

Financing Mitigation and Adaptation in Developing Countries: New options and mechanisms

Background Paper

Dennis Tirpak and Jo-Ellen Parry

March, 2009

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Preface

The International Institute for Sustainable Development (IISD) has prepared three papers to explore how major developing economies might become effectively engaged in a post-2012 global climate change regime. The goal of this first background paper, *Financing Mitigation and Adaptation in Developing Countries: New options and mechanisms*, is to review financing issues relating to mitigation and adaptation under the United Nations Framework Convention on Climate Change (UNFCCC).

The information in this background paper provides input to the analysis of the main report of the series, *Global Climate Change Goals: Encouraging developing country participation*, and should be read in conjunction with that report. The second background paper in the series is, *The Carbon Market: How the future market can encourage developing country participation*.

Abbreviations and Acronyms

AAU	Assigned Amount Unit
AF	Adaptation Fund
AFB	Adaptation Fund Board
AOSIS	Alliance of Small Island States
AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	Ad Hoc Working Group on Long-term Cooperative Action under the Convention
CCS	carbon capture and storage
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CEP	Cool Earth Partnership
CIF	Climate Investment Funds
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
COP	Conference of the Parties
CTF	Clean Technology Fund
EU	European Union
EC	European Commission
EF	Efficiency Fund
EU-ETS	European Union Emission Trading System
G-77	Group of 77
GCCA	Global Climate Change Alliance
GCFM	Global Climate Financing Mechanism
GDP	gross domestic product
GEF	Global Environment Facility
GFDRR	Global Facility for Disaster Reduction and Recovery
GHG	greenhouse gas
GNI	gross national income
GNP	gross national product
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
IAME	International Aviation and Marine Emissions
IATAL	International Air Travel Adaptation Levy
ICAO	International Civil Aviation Authority
ICPI	International Climate Protection Initiative
IEA	International Energy Agency

IET	International Emissions Trading
IMERS	International Maritime Emission Reductions Scheme
IMF	International Monetary Fund
IMO	International Maritime Organization
IPR	intellectual property rights
JI	Joint Implementation
LDC	least developed country
LDCF	Least Developed Countries Fund
MAF	Multilateral Adaptation Fund
MDB	Multilateral Development Bank
MDG	Millennium Development Goal
MRV	measurable, reportable and verifiable
NAMA	nationally appropriate mitigation actions
NAPA	National Adaptation Programmes of Action
NGO	non-governmental organization
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
PPCR	Pilot Project for Climate Resilience
ppm	parts per million
R&D	research and development
RD&D	research, development and demonstration
REDD	reducing emissions from deforestation and forest degradation
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCCF	Special Climate Change Fund
SCF	Strategic Climate Fund
SD-PAM	Sustainable Development Policies and Measures
SDR	Special Drawing Right
SEFI	Sustainable Energy Finance Initiative
SIDS	small island developing state
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
U.S.	United States of America
WCCF	World Climate Change Fund
WEO	World Energy Outlook
WRI	World Resources Institute
ZCF	Zero Carbon Fund

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1.0 Introduction

This background paper addresses financing issues relating to mitigation and adaptation under the UNFCCC. It briefly reviews current funding mechanisms, proposals for additional sources of funds, and proposals relating to what should be funded and mechanisms to structure a new financial agreement.¹

¹ The paper addresses mitigation technology and adaptation, but does not address forestry.

2.0 Financing and Investment – Meeting the Needs of the Climate Challenge

In 2007, the UNFCCC Secretariat prepared a report on *Investment and Financial Flows to Address Climate Change* (UNFCCC, 2007). The report covers mitigation and adaptation in various sectors over the period to 2030. The report defines an investment as the initial (capital) cost of a new physical asset with a life of more than one year, such as the capital cost of a gas-fired generating unit or a water supply system. A financial flow is an ongoing expenditure related to climate change mitigation or adaptation that does not involve physical assets, such as research or health care. These investment and financial flows are *not* the same as the cost of addressing climate change; changes to the operating costs of investments are not considered nor are damages due to climate change estimated. Operating costs can be important, can change the long-run costs of many technologies and will affect technology choices in some circumstances.

Total investment and relevant financial flows are estimated for both a reference scenario and a mitigation scenario. The scenarios are a composite of several sources covering energy-related emissions, industrial process carbon dioxide (CO₂) emissions, non-CO₂ emissions, and agriculture and forest sinks. A comparison of those scenarios indicates the investment and financial flows needed to address climate change.

Addressing climate change will require significant shifts and an overall net increase in global investment and financial flows. While the changes appear large in absolute terms, they are small relative to total investment. Most of the changes and additional investment are likely to be made by corporations and households, although this may require government policies and incentives. But additional public sector investment and financial flows will be required, especially for adaptation.

Approximately half of the shifts and net increase in investment and financial flows needed to address climate change occur in developing countries. Mitigation investments in developing countries are more cost-effective because larger emission reductions can be generated per dollar invested. On the other side, on average, developing countries are expected to suffer more damage from climate change impacts as a percentage of their gross domestic product (GDP) in comparison to developed countries. Investments in planned adaptation should reduce the amount of damage experienced by developing countries and, therefore, should yield proportionately larger economic benefits.

The UNFCCC report and other studies conclude that developing countries, especially the poorest and those most vulnerable to the adverse impacts of climate change, will need international financial support for mitigation and adaptation. These investment and financial flows are calculated to be

over and above those of official development assistance (ODA), which plays a large role in meeting the development needs of the least developed countries (LDCs). Mitigation and adaptation financing needs to be additional to ODA, but the management of any funding needs to be integrated with on-going development assistance processes.

2.1 Mitigation

The changes to the investment and financial flows in 2030 for climate change mitigation are shown in Table 1. Global additional investment and financial flows of US\$200-210 billion will be needed in 2030 to return global greenhouse gas (GHG) emissions to 2005 levels with about US\$75 billion of this funding needed in developing countries. The net increase involves reduced investment for fossil fuel supply and large shifts in investment for electricity generation. Annual investment in fossil fuel supply and associated infrastructure in 2030 is almost US\$60 billion lower due to increased energy efficiency. However, global fossil fuel consumption is still about 30 per cent higher than in 2000.

Table 1: Change to the Annual Investment and Financial Flows in 2030 for Climate Change Mitigation

Sectors	Global (billions of 2005 U.S. dollars)	Share of Developing Parties (percentage)
Fossil fuel supply	(-) 59	50 to 55
Electricity supply	(-) 7	50 to 55
Fossil-fired generation, transmission and distribution	(-) 156	50 to 55
“Renewables,” nuclear and CCS	148	50 to 55
Industry	36	50 to 55
Building	51	25 to 30
Waste	0.9	66 to 70
Transport	88	40 to 4%
Forestry	21	Almost 100
Agriculture	35	35 to 40
Energy research, development and demonstration (RD&D)	35-45	-
Net Change	200-210	35 to 40

Source: UNFCCC, 2007, Tables IX-61, IX-62 and IX-63, pp. 173 and 174.

Substantial shifts in investment for electricity supply will be needed. Mitigation is projected to reduce investment for fossil-fired generation, transmission and distribution of the power supply by US\$156 billion in 2030. Almost all, about US\$148 billion, needs to be shifted to “renewables,” nuclear, and carbon capture and storage (CCS). Increased energy efficiency requires additional investment for electrical and fossil fuel equipment in industry and buildings. Improved vehicle

efficiency, including hybrid vehicles, increases energy efficiency in the transportation sector. Annual spending on energy research and development (R&D), US\$10 billion, and on demonstration, US\$25 to 35 billion, was projected to double by 2030. Currently, most research is undertaken in a few developed countries; what share of the research will be conducted in developing countries in 2030 is difficult to predict.

A little over half of the incremental investment for energy supply, electricity generation and industry is projected for developing countries, which reflects the relatively rapid economic growth projected for those countries and the cost-effective emission reduction opportunities available there. The shares are lower for buildings and transportation because the building stock with heating and/or cooling and the vehicle fleet are concentrated in developed countries.

The UNFCCC (2008b) updated these numbers in a recent report which relied heavily on new information from the International Energy Agency's (IEA, 2008) *World Energy Outlook 2008*. The energy related CO₂ emission reductions drawn from this 2008 report are only marginally (1.2 per cent) higher than those reported in 2007, however, the investment needs changed significantly—increased more than 170 per cent—largely due to the capital costs of energy supply facilities.

The IEA (2008) also undertook a bottom-up assessment of the investment needs out to 2050 for a wide range of power generation, infrastructure, transport and energy demand technologies in 2008. Importantly, the IEA study examined the implications of meeting long-term abatement targets on near- to mid-term investments. A comparison of current and additional finance from this analysis for achieving a 500 parts per million scenario is presented in Table 2. The estimated additional finance needed increases with each stage of the innovation cycle, from US\$10 to 100 billion per year for R&D to US\$1,000 billion annually for diffusion. These estimates are the total annual investment needed at each stage. The support needed for deployment and diffusion will be only the cost in excess of the cost of the incumbent technology.

Caution should be used when interpreting these numbers owing to the uncertainties of the assumptions, particularly the limited data associated with financing technology development and diffusion so far into the future.

Table 2: Estimated Additional Financing needs by Stage of Technology Innovation Pathway

	R&D (Global)	Demonstration (Global)	Deployment (Global)	Deployment (Developing)	Diffusion (Global)	Diffusion (Developing)
Existing finance	US\$20 billion per annum ¹	Not Available	US\$45 billion per annum ¹	Not Available	US\$71 billion in 2006 ^{1,2}	US\$14.2 billion per annum ^{1,2}
Additional finance required	US\$10-100 billion per annum	US\$27-36 billion per annum until 2030	US\$73-163 billion per annum ¹	US\$18.25-40.75 billion per annum ¹	US\$1,000 billion per annum from 2010-2050 ^{1,3}	US\$370 billion per annum from 2010-2050 ⁴

Derived from: IEA, 2008; IEA, 2006; Greenwood et al., 2007; and Doornbosch *et al.*, 2008.

Notes: ¹ Does not include investments in non-energy technologies.

² Not all investments are incremental.

³ This is the low end of the range. Potential incremental costs (up to US\$5,600 billion per annum) are possible if technology development is slow and if relatively cheap abatement in developing countries does not occur.

⁴ Assuming a 63:37 ratio of developed to developing country investment as per IEA, 2006.

2.2 Adaptation

The global cost of adaptation to climate change is difficult to estimate, largely because 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 large, new and additional investment and financial flows will be needed to help adapt to climate change. Based on the available literature, the UNFCCC secretariat was able to compile partial estimates of the investment and financial flows for adaptation of: agriculture, forestry and fisheries; water supply; human health; coastal protection; and infrastructure. The UNFCCC estimates do not represent the full incremental cost of adaptation.

