funding mechanism, the US auction tax receives a neutral 0.5 score for this criterion.

The Swiss Carbon Tax proposal

SUFFICIENCY A carbon tax levied at the rate (and with the exceptions) proposed by the Swiss government, would raise almost $50 billion per year. Although this is only half the level required, it would be straightforward to increase the rate so as to reach $100 billion. Furthermore, were a carbon tax to be used as a mitigation as well as a revenue-raising mechanism, such an increase would almost certainly be needed. As a result, the proposal receives a neutral score of *0.5* for sufficiency, though this is italicised to reflect the issues described here.

PREDICTABILITY The tax would be collected by national agencies and therefore receives a neutral score of 0.5 for predictability.

EQUITY As with the CTT and all proposals based on national income, a universal tax applied on carbon emissions would – in general terms – raise proportionally higher revenues from richer countries with more capacity to pay. Furthermore, the Swiss proposal to exempt

per capita emissions below a threshold level would eliminate some of the more regressive features of such a tax, where it would otherwise fall disproportionately on those least able to pay, particularly within poorer countries. The proposal therefore receives a neutral score on equity grounds of 0.5.

ADDITIONALITY This revenue source is clearly new and additional receiving a positive score of 1.0.

VERIFIABILITY As an essentially national funding mechanism, the carbon tax receives a neutral 0.5 score for this criterion.

The Global Capital Fund Mechanism (GCFM)

SUFFICIENCY While it might previously have been possible to imagine that the global capital markets could be used to raise almost any level of revenue, this is no longer the case. The current financial crisis has seriously undermined the potential supply of funds from this quarter. Also, demand has increased significantly – and it likely to increase further – as developed country governments increase their levels of borrowing to fund anti-recessionary measures in their domestic economies. For these reasons, the GCFM receives the lowest score of 0.0 for sufficiency.

PREDICTABILITY The GCFM would be collected by national agencies and therefore receives a neutral score of 0.5 for predictability.

EQUITY The ad hoc and discretionary nature of the GCFM leads to a low score of 0.0 on grounds of equity.

ADDITIONALITY This revenue source would, however, be new and additional, and therefore receives a positive score of 1.0.

VERIFIABILITY As an essentially national funding mechanism, the GCFM receives a neutral 0.5 score for this criterion.

The World Bank's Pilot Programme for Climate Resilience (PPCR)

SUFFICIENCY The PPCR is a pilot mechanism which has thus far raised very low levels of finance and therefore receives the lowest score of 0.0 for sufficiency.

PREDICTABILITY The PPCR is also discretionary in nature and therefore inherently unpredictable, which leads to a similarly low score of 0.0 for the predictability criterion.

EQUITY The ad hoc and discretionary nature of the PPCR leads to a low score of 0.0 on grounds of equity.

ADDITIONALITY The fact that funds channelled through the PPCR can be counted as ODA and that revenues may be in the form of loans, leads to the lowest score of 0.0 as it cannot be thought of as new and additional finance.

VERIFIABILITY As an essentially national funding mechanism, the PPCR receives a neutral 0.5 score for this criterion.

Table 8 gives the resulting scores for each of the proposals:

TABLE 8 **Applying the first-order criteria set**

	Sufficiency	Predictability	Equity	Additionality	Verifiability	TOTAL
AAU Levy	0.5	1	*1*	1	1	4.5
IAPAL	0.5	1	1	1	1	4.5
IMERSi	0.5	1	1	1	1	4.5
G-77 + China	1	0.5	1	*1*	0.5	4
TBSM	0	*1*	1	1	*1*	4
CTT	0.5	0.5	1	1	0.5	3.5
IMERSn	0.5	0.5	1	1	0.5	3.5
MCCF	*1*	0.5	*1*	0.5	0.5	3.5
Swiss Carbon Tax	*0.5*	0.5	0.5	1	0.5	3
ETS Auction Levy	0.5	0.5	*0.5*	1	0.5	3
US Auction Tax	0.5	0.5	*0.5*	1	0.5	3
GCFM	0	0.5	0	1	0.5	2
PPCR	0	0	0	0	0.5	0.5

As we can see, the highest-ranking proposals are the AAU Levy, the IAPAL and IMERSi – all of these receive a score of 4.5 from a possible 5. At the other extreme, the PPCR is by far the lowest scoring proposal, with a total of just 0.5. The GCFM proposal scores next lowest with a total of 2.

