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Global Solidarity in Financing Adaptation

A Swiss Proposal for a Funding Scheme

Paper for further Discussion

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CONTENT

GLOSSARY

AAU	Assigned Amount Units
CDM	Clean Development Mechanism under the Kyoto Protocol
DC	Developing countries
GDP	Gross Domestic Product
GHG	Greenhouse gas emissions
GIS	Green Investment Schemes
IC	Industrialised countries
LDC	Least developed countries
MAF	Multilateral Adaptation Fund
NCCF	National Climate Change Fund
USD	US Dollar
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

Situation

Scientific evidence confirms that climate change will continue even if mitigation measures could stabilise greenhouse gas (GHG) emissions globally. Therefore, adaptation measures must complement mitigation, if damages are to be kept from growing to truly catastrophic levels, especially in vulnerable countries of the developing world. According to UNFCCC and World Bank estimates, the global financing needs to adapt to climate change will lie between 10 and 40 bn. USD per year. Neither the adaptation fund under the CDM of the Kyoto protocol nor other existing mechanisms can provide financing of such orders of magnitude. Thus, the issue of financing the necessary measures remains unresolved.

This is why Minister Moritz Leuenberger, at the twelfth Conference of the Parties of the UNFCCC, 2006 in Nairobi, proposed the establishment of a funding scheme based on the polluter pays principle, on solidarity and subsidiarity, with a low tax on CO_2 emissions, to cope with these financing bottlenecks. The proposal presented in this paper develops this idea further and illustrates possible designs of such a system. The proposal is herewith submitted for international discussion and further development.

Objectives and principles

The overall goal is to strengthen the capability of the Parties to UNFCCC to address the challenges of financing climate change measures – especially for adaptation in vulnerable developing countries.

In pursuit of this goal, a global burden sharing system, fair, with solidarity, and legally binding to all nations, is established for overcoming barriers for financing effective climate policy measures in particular for adaptation to the unavoidable part of climate change. The system shall be designed considering the different shares of responsibility between industrialised and developing countries for the problem of climate change and in terms of different economic capacities to contribute to the solution. Subsidiarity and effectiveness shall be further guiding principles.

Overview of proposal

The resources needed for financing the scheme are generated by means of a low CO_2 tax levied by each country on the basis of the polluter pays principle; a higher tax in industrialised countries (Annex I) and a lower tax in developing and least developed countries (Non-Annex I). The

revenues generated are partly kept in each country in a National Climate Change Fund (NCCF), to be used for financing national climate change policies according to the country's specific needs and legal frame. The other part of the revenues flow into a global Multilateral Adaptation Fund (MAF) and are used for financing adaptation measures in vulnerable Non-Annex I countries. Industrialised countries deliver a significantly larger fraction of their tax revenues to the MAF than developing countries. In contrast, developing countries keep the largest share for their national policies and deliver only a small fraction to the MAF.

Figure S-1 shows the financial flows, on the basis of assumed tax levels and shares contributed to the MAF and the NCCFs, respectively. The tax rates of 2 and 1 USD/ton and 50%, 10%, 5% for the fraction contributed to the MAF are illustrations for discussion only.