Since they are drawn from available literature, the UNFCCC estimates of the investment and financial flows for adaptation in 2030 are based on a different scenario for each sector.² For water supply and coastal zones, adaptation costs are the capital costs of measures designed for the projected climate over the life of the facility; 2050 and 2080 respectively.

The UNFCCC estimates the incremental investment and financial flows needed to adapt to climate change in selected sectors total US\$49 to 171 billion globally in 2030 with US\$28 to 67 billion of this total being needed in developing countries. Other recent estimates of adaptation costs for developing countries include World Bank (US\$9 to 41 billion),³ Oxford Institute for Energy Studies

² The differences in temperature, precipitation and sea level rise between a reference and mitigation scenario would be quite small in 2030.

³ World Bank, 2006, Table K.1. Current needs, based on share of investment estimated to be climate sensitive.

(US\$2 to 17 billion),⁴ Oxfam (greater than US\$50 billion)⁵ and UNDP (US\$86 billion).⁶ While these estimates differ in terms of their scope and approach, and hence are not directly comparable, they all show that tens of billions U.S. dollars annually will be needed by developing countries to adapt to climate change. The estimated additional investment and financial flows needed for climate change adaptation in 2030 are shown in Table 3.

The agriculture, forestry and fisheries sector is estimated to need an additional investment of US\$11 billion annually in new capital, such as irrigation systems, equipment for new crops and fishing practices, and relocation and modification of processing facilities. An additional US\$3 billion will be needed annually for research and extension activities to facilitate adaptation. About half of the total requirement will be for developing countries.

Table 3: Change to the Annual Investment and Financial Flows in 2030 for Climate Change Adaptation

	Global (billions of 2005 U.S. dollars)	Developing Countries (%)
Agriculture	14	50
Water supply	11	85
Human Health	5	100
Coastal protection	11	45
Infrastructure	8 to 130	25 to 35
Total	49 to 171	35 to 60

Source: UNFCCC, 2007, Table IX-65, p. 177.

The capital cost of the water supply infrastructure needed to meet the projected population and economic growth to 2030 given the projected climate in 2050 is about US\$800 billion.⁷ with about 28 per cent of this—US\$225 billion—estimated to be due to climate change. Spreading the capital cost over the 20-year life of the facilities leads to an annual adaptation cost of US\$11 billion.⁸ About 85 per cent of the additional investment would be needed in developing countries.

⁴ Müller and Hepburn, 2006, p. 14. Current needs, based on extrapolations of LDC *National Adaptation Programmes of Action* (NAPAs).

⁵ Oxfam, 2007, p. 3. Current needs, based on extrapolations of NAPAs.

⁶ Watkins, 2007. Needs in 2015.

⁷ The model used to develop the estimates for water supply considered changes in demand due to population and economic growth, and changes in supply due to projected climate change. The estimates in the UNFCCC report include water supply, but not water quality, flood protection, unmet irrigation needs or water distribution systems. UNFCCC, 2007, p. 105).

⁸ These estimates do not include the cost of sanitation facilities, storm water management or flood protection. They also do not include the cost of meeting Target 10 of the Millennium Development Goals (MDGs)—halving the number of people without sustainable access to safe drinking water and basic sanitation by 2015—which is estimated to require an annual expenditure of US\$10 billion over that period.

3.0 Funding Mechanism for Climate Change

3.1 Current Funding for Mitigation

Public funding for mitigation includes direct funding from national budgets through a bilateral financing channel, national budget contributions to multilateral funds, resources raised from capital markets backed by government guarantee and a share of government taxes or revenues earmarked at the national level for a climate fund. The second source of public finance is the funds collected internationally without going through national budgets. It includes international levies on emission reduction credits and auctioning of emission allowances at the national or international level. Estimates by the UNFCCC of current sources of public finance for developing mitigation technologies are listed in Table 4 for the RD&D stages and the incremental financing, in excess of the cost of the incumbent technology, for the technologies at deployment and diffusion stages.

Data in Table 4 indicate that UNFCCC funding for innovative mitigation technologies has been much lower than funding from sources outside the Convention. While R&D funding by governments is estimated at US\$10 billion and thus represents a significant share, these funds are mostly spent domestically by developed countries. Bilateral and multilateral sources outside the Convention have delivered financing of a similar magnitude but have targeted technologies at later stages in the technology development cycle.

Table 4: Estimates of Current Public Financing for Innovation of Mitigation Technologies (\$US billions)

Stage of Technological Development at which Financing is Applied	Source	Estimated Average Annual Investment
	Sources outside the Convention	
RD&D	Government funding	10
	Sources under the Convention	
Deployment, diffusion	Financial mechanisms under the Convention [GEF Trust Fund, Special Climate Change Fund (SCCF), LDC Fund]	0.22–0.32
Deployment, diffusion	Kyoto flexibility mechanisms (CDM, JI)	4.5–8.5
	Sources outside the Convention	
Diffusion	Export credit agencies	1–2 ¹
Deployment, diffusion	Bilateral and multilateral sources	5–10 ¹

Deployment, diffusion	Philanthropic private sources (including NGOs, foundations and voluntary carbon market finance)	1
	Total	22–32
<p>¹ The estimates apply only to low-carbon technologies and hence cover only a small fraction of the total activity of export credit agencies and bilateral and multilateral sources. The estimates are subject to revision. Source: UNFCCC, 2007.</p>		

As detailed in Table 5, private finance (for clean energy investments in energy efficiency and renewables) increased from US\$33.2 billion to US\$148.4 billion between 2004 and 2007, and amounted to nearly five to seven times the level of public funding. Investments are estimated to have declined slightly to US\$142 billion in 2008. The investment in clean energy is dominated by wind and solar power, biofuels, biomass and waste. Developing countries received an increasing share of the new investment in clean energy: growing from 13 per cent (US\$1.8 billion) in 2004 to 23 per cent (US\$26 billion) in 2007. This growth was driven by concern over energy supply constraints, better policy and regulatory frameworks, and sustained high oil prices. China, India and Brazil accounted for most of this investment (82 per cent in 2007).⁹ Financing in developing countries is highly concentrated in a limited number of nations; indicating that the development of clean energy systems is not happening on a global basis.

Table 5: Global New Investment in Clean Energy, 2004-2007 (US\$ billions)

Year	Venture Capital/Private Equity	Public Markets	Government/Corporate RD&D	Asset Finance	Small Scale Projects ¹
2004	1.7	0.7	10.3	12.4	8.2
2005	3.0	4.1	12.3	27.5	11.6
2006	7.3	10.5	14.3	48.0	12.5
2007	9.8	23.4	16.9	79.2	19.0

¹ Small-scale projects relate mainly to financing of distributed or off-grid installations, such as solar water heaters, biogas digesters and micro wind turbines.

Source: UNEP Sustainable Energy Finance Initiative (SEFI), 2008.

The data in Table 5 cover a mix of different investment types across the financing spectrum, from R&D funding and venture capital for technology and early-stage companies, through to public market financing for projects and mature companies and asset financing for increasing installed generation capacity.

The major share of venture capital and private equity investments were for solar technologies. Venture capital investors often hope to develop a technology up to these stages within three to five

⁹ These figures exclude investment in RD&D and small-scale projects.

years and then recover their investment from the proceeds of an initial public offering. ¹⁰ Almost US\$10 billion of private funds and US\$7 billion of government funds were invested in R&D of mitigation technologies in 2007. Asset financing was mainly directed toward wind power and biofuels. Asset finance typically includes a significant debt component that can come from a local or international bank, or local or foreign capital markets, on commercial terms or with credit enhancement structures offered by international financial institutions and export credit agencies. To attract the required additional investment, governments need to institute policies, laws and regulations that offer the prospect of a growing market for mitigation technologies. The establishment of emission reduction commitments, for example, creates a bigger potential market for a technology and a higher potential return on private financing. Similarly, measures that reduce the net cost of financing research, such as tax credits, reduce the risks associated with new technologies. Measures that provide returns at earlier stages of technological maturity, such as feed-in tariffs and renewable energy obligations, could also help create favourable conditions for investment in clean energy technologies.

3.2 Current Funding for Adaptation

Funding for climate change adaptation under the UNFCCC is currently provided through funds operated by the Global Environment Facility (GEF) and will soon be made available through an operational Adaptation Fund (AF). These Convention and Kyoto Protocol sources are complemented, and currently surpassed, by additional sources, particularly development assistance activities that enhance the adaptive capacity of developing countries. New funding provided through adaptation-related bilateral and multilateral initiatives is being added to this mix, such as the World Bank's Pilot Project for Climate Resilience (PPCR). These sources are also expected to surpass the resource levels provided under the Convention. See Table 6 for an overview of the levels and sources of existing resources for adaptation (including pledged contributions).

¹⁰ The data in Table 5 exclude private equity and venture capital buy-outs, existing public stock changing hands, acquisitions of projects and companies, and acquisitions and refinancing of assets.

Table 6: Overview of Current and Pledged Financial Resources for Adaptation (US\$ million)

	Estimated Funding Level	Period	Nominal Annual Level of Funding
Funding under the Convention			
Strategic Priority on Adaptation	50	GEF 3 (2002-2006) – GEF 4 (2006-2010)	NA
LDC Fund	172	As of 7 November 2008	NA
SCCF	90	As of 7 November 2008	NA
AF	400-1,500 (estimated total)	2008-2012	80-300
	91	As of October 31, 2008	
Multilateral Initiatives			
PPCR (World Bank)	240	2009–2012	60
Global Facility for Disaster Reduction and Recovery (GFDRR)	11	2007–2008	5.5
Bilateral Initiatives			
Cool Earth Partnership (CEP) (Japan)	1,000	2008–2012	200
International Climate Protection Initiative (ICI) (Germany)	200	2008–2012	40
Global Climate Change Alliance (GCCA) (European Commission)	84	2008–2010	28
UNDP-Spain MDG Achievement Fund	22	2008–2011	5.5

Source: UNFCCC, 2008b; Fuentes, 2008; Commission of the European Communities, 2007.

As of October 2008, 4,085,352 certified emission reductions (CERs) had been issued in the AF account from the CDM registry. Assuming a market price of €17.5 for a CER, that would equal US\$93.3 million available for the AF (using the exchange rate of 31 October 2008).