In terms of filtering, the PPCR is removed in this first stage. We also remove the GCFM proposal, in part because of its low overall score, but also because the ongoing turmoil in the financial markets make this a difficult approach at this time.

We also remove the IMERSn and the TBSM at this stage. In the first instance, the international version of the IMERS proposal is clearly superior to the national version proposed by the Danish government. Similarly, the TBSM proposal is superseded by both the IAPAL and IMERSi mechanisms and is thus also removed. The remaining proposals to be considered against our second-order criteria set are shown in table 9.

TABLE 9 **Filtered proposals**

AAU Levy	4.5
IMERSi	4.5
IAPAL	4.5
CTT	3.5
G-77 + China	3.5
MCCF	3.5
Swiss Carbon Tax	3
ETS Auction Levy	3
US Auction Tax	3

2.5 Applying the second-order criteria

To recap, our second-order criteria are:

- EFFICIENCY
- EASE OF IMPLEMENTATION
- CO-BENEFITS

As with the first-order criteria, we score each remaining proposal as 0.0 (negative), 0.5 (neutral) or 1.0 (positive) against the three second-order criteria.

For efficiency this entails the economic costs or lack of them that would be associated with the proposal, with contributing factors including transactions costs and possible market distortions.

For ease of implementation we consider a) whether the mechanism builds on existing institutions and infrastructure, b) whether it builds on existing international agreements or requires fresh negotiations, and c) the speed with which the mechanism could be introduced. A negative on all elements leads to the lowest score (0.0), a mixed outcome leads to a neutral score (0.5), while a positive on all fronts leads to a high score (1.0).

For co-benefits, we consider both developmental implications and compatibility with a comprehensive global deal on mitigation. This reviews both positive and negative aspects with 'neutral' proposals receiving a score of 0.5.

2.5.1 Assessing the mechanisms against the second-order criteria set

The Norwegian 'Assigned Amount Units' (AAU) proposal

EFFICIENCY The AAU proposal scores the maximum 1.0 on efficiency grounds, as it is non-distortionary and, while absolute transaction costs are relatively high, the additional or marginal transaction costs would be low because the necessary institutional infrastructure would already be in place.

IMPLEMENTATION A neutral score of 0.5 is assigned for ease of implementation. While the mechanism builds on existing institutions, it is dependent upon a process of multilateral negotiations, which also delays the speed with which it could be implemented.

CO-BENEFITS The AAU levy proposal scores positively for sustainable development benefits (i.e. by reducing the carbon allowances allocated to participating economies, the proposal increases incentives to mitigate) however its compatibility with a possible future global deal to cut carbon emissions is ambiguous. This is because a deal that would be acceptable to **non-Annex I** countries in terms of equitable carbon allowances would be unlikely to be acceptable to **Annex I** countries and vice-versa. As a result of these issues the AAU levy scores 0.5 for co-benefits.

International Maritime Emission Reduction Scheme (international version – IMERSi)

EFFICIENCY Given its partial application (i.e. it only applies to shipping of Annex I countries) the IMERSi proposal would have distortionary implications. The complexity involved in calculating the charge (based on an overall cap on emissions and the forward price of

carbon) also suggest that transaction costs could be relatively high, at least in the first instance. These uncertainties lead to a neutral efficiency score of 0.5.

IMPLEMENTATION The proposal would require a new and dedicated structure to collect and transfer the funds generated. A low score of 0.0 is therefore assigned for implementation.

CO-BENEFITS The IMERSi proposal scores positively for sustainable development benefits (i.e. by creating an incentive to reduce carbon emissions from international shipping). It is also fully compatible with a possible future global deal to cap carbon emissions, not least because of the proposed 'cap and charge' structure. This leads to a positive score of 1.0 for co-benefits.