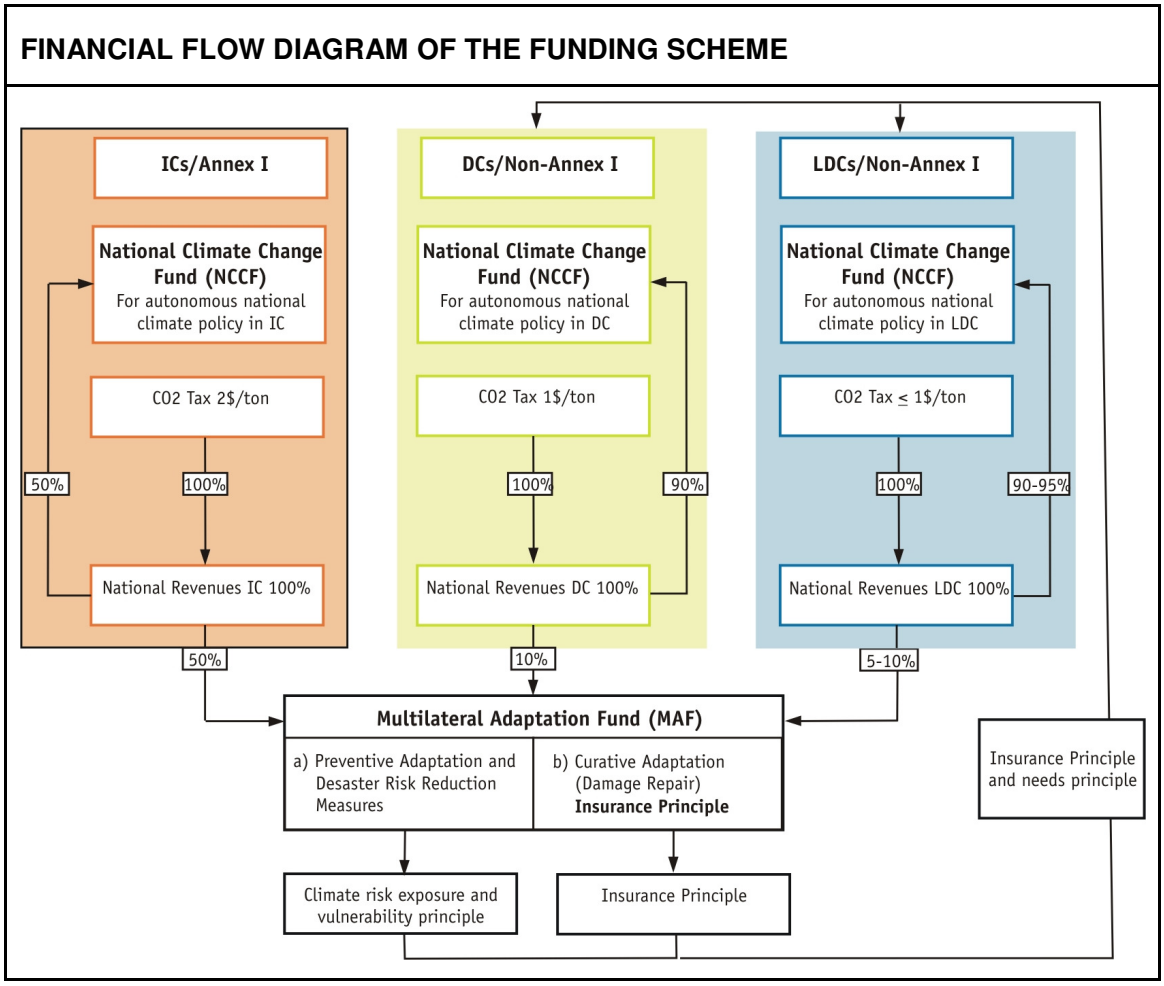

Figure S-1 The figures are meant as an illustration. Based on these assumed figures the total revenues for funding the global MAF amount to 17.5 bn USD, of which 16.1 bn come from Annex I, and 1.4 from Non-Annex I countries. This money is used to finance adaptation measures in vulnerable Non-Annex I countries. Annex I countries feed their NCCFs with 16.1 bn USD/a, and Non-Annex I countries theirs with 12.9 bn USD/a. Total revenues world wide amount to 46.4 bn USD/a (based on data of 2010).

National Climate Change Funds

Each country which decides to participate in the scheme will autonomously operate its own NCCF. These funds are encouraged to address the priorities of national climate change programmes and to closely coordinate with other national climate policy financing facilities, depending on the national circumstances such as vulnerability to climate change and economic development. These NCCFs are seen complementary to the project based funds established under the Marrakesh Accord. NCCF funds can be used, according to national priorities, for adaptation as well as for mitigation measures such as improving the energy- and climate efficiency of buildings, cars, electrical equipment, or power plants and promotion of renewable energy. Possible examples for existing national climate change funds or guidelines for designing such funds are the China CDM Fund and the Green Investment Schemes (GIS) developed between Russia and potential AAU buyers, respectively.

Multilateral Adaptation Fund (MAF)

The Multilateral Adaptation Fund is operated internationally. While by far the largest contributions come from Annex I countries, only adaptation measures in vulnerable Non-Annex I countries are financed. This reflects the special overall responsibility of the ICs for the climate change problem. The MAF consists of the prevention and the insurance pillar. These two pillars finance preventive risk reduction measures and damage insurance or damage repair, respectively.

The World Bank and UNFCCC estimate the financial needs for adaptation in non-industrialised countries at 10 and 40 bn USD/year in 2030, while the financial flow under the Marrakech Accord merely provides some 0.2-0.3 bn. USD/a. This illustrates the urgent need for further funding.

The MAF releases its funds of some 17.5 bn USD/a within a legally clearly defined governance framework. It shall be able to operate efficiently and complementarily to other similar facilities such as the GEF trust fund, the funds established under the Marrakech Accord, or development assistance operating basically on a project by project basis.

Prevention Pillar

The MAF shall finance preventive climate change adaptation and disaster risk reduction measures in the form of contributions at programme- rather than project level. This enhances efficiency, in line with the OECD Paris declaration on aid effectiveness. Such programmes can include risk responsive planning and design of infrastructures and of land use.