In 2007, ODA for all purposes totalled US\$103.5 billion (OECD, 2008). A rough analysis by the OECD of the categories of ODA-funded activities suggested that more than 60 per cent of overall ODA could be relevant to adaptive capacity and adaptation (Levina, 2007). Support for adaptation is provided by bilateral donors and multilateral development banks (MDBs). Among these, the World Bank has the largest resources, providing loans and grants of almost the same amount as those provided by the Asian Development Bank (ADB), African Development Bank, European Bank for

Reconstruction and Development, and Inter-American Development Bank combined. The greater part of MDB lending is for infrastructure projects that are likely to be adversely affected by climate change. Only a small portion of lending relevant to adaptation is used directly by adaptation projects, most of which has so far focused on analytical work, capacity building and impact assessments (UNFCCC, 2008c).

The most significant MDB effort in adaptation is the World Bank's PPCR, part of its Climate Investment Funds (CIFs) that are being set up jointly with the regional development banks. The Pilot Programme seeks to mobilize new and additional financing for activities and investments that demonstrate how financial and other incentives can be scaled up to support adaptation. A total of US\$600 million has already been pledged by bilateral donors (World Bank, 2008). All funds and programs under the CIFs end in 2012 in order not to prejudice deliberations under the Convention regarding the future of the climate change regime.

The GFDRR is another avenue for financial resources. This facility provides technical and financial assistance to high-risk, low- and middle-income countries in mainstreaming disaster reduction in national development strategies and plans to achieve the MDGs. Between 2007 and 2008, US\$11.1 million was provided for 20 adaptation projects, including a drought adaptation plan for Morocco and analyses of future climate change risks and adaptation measures in Bangladesh, East Africa and the Caribbean (GFDRR, 2008).

In addition, new bilateral initiatives with a strong focus on adaptation have been established. The CEP launched by Japan is intended to provide up to US\$2 billion, out of a total US\$10 billion, in assistance for adaptation and improved access to clean energy. The UNDP-Spain MDG AF, with an estimated level of funding of US\$143 million, includes funding for environment and climate change, of which an estimated US\$22 million has been allocated to adaptation. This funding will support interventions that improve environmental management and service delivery at the local and national level; activities that will increase access to new financing mechanisms and efforts to enhance adaptive capacity. The German International Climate Protection Initiative (ICPI) will provide up to US\$40 million annually to support adaptation. These resources are generated through auctioning nearly 10 per cent of Germany's allowances from the European Union Emission Trading System (EU-ETS) for the period 2008-2012. The European Commission's GCCA also draws on proceeds from the EU-ETS. It is expected to provide US\$84 million from 2008 to 2010. The overall objective of the GCCA is to help developing countries that are most vulnerable to climate change, in particular LDCs and small island developing states, increase their capabilities to cope with the effects of climate change. The United Kingdom is providing US\$110 million in support of Bangladesh's climate change strategy.

3.3 Proposals for New Funding Sources

The UNFCCC report on investment and financial flows concluded that meeting the additional investment and financial flows would require a combination of:

- commitments by developed countries to provide additional financial assistance to developing countries under the Convention;
- appropriate national policies to encourage private investment and domestic government investment in mitigation and adaptation measures;
- optimal use of the funds available under the Convention and from other sources to spread the risk across public and private sources;
- expansion of the carbon market through more stringent commitments by Annex I Parties to increase demand and possible additional mechanisms to increase supply; and
- new sources of predictable funds to provide additional external financial flows to developing countries for adaptation and mitigation.

If the funding available under the financial mechanism of the UNFCCC remains at its current level and continues to rely mainly on voluntary contributions, it would not be sufficient to address the estimated future financial flows needed for mitigation and adaptation. However, with appropriate policies and/or incentives, a substantial part of the required additional investment and financial flows could be covered by currently available sources. National policies can assist in shifting investments and financial flows made by private and public investors into more climate-friendly alternatives and optimizing the use of available funds by spreading the risk across private and public investors. Improvement in, and an optimal combination of mechanisms, such as the carbon markets, financial mechanism of the Convention, ODA, national policies and, in some cases, new and additional resources—will be needed to mobilize the necessary investment and financial flows to address climate change.

Parties to the Convention and experts have proposed several options for generating additional funds, as summarized in Table 7 and presented in greater detail in Annex I. These options can be divided into three broad categories (Bapna and McGray, 2008):

- National budgetary allocations – Financial resources can continue to be provided through pledges provided by donor countries to existing financial mechanisms, such as the GEF and the World Bank. As reliance on this approach has historically not generated the level of financial resources needed, proposals that establish donation targets have been put forward. These include the proposal by China to introduce a levy of 0.5 to 1.0 per cent on the GDP of Annex I Parties that would be collected in a series of specialized funds established under the UNFCCC. As well, Mexico has suggested the establishment of a World Climate Change

Fund (WCCF) (discussed below in Section 4.2).

- National market-based levies – Predictably generated over a period of years, these levies would be generated independent of national budgetary processes, but the revenue would be collected by national governments. An example is the placement of levies on the auctioning of emission permits, such as that introduced under the EU-ETS and proposed by the U.S.
- International market-based levies – Financial resources can also be generated and collected at the international level (for example, through the CDM and the Norwegian proposal to auction a portion of emission permits allocated to Annex I Parties under the Kyoto Protocol).

Table 7: Summary of the Options to Enhance International Investment and Financial Flows to Developing Countries

Option	Estimate Annual Revenue (Billion\$)	Specific to Mitigation (M), Adaptation (A) or Technology (T)	Under the Convention	Defined Contribution	Go through Government Budget
Increasing the Scale of Existing Mechanisms					
GEF Trust Fund	Currently \$0.25	N	Y	Y	Y
SCCF and LDCF	Currently \$0.10	A	Y	N	Y
CDM and Other Possible Crediting Mechanisms	Currently \$25 to \$100	M	Y	N	N
AF	\$0.50 to \$2	A	Y	N	N
New Bilateral and Multilateral Funds					
Cool Earth Partnership	\$2	N	N	N	Y
International Climate Protection Initiative (ICPI)	\$0.15	N	N	Y	Y
Clean Investment Fund	\$1 to \$2	N	N	N	Y
Global Climate Financing Mechanism (GCFM)	\$5 ¹	N	N	N	Y
Proposals Funded by defined Contributions from Developed Countries					
Convention AF, Technology Fund and Insurance Mechanism		N	Y	Y	Y
AF and Multilateral Technology Acquisition Fund	\$170	N	Y	Y	Y
Mechanism for Meeting Financial Commitments under the	\$130 to \$260	N	Y	N	Y
Convention Efficiency Penny	\$20	M	N	Y	Y
Proposals Funded by Contributions					

from Developed and Developing Countries						
WCCF	\$10	N	Y	Y	Y	
Multilateral AF	\$18	A	Y	Y	Y	
More Stringent Commitments by Developed Countries						
Auction of Assigned Amount Units	\$5	A	Y	Y	N	
Nationally Appropriate Mitigation Actions		M	Y	N	N	
Other Funding Sources						
Extension of the 2 per cent levy on CDM to other Market Mechanisms	\$0.5 or \$5	N	Y	Y	N	
International Air Travel Adaptation Levy (IATAL)	\$13	A	N	Y	N	
International Maritime Emission Reduction Scheme (IMERS)	\$3	N	N	Y	N	
Auction of Allowances for International Aviation and Marine Emissions (IAME)	\$20 to \$40	N	N	N	N	
Funds to Invest Foreign Exchange Reserves	Fund of up to \$200	M	N	N	N	
Access to Renewables Programmes in Developed Countries	\$0.5	M	N	N	N	
Tobin Tax	\$15 to \$20	N	N	Y	N	
Donated Special Drawing Rights	\$18	N	N	N	N	
Debt-for-clean-energy Swap		M	N	N	Y	
Note: N = No and Y = Yes						
¹ The total payment to frontload €5 billion over the period of 2010-2014 would amount to €7.2 billion. Repayment would start in 2011 at €74 million, gradually rise to €380 million in 2015 and continue at that level until 2031.						

Source: Haites, 200, p. 35.

To this list of options must be added recognition of the critical role of developing country governments in financing mitigation and adaptation efforts through their existing financial resources. National budgets in all countries, including developing countries, need to be examined to determine the degree to which existing financial flows are investing in measures that contribute to achievement of sustainable development objectives while also helping to reduce GHG emissions and increasing resilience to climate change impacts.

Some of these options, such as auctioning a share of the assigned amount and auctioning allowances for emissions from international bunkers, could generate revenues commensurate with the additional needs.

A recent proposal by the European Commission (EC) illustrates how these various options for financing adaptation could be brought together. The EC has noted that the scale of financial support for mitigation and adaptation in developing countries will need to reach a magnitude up to €30 billion in 2020 and that the EU should be ready to contribute its fair share. It suggested that the EU explore two principal options to generate funding that also could be combined. The first option determines the annual financial commitment of developed countries on the basis of an agreed formula, which could be based on a combination of the polluter-pays principle and ability to pay. The second option is to set aside a certain percentage of the allowed emissions from each developed country. These emissions would then be auctioned to governments at the international level. This percentage could increase progressively in line with the per capita income. (Commission for the European Communities, 2009).

Both instruments could be linked with a levy on international aviation and maritime transport or using the proceeds from auctioning allowances under a global cap-and-trade system that applies to those sectors. Financing obligations could be collected centrally at the UN level or via a single global multilateral fund. It could also be honoured by national governments individually by using bilateral and multilateral channels. In this case, monitoring, reporting and verification of those funding streams must be robust and transparent combined with an effective compliance mechanism. This could consist of withholding a corresponding number of emission rights in the following year. Significant additional public revenues could be generated from auctioning of allowances in the EU-ETS. Member States could use some of these revenues to honour their international financial obligations under the future climate change agreement.

Financial contributions should not be limited to developed countries alone. Developing countries, except LDCs, should make contributions on the basis of their financial capability.

4.0 Proposals related to Financing Mitigation

Several proposals have been put forward by Parties and research institutes regarding mechanisms for providing the financing needed to support climate change mitigation actions. Several of these proposals are presented below, looking first at options for financing technology innovation and diffusion, and then broadening out to a more general examination of options for generating and delivering financing for mitigation. Four key proposals are looked at in greater detail—Renmin University, China; World Resources Institute (WRI); Netherlands Environmental Assessment Agency; and E3G and Chatham House. These four proposals are then assessed regarding their commonalities and differences.

4.1 Financing Technology Innovation

There is a vast body of literature describing the stages of technology innovation and diffusion. While there are differences in definitions and terminology, experts generally agree there are key stages of technology innovation: RD&D, deployment and commercialization/ diffusion.