The International Air Passenger Adaptation Levy (IAPAL)

EFFICIENCY The IAPAL proposal would be non-distortionary if implemented according to the UNFCCC submission by the government of the Maldives, which is positive on efficiency grounds. As the tax is collected at point of sale of airline tickets, transaction costs would be low, leading to a positive score of 1.0.

IMPLEMENTATION The proposal would require a new and dedicated structure to collect and transfer the funds generated. A low score of 0.0 is therefore assigned.

CO-BENEFITS The IAPAL mechanism scores positively for sustainable development benefits (i.e. by creating an incentive to reduce carbon emissions from international air travel). It is also broadly compatible with a possible future global deal to cap carbon emissions. This leads to a positive score of 1.0.

The Currency Transaction Tax (CTT)

EFFICIENCY The CTT proposal would be non-distortionary in that a standard rate of 0.005% is applied. Transaction costs would be low, as the process could be automated and revenues collected directly from settlement accounts in national central banks. This leads to a positive score of 1.0.

IMPLEMENTATION The proposal would require a new and dedicated structure to collect and transfer the funds generated. A low score of 0.0 is therefore assigned for implementation.

CO-BENEFITS While unconnected with the issue of climate change, a CTT has the potential to bring broader developmental benefits by reducing exchange rate volatility. Such a mechanism would neither help nor hinder a global deal on mitigation – the CTT therefore receives a neutral score of 0.5 for co-benefits.

The Mexican Climate Change Fund (MCCF)

EFFICIENCY The MCCF would be an international fund to which countries paid annual contributions based on predetermined criteria of responsibility and capacity. It is envisaged that part of this funding would come from central budgets, which is positive for efficiency. The remainder would come from a tax on the auction of permits under national carbon trading schemes. This is less positive in terms of the transaction costs involved in this process. As a result the proposal scores a neutral 0.5 for efficiency.

IMPLEMENTATION The proposal would not require a new and dedicated structure to collect part of the funds generated, as national agencies would perform this function. The establishment of the MCCF itself would have cost implications, however, and the negotiations required to reach this stage would also delay implementation. As a result, a neutral score of 0.5 is assigned for implementation.

CO-BENEFITS Depending on the details of the framework, the MCCF could well form one part of a global deal on mitigation. The fact that all countries – developed and developing – would participate, sets a precedent and creates momentum in this respect. Sustainable development implications, however, are broadly neutral, leading to a score of 0.5 on this criterion.

US Auction Tax

EFFICIENCY The tax on carbon permits within the proposed US carbon trading system is partially efficient in that, on the one hand, it would be universally applied in the US and so non-distortionary, however would have distortionary implications in that it only applies in one jurisdiction. As a result the proposal scores a neutral 0.5 for efficiency.

IMPLEMENTATION Once the US trading system was in place, the proposal would not require a dedicated infrastructure, as it could 'piggy-back' on this framework. However, the legislation and infrastructure to make this a reality is not currently in place, leading to a neutral score of 0.5 for implementation.

CO-BENEFITS The proposed tax would be broadly neutral with respect to sustainable development co-benefits, but would be fully compatible with a future global deal on mitigation that adopted a cap and trade approach at the global level. Again, therefore, the proposal scores 0.5 on this criterion.

EU Emission Trading Scheme (ETS) Auction Levy

EFFICIENCY The proposed levy on carbon permits within the ETS system is partially efficient in that, on the one hand, it would be universally applied across participants and so non-distortionary, but would have distortionary implications in that it only applies in one jurisdiction. As a result the proposal scores a neutral 0.5 for efficiency.

IMPLEMENTATION As the ETS system is already in place, the proposal would not require a dedicated infrastructure. This leads to a positive score of 1.0 for implementation.

CO-BENEFITS The proposed tax would be broadly neutral with respect to sustainable development co-benefits, but would be fully compatible with a future global deal on mitigation that adopted a cap and trade approach at the global level. As with the US version, therefore, the proposal scores 0.5 on this criterion.

G-77+ China proposal

EFFICIENCY The Chinese proposal scores highly for efficiency because of its simplicity (0.5% of GDP), but less so in that this is only applied to Annex I countries and so would have distortionary implications. As a result, a neutral score of 0.5 is assigned.