Insurance Pillar

This pillar aims at providing the financial means to insure climate related risks, which are not covered by private insurance companies because premiums are not affordable for local insurance takers (low probability, high consequences risks). The focus is on vulnerable institutions, enterprises and segments of population in Non-Annex countries. Insuring the rehabilitation of core infrastructure of an affected area, or compensation of lost assets of the most vulnerable groups shall have priority. Furthermore, the insurance pillar will develop pilot projects for weather risk insurances (e.g. for agriculture) at sub-regional levels. Also, a small amount of the budget can be used for developing the data basis required for such schemes (technical assistance).

An optimal form of private public partnership with the insurance sector must be developed, while guaranteeing the interests of affected groups in vulnerable developing countries. One possibility to be evaluated is assistance to the countries in the form of payment of special insurance premiums. This would correspond to the principles of subsidiarity and efficiency, and allow for a lean and efficient administration of the MAF.

Impacts and Implementation

Table S-1 shows an overview of the impacts in terms of financial flows between regions.

INDICATIVE FINANCIAL FLOWS BETWEEN PARTICIPATING REGIONS						
		Multilateral Adaptation Fund (MAF)				NCCF + MAF
	Total revenue of tax	Revenue going to MAF	Funding obtained from adaptation pillar	Payments obtained from insurance pillar	Net payments to and from MAF	Receipts from NCCF, plus contribution from the MAF
OECD North America	15010	7505	0.0	0.0	-7505.0	7505
OECD Europe	8948	4474	0.0	0.0	-4474.0	4474
East Asia (JPN, KOR)	3616	1808	0.0	0.0	-1808.0	1808
Oceania (AUS, NZL)	924	462	0.0	0.0	-462.0	462
Russia	3598	1799	0.0	0.0	-1799.0	1799
China	5857	585.7	1487.2	2577.4	3478.9	9336
India	1369	136.9	1947.6	2114.2	3924.9	5294
Non-OECD Asia	1853	185.3	2313.6	2245.8	4374.1	6227
Middle East	1463	146.3	474.1	191.8	519.6	1983
Africa	1188	118.8	1657.8	838.8	2377.9	3566
Latin America/Carrib.	1270	127	533.4	463.0	869.4	2139
Rest of the World	1314	131.4	326.0	308.7	503.3	1817
Total World	46410	17479	8739.7	8739.7	17479.4	46410.0

Table S-1 Net financial flows of the MAF between participating regions and total receipts from MAF and NCCC (data basis year 2010, Rest of the World includes non-Annex I countries only). The first and last columns show the total tax revenues collected in, and the total resources flowing into a region, respectively.

The last column of Table S-1 illustrates the total receipts from both the NCCF and the MAF in the different regions. The transfer of finances from industrialised to developing countries is shown in the last but one column, showing the positive net payments from the MAF for developing countries. This is not a technical cooperation donor flow, but rather the result of a contractual agreement.

A per capita analysis as depicted in Figure S-2 shows that the average contributions per capita of IC/Annex I are much higher than in DC/Non-Annex I countries although the tax rate only differs by a factor 2 (2 USD/ t CO_2 in Annex I, 1 USD/t CO_2 in non-Annex I). The per-capita receipts from the NCCF show the same pattern.