Public policy can intervene at any stage of this innovation cycle to accelerate the movement of a technology through to large-scale diffusion. Different innovations and technologies require different levels and types of support at the various stages of the innovation chain. For instance, the kind of public policy intervention (including financial incentives) that might successfully accelerate the deployment of a technology near commercialization, such as concentrating solar thermal power, will be very different from that required by technologies just emerging from the laboratory, such as advanced biofuels from algae. It is widely recognized that additional support across the innovation chain is necessary to address climate change. Many Parties have proposed that the UNFCCC support or accelerate technology deployment by providing funding at different stages in the technology innovation chain. However, each stage of the innovation chain for clean energy technologies may not be equally conducive to international cooperation and public finance. Indeed, the level and kind of support to facilitate deployment of specific technologies are frequently country/region specific as well.

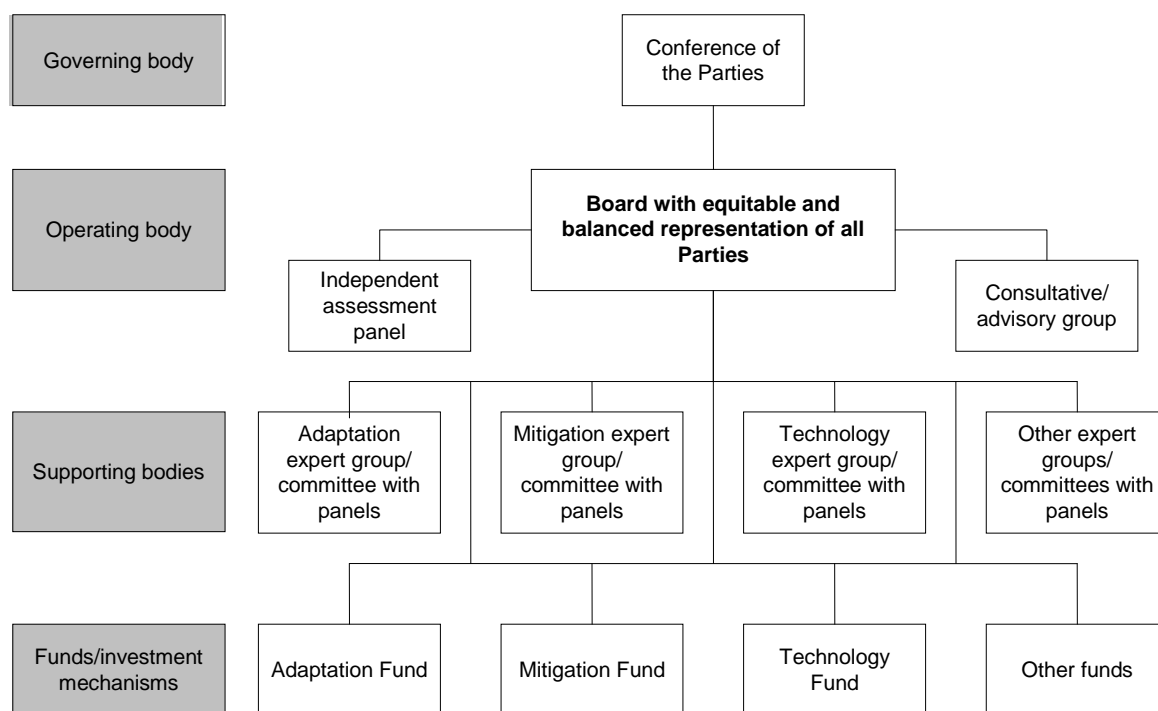
G-77 countries propose that a new technology fund be established to pay for the incremental cost of deploying more expensive, but commercially available technologies. Multiple reasons are cited for requiring additional funding, including costs of acquiring intellectual property rights (IPRs) for new technologies, which developing countries perceive as critical barriers to technology adoption. G-77 countries generally support the creation of a new institution or body to be responsible for technology transfer and finance, including managing the Multilateral Clean Technology Fund under the UNFCCC. Developed countries, particularly the EU and Japan, emphasize the need for public funding to leverage private investment, including through sectoral agreements.

In stark contrast to the G-77's call for a large fund to cover all incremental costs, Europe suggests that some developing country mitigation activities could be implemented unilaterally at low or no cost, while more ambitious ones will require more support, including from the carbon markets. The EC (2009) cites the carbon markets as the largest potential funding mechanism for mitigation—any additional public funding would complement this existing mechanism. Developed countries prefer to address the perceived problems of the existing institutions and articulate what the institutions need to achieve before creating new ones. They also support a broad framework that includes activities outside of the Convention, such as bilateral assistance, and support for technology agreements and sectoral public/private partnerships.

4.2 Submissions from Parties

Several countries have provided submissions to the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA). The G-77 and China have proposed the establishment of overarching institutional arrangements for the operationalization of a financial mechanism that would be under the authority and guidance of the Conference of the Parties (COP). It would include a board with equitable and balanced representation of all Parties and assistance from a secretariat. The COP and the board would establish specialized funds and funding windows under its guidance and a mechanism to link various funds. Each of the funds could be advised by an expert group, supported by a technical panel or panels. To ensure transparency, other possible elements could include a consultative or advisory group of all relevant stakeholders and an independent assessment panel. An overview of such an institutional arrangement is shown in Figure 1 (Philippines on behalf of G-77 and China, 2008).

Figure 1: Institutional Arrangements reflecting the G77 and China Proposal to Provide Overall Financial Resources under the Convention



Source: Philippines on behalf of G-77 and China, 2008.

Mexico has proposed a WCCF for both mitigation and adaptation activities, operating under the aegis of the COP and with an inclusive and transparent governance system. Contributions would be collected from both developed and developing countries, and based on a formula that takes into consideration GHG emissions, population and GDP. All disbursements from the fund would be subject to a two per cent levy that would finance adaptation actions (Bapna and McGray, 2008). Operation of the fund would be led by an executive council, constituted by representatives of all participant countries grouped in a balanced and practical way. The council would have three independent counsellors—a scientific counsellor, one from MDBs and one from social organizations. In addition, a scientific committee and a multilateral banks committee would support the functioning of the council. The fund could be administered by an existing multilateral institution agreed by the COP (Mexico, 2008).

The EC, in a paper to the European Council, has noted that as the sources of funding for adaptation and mitigation are likely to be multiple, their coordination and cooperation will need to be improved. A high-level forum on international climate finance should be established, bringing together key decision makers from the public and private financial sector, as well as international financial institutions. It would regularly review funding availability and expenditure and provide recommendations for improvements. This forum should cooperate closely with the Facilitative

Mechanisms for Mitigation Support, a proposed platform for bilateral and multilateral support schemes (Commission for the European Communities, 2009).

Indonesia and Bangladesh have both proposed the establishment of a multi-donor climate fund to promote climate adaptation and mitigation. These funds would include national contributions and would pool contributions from various donors to support climate mitigation and adaptation activities in the country over several years. Priorities would be negotiated with the fund's contributors. The funds would promote robust fiduciary management, donor harmonization, lower transaction costs, efficiency and cost effectiveness. By doing so, they could demonstrate that there is no need for existing multilateral banks to serve as operational entities.

4.3 Proposal from Renmin University, China

The proposal from Renmin University is a variation of the G-77 proposal depicted in Figure 1, but is more specific and hence it is worth examining in more detail (Zou *et al.*, 2008) The paper identifies a framework that includes an institutional arrangement under the UNFCCC, financial mechanism and performance monitoring and an assessment mechanism. The goals of the mechanism are to protect climate and promote sustainable development. It identifies several principles including consistency with common but differentiated responsibilities, balance between mitigation and adaptation, public-private partnerships,¹¹ equal emphasis on technology R&D and diffusion, cost effectiveness and globally interest oriented.

The institutional framework includes a subsidiary body for technology development and transfer that would report directly to the COP in parallel to the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI). The subsidiary body would be composed of a strategic planning committee and several panels for technology needs assessment and information, coordination of enabling policies and measures, IPR cooperation, fiscal management of financial resources, capacity building, and monitoring and assessment of performance.

A new financial mechanism is proposed because the GEF has insufficient funds, is decoupled from financial markets and has little impact on technology development and transfer. The basic idea of the financial mechanism is to develop public/private partnerships by linking public finance with the carbon market and capital markets, and leveraging large amounts of private capital with small amounts of public money. A Multilateral Technology Acquisition Fund would be established with financing by developed countries to provide incentives to the private sector, such as loan guarantees, tax exemptions and subsidies.

¹¹ In the paper, public/private partnerships are defined as developed country governments providing signals to private corporations to take climate friendly measures, as well as using public money, to reduce the transaction costs of transferring technology.

The proposal is, therefore, a combination of a centralized committee structure and market oriented financial policies and instruments. The latter mirror many of those currently used by financial institutions, such as the World Bank and private banks and as identified by the United Nations Program in a recent report of public finance mechanisms (Maclean, *et al.*, 2008).¹²

4.4 WRI Proposal

The WRI discussion paper (Tirpak and Staley, 2008) focuses on what should be included in a new financial agreement under the UNFCCC. It indicates that six criteria should guide the consideration of a new financial initiative for mitigation:

- Accessible – allow all developing country Parties to access financing.¹³
- Comprehensive – seek to fill the major financing gaps in the innovation stages and overcome barriers that prevent the development and deployment of technologies.¹⁴
- Flexible – allow for the use of a variety of financial instruments, such as debt credit lines, guarantees, public finance funds, innovative uses of carbon finance, grants and contingent grants, and other forms of risk sharing.
- Encourage the use of leverage – promote the maximum mobilization of commercial financing.
- Adaptable – meet the unique circumstances, for example, priorities and market conditions of each country.
- Verifiable – support the use of metrics for reporting and assessing implementation.

The paper outlines a framework and proposes five specific components of a “new deal” to address the stages of the technology innovation process and some of the most significant barriers and weaknesses of current international efforts to finance the development and deployment of climate change mitigation technology. Greater emphasis is given to the early stages of the technology innovation process, as it is assumed that a carbon crediting system will promote the deployment of

¹² The report by Maclean *et al.* (2008) is based on a substantial body of experience with public finance mechanisms that have been used to mobilize investment in renewable energy and energy efficiency technologies in a wide variety of developed and developing countries. The report summarizes the rationale and design criteria for public finance mechanisms, describes a range of mechanisms, and offers strategies for their scale up and replication, should they be included in a new financial architecture under the UNFCCC.

¹³ Many barriers can only be addressed by national governments; not all barriers are well suited to solutions through international cooperation.

¹⁴ Financing through the use of the carbon credit market is a necessary complement to the components in this paper, but is likely to be treated as a separate issue as it is linked to discussions on national commitments and improvements to the CDM.

many technologies in the later part of the early deployment and commercialization stages.¹⁵ Table 8 identifies five critical barriers and the corresponding component of a new financial agreement.

The paper does not go deeply into issues relating to governance or how financing might be linked to actions by developing countries. Instead, its goal is to stimulate an initial conversation on “what should be funded” before launching into a discussion on how funds should be managed, since the former can significantly affect the latter. It does, however, suggest that innovative public finance mechanisms should be used to scale up and leverage private money through innovative debt, equity and grants.