IMPLEMENTATION While the proposal would not require a new and dedicated structure to collect the funds generated, as national agencies would perform this function, there would be a need for a dedicated international body to manage these funds. Furthermore, the intricacies of negotiating such a historically unprecedented straight transfer of revenues

from North to South – particularly given the difficulties in getting countries to honour their pledges to earmark 0.7% of GDP for international development – would be severe. As a result of these difficulties, a neutral 0.5 score is again assigned.

CO-BENEFITS The Chinese proposal has no clear co-benefits in terms of sustainable development. While the proposal may not be fully compatible with certain forms of global deal such as a global cap and trade system, it would be compatible with a UNFCCC mechanism financed directly through national budgets. As a result, a neutral score of 0.5 is assigned.

The Swiss Carbon Tax proposal

EFFICIENCY A universally applied (with exemptions) global carbon tax as proposed by the Swiss government would be positive on efficiency grounds, leading to a positive score of 1.0.

IMPLEMENTATION If adopted, the proposal would require dedicated national infrastructures to administer, an international body to monitor and collect revenues, and a negotiated international agreement within which these institutions would be located. The difficulties inherent in this lead to a low score of 0.0 for implementation.

CO-BENEFITS A global carbon tax would be positive for mitigation and clearly compatible with a global deal based on a 'tax and redistribute' model. However, the regressive nature of universally applied taxes – even taking account of the exemption proposed by the Swiss government – would be likely to have negative developmental implications. As a result, the proposal scores a neutral 0.5 on this criterion.

Table 10 gives the second order criteria scores:

TABLE 10 **Applying the second-order criteria set**

	Efficiency	Implementation	Co-benefits	TOTAL
AAU Levy	1	0.5	0.5	2
CTT	1	0.5	0.5	2
ETS Auction Levy	0.5	1	0.5	2
IAPAL	1	0	1	2
Swiss Carbon Tax	1	0	0.5	1.5
G-77 + China	0.5	0.5	0.5	1.5
IMERSi	0.5	0	1	1.5
MCCF	0.5	0.5	0.5	1.5
US Auction Tax	0.5	0.5	0.5	1.5

2.6 Ranking the proposals

The final ranking of proposals using both sets of criteria is shown in Table 11. The highest scoring proposals are the AAU Levy and IAPAL with scores of 6.5 from a possible 8. The IMERSi and CTT proposals also score highly with 6 and 5.5, respectively.

At the other end of the table, the Swiss Carbon Tax and the US Auction Tax receive the lowest scores of 4.5. An intermediary group (scoring 5) comprises the G-77 + China proposal, the MCCF and the ETS Auction Levy. These three groupings are shown as differently shaded sections of table 11.

TABLE 11 **Combined first and second order criteria**

	First order	Second order	TOTAL
AAU Levy	4.5	2	6.5
IAPAL	4.5	2	6.5
IMERSi	4.5	1.5	6
CTT	3.5	2	5.5
G-77 + China	3.5	1.5	5
MCCF	3.5	1.5	5
ETS Auction Levy	3	2	5
Swiss Carbon Tax	3	1.5	4.5
US Auction Tax	3	1.5	4.5

These scorings are indicative rather than definitive. They are intended to do no more than give a sense of the relative attractiveness of the financing mechanisms.

2.6.1 A recommendation

Employing the preceding analysis the AAU levy ranks as one of the highest proposals – viewed across a wide range of criteria – to fund adaptation in developing countries. The estimated annual revenue stream is US$14 billion – assuming the 2% CDM rate is replicated. Although this could be increased to a higher rate, this has limits and there is a real danger in overloading this one mechanism. This is particularly the case if the international carbon market were to be seen as the most promising source of funding for mitigation.

In our typology it was suggested that the ideal location for an adaptation financing instrument on our spectrums would be **international** and **diverse**, which applies to the AAU mechanism. In looking for additional mechanisms to complement the AAU levy one permutation which our ranking suggests is as follows. To supplement the AAU levy applied at 2%, raising around $14 billion per annum, with the IAPAL raising $10 billion pa and the IMERSi raising $15 billion pa. All of these mechanisms score highly in our rankings and all are **international** and **diverse**. Between them they would raise an annual total in the region of $39 billion. This is a considerable sum but short of the $100 billion target we have identified.

