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Financing the Climate Mitigation and Adaptation Measures in Developing Countries

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PREFACE

The *G-24 Discussion Paper Series* is a collection of research papers prepared under the UNCTAD Project of Technical Support to the Intergovernmental Group of Twenty-Four on International Monetary Affairs and Development (G-24). The G-24 was established in 1971 with a view to increasing the analytical capacity and the negotiating strength of the developing countries in discussions and negotiations in the international financial institutions. The G-24 is the only formal developing-country grouping within the IMF and the World Bank. Its meetings are open to all developing countries.

The G-24 Project, which is administered by UNCTAD's Division on Globalization and Development Strategies, aims at enhancing the understanding of policy makers in developing countries of the complex issues in the international monetary and financial system, and at raising awareness outside developing countries of the need to introduce a development dimension into the discussion of international financial and institutional reform.

The research papers are discussed among experts and policy makers at the meetings of the G-24 Technical Group, and provide inputs to the meetings of the G-24 Ministers and Deputies in their preparations for negotiations and discussions in the framework of the IMF's International Monetary and Financial Committee (formerly Interim Committee) and the Joint IMF/IBRD Development Committee, as well as in other forums.

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FINANCING THE CLIMATE MITIGATION AND ADAPTATION MEASURES IN DEVELOPING COUNTRIES

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Abstract

Climate change creates a crisis for economic development, which has historically been synonymous with high-carbon growth. It is essential for the world economy to make a rapid transition to a new, low-carbon style of growth. Developed countries might be expected to pay a large share of the total global costs of this transition, due to their ability to pay and their historical responsibility for causing the problem.

Two-thirds of the world's greenhouse gas emission reduction potential through 2030 is located in developing countries. More than half of that is in forestry, including reduction of emissions from deforestation and forest degradation (REDD), a top priority for near-term reductions. Beyond REDD, achieving the full potential of emission reduction in developing countries requires investment of hundreds of billions of dollars in energy, transport, and other sectors. One source of funding is the sale of offsets to developed countries – expanding the opportunities created by the Clean Development Mechanism (CDM). The value of such opportunities depends on the scope of a future trading system, and on the initial distribution of carbon allowances.

Adaptation to the unavoidable damages from climate change is an additional financial burden on developing countries, with costs in the tens of billions of the United States dollars annually.

Climate funding currently available under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol is less than $10 billion per year, most of it through CDM. Additional funding is provided by the World Bank and by bilateral aid programmes, but the annual total of all existing multilateral and bilateral climate funding is less than $15 billion. This is too small, by an order of magnitude, to meet the needs for climate investments in developing countries. Moreover, donor preferences have distorted some bilateral and multilateral aid efforts in the past; funding for climate investments could be weighted down by the reappearance of similar obstacles. Streamlined and improved institutional arrangements, such as a much-simplified replacement for CDM, will be needed.

Finally, it may be worth studying an example of success in international environmental cooperation: the Montreal Protocol for reduction of ozone-depleting substances (ODS). The Montreal Protocol paid the costs of compliance for developing countries; it required majority agreement of both developed and developing countries for all decisions; and it set a threshold for per capita emissions, above which developing countries became subject to developed-country standards. Within this cooperative structure, the parties to the Montreal Protocol moved rapidly toward reduction of ODS, finding that costs were lower and benefits were higher than had been anticipated in advance. Could the same turn out to be true for the reduction of greenhouse gases?

Table of contents

FINANCING THE CLIMATE MITIGATION AND ADAPTATION MEASURES IN DEVELOPING COUNTRIES

Frank Ackerman*

I. The current understanding of climate change and the consequences for development

The scientific evidence is increasingly clear, and ominous in its implications: climate change, driven by fossil fuel combustion and deforestation, is a serious threat to lives and livelihoods in every part of the world. The 2007 summary from the Intergovernmental Panel on Climate Change (IPCC), representing the consensus of the world's scientists, concluded that "Warming of the climate system is unequivocal ... observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes" (IPCC, 2007: 2).

Impacts will differ around the world, with high-temperature and coastal areas generally hit harder and sooner. However, if the world economy continues on its present course, every country will be suffering from the effects of climate change long before the end of this century. IPCC projects regional impacts such as (IPCC, 2007: 11):

- rapidly falling agricultural yields in some African countries, worsening food security and increasing malnutrition;
- decreased freshwater availability throughout much of Asia, along with increased flooding in major deltas and other coastal areas;
- in Latin America, replacement of tropical forest with savanna in eastern Amazonia, together with decreasing productivity of some important crops and livestock, worsening food security.

According to Nicholas Stern, the prominent British economist who led the Stern Review of the economics of climate change, "High-carbon growth – business as usual – will by mid-century have taken greenhouse gas concentrations to a point where a major climate disaster is very likely ... Put simply, high-carbon growth will choke off growth."

The climate crisis is also a crisis for development. Historically, economic development has been synonymous with high-carbon growth; it has relied on massive use of fossil fuels, causing massive emissions of greenhouse gases. The most important greenhouse gas, carbon dioxide, remains in the atmosphere and contributes to global warming for a century or more after it is emitted. So the earth's atmosphere is already filled, almost to its sustainable limit, primarily by the past emissions from today's developed countries.