Table 8: Critical Barriers and the Corresponding Component of a New Financial Agreement

Critical Barriers	Components of a New Financial Agreement
Insufficient R&D for critical technologies	International Critical Technologies R&D Effort
Inadequate capital for early stage deployment of new technologies	International Venture Capital Fund
Limited pipelines of good projects	International Project Development Facility
Limited financial resources to promote the deployment of currently available technologies	Scaling up Investments to Deploy Technology
Lack of technical and financial capacity within developing countries	Capacity Building Forum on Investments

Source: Tirpak and Staley, 2008.

4.5 Netherlands Environment Assessment Agency (workshop report)

The ideas emerging from a workshop held in the Netherlands in September, 2008 focus on the deployment and commercialization stages of the innovation pathway, in particular, how to link developing country actions with financial support (Netherlands Environment Assessment Agency, 2008). The proposal for advanced developing countries suggests that they commit to a long-term low carbon development plan, as well as short-term sectoral implementation plans, which can take the form of sustainable development policies and programs to make the transition to a low carbon development path.

Development and implementation of these plans would be supported by international funding. Developing country commitments would be voluntary. Funding of their efforts would be done through a combination of self-financing of the options with negative costs, plus a new international

¹⁵ In analyzing the issue of “what” should be funded, the WRI paper considered an approach based on the marginal cost of existing technology as it partially reflects the innovation pathway. Using a marginal cost curve, more costly technologies are likely to require the use of carbon credits while others that have lower marginal costs are likely to need public finance mechanisms to overcome barriers. In such an approach, upgrading old inefficient power plants would likely be a candidate for public finance instruments while the deployment of a new biomass-to-liquid-fuel process would likely need carbon credits to be deployed. However, considering only existing technologies would leave out the R&D and early deployment of technology. The framework and components proposed are broader and intended to address crucial barriers in these stages as well.

fund that would help advanced developing countries invest in sectoral policies and programs to actually make the transition to low carbon economies. The proposal is to create a three-stage financing system for developing countries committing to the low carbon development path approach. The financing system would include:

- Domestic finance, supported by an international Efficiency Fund (EF) – Domestic financing would be used for putting together a low carbon development plan and for those policies and programs that have negative costs, either directly or because of co-benefits. International technical and financial support for capacity building and overcoming barriers will come from the EF.
- Zero Carbon Fund (ZCF) – International funding would be used for positive costs of implementing policies and programs to make the transition to a low carbon economy.
- Carbon market – This involves the use of actions that go beyond the policies and programs to get to a low carbon economy.

The funding system could work as follows:

- Developing countries, as part of their domestic efforts, produce low carbon development plans and can get required financial and technical support for the plans from existing capacity building funds.
- Developing countries can get support for overcoming barriers and building capacity on domestic actions from the EF.
-

Developing countries could submit proposals to the ZCF for co-funding specific policies and programs on the basis of a tendering system, whereby the best proposals with the biggest impact would get the money. Co-funding from other sources would enhance the chance of being supported by the ZCF. International expert committees would assess proposals. There is the possibility, similar to the situation of investment in clean energy in developing countries noted in Section 3.2, that only a few countries would benefit unless there is criteria to ensure distribution of funds across several developing countries.

Money for these funds would come from developed countries, preferably on the basis of the proceeds of auctioning of emission allowances. This can be domestic auctioning and transferring part of the proceeds to the international funds or direct international auctioning. The fund provides financing that is complementary to other financing by multilateral institutions, bilateral funds, ODA, foreign direct investments and philanthropic foundations. The advantages of this proposal are:

- The possible synergy with social and economic development goals, because it focuses on development plans for key sectors in the economy.

- By focusing on best known and large emitting sectors first, a relatively limited number of sectors and companies need to be included in the system.
- If a substantial share of the sector worldwide is included, it could address competitiveness concerns of business in industrialized countries. However, it subsidizes developing country competitor firms to get more efficient, which exacerbates competitiveness concerns.
- A sectoral focus of national policies and programs toward a low carbon economy will promote the transfer of low carbon technologies and increase investments within the sector.
- A larger and more efficient flow of financing would become available for advanced developing countries that could replace CDM funding. CDM would then be available for other developing countries that are not participating in the ZCF.

4.6 Proposal from E3G and Chatham House

The E3G and Chatham House proposal addresses critical features needed in the UNFCCC system and their link to what must be done outside of the UNFCCC process. The proposal focuses on:

- increasing absolute levels of both innovation and diffusion for adaptation and mitigation through outcome based strategic approaches;
- developing an overall innovation system for low carbon development and use of sectoral approaches to engage all stages of the innovation chain to accelerate technology development and deployment;
- supporting developing countries and international institutions in driving appropriate innovation in areas vital for developing economies; and
- explicitly rebalancing the incentives for innovation and diffusion, including the use of IPRs.

The proposal suggests that new institutional structures will need to be established under the UNFCCC to organize and administer such an ambitious program, especially in regard to the priority areas of international technology development and regional diffusion programs.

Within the UNFCCC seven key actions are suggested:

- Agreement on Technology Development Objectives – The technology development objective would establish a set of critical climate change technologies (for both mitigation and adaptation) which must be developed to meet the goals of the agreement. The achievement of the technology development objective would be supported by a set of Technology Action Plans for each identified technology and a Technology Development Executive. The role of the Executive would be to monitor global efforts to deliver a portfolio of critical technologies, including public and private efforts, and propose complementary support and activities at the multilateral level needed to deliver agreed technology outcomes.

- Establish criteria for measurement, reporting and verification (MRV) action – The MRV criteria should set out the conditions under which national R&D and development spending by developed countries, including on sectoral agreements, would qualify as a contribution to their UNFCCC commitments on technology, financing and capacity building support. Elements could include additional spending over and above the existing ODA and R&D spending, reciprocal knowledge sharing with other related R&D programs, and a demonstrable link to a developing country’s low carbon development plan.
- Market creation mechanisms – Market creation mechanisms could include technology-led sectoral agreements for developing country enhanced actions, international standards agreements and public sector purchasing commitments.
- A new multilateral Global Innovation and Diffusion Fund – To implement the Technology Action Plans, a new Global Innovation and Diffusion Fund would be established. This fund could integrate existing activity (for example, World Bank Climate Investment Funds) through two windows under the new Technology Development Executive.
- The RD&D Window – This would be responsible for the development of new technologies with a focus on applied research and demonstration to push new technologies down the innovation chain, adapt them for use in developing countries and address orphan innovation areas.
- The Diffusion Window – This would be responsible for wide-scale uptake of new technologies including direct financing, patent buy-outs and capacity building to ensure developing countries have the support systems necessary to use new technologies.
- A “Protect and Share” agreement for IPR and licensing – The agreement would provide government-to-government commitments to “protect and share” low carbon technologies and encourage joint-ventures and public-private partnerships. Support would be made available under the fund to strengthen IPR protection measures in developing countries, consistent with their existing international commitments under the World Intellectual Property Organization and World Trade Organization.

4.7 Common Elements

The four key proposals identified above—Renmin University, WRI, Netherlands Environmental Assessment Agency; and E3G and Chatham House—provide a cascading set of components with different levels of details. The G-77 and China proposal is an overall framework for managing funds, but it provides relatively few details about what should be funded. For this reason, it is in a different category than the rest.

We note also that there are no specific ideas relating to the management of adaptation (see Section 5 for a discussion of adaptation proposals); the assumption by the G-77 and China is that the AF established to disburse CDM funds could be expanded to accommodate any new funds that might

be made available by developed countries.

Among the proposals identified above and listed in Table 8, the following is noted:

- They all recognize the need for a new fund dedicated to the deployment of mitigation technologies on a significantly larger scale than the GEF.
- They address, to varying degrees and different levels of depth, one or more stages of the technology innovation chain. Only the WRI proposal sets out to address specific barriers at each stage of the innovation chain.
- They address the need for new institutional arrangements under the UNFCCC, however the proposed arrangements vary from the creation of a new subsidiary body with centralized responsibilities to less elaborate and decentralized links to the UNFCCC.
- Several proposals link new funds for the development of technology to a variety of policy actions by developing countries. These include the development of NAMAs, sectoral plans, technology needs assessments and other national policies.
- Proposals to promote R&D vary with some focusing just on a few critical technologies while others appear to address a broad set of technologies.
- There are no common elements regarding capacity building and IPR. They are treated in some proposals, but the details vary considerably.
- While all the proposals acknowledge the role of a carbon market, no explicit suggestions are made about how to integrate the above proposals into an overall framework. The elements tend to be viewed as components that would set the stage for, but be supplemental to, carbon offset mechanisms.
- Two of the proposals explicitly recognize the need to leverage private sector funds with innovative public sector finance instruments.
- There is general recognition of the need for MRV procedures, but few details are provided in the context of the above proposals.

Table 9: Possible Components of a New Financial Agreement

Component	Policy Action ¹	R&D	Early Deployment Component	MRV	Deployment Fund	IPR	Capacity Building
Renmin University	X	X			X		X
WRI		X	X		X		X
Chatham House/E3G	X	X		X	X	X	X
Netherlands Environmental Assessment Agency	X				X		

¹These differ among the proposals, but include standards, national plans, technology assessments, purchasing agreements and other national policies.

Regardless of how funds are collected and targeted, Parties will need to consider how to disburse funds efficiently. Disbursement could be on a project or program basis. A project approach enables each proposed project to be reviewed carefully, but each project takes a long time to process and incurs high administrative costs. A program approach reduces the administrative costs, but may provide funding for some less cost-effective actions.

At present, mitigation projects, whether through the CDM or Convention funds, are approved on a project-by-project basis. The process is costly and cumbersome, thus provoking calls for changes to the administration of the CDM. These include actions to reduce the administrative burden for individual projects and an expanded mechanism (such as sectoral CDM) that would enable much larger reductions to be approved by a single decision.

Adaptation likewise is currently being implemented on a project-by-project basis, although the option to finance program-based actions exists under the AF. The number of projects is still small because the funds are limited and few countries have established their adaptation needs and priorities. If funds are allocated to countries, approval could be based on proposed plans. If funds are disbursed for different purposes, suitable cost-sharing arrangements may be needed. The cost-sharing arrangements are likely to differ for coastal protection, health care and other purposes. But predictable cost-sharing arrangements would enable national governments and international agencies to prepare and execute implementation plans.