This would suggest one of two options. First, the rate at which the three mechanisms were applied could be increased. If each were doubled, the annual revenues would be in the region of $78 billion, relatively close to the estimated UNDP figure of $86 billion. However, this

would present potential difficulties. The attractiveness of the AAU levy is, in part, because it can 'piggy back' on a functioning international carbon allocation and trading system. However, the greater the quantity of AAUs withdrawn to fund adaptation, the more this system would be undermined. Furthermore, if achieving and funding mitigation were also pursued through the same carbon market, this could hamper its operation putting at risk wider benefits.

As well, concern about the possible economic and developmental implications of the IAPAL and IMERS (for those developing countries dependent on tourism or heavy users of international shipping) may have been allayed by the relatively low rate applied. As this rate increases, volume of air and maritime transport is likely to decrease, suggesting a limit to how far it could be raised.

If the potential to increase the rate at which these three mechanisms were applied is limited, the second option is to add a further mechanism to complete a 'portfolio' of approaches to funding adaptation. The next ranked proposal is the Currency Transaction Tax (CTT). If levied at a rate of 0.005%, the CTT could raise in the region of $40 billion pa, taking the total raised from the four mechanisms to approximately $79 billion a year. The inclusion of the CTT would also have very positive equity implications. As we can see from table 12, the top six countries in terms of AFI weighting have a similar corresponding share of the global foreign exchange (FX) market.

TABLE 12 **AFI vs Global FX weightings**

Country/region	AFI weight	Global FX Weight
USA	44	44.5
Europe	32	27
Japan	13	10.3
Canada	4	2.3
Australia	3	2.6
Korea	2	1

Finally, it ought to be noted that both the IMERSi and the IAPAL in addition to revenue-raising, bring very positive international features, as well as clear benefits in terms of mitigation.

PART 3 Conclusion

In this paper we have considered the framework required for mitigation to be achieved and examined proposals for how both mitigation and adaptation in developing countries could be financed. We conclude with a recommendation of a cluster of mechanisms that could generate in the region of £80 billion a year to finance adaptation. However, we emphasise that the role of this paper has been more concerned with developing a way of thinking about the issues inherent to climate change financing; as well, to articulate clear principles and criteria upon which current and future proposals can be assessed.

Mitigation

Estimates of the cost of mitigation vary hugely, but the UNFCCC speaks of figures upwards of US$200 billion a year. This may be a huge sum but it is dwarfed by estimates of the cost of failing to act, both in economic and in human terms. In developing countries alone, we are looking to secure mitigation finance in excess of the entire global aid budget today. We need to find 'new and additional' sources of funds, which ideally should be derived from a new framework to achieve mitigation financing at the global level.

To shift to a sustainable, low-carbon trajectory we argue that either the **quantity** of global emissions can be **restricted**, or the **costs** of these emissions can be **increased** to achieve the same result. In policy terms these two options equate to a global limit, or 'cap', with national allocations and some form of trading; or to a global carbon tax with redistributive transfers.

Although a global cap may be the best means of ensuring that global emissions remain within scientifically determined levels such an argument is fraught with political difficulty. Developing countries argue with good reason that they should not be constrained by any restriction of this kind as this would in effect penalise them for problems created by the developed world (which should sharply reduce its own emissions before asking anything of the developing world). This is of course entirely reasonable, and it is likely that today's developed economies would have to proceed with a post-2012 agreement in the first instance, with larger middle-income countries eventually joining such a scheme, but only if the terms were fair and compatible with development objectives, and that sufficient financing was committed and in place to enable this participation.

A further point in respect of a cap with national allocations and some form of trading is that we do not currently have a functioning international carbon market. What we have instead are a number of national and regional markets – with sub-optimal performance in terms of achieving substantial low-carbon transformation or reducing emissions – and the beginnings of an international market, which is far from universal in coverage. As well, if a cap and trade scheme of some kind were to be acceptable it would require the system to have scientifically determined caps – rather than be subject to lobby interests and exemptions. Moreover, it would have to ensure there was no leakage through offsetting.