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There is simply no more room for high-carbon growth by anyone. Even if developed countries reduce their emissions 90 per cent below 1990 levels by 2050 – the target advocated by the former United States Vice President Al Gore, which is more ambitious than the leading United States and European proposals – the rest of the world will still need to begin rapid reduction in emissions by 2020 in order to avoid risks of dangerous climate change (Baer et al., 2008). Widely discussed targets for climate stabilization, such as a 50 per cent reduction in global emissions by 2050, will require global per capita emissions to fall to less than half the level of China, Thailand, or Mexico today.[1]

The urgent need for development in low- and middle-income countries, therefore, can only be met by the creation and adoption of a new, low-carbon style of economic growth, along with the adoption of similarly low-carbon patterns of production and consumption in the developed countries. The shift to this new style of growth requires a process of global structural change in the course of which many synergies are possible between emission reduction and development objectives. Moreover, while this shift will cause losses and adjustment costs for many economic agents at the microeconomic level, it will also generate new income and gains for others. From this macroeconomic perspective, it has been suggested that climate change mitigation may even have a growth stimulating effect in many countries, and that with appropriate environmental and industrial policies developing economies may share in the years and decades ahead in these gains (UNCTAD, 2009). Although the technological transformation of the world economy is the only viable option for the long run, it will require substantial additional investments in the short run. This paper examines the question of financing for those investments, with a focus on the problems of developing countries.

The question of the financing of investments for adaptation to and mitigation of climate change in developing countries is central to global negotiations on climate policy. Without a plan for climate financing that is mutually acceptable to everyone at the table, there will be no global agreement on emission reduction; with no new global agreement, there will be little chance of averting a disastrous deterioration in the earth's climate.

As economists often point out, questions of efficiency can be separated from concerns about equity. Climate change is entirely global in its causes; every country is affected by the total quantity of greenhouse gases in the earth's atmosphere. Therefore, the efficient solution, from everyone's point of view, is to find the least-cost opportunities to reduce emissions (or to remove additional carbon from the atmosphere), regardless of location. Seen purely from the perspective of global cost minimization, some of the top priorities for climate protection may include slowing deforestation in Brazil, Indonesia, and other countries with extensive rainforests, and introducing energy conservation measures and alternative fuels in China, India, and other coal-dependent emerging economies.

From an equity perspective, however, developed countries might be expected to pay a large share of total global costs, due to both their current ability to pay, and their historical responsibility for past emissions that still fill the atmosphere.[2] That is to say, developing countries should not bear the sole responsibility for financing future emission reductions that occur within their borders.

Proposals for international burden-sharing, such as Contraction and Convergence, the recent Greenhouse Development Rights framework, and others, attempt to establish transparent, equitable allocations of responsibility. Contraction and Convergence allows a transitional period, usually several decades, for the world to converge to a uniform, low per capita emissions level. Greenhouse Development Rights assigns shares of the total global cost of climate protection, in proportion to both historical emissions and current incomes above a minimum-income threshold. All such formulas assume that mechanisms exist or will be created to transfer financial resources to developing countries.

What channels should this financing flow through? Existing multilateral funds provide only limited resources, subject to many institutional and political constraints. What new institutions and international mechanisms are needed to finance the least-cost global reductions in emissions, when those reduction opportunities are located in countries with limited ability to pay for them?

The next section of this paper surveys the opportunities and costs for mitigation of carbon emissions, including the potential for sale of offsets, or carbon allowances, to developed countries. The related question of adaptation to the effects of climate change, and its implications for funding needs, is addressed in the

following section. The principal multilateral funding agencies for climate investments are the fifth section, including the Clean Development Mechanism (CDM), the Global Environment Facility (GEF), and the World Bank's Clean Investment Mechanism. Finally, the last section offers critiques of the existing institutions and suggestions for alternatives, including a comparison to the more successful experience of the Montreal Protocol.

II. Opportunities and costs for mitigation, and potential revenues from sale of offsets

How large are the opportunities for mitigation? The United Nations Framework Convention on Climate Change (UNFCCC) produces periodic estimates, most recently in 2008, of the technical potential and the financing requirements for climate investments (UNFCCC, 2008). The latest report focuses on a relatively near-term target, namely reducing global emissions in 2030 by 25 per cent below 2000 levels, relying on estimates from the International Energy Agency and other sources.

The UNFCCC reference scenario – that is, the estimate of business-as-usual emissions, prior to reduction – includes a global total of 61.5 gigatons of CO_2-equivalent (Gt CO_2-e) in 2030, of which 35.6 Gt CO_2-e are in non-Annex I countries. The global potential for reduction is 31.7 Gt CO_2-e, of which two-thirds, or 21.7 Gt CO_2-e, is located in non-Annex I countries. More than half of the non-Annex I reduction potential (indeed, more than one-third of the global total) is located in the forestry sector, including reduction of emissions from deforestation and forest degradation (REDD), as shown in table 1.