A programmatic approach requires that the implementing agency or the national government to have some basis for establishing priorities for measures to be funded. Some countries have laid the groundwork by identifying actions in their NAPAs and/or Technology Needs Assessments. There likely will need to be additional effort to roll the findings of these assessments and additional information into programmatic approaches for mitigation, adaptation or technology cooperation. Countries have some experience with this, given that development aid policy has been moving in this direction for some time.

5.0 Proposals related to Financing Adaptation

Proposals that specifically address the need to generate and disperse financing for adaptation have been put forward by a limited number of countries and research institutes. Some have suggested options that will generate financing for both adaptation and mitigation (for example, China's proposed levy on GDP of Annex I countries or the IATAL), while a smaller number propose mechanisms tailored specifically to funding adaptation. These include the existing levy on the CDM, Norway's proposal to withhold a small percentage of countries' assigned amount units (AAUs) after 2012 and auction them in carbon markets, and Tuvalu's International Blueprint on Adaptation.

Although the number of concrete proposals tailored specifically to financing adaptation is limited, there is general consensus regarding the principles that should underlie the basis upon which this funding should be provided.¹⁶ Expectations are that the funding should be:

- adequate – reflecting the scale of investment estimated to be needed (tens of billions of dollars per year);
- predictable – to ensure the steady flow of resources needed to enable planned and effective adaptation;
- new and additional – reflecting the commitment made under the Convention and understood to mean the resources will be over and above existing ODA commitments; and
- equitable – reflecting the principle of common but differentiated responsibility and implying that funding provided by donor countries should be tied to their level of responsibility for GHG emissions.

Specific principles have also been put forward regarding the type of financial mechanism(s) that should be established to deliver adaptation investments to developing countries. For example, AOSIS (2008) has suggested that the mechanism should serve to coordinate adaptation efforts at the international and regional level, and be flexible enough to ensure that it is able to meet the diverse adaptation needs of developing countries. Bapna and McGray (2008) have further suggested that an appropriate adaptation mechanism should be transparent, ensure decision-making is undertaken by a balanced and representative number of developing and developed country representatives, held to the highest standards of professionalism and public accountability, and establish systems for monitoring and evaluating the effectiveness of the funding it provides. Similar criteria could also be applied to any financial mechanism established under a new climate agreement.

¹⁶ See AOSIS, 2008; India, 2008; and Muller, 2008.

More uniquely, several developing countries have clearly indicated in their submissions that they are seeking the provision of financial support in the form of grants and not loans. This expectation reflects an understanding that funding for adaptation is being provided as compensation for the damages imposed by developed countries whose historical GHG emissions have spurred the current process of climate change. The basis upon which adaptation should be provided is a long standing moral (and legal) issue that likely will need to be directly addressed within the current negotiations.

Agreement will also need to be reached on how to determine the “additional cost” of adaptation. Such determination is significantly more difficult for adaptation than mitigation, in part because of the strong inter-linkages between adaptation and development, incomplete analysis of the projected impacts of climate change and limited experience at present with costing adaptation. The Adaptation Fund Board (AFB, 2009, p. 11), which is to finance “the full cost of adaptation,” has proposed to define this commitment as, “the costs of concrete activities to be implemented to address the adverse impacts of and risks posed by climate change, or the additional adaptation costs of business-as-usual projects.” Acknowledging the present challenges of allocating financing on this basis, the AFB has proposed adopting a “flexible approach” that will enable funding, “to be reviewed on an ad hoc basis” (AFB 2009, p. 11). The final approach agreed upon by the AFB and its experience in applying this process will contribute to determining how to address the incremental cost principle in the modalities of the post-2012 agreement.

In its submission to the AWG-LCA, India (2008) suggested that a negotiated set of co-financing or cost-sharing levels be determined based on indicators that are simple, predictable, flexible and comprehensive. There are several ways that this suggestion could be enacted, including:

- Full cost financing of activities that are exclusively driven by climate change adaptation – Examples would be UNFCCC focal points, the National Adaptation Plans, modelling capacity, information exchange and others.
- Determine incremental costs on a project by project basis, using the best available information – As acknowledged by the AFB, this approach could be difficult because of scientific and socio-economic analyses limitations of the likely impacts of climate change and of the additional costs associated with preparing for these impacts.
- Determine the percentage of finances to be covered based on the nature of the project to be undertaken – As an illustration, funding could be provided to cover a set percentage of the costs associated with emergency preparedness projects or programs and a higher or lower percentage allocated to agricultural initiatives. A sliding scale could be applied to reflect the differential financial capacity of developing countries (for example, covering a greater proportion of the agriculture related projects put forward by LDCs). The percentages allocated would need to be periodically reviewed in light of new research and assessments.
- Determine a percentage allocation based on the vulnerability of a country – As such, all

projects from highly vulnerable LDCs, for example, could be eligible to have all or a high proportion of the cost of their adaptation projects or programs covered with a sliding scale applied to other countries. Prioritization also could be tied to the list of priority country types contained in Article 4.8 of the Convention. Of course, there are several issues associated with creating a vulnerability ranking for countries—something currently being addressed in the discussions on MRV efforts for adaptation.

For the delivery mechanism for adaptation funding, several Parties have suggested the establishment of an AF under the Convention (for example, China's proposal, AOSIS and India). It is suggested that such a fund be modeled on the existing AF under the Kyoto Protocol with an executive board responsible for the management and delivery of resources. It could, in fact, be this fund if moved under the banner of the Convention itself. In focusing on the AF, countries point to the greater control over decision-making gained by developing countries and their ability to directly access resources.

Otherwise, Tuvalu has suggested the establishment of an International Blueprint for Adaptation that would provide predictable and adequate international funding to support the work of the LDC Fund and Special Climate Change Fund (SCCF). Under this proposal, a special collection authority would be created under the guidance of the COP. This authority would closely collaborate with the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), reflecting an expectation that its financing would be generated through the collection of several levies on international maritime and aviation transport (Muller, 2008).¹⁷

In determining the appropriate mechanism for financing adaptation after 2012, attention will also need to be given to the future of the existing LDCF and SCCF. These funds could remain as stand-alone entities managed directly by the GEF or could be incorporated into a new financing mechanism for adaptation. An AF under the Convention, for instance, could be expanded to include a specific funding stream dedicated to financing the implementation of NAPAs.

Parties have also suggested the establishment of a new body that would provide technical assistance either to a new AF under the Convention or to the COP as a whole. For example, AOSIS has proposed the establishment of a Permanent Adaptation Committee under the Convention that would facilitate adaptation to climate change, acting as a bridge between the SBI and SBSTA. The envisioned Committee would, among other actions: deliver advice and technical support, drawing

¹⁷ Specifically, Tuvalu has proposed that the following levies be applied: “a) a 0.01% levy on international airfares and maritime transport freight charges operated by Annex II nationals; b) a 0.001% levy on international airfares and maritime transport freight charges operated by Non Annex I nationals; c) exemptions to (a) and (b) would apply to all flights and maritime freight to and from LDCs and SIDS (irrespective of whether the airlines or freight are owned by Annex II or Non Annex I nationals)” (Muller, 2008, p. 19).

from Parties, the UNFCCC and other major agencies; develop mechanisms for the transfer of adaptation technologies; and provide guidance on best practices. The Committee would liaise with financial mechanism(s) for adaptation rather than be a venue for the delivery of these resources. Similarly, China has recommended the establishment of an “Adaptation Committee” to provide guidance related to planning, capacity building, information sharing, monitoring and evaluation.

AOSIS has also proposed the establishment of a Multi-Window Mechanism to Address Loss and Damage from Climate Change Impacts, with Insurance, Rehabilitation/Compensatory and Risk Management Components that would provide support to SIDS and other particularly vulnerable developing countries. Established under the Convention and housed within the UNFCCC Secretariat or a financial institution outside the UNFCCC, the envisioned Multi-Window Mechanism would have technical, financial and administrative functions. A Financial Vehicle or Facility created inside the Mechanism would manage its revenue (AOSIS, 2008).

6.0 Conclusion

Having developed individual national positions, the following is a possible general sequence for addressing financial issues leading up to (and in) Copenhagen, recognizing that some elements are being discussed in different forums, for example, reducing emissions from deforestation and forest degradation (REDD), AWG-KP and other working groups.

- Developed country governments (individually and collectively) would need to decide what new sources of funds would be used to support an expanded mitigation technology program to provide some certainty that funds would be available over time. The specific level of funding might wait until later in the process, but consideration would need to be given to the mix of ODA, auction revenues and other sources that might be made available and whether countries would have flexibility to raise funds using different sources.
- All governments would need to decide what “needs” would be covered with any new funds and how such funds would be linked to developing country actions in the case of mitigation, adaptation and forestry. For example, would funding be contingent on developing countries preparing adaptation and low carbon development or sectoral plans, including national policies? Would all stages of the technology innovation cycle be addressed in the case of mitigation? In other words, seek to find common ground on what problems/barriers are to be addressed and to get some sense of how significant they are prior to getting into a discussion of how to structure any new financial mechanism.
- All governments would then need to decide how such funds should be managed within the UNFCCC and what should be left to other processes. A key issue would be the governance. Should technology funds be managed in a centralized or decentralized approach or in some compromise fashion? Should the management of funds differ for adaptation, forestry and mitigation? Would different funds be established to address different needs? Should any new mechanism(s) have flexibility, indeed be encouraged, to use a variety of public finance mechanisms to leverage private funds?
- Finally, all governments would need to decide on an accounting system to monitor, report and verify what money has been made available, what it has been spent on and what it has accomplished.

Annex 1: Options to Enhance International Investment and Financial Flows to Developing Countries ¹⁸

1.0 Increasing the Scale of Existing Mechanisms

GEF Trust Fund, the SCCF and the LDCF: Replenishment of the GEF Trust Fund occurs on a fixed four-year cycle and follows a pre-defined “basic” burden share formula. A country that feels its share of the proposed replenishment is higher than it wishes to contribute may argue for a lower amount thus reducing the contributions by all countries.

Contributions to the SCCF and LDCF are voluntary and may occur at any time. The SCCF and LDCF have defined roles that meet specific needs of developing countries, rather than their overall mitigation and adaptation needs.

CDM and other Crediting Mechanisms: The scale of the CDM depends on commitments by developed countries, which determines the demand, and the availability of eligible, cost-effective mitigation measures in developing countries, which determines the supply. The supply can be increased by expanding the range of eligible mitigation actions, for example, to include CCS, REDD, and by expanding the range of crediting approaches to include, for example, sectoral CDM or sectoral crediting.

Increasing the number of countries with commitments and/or the stringency of the commitments is the only way to increase the demand. The demand can be reduced by restrictions on the use of CDM credits, for example, by restrictions on the eligible countries or project types. Developed countries may also restrict the quantity or types of CERs that will be accepted. A requirement that use of the market mechanisms be supplemental to domestic action by developed countries may also reduce the demand for CERs. Due to the uncertainties affecting potential supply and demand, estimates of the potential scale of the CDM span a wide range. The UNFCCC (2007, p. 158) reported that the post-2012 market is likely to be between US\$25 and US\$100 billion per year.