One of the advantages of a 'cap and trade' arrangement (were it to be made to work) would be that it would require rich countries, which were allocated far fewer permits than they needed, to purchase the surplus permits held by poorer countries, where current emissions

would be below their allocations. As a result, much of the vast annual transfers needed to fund mitigation in developing countries would be 'hard-wired' into the system.

However, for a variety of reasons, it may be that neither **developing** nor **developed** countries will accept a cap which would mean looking at other options. For a comprehensive alternative to quantitative limits on emissions one would have to examine a global carbon tax of some kind. While this would not bring the same certainty as a cap, it may still be extremely effective. A problem, however, is that there are no North-South transfers 'hard-wired' into such a system, which would mean being reliant on the redistribution of tax revenues from the developed to the developing world to fund mitigation. There is a risk, therefore, of becoming entangled in domestic political cycles in developed economies. To accommodate this, it would be essential to establish a clear and binding (insofar as this would be possible) framework for redistribution.

Whether a cap and trade system or a carbon tax was used as the main means of achieving mitigation and financing the process in developing countries, it is unlikely that the level of transfers would either match what was required, or would reflect what was ethical in terms of historical responsibility or contemporary capacity to pay. For this reason, additionally, a fund established along the lines of that proposed to the UNFCCC by the Mexican government is a good option. Contributions to this could come from the auctions of carbon permits in domestic or regional markets (such as the United States and European Union) augmented by direct national contributions. These national contributions could vary to reflect responsibility and capacity to pay, potentially using weightings such as those derived from the Greenhouse Development Rights (GDR) approach.

Adaptation

The science is clear: the process of industrialisation has caused the concentration of greenhouse gases in the atmosphere to steadily increase. By the middle of 2008 CO_2 equivalent concentration levels had reached 420 ppm and emissions continue to rise at a rate of 3% every year. Whatever else happens, we will need to adapt to the climate change that is already 'in the system'. At best this will be a 1.5–2.0°C increase, and the impacts will be felt hardest by the least able to cope: the poorest countries in the world and the poorest people within these countries.

Moreover, the tragic fact is that those who stand to lose most through the effects of climate change have little or no responsibility for creating it: it is the cumulative impact of industrial activity in the developed world that has created this problem, and it is these **developed** countries, therefore, that need to shoulder the burden of dealing with it.

Indeed, not only do developed countries face a clear moral obligation to finance the costs of adaptation in developing countries, they have already accepted this as signatories to the UN Framework Convention on Climate Change (UNFCCC) where this obligation is explicit.

Estimates of the volume of finance required to fund adaptation vary considerably. After assessing figures from various bodies including the UNFCCC, the World Bank, the UNDP and Oxfam, we concluded that a target of $100 billion a year ought to be aimed for.

We assessed 12 prospective financing mechanisms on three occasions through different lenses in order to familiarise ourselves with the proposals assessing them against such factors as sufficiency, predictability, equity, additionality, efficiency and ease of implementation.

At the end of this process it was clear that no one mechanism would bring in a sufficient volume of funds on its own. A permutation we recommend that could provide substantial

funds for adaptation would be to apply the **Norwegian 'Assigned Amount Units' Levy** at 2%, raising around $14 billion pa, combined with the **International Air Passenger Adaptation Levy** raising $10 billion pa and the **IMERS levy on international shipping** raising $15 billion a year. Between them they would raise an annual total in the region of $39 billion. This is a considerable sum but short of the $100 billion target we have identified. However, adding in the **Currency Transaction Tax**, which could raise in the region of $40 billion pa, would increase the total generated from the four mechanisms to approximately $79 billion a year.

Closing remarks

In the final analysis, the main purpose of this paper is as a tool to better get to know the financing proposals currently on the table. We have set out, therefore, to assist in the navigation of what to many are still new and yet uncharted waters. However, the need to make advances in the field of mitigation and adaptation finance has reached a critical juncture. Time is not on our side. In the end, it will be political intention and feasibility that determine whether some or any of the instruments will be adopted. Yet the requirement is so great and the cost of failure so immense, that we hope there is a determination to agree a mix of mechanisms in Copenhagen and that this paper may in some way assist with that decision-making.

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