An earlier UNFCCC analysis of the same emission reductions (described in the 2008 publication) estimated that the non-Annex I countries would need $176 billion of annual investment and financing to achieve these reductions (implying an average cost of just over $8 per ton of CO_2-e), partially offset by $111 billion of annual savings on reduced fossil fuel supply and investment in fossil-fired power supply. Thus the net financing requirement was $65 billion per year. The current UNFCCC report (2008), however, suggests that the annual financial needs may be more than twice that large, due to revised estimates of the costs of low-carbon power generation.

Table 1

GREENHOUSE GAS EMISSION REDUCTION POTENTIAL, 2030 (GT CO_2-e)

Sector	*Global*	*Non-Annex I*
Power generation	9.4	5.0
Forestry (includes REDD)	12.5	12.4
All other	9.8	4.3
Total	31.7	21.7

Source: UNFCCC, 2008: 53.

In an even shorter time frame, bottom-up estimates of mitigation potential in developing countries suggest a total of 7 Gt CO_2-e by 2020, most of which is available at costs below $25 per ton of CO_2 (UNFCCC, 2008: 66–68). Of this amount, REDD accounts for 1.6 – 2.0 Gt CO_2-e, with most reductions available for less than $15 per ton of CO_2. The total technical potential for CDM-eligible technologies in developing countries is estimated at 4.8 Gt CO_2-e, although non-price barriers and CDM rules about additionality imply that the market potential is lower than that. On the other hand, most of the underlying cost studies assume oil prices in the range of $20–40 per barrel; as of mid-2009 the price hovered around $70 per barrel. Oil prices matter for projects which reduce the use of oil or other fossil fuels; the fuel savings is counted as a benefit, offsetting some of the cost of the investment. At a higher oil price the fuel savings is worth more, reducing the net cost of the project.

Both of the UNFCCC estimates of the potential for emission reduction in developing countries suggest the need for large amounts of financing. At $20 per ton of CO_2, reductions of 7 Gt by 2020 would require investment of $140 billion, while the larger estimate of 21.7 Gt by 2030 would imply over $400 billion per year.

Direct estimates of mitigation costs vary widely, based on multiple differences in scenarios and model assumptions. In a review of several recent estimates, the 2009 *World Economic and Social Survey* found a range from $200 billion to $1.2 trillion, or from 0.2 to 2 per cent of world output (UN/DESA, 2009: 154–155).

Some categories of reductions, especially those involving REDD, may have costs lower than $20 per ton. Indeed, one of the principal conclusions emerging from the UNFCCC estimates is the importance of REDD. The search for low-cost global opportunities for mitigation repeatedly leads to a focus on tropical forest management. UNFCCC estimates, with considerable uncertainty in the underlying assumptions, that the 12.4 Gt CO_2-e of forestry reductions in non-Annex I countries in 2030 might cost only $21 billion (UNFCCC, 2008: 53). Similarly, Nicholas Stern's "blueprint" for a new global deal on climate change involves spending $15 billion per year to combat deforestation in tropical countries; he estimates that this would buy 3 Gt per year of reduction at a bargain price of $5 per ton of CO_2-e (Stern, 2009: 165–169).

Funding for forest management and protection will be of importance to those countries with substantial forest areas. If adequate institutional structures and financing can be arranged, this initiative may lead to a rethinking of the role of forests and the opportunities for sustainable forest use, as one aspect of development. It is, however, only one specialized part of the development process even in well-forested countries, and it is of little direct importance for countries with more limited forest resources.

Emission reduction in other areas has broader implications for development; the central challenge is the creation of new, low-carbon ways of producing and using energy. Private-sector investment in clean energy in developing countries has grown rapidly, but reached only $26 billion in 2007; almost all of that investment occurred in China, India, and Brazil. Total global investment in clean energy in 2007 (most of it in developed countries) was $148 billion, which was 10 per cent of global energy investment, and 1 per cent of global fixed investments (UNFCCC, 2008: 61).

One of the easiest ways to obtain financing for climate investments may be the sale of offsets to developed countries. Some trading systems, such as the European Union's (EU) current Emissions Trading System (ETS) and many other proposed systems, allow companies or nations to purchase offsets, representing emission reductions achieved in other countries. Roughly speaking, this can be seen as a continuation and expansion of the opportunity created by the Clean Development Mechanism (CDM) under the Kyoto Protocol.

The size of the international carbon market depends on international, the United States, and European Union policy decisions; any projection of the market is based on guesses about those future decisions. Estimates of the size of the market in 2020, from consulting firms specializing in this area, range from 0.5 to 1.7 Gt CO_2-e, or from about the current size of the market to three times larger. In the highest estimate, purchases from the United States would account for half of the global market. At $20 per ton, these estimates imply that the offset market would provide financing of $10–34 billion in 2020, compared to roughly $8 billion in 2007 (UNFCCC, 2008: 64–66).

Looking farther into the future, most analyses have assumed that a comprehensive global trading regime will be needed to reduce the costs of climate stabilization. The size of a global carbon market could be enormous: a worldwide cap of 30 Gt CO_2-e, trading at $20 per ton, would imply a total value of carbon allowances of $600 billion per year. Not all of that amount, of course, would flow to developing countries.