Most proposals for the expansion of the international carbon market for developing countries focus on the CDM, increasing the supply of credits from countries with no target or a non-binding target. The suggestions cover both expansion of the types of project eligible under the CDM and possible new mechanisms. Suggestions for expansion of the project types: ¹⁹

- HFC-23 destruction projects at new HCFC-22 plants;

¹⁸ This Annex is adapted from Haites, 2008.

¹⁹ Almost all of these proposals are being considered under various agenda items in the international Climate Change Talks. Additional material can be found in the UNFCCC documents for the agenda item or AWG-KP. Background on some of these proposals can be found in Winkler, 2008.

- CCS;
- REDD;
- nationally appropriate mitigation actions (NAMAs);
- new nuclear generation stations;
- sectoral CDM; and
- policy CDM.

AF – The Adaptation Fund: A share of proceeds, currently 2 per cent of the CERs issued for most projects, is the main source of revenue for the AF. Thus the revenue received by the AF depends mainly on the scale of the CDM. If the post-2012 market for CERs is US\$25 to US\$100 billion per year, the contribution to the AF would be US\$0.5 to US\$2 billion annually. This could rise by increasing the share of proceeds from the current 2 per cent. Further exemptions from the share of proceeds for groups of host countries for categories of projects would reduce the revenue received by the AF. Proposals to extend the share of proceeds to other mechanisms are discussed below.

2.0 Increased Contributions by Developed Countries

New bilateral and multilateral funds, supported by voluntary contributions, have been established to address climate change.

CEP – Cool Earth Partnership: Japan announced the establishment of a five-year, US\$10 billion fund to support efforts in developing countries to combat climate change. The CEP fund will support climate change mitigation policies, adaptation policies for developing countries vulnerable to climate change and support for access to clean energy.

ICPI – International Climate Protection Initiative: Germany has decided to use some of the revenue raised from auctioning allowances from its domestic emission trading scheme for national and international climate initiatives. The international component has a budget of €120 million in 2008 with a smaller allocation in subsequent years. Half of this amount will be used to fund sustainable energy supply projects. The projects will include both investment and capacity building in emerging, developing and transition economies for improved energy efficiency, renewable energy and fluorocarbon reductions. The other €60 million will support climate change adaptation and measures to conserve climate-relevant biodiversity, mainly through bilateral projects (Fuentes, 2008).

CIF – Climate Investment Funds: The World Bank and regional development banks have established the Climate Investment Funds—the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF). The CTF is designed to promote scaled-up demonstration, deployment and transfer of low-carbon technologies in the power, transportation, and energy efficiency sectors. The SCF will provide financing to pilot new development approaches or scale-up activities aimed at a specific climate change challenges through targeted programs. The SCF will pilot national level actions for enhancing climate resilience in a few highly vulnerable countries. Other programs under consideration include: support for energy efficient and renewable energy technologies to increase access to “green” energy in low income countries, and investments to reduce emissions from deforestation and forest degradation through sustainable forest management. The funds have an initial target of US\$5 billion. Each fund will be managed by a committee with equal representation from donor and recipient countries.

GCFM – Global Climate Financing Mechanism: The EC and the World Bank are exploring the possibility of selling a bond and using the funds generated to finance initiatives aimed at helping the poorest developing countries deal with climate change. The concept is to raise money in the capital market to fund critical investments immediately and to repay the bonds from future ODA commitments, carbon linked revenue (such as auctioned allowances for national emission trading schemes) or from another innovative sources. The mechanism would provide grants for adaptation actions and possibly mitigation actions that contribute to domestic poverty reduction strategies, in

LDCs and SIDS (European Commission, 2007).

3.0 Proposals Funded by Defined Contributions from Developed Countries

Some recent proposals move from voluntary contributions to defined contributions.

Convention AF, Technology Fund and Insurance Mechanism: AOSIS has proposed the establishment of new adaptation and technology funds and an insurance mechanism. The funds would receive revenue from mandatory or assessed contributions from developed countries beyond traditional ODA and levies on carbon markets. Funds would be disbursed as grants rather than loans, and SIDS and LDCs should be given priority access to the AF. The technology fund would focus on accelerating development of renewable energy technologies. The insurance mechanism would create a pool of funds to help SIDS manage financial risk from extreme weather events (Hart, 2008).

AF and Multilateral Technology Acquisition Fund: China has proposed that developed countries contribute 0.5 per cent of GDP for climate change, almost US\$170 billion per year.²⁰ The funds could come from various sources, including auctioned allowances, in addition to government contributions. The money would go to enhance action on mitigation, adaptation and technology cooperation by establishing specialized funds, such as a multilateral technology acquisition fund (Huang and Zhu, 2008).

Mechanism for Meeting Financial Commitments under the Convention: The G-77 and China have proposed the establishment of a new mechanism for meeting financial commitments under the Convention. The mechanism would be accountable to the COP, which would elect the members of its governing board. The main source of funds would be contributions by Annex II Parties new and additional to ODA and set at a level of 0.5 to 1 per cent of their GNP. The mechanism would fund the agreed full incremental costs for the implementation of mitigation, adaptation, technology deployment and diffusion, and other actions by developing countries (Philippines for the G-77 and China, 2008).

Efficiency Penny: A UN Foundation report, *Realizing the Potential of Energy Efficiency: Target Policies and Measures for G8 Countries*, proposes that G8 countries impose a small surcharge (for example, 0.5 to 1 per cent, 1 cent per dollar of sales or 1 cent per unit of consumption) on end-use energy consumption (for example, electricity, natural gas and transportation fuels). The “efficiency penny”

²⁰ In 2006, ODA by OECD countries totalled US\$104 billion, which amounted to 0.31 per cent of their gross national income (GNI, about the same as GDP). This means that ODA would have had to be US\$130 billion higher to reach the 0.7 per cent target. At 0.5 per cent, the climate change contribution would have been almost US\$170 billion. China’s proposal would require OECD countries to almost quadruple their ODA, which seems very unlikely given the persistent failure to meet the 0.7 per cent target.

surcharge would raise about US\$20 billion per year in G8 countries (US\$8 billion from electricity, US\$6 billion from natural gas and US\$6 billion from oil) without significantly affecting macroeconomic conditions. The revenue would be invested in energy efficiency measures with at least 25 per cent of revenue going to energy efficiency policies, programs, and projects in developing and transition economies (Expert Group on Energy Efficiency, 2007).

4.0 Proposals Funded by Contributions from Developed and Developing Countries

WCCF – World Climate Change Fund: Mexico has proposed the establishment of a WCCF with revenue of at least US\$10 billion per year. The fund would be open to all countries with annual contributions based on agreed criteria, such as GHG emissions, population and GDP. All members could benefit from the fund, although it is expected that developed countries would be net contributors and developing countries would be net beneficiaries. The contributions would be divided among mitigation, adaptation and clean technology as agreed by the members (Mexico, 2008).

Multilateral Adaptation Fund (MAF): Switzerland has proposed a global CO₂ levy of US\$2/tonne tCO₂. Every country, except those with per capita emissions less than 1.5 tCO₂ would impose and collect the tax and forward part of the revenue to the fund. The tax would generate an estimated US\$48.5 billion. Low-, medium- and high-income countries would forward 15, 35 and 60 per cent respectively of the tax revenue collected. The remaining tax revenue (US\$30.1 billion globally) would go into each country's National Climate Change Fund. The tax revenue forwarded to the MAF (US\$18.4 billion) would be divided equally between a prevention pillar and an insurance pillar (Kolly, 2008).

5.0 More Stringent Commitments by Developed Countries

As mentioned above, the scale of the CDM depends, in part, on the stringency of developed country commitments. Other proposals increase the stringency of developed country commitments to raise funds for adaptation, mitigation or technology cooperation.

Auction of Assigned Amount Units: Norway has proposed that a small percentage of the AAUs²¹ of each country with an emission reduction commitment be auctioned to raise revenue for adaptation. This proposal has the effect of making compliance with the national emission reduction commitments more costly for developed countries. Their emission reduction commitments need to take the form of quantitative limits so that a share of the units can be auctioned (Ervik, 2008).

A target reduction of 25 to 40 per cent from 1990 emissions in 2020 has been suggested for developed countries. That would mean total allowable emissions (assigned amount) by these countries of 10 to 13 billion tonnes of CO₂e per year. If 2 per cent of that amount were auctioned with an average price of US\$25 per tonne, the revenue would be US\$5 to 6.5 billion per year. As national commitments become more stringent the revenue generated falls unless the price rises and/or additional countries adopt commitments.

The Norwegian proposal differs from Germany's voluntary initiative described above. The Norwegian proposal is mandatory for all developed countries. The AAUs to be auctioned would not be issued to countries. They would be sold by a financial institution on behalf of the AF and the revenue would go directly to the fund. Germany is auctioning some of the allowances for its domestic emission trading scheme. The revenue goes to the German government, which decides how it is to be used.

NAMAs – Nationally Appropriate Mitigation Actions: The Republic of Korea has proposed that developing countries implement NAMAs with technology, financing and capacity building support from developed countries. The verified emission reductions achieved by NAMAs would earn credits that could be used by developed countries for compliance with their commitments. In effect, the NAMAs are a wholesale form of CDM and the rules, modalities and procedures could draw on those for the CDM. To create a demand for NAMA credits, developed countries would commit to more stringent targets. As with the CDM, a share of the proceeds from the sale of NAMA credits could be collected to fund adaptation. No estimate of the potential scale of NAMA reductions is available.

²¹ 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 AAUs equal to one metric tonne of CO₂ equivalent (CO₂e).

6.0 Other Possible Funding Sources

Several potential funding sources that do not depend directly on developed country contributions have also been suggested.

Extension of the 2 per cent levy on CDM to other Market Mechanisms²²: Some countries have proposed that the 2 per cent share of proceeds collected from most CDM projects for the AF be applied to Joint Implementation (JI) and International Emissions Trading (IET). The UNFCCC estimated that applying a 2 per cent levy to international transfers of units under JI and IET would generate US\$10 to 50 million per year for 2008-2012.²³ This compares with its estimate of US\$80 to 300 million per year for the levy on the CDM. The estimates for 2008-2012 are that extension of the levy would increase the revenue by 10 to 20 per cent. The maximum contribution of the 2 per cent levy on the CDM to the AF after 2012 is about US\$2 billion per year. Based on the estimates for 2008-2012, extension of the levy to the other mechanisms would increase the post-2012 revenue by at most US\$0.5 billion per year.