The international flow of financing resulting from a future trading system depends entirely on the allocation of allowances. Some researchers have tried to estimate the distributional consequences of different allocation schemes. Two major studies, described here, each model a path to climate stabilization under varying allowance allocations, and compare the revenues received from the trading system to the costs of emission reduction for each region of the world.

Tobias Persson, Christian Azar, and Kristian Lindgren, at Chalmers University in Sweden, have estimated the net costs of climate stabilization for regions of the world under three alternatives: equal per capita emission rights starting in 2020; contraction and convergence (i.e., the world moves gradually to equal per capita emission rights, while also reducing the global total) by 2050; and contraction and convergence by 2100 (Persson et al., 2006). In general, equalization sooner is better for developing countries and worse for developed countries.

Africa benefits from all three plans, with the annual gain exceeding current levels of official development assistance (ODA) to the continent. China experiences net costs from all three. South Asia benefits from equalization in 2020, breaks even from convergence by 2050, and has net costs from

convergence by 2100. Latin America benefits from equalization in 2020, and roughly breaks even on the other alternatives; outcomes for Latin America are sensitive to the model's assumptions about revenues from the sale of biofuels.

Michel den Elzen, Paul Lucas, and Detlef van Vuuren, at the National Institute for Public Health and the Environment (RIVM) in the Netherlands, have performed a similar analysis of regional abatement costs under three different types of agreements: a multi-stage approach, gradually increasing the number of countries with binding emission targets; a proposal for reduction targets based on contributions to climate change and on per capita incomes; and contraction and convergence by 2050 or 2100 (den Elzen et al., 2005).[3] Convergence by 2100 appears to be so slow that it undermines the pursuit of equity; under that approach, abatement costs are a smaller percentage of GDP, in both 2025 and 2050, for the United States and the EU than for most developing regions.

In general, den Elzen et al. (2005) find that the Middle East and the former Soviet Union face the highest costs, as a percentage of GDP, under all agreements. Africa and South Asia have net benefits (i.e., revenues from the sale of offsets exceed total costs of abatement) under all plans except convergence by 2100. Latin America has costs as a percentage of GDP similar to those of developed countries, while costs for East and Southeast Asia are somewhat lower, but positive.

Thus both groups agree that with convergence to equal per capita rights by 2050 or sooner, the long-run costs of abatement with allowance trading provide net benefits to Africa and probably South Asia. East Asia faces some net costs, and implications for Latin America are uncertain.

III. Costs of adaptation, and funding needs

Even a rapid and successful programme of worldwide emission reduction can no longer prevent all climate damages. In addition to the costs of mitigation, the world must address the costs of adaptation to unavoidable climate impacts, such as additional drought, sea-level rise, shrinkage of the glaciers and snow-pack which supply water to many river basins, and increases in extreme weather events.

Adaptation to climate damages is a very different process from mitigation: in the broadest terms, adaptation involves protection and strengthening of current activities, in contrast to the invention of new technologies and development paths required for mitigation. For this reason, adaptation has more immediate synergy with development, as it often involves protection of public health, conservation of farmland, and improvements in disaster preparedness (Michaelowa and Michaelowa, 2007). Economic development, if carefully managed, can increase resilience, promote adaptation, and reduce climate impacts (Garg et al., 2008). There are, however, sizeable costs associated with adaptation; just as with mitigation, financing for adaptation raises complex issues of fairness, including the distribution of impacts, and the ability to pay (Paavola and Adger, 2006).

Estimates of global adaptation requirements are even more uncertain than those for mitigation. Adaptation is a complex, site-specific process, drawing on local knowledge and experience in dealing with climate-related risks (Adger et al., 2003). However, adaptation cannot be entirely local, since it often involves national-scale political and economic changes designed to reduce poverty and vulnerability to climate damages (Eriksen and O'Brien, 2007). In the agricultural sector, which will be hard hit by climate change, adaptation is not only a matter of farm-level decisions, but increasingly depends on national governments, agri-business strategies, and trade policies (Burton and Lim, 2005).

Adaptation to climate change can include several categories of actions (UNFCCC, 2008: 26):

- measures that climate-proof economic activity by addressing future climate risk;
- measures that improve the capacity to deal with future risks in general; and
- measures that are exclusively intended to adapt to impacts of climate change.

Only the third category is completely concerned with adaptation to climate change; the important measures in the first two categories include many steps that address other development goals as well. For example, financial instruments for risk management, such as insurance – which is currently rare in developing countries – are beneficial in many respects, for climate and other objectives alike. This

multi-purpose nature of many adaptation measures makes it difficult to produce a definitive estimate of adaptation costs.

Bottom-up estimates of adaptation needs and costs are only beginning to be available. National adaptation programmes of action (NAPAs) completed by 38 least developed countries (LDCs) included about 400 "urgent and immediate" adaptation projects, with an average cost of about $2 million each (excluding a $700 million water management project to promote food security in Ethiopia). Many sectors and activities are included, with the greatest number and the majority of costs in agriculture, livestock and fisheries; water resources; and coastal zones and marine ecosystems (UNFCCC, 2008: 25). This is, however, a very partial estimate of total worldwide requirements.

Global estimates of annual adaptation costs from UNFCCC, World Bank, Oxfam International, and the United Nations Development Programme (UNDP) have all been similar in orders of magnitude, i.e. tens of billions of dollars, perhaps even over $100 billion – with a large fraction of the total in developing countries. UNFCCC estimates span the range from $49 billion–$171 billion, with one-third to just over half in developing countries (UN/DESA, 2009: 157). UNDP's *Human Development Report* for 2007–2008 projects a need for annual adaptation investment of $86 billion by 2015 (UNFCCC, 2008: 23). Nicholas Stern has similarly estimated a need for $75 billion per year for adaptation funding (Stern, 2009: 178). Private financing currently provides very little of the needed funding for adaptation.

IV. Multilateral financing agencies and mechanisms for climate investments

To summarize the story of the preceding sections, immediate action to combat climate change is an urgent global priority; the ongoing efforts to achieve economic development must occur in a climate-constrained environment, following a new, low-carbon technological path. Annual global financing requirements are probably in the range of hundreds of billions of dollars for emission reduction and new energy technologies, and additional tens of billions of dollars for adaptation to the unavoidable damages from climate change. Many of the lowest-cost opportunities for abatement, and many of the most costly damages requiring adaptation, will be located in developing countries. The climate crisis, however, is completely global in its origins and physical causes; it is largely the result of the past and present economic activity of high-income countries. Thus developed countries might be expected to pay a large share of the global costs of both mitigation and adaptation. There is a wide range of possible standards of fairness for allocation of the global burden of climate financing, which have been extensively discussed in recent analyses.[4]

International equity arguments provide the rationale for the existing multilateral financing for climate protection. Funding available under the UNFCCC and the Kyoto Protocol is the most important source of international financing for climate investments: the CDM, the Joint Implementation program (CCAP-JI), the climate change programmes of the Global Environment Facility (GEF), and the Adaptation Fund. Other sources of funding include the World Bank's Climate Investment Funds and bilateral initiatives sponsored by Japan, Norway, Germany, and other countries.

By far the largest of these funding sources is CDM. Authorized by the Kyoto Protocol and launched in 2001, the Clean Development Mechanism grew slowly at first, but reached an annual volume of $8.4 billion by 2007. (The smaller JI programme added another $0.4 billion that year (UNFCCC, 2008: 91).) Individual transactions under CDM are negotiated between Annex I countries seeking reductions that can be counted toward Kyoto targets, and host countries offering to provide those reductions. The relatively small volume of transactions reflects, in part, the relatively lax Kyoto targets and the refusal of the United States to participate. It also reflects the notorious bureaucratic complexity of the CDM process, with lengthy, case-specific analyses required for each transaction. It takes an average of 300 days for a project to complete the CDM regulatory process, with transaction costs as high as $500,000 per project (Stern, 2009: 160).

CDM is not only limited in total size; in practice, it has been narrowly focused on a few countries and activities. China alone has issued almost half (more than 46 per cent) of the certified emission reductions (CERs) under CDM; China, India, the Republic of Korea and Brazil together have issued more than 90 per cent of the total.[5]

Classified by type of project, more than half of the CERs issued to date have been for reduction of hydrofluorocarbons (HFCs), a group of relatively rare industrial gases with high global warming potentials.[6] If a gas has an impact on global warming more than 10,000 times as great as carbon dioxide, as is the case for some HFCs, then reducing emissions by less than 100 grams of that gas is equivalent to reducing a ton of carbon dioxide. It is interesting to discover that industry in China and elsewhere was releasing HFCs, and that reducing these emissions is a cost-effective way to abate global warming. This is an unexpected insight into the complexity of the least-cost strategy for combating climate change; but like the focus on REDD, it provides no information about the methods for reducing carbon emissions from fossil fuel consumption, which is the heart of the problem in the long run.

International financing for climate investments is also provided, although in smaller amounts, by the GEF. This agency, created in 1991, is a partnership of many countries and international institutions, and provides grants in six areas of environmental concern, including climate change. It also acts as the designated financial mechanism for a number of multilateral environmental agreements, including the UNFCCC. GEF's climate programme disburses about $250 million per year for projects in energy efficiency, renewable energy, and sustainable transportation.[7] It also manages two small, specialized funds for UNFCCC, the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF).

Both LDCF and SCCF focus on aspects of adaptation. LDCF addresses the special needs of the 48 least developed countries; SCCF has a broader mandate to address adaptation, technology transfer, and related areas. Both funds are dependent on voluntary contributions from national governments; to date, pledges from many European nations, Canada, Japan, Australia, and New Zealand have totalled $172 million for LDCF, and $90 million for SCCF.[8]

Finally, the Kyoto Protocol also established the Adaptation Fund, a separately administered entity that is funded by a two per cent levy on CDM transactions. At the 2007 rate of $8.4 billion in CDM funding, the Adaptation Fund would receive roughly $170 million per year. Proposals to boost adaptation funding by increasing the levy on CDM transactions, and by applying similar levies to other transactions, have been made, but not adopted.