IATAL – International Air Travel Adaptation Levy: Müller and Hepburn (2006) suggest that international air transport emissions be addressed through an IATAL or an emission trading scheme with auction revenues hypothecated for adaptation (discussed below). The IATAL is a charge based on the per capita flight emissions levied on the ticket price. Müller and Hepburn suggest that the IATAL levy be set at an average of €5 (2005 US\$6.50) per passenger per flight to generate €10 billion (2005 US\$13 billion) annually.²⁴ Air travel is projected to grow at over 4 per cent per year for the next decade, therefore, this mechanism is likely to generate increasing amounts of revenue over time. A levy on passenger tickets would not address the emissions associated with air freight.

IMERS – International Maritime Emission Reduction Scheme: IMERS would implement a charge on the CO₂ emissions from international shipping based on fuel use. Ship managers would report fuel use for voyages ended during the previous month. The fees would be collected from the fuel payers.²⁵ The fees would go to a fund established under the IMO and be used to fund maritime

²² This was considered as part of the Article 9 review of the Kyoto Protocol in Poznan, but no decision was reached.

²³ UNFCCC, 2007, Table IX-66, p. 186. All CDM units are transferred internationally. Application of the levy to the units (AAUs, removal units and emissions reduction units) *issued* to each country has been proposed by Norway.

²⁴ This proposal is modeled on the “international solidarity contribution” implemented by France in July 2006. It imposes a levy of €1 on all European economy class flights (€10 in business) and €4 on international economy flights (€40 in business), which is expected to generate revenue of €200 million per annum that will be devoted to fight pandemics, including access to anti-retroviral treatments for HIV/AIDS.

²⁵ Separate emissions limits and fees could be established for different types of ships—container ships, bulk carriers, passenger ships. This would reduce the impact on developing countries since much of their ship traffic (food imports

industry GHG improvements, purchase CO₂ credits equal to the actual emissions in excess of an established emission cap and contribute to climate change adaptation in developing countries. A fee of US\$10/tCO₂ would raise about US\$3 billion annually and raise shipping costs by about 3 per cent. Assuming a market price of US\$25 for CERs, about half of the revenue would go to adaptation (Stochniol, 2008).

Auction of Allowances for IAME – International Aviation and Marine Emissions: GHG emissions associated with international air and marine transport are rising rapidly and are currently not regulated. CO₂ emissions from fuel used for international air and marine transport could be regulated under a post-2012 climate regime in conjunction with ICAO and IMO.

An emission trading scheme similar to IMERS could be established for international shipping. Rather than paying the fee of US\$10/tCO₂, fuel payers would be responsible for remitting allowances for the CO₂ emissions from the fuel used. The ship managers and/or fuel suppliers would provide data on fuel use independently. The UNFCCC estimates that auctioning allowances equal to the projected international marine emissions could generate revenue of US\$12 billion in 2010, rising to US\$13 billion in 2020.²⁶

ICAO could implement an emission trading scheme for international aviation. An emissions cap would be established for the sector. Airlines could use international aviation allowances or other Kyoto units, such as CERs, for compliance. Countries would agree to collect data on fuel sales by airline for international flights and to cooperate with compliance enforcement actions. Each airline would report its CO₂ emissions (based on its fuel use) and remit the necessary allowances and credits annually.²⁷ The UNFCCC (2007, p. 204) estimates that auctioning allowances equal to the projected international aviation emissions could generate revenue of US\$10 billion in 2010, rising to US\$15 billion in 2020.²⁸ Emission trading schemes for international aviation and shipping could provide special treatment for countries that would be adversely affected, such as small island nations highly dependent on shipping and international tourism.

and exports) uses bulk carriers and they are growing more slowly than the total, so the fee for these ships would be lower than that for container ships.

²⁶ The IMERS and UNFCCC estimates are not consistent. IMERS estimates revenue of about US\$3 billion annually for a US\$10/tCO₂ charge. The UNFCCC estimates revenue of about US\$12 billion for an allowance price of US\$23.60. At that price the IMERS estimate corresponds to revenue of about US\$7.5 billion per year.

²⁷ Other emissions at altitude also have an adverse climate impact, but it is not possible yet to monitor them accurately enough to include them in an emission trading scheme.

²⁸ UNFCCC, 2007, p. 204. These totals would be about 6 per cent higher if a price of US\$25 is used.

Funds to Invest Foreign Exchange Reserves: Currently, most foreign exchange reserves are invested in government, mainly U.S., treasury bills with low yield and significant exchange risk.²⁹ Countries could transfer a small part of their foreign exchange reserves into funds that would invest the money in energy efficiency, renewable energy and other mitigation measures. The investor(s) would establish the fund policies, such as eligibility of investments and target return on investment. With an appropriate mix of investments it should be possible to maintain the value of the reserves contributed and earn a small return. A fund would provide some diversification in the foreign exchange reserve investments, but would be less liquid than treasury bills. Liquidity is important for foreign exchange reserves, therefore, only a small part of the total, less than five per cent, could prudently be contributed to such funds. Global foreign exchange reserves at the end of 2004 totalled US\$3.941 trillion. Contributing five per cent of the reserves to funds would provide capital of US\$197 billion (UNFCCC, 2007, p. 205).

Access to Renewables Programs in Developed Countries: Several developed countries have programs to promote renewable energy, including feed-in tariffs, renewable energy obligations and targets with renewable energy certificates. One motivation for these programs is the environmental benefits of renewable energy. Reduction of GHG emissions is one such benefit.

Recognizing that the climate change mitigation benefits of GHG emission reductions do not depend on the location of the reductions, such programmes could allow a share; say 5 per cent, of the renewable energy supply to be met by sources in developing countries that meet the program requirements. Specifically verified deliveries of power by eligible renewable sources in developing countries would receive certificates. Entities with compliance obligations under a "renewables" program could purchase certificates to a maximum of 5 per cent of their compliance obligation. A 5 per cent share of the renewable energy programs in developed countries in 2005 would have provided approximately US\$500 million for renewable energy technologies in developing countries (UNFCCC, 2007, p. 206).

Tobin Tax: James Tobin proposed a currency transaction tax as a way to enhance the efficacy of national macroeconomic policy and reduce short-term speculative currency flows. While the impact of such a tax on exchange rate volatility continues to be debated, there is a consensus that the tax rate should be 0.1 per cent or lower to minimize the loss of liquidity. Although a currency transaction tax is widely accepted as being technically feasible, how it could best be implemented and enforced is still debated. But the biggest barrier is the global political consensus needed for universal adoption.

²⁹ The ADB (2007, p. 18) reports that, "Some analysts estimate that in local (appreciating) currency terms, the returns from these reserves are close to zero. Given the large reserves-to-GDP ratio of many Asian countries, the current investment strategies could be costing the countries between 1.5 and 2 per cent of GDP each year."

Nissanke (2003) assumes that the tax rate would need to be low for both political reasons (to achieve universal adoption) and technical reasons (to minimize market disruption and tax evasion). She estimates that a tax of 0.01 per cent applied to wholesale transactions would generate revenue of 2003 US\$15-20 billion.

Donated Special Drawing Rights: In 2002, Soros and Stiglitz proposed that the International Monetary Fund (IMF) authorize a new form of special drawing rights (SDRs) to meet a share of the estimated cost of meeting the MDGs. SDRs are a form of intergovernmental currency issued by the IMF to provide supplemental liquidity for member countries. Under the proposal, the IMF would allocate new SDRs to all member countries and developed countries that do not need the additional liquidity, which would make their new SDRs available to approved international NGOs that would convert them to hard currencies and fund implementation of MDG projects.

A modification of the Soros and Stiglitz proposal could be envisaged to address climate mitigation and/or adaptation. It could be implemented in two stages. First, a special SDR issue of US\$27 billion authorized by the IMF in 1997 would be released, of which approximately US\$18 billion would be donated. The second stage would see annual issues of SDRs, of which some would be donated for climate mitigation and/or adaptation (UNFCCC, 2007, p. 206).

Debt-for-clean Energy Swap: Debt-swap programs could become a new source of funding for clean energy projects. Under a debt-swap program, creditors negotiate an agreement whereby a portion of the debt owed to them is cancelled in exchange for a commitment by the debtor government to convert the cancelled amount into local currency for investment in clean energy projects. Where other financing can be found to pay for imported clean energy technologies, the proceeds from debt-swap programs could be used to finance recurring local costs (UNFCCC, 2007, p. 207).

Annex 2: New vs. Existing Institution

The key arguments for a new mechanism are:

- The current financial crisis provides an opportunity to rethink existing financial mechanisms and to perhaps create one that will be commensurate with the climate change problems to be faced over the century.
- Taking a radical new approach to ownership and governance may secure buy-in from India and China and other key developing countries. In practice, this means initiating a qualitatively different dialogue that is not grounded in the old power relationships of the Bretton Woods Institutions.
- It would signal additionality to the established sustainable development agenda. In particular, developing countries are adamant that new financing for adaptation should not come at the expense of existing ODA commitments. Establishing a new mechanism as a separate institution would make it clear that other development activities are not being crowded out.
- It could focus exclusively on the carbon finance space that is distinct from traditional financial institutions. However, its functions would need careful consideration, for example, carbon market oversight, central banking or regulatory role. A new institution would align with the fact that new expertise and functional competencies would be required to realize the objectives of the UNFCCC.

A new mechanism would need to have:

- The ability to operate throughout the value chain, taking an end-to-end view to overcome the fragmentation that often blocks the realization of mitigation opportunities and to deliver truly holistic sectoral programs.
- A high degree of flexibility to innovate, sustain and rework coalitions of Parties from across the public and private sectors.
- A wide range of financial capabilities, including in-depth knowledge of the carbon space to work effectively with carbon loans, leasing arrangements and insurance products.
- Extremely strong technical knowledge to effectively unify different interventions on various parts of a low-carbon value chain.

A new mechanism would take time to establish and would need to coordinate extensively with existing institutions. In practice, the degree of overlap is likely to be higher for countries with relatively lower incomes and which are, therefore, already eligible for multiple sources of support from existing institutions. Overlap is also likely to be high in areas where its activities most closely

resemble traditional development aid. Consequently, its role would need to be delineated from that of existing institutions.

Alternatively a new mechanism could be operationalized within an existing institution, such as the World Bank Group. The key arguments for this approach are:

- All countries are familiar with the roles and responsibilities of established institutions and their governing structures. It would also reduce the issues to be negotiated and may be more doable with the Copenhagen timetable.
- Synergies with existing activities could be more easily exploited. The World Bank Group in particular is already active in capital raising and lending, providing grant financing and venture capital, and in the carbon offset market.

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