Outside of the UNFCCC framework, the most important multilateral initiative is the World Bank's Climate Investment Funds. Responding to the 2007 Bali Action Plan, these funds were launched in 2008 and received pledges of $6.1 billion from ten donor countries, primarily from the United States ($2 billion), the United Kingdom ($1.5 billion), and Japan ($1.2 billion).[9] Assuming that the funds will be disbursed over a four-year period, 2009 to 2012, the World Bank will be contributing $1.5 billion per year in grants and loans for climate investments. The funds are governed by boards giving equal voice to donors and recipients. There are two separate funds: the Clean Technology Fund, which includes programmes in electric power, transport, and energy efficiency; and the Strategic Climate Fund, which supports new development approaches that involve adaptation to specific climate challenges while complementing other development activities.

In addition to multilateral initiatives, there are a number of bilateral funding initiatives aimed at climate investments in developing countries. The largest is Japan's "Cool Earth Partnership," which is projected to spend $2 billion per year from 2008 through 2012. Four-fifths of its funding is for mitigation, and one-fifth for adaptation.[10] Other substantial initiatives include Norway's pledge to spend up to $600 million per year on REDD,[11] and Germany's commitment of about €600 million to its International Climate Initiative (if spread over five years, 2008–2012, the German initiative is roughly equivalent to $150 million per year).[12] The European Union Global Climate Change Alliance, with total pledges of almost €300 million for programmes extending over several years, is supporting a combination of mitigation and adaptation measures in low-income countries; much of the funding is earmarked for disaster risk reduction efforts (UN/DESA, 2009: 94).

To summarize the current availability of funding for climate investments, there is less than $10 billion per year flowing through official UNFCCC-sponsored channels, almost all of it accounted for by CDM. Outside of the UNFCCC process, there is probably less than $5 billion per year in additional multilateral and bilateral climate funding, most of it in the World Bank's Climate Investment Funds and Japan's Cool Earth Partnership.[13]

These amounts are too small, by more than an order of magnitude, to meet the needs described in the previous sections. Although there is a vast shortfall

of funding for mitigation, the funds available for adaptation are, if anything, even more inadequate to the task (Flåm and Skjaerseth, 2009). Funds for climate investments in developing countries are, moreover, provided through problematical institutional channels; it is not obvious that scaling up the existing institutions would be the right answer, even if the necessary funds were available. The next section examines some of the critical issues that have been raised regarding the existing financing channels.

V. Alternative perspectives on climate financing

This section addresses three topics regarding financing for climate investments in developing countries:

- the quantity of funding;
- the governance of funding mechanisms; and
- the contrast with the more clearly successful experience under the Montreal Protocol for ozone-depleting substances.

A. Funding and climate targets: not even close

On most policy initiatives, compromise and gradualism are the norm: half a loaf is always better than none; 10 per cent of what you want is better than 5 per cent; there will be another chance to make your case next year.

In the case of climate policy, the latest findings from climate scientists (see the first section above) increasingly imply that there is no more time for gradualism and delay. How much we do in the next decade or two will determine whether or not future generations live in a tolerable, dependable climate. For a happy ending, the response today needs to be big, and fast.

The level of investment that is supported by the available funding sources is not even close to meeting the targets for a livable future climate. Asking developing countries to make do with the existing multilateral and bilateral climate funds, a global total of less than $15 billion per year from all sources, is tantamount to ignoring the climate crisis.

A more appropriate scale of response is suggested by Nicholas Stern, in his proposals for a new global agreement on climate change. He calls for a much-expanded global carbon market (which would mean a large increase in the revenues developing countries now obtain through CDM), and additional annual commitments from developed countries of $15 billion for programmes to reduce deforestation, $75 billion for adaptation, and $50 billion of public funding for research and development in clean energy technologies (an increase from $10 billion of clean energy research today) (Stern, 2009: 178). This, he calculates, would cost developed countries as a whole 0.3 per cent of their GDP, in addition to the cost of meeting their own carbon reduction targets – an entirely affordable expenditure when the fate of the earth is at stake. Stern's proposal, it should be noted, is toward the lower end of the range of estimates, discussed above, for the global costs of mitigation.

The 2009 *World Economic and Social Survey* argues that since financial and other markets are weaker in developing countries, the public sector has to assume a leading role in mobilizing and directing resources. To finance climate investments in developing countries on the necessary scale, new measures and institutions will be needed. These might include:

- a global clean energy fund, established outside the existing multilateral financing organizations;
- a global feed-in tariff, guaranteeing fixed purchase prices to producers of renewable energy in developing countries;
- a reformed and streamlined CDM, which by some estimates could mobilize more than $40 billion annually;
- separate forest-related financing mechanisms, to address the potential for both mitigation and adaptation in the forest sector; and
- a global research, development, and deployment fund, along with measures to accelerate technology transfer.

B. Who makes the decisions?

The majority of the limited funds available for climate investments come through UNFCCC-sponsored channels, such as CDM, JI, the GEF climate

programme, and the Adaptation Fund. Governance of these funds, while not completely problem-free, is at least part of the established international process for addressing the global climate crisis.

Funding provided through the World Bank and bilateral programmes, on the other hand, is outside of the United Nations-based international process. Critics such as Celine Tan have argued that the World Bank, along with the three principal donors to its climate funds (the United States, the United Kingdom, and Japan) are creating parallel frameworks of governance that may undermine the existing multilateral process (Tan, 2008). New forms of conditionality, the bane of traditional foreign aid programmes, may appear as the World Bank elaborates its own criteria for climate funding. Echoes of the Bank's traditional lending criteria, including tight fiscal discipline and structural reforms, may yet be heard in the climate arena. Meanwhile, the World Bank's environmental record leaves much to be desired, and its energy programme, even in recent years, has remained heavily slanted toward fossil fuel production (Tan, 2008: 11).

More broadly speaking, the reforms in development financing in recent years, designed to reduce the intricate project-based requirements and donor conditionality restrictions of the past, may have ended up creating new, modernized forms of conditionality (Tan, 2005). Donor preferences, such as a favourable attitude toward privatization, continue to shape aid programmes. In the case of climate funding, the bureaucratic complexity of the CDM process, with its extremely detailed project-specific requirements, may recreate some of the drawbacks of early, project-based aid efforts. The hoped-for expansion of carbon markets will require significant streamlining of the contracting process, if it is to achieve its goals of global efficiency and cost minimization. An enhanced, reformed CDM with lower transaction costs could, according to UNFCCC estimates, yield more than $40 billion per year by 2020 – five times the recent level of CDM, though still only a fraction of what is needed (UN/DESA, 2009: 174).

Along these lines, it has been suggested that targeted funding programmes will inevitably fall short of what is needed; in addition to such programmes, governments should focus on realigning incentives, for instance eliminating subsidies for fossil fuels and creating infrastructure, support, and incentives for renewables. Such measures will send a clear market signal, prompting an increase in private investment in clean energy (Miller, 2008). This is not a complete replacement for targeted, multilateral funding, but it may be a valuable complement to conventional financing initiatives.

Even the existing multilateral institutions may be in need of reform. An analysis of the GEF adaptation funds found that they are not adequate to the task of responding to developing countries' needs, owing both to the complexity of the funds and to incomplete implementation of UNFCCC guidance. Improvements in both communications and organizational structure are needed in order for multilateral adaptation funding to serve the needs of the affected countries (Möhner and Klein, 2007).

Concerns about the weakness and limitations of existing, single-purpose multilateral organizations has led some observers to advocate the creation of a more powerful, multi-issue World Environmental Organization – or a World Environment and Development Organization. Such an organization could improve coordination among issues and organizations, promote capacity building and technology transfer, and initiate and manage new environmental treaties (Biermann, 2000; Biermann and Simonis, 1998).

Provision for technology transfer in clean energy and related fields is essential in any new climate agreement. Most of the crucial climate-related technologies have been developed and patented in industrial countries. Strict protection of existing intellectual property rights could slow the deployment of new technologies in developing countries, undermining the pursuit of rapid, cost-effective emission reduction. The experience with clean energy technologies in emerging economies such as China, India, and Brazil has been mixed. Barriers to entry have been relatively low in the photovoltaics and biofuels industries, allowing new companies and countries to compete. In contrast, wind power and automobile pollution control technologies have been more tightly controlled by established producers based in developed countries (UN/DESA, 2009). In theory, free trade could accelerate the transfer of new technologies; in practice, some trade agreements, particularly bilateral ones between unequally matched countries, may incorporate restrictive language on intellectual property rights that will impede the flow of clean energy technologies.

C. Success is sometimes an option

Focusing only on the limitations of existing climate financing, both in magnitude and in governance, could lead to very gloomy conclusions. To end on a positive note, it is worth examining the lessons of a more successful episode, the process of compliance with the 1987 Montreal Protocol on ozone-depleting substances (ODS). How and why did the Multilateral Fund for the Implementation of the Montreal Protocol succeed in phasing out those substances around the world, in a relatively short period of time and with minimal conflict?

The Montreal Protocol is widely seen as a premier success story for international environmental agreements. It achieved near-universal global participation, and progressed promptly toward its goal of replacing ODSs with safer alternatives. It established different deadlines for industrial and developing countries, with a rapid phase-out of ODSs in developed countries and a much longer timetable for developing countries. In an insightful analysis, Frank Biermann and Udo Simonis identified several lessons to be drawn from the success of the Montreal Protocol, which are potentially relevant to agreements on climate change and other issues (Biermann and Simonis, 1999):

- Nearly all of developing countries' incremental costs of compliance were paid, net of the identified economic savings that resulted from compliance.
- The governance structure encouraged cooperation; all decisions required simple majorities of both the developed and developing countries, and a two-thirds majority of the parties as a whole. This led to a high degree of trust, and decision-making by consensus was the norm.
- Concerns about trade distortions were effectively addressed; subsidiaries of multinational corporations, and developing-country enterprises producing predominantly for export into industrial countries, were not reimbursed for conversion costs.
- Developing countries which exceeded a threshold of per capita consumption of harmful substances "graduated" into becoming responsible for making financial contributions, and for meeting the industrial countries' reduction schedule. Wealthier countries such as the United Arab Emirates thus faced the same standards as industrial countries.
- In-kind contributions of ODS-reducing equipment were accepted from some ex-Soviet countries, which were unable to meet their obligations in hard currency.

One advantage enjoyed by the Montreal Protocol, in contrast to the climate problem, was the much smaller magnitude of the necessary investments; the leading international agencies involved in aiding the ODS phase-out in developing countries spent a total of $1.2 billion through 2003 (Luken and Grof, 2006). However, as Catherine Norman, Stephen DeCanio, and Lin Fan observed in a retrospective analysis,

> Perhaps the most important lesson learned so far from experience in implementing the Montreal Protocol is that the technological and economic disruptions accompanying replacement of ODSs with ozone-friendly technologies have been much less serious than originally feared. Also, the Protocol has stimulated both R&D and institutional change that have improved product quality and profitability in unanticipated ways (Norman et al., 2008: 138).

The availability of new technologies, combined with an international agreement to assist developing countries in adoption of those technologies, had numerous indirect benefits. A review of ODS-reducing projects implemented by the United Nations Industrial Development Organization (UNIDO) found that they typically reduced greenhouse gas emissions and local pollutants as well as ODSs, maintained or increased employment, and frequently led to overall modernization of developing-country firms that had previously relied on outdated production practices (Luken and Grof, 2006).

In summary, the Montreal Protocol had near-universal involvement, with equal roles in governance for developing and industrial countries; it had differentiated timetables for emission reduction; it addressed trade distortions; and it financed the introduction of new technologies in developing countries, which had multiple benefits in addition to the intended reduction in ODSs.

Application of a similar approach to climate investment would face additional hurdles resulting from the much larger funding requirements, and from the need to continue developing the essential

new technologies. Yet it may be helpful to imagine what a climate agreement in the spirit of the Montreal Protocol would look like:

- Developed countries would pay the incremental costs of compliance for developing countries, net of any economic benefits that accrue to the developing-country hosts;
- Developing countries receive international assistance in the adoption of new, clean technologies;
- Subsidiaries of multinational corporations, and enterprises producing primarily for export, would be excluded from these benefits;
- When developing countries cross an established threshold level of per capita income, they are reclassified as developed countries for the purposes of the agreement;
- A new international governing body is established, in which all major decisions must be endorsed by majorities of both the developed and the developing countries.

In the case of the Montreal Protocol, this institutional framework led to a high degree of trust and cooperation, and to rapid reduction in the costs of clean technologies, since all parties shared an interest in cost reductions.

Despite differences of scale and expense, the Montreal Protocol experience stands as a reminder that success is sometimes an option – and that much can be accomplished by skillful design of multilateral financing structures and environmental protection measures. Could the same turn out to be true for the reduction of greenhouse gases?

Notes

1 Global emissions of carbon dioxide from fossil fuel combustion amounted to 6.1 billion metric tons of carbon in 1990, and 8.2 billion tons in 2006. A 50 per cent reduction thus allows a global total in 2050 of about 3 billion tons if measured from 1990, or 4 billion tons if measured from 2006. With an estimated global population of 9 billion in 2050, this is less than 0.5 tons per capita. In 2006, per capita emissions in Mexico, Thailand, and China were 1.1–1.3 tons. Data from Carbon Dioxide Information Analysis Center, United States Department of Energy (DOE), http://cdiac.ornl.gov.

2 Among other sources, this is argued persuasively in Baer et al. (2008).

3 den Elzen's second alternative, described as a modified version of the "Brazilian proposal" from past negotiations, is similar in spirit to the greenhouse development rights proposal of Baer et al. (2008).

4 Baer et al. (2008) offers a flexible formula that can be adjusted to reflect varying standards and thresholds for financial responsibility

5 CDM website, http://cdm.unfccc.int/Statistics/Issuance/CERsIssuedByHostPartyPieChart.html.

6 UNEP Risø Centre, http://cdmpipeline.org/cdm-projects-type.htm.

7 Global Environment Facility website, http://www.gefweb.org/.

8 Global Environment Facility website, http://www.gefweb.org/.

9 World Bank website, http://web.worldbank.org .

10 Ministry of Foreign Affairs of Japan, http://www.mofa.go.jp/policy/economy/wef/2008/mechanism.html .

11 Government of Norway, http://www.norway.or.id/policy/environment/introforest1.htm .

12 German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, http://www.erneuerbare-energien.de/inhalt/42000/ .

13 Similarly, the *2009 World Economic and Social Survey* estimates "current dedicated climate resources," excluding CDM, at $21 billion, of which the multi-year totals for Japan's Cool Earth Partnership and the World Bank's Climate Investment Funds account for more than $16 billion. The remainder of their total includes several funds that have not yet received pledges for the full, targeted amounts (UN/DESA, 2009: 157–159).

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