PER CAPITA CONTRIBUTIONS AND RECEIPTS FROM NCCF AND MAF

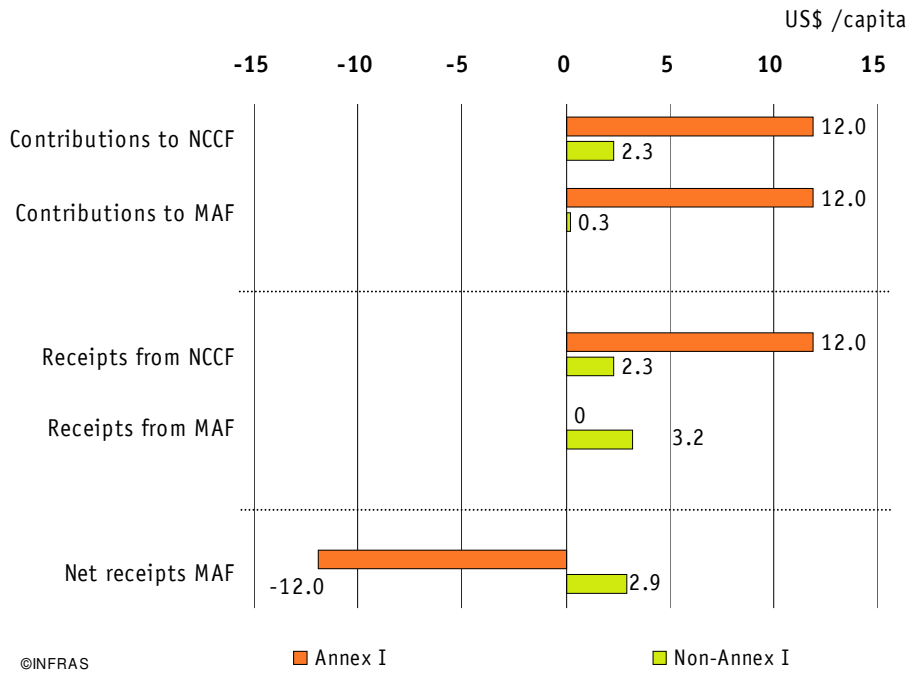

Figure S-2 How many USD/ capita on average does an IC/Annex I country and a DC/Non-Annex I country contribute to, and receive from the MAF and its own NCCF. For the MAF, IC countries contribute 12 USD/cap, but do not receive any funds. DC countries contribute 0.3 USD/cap to the MAF, and receive some 3.2USD/cap.

As only a low CO_2 tax is introduced, it can be assumed that the introduction of this tax will not have any negative effects on economic growth and GDP in industrialised countries. Also, in DCs and LDCs negative economic impacts are not likely, especially if the CO_2 tax is adjusted with the development stage (e.g. 1 USD/t CO_2 in DCs, 0.5 USD/t CO_2 in LDCs). Much more,

the funding scheme can lead to positive economic impacts in DCs and LDCs as adaptation measures can reduce the potential GDP damages caused by climate change.
Implementation issues need to be studied carefully to meet the challenge of efficiency. One issue is how to collect the CO_2 taxes. Experience in several countries suggests that an upstream approach seems to be attractive, because of the small number of subjects that need to be taxed, when collecting the tax at the points of import and production, rather than at consumer levels.

Another issue concerns the possible lack of economic capacity of some least developing countries (LDC) to contribute to the Multilateral Adaptation fund. Transition periods or exemptions from this obligation could be foreseen for certain countries, in order not to exclude them from being eligible to receive support from the MAF.

Further work

This paper outlines cornerstones of a climate change financing scheme. At this stage, the level of consultation and investigation is limited only. Hence this paper presents a leading idea and a tool box of instruments for refinement and discussion. Examples of open questions which do need further investigation and consultation are:

› How to best integrate the proposed scheme into the current negotiation process for a post 2012 international UNFCC agreement.
› How to best modify the proposed design parameters in order to attract sufficient support from other Parties to justify a comprehensive assessment process. The levels of taxation are one example.
› How to best design the insurance pillar, especially the form of public private partnerships.

Next steps: Interested Parties are invited to cooperate in a process to further develop the proposed scheme.

1. SITUATION

The recent Fourth Assessment Report of the IPCC establishes that anthropogenic warming and sea level rise would continue for centuries due to the timescales associated with climate processes and feedbacks, even if greenhouse gas (GHG) concentrations were to be stabilized soon. The IPCC attributes the responsibility of most of the observed increase in globally-averaged temperatures since the mid-20th century with high probability to anthropogenic GHG activities.

Effects of regional climate change on natural and human environments are emerging. Thus, adaptation, along with mitigation is indispensable. Within the framework of the UNFCCC, the responsibilities to combat climate change and to adapt to its adverse effects are common but differentiated among parties. In this context, industrialised countries have to take the lead in reducing GHG emissions. Furthermore, they have to provide technical and financial means to developing countries to combat climate change.

Adaptive capacity is intimately connected to social and economic development but is unevenly distributed across and within societies. Developing countries have lower per capita emissions but will incur disproportionately damages from climate change. For example, for Africa, the recent Fourth Assessment Report of the IPCC states that towards the end of the 21st century, the cost of adaptation could amount to at least 5–10% of the Gross Domestic Product (GDP). The damages resulting from a projected sea-level rise will affect low-lying coastal areas with large populations.

There is high confidence that neither adaptation nor mitigation alone can avoid all climate change impacts. However, they can complement each other and together significantly reduce the risks of climate change. As impacts of climate change are already visible, adaptation measures need to be implemented as soon as possible. However, the issue of financing these measures is not solved. The recent report on investment and financial flows relevant to the development of an effective and appropriate international response to climate change (UNFCCC 2007, dialogue working paper 8) indicates that total global investment needs between now and 2030 are estimated at a level of USD 200–300 billion, or 10–15 bn USD/a. World Bank estimates even amount to 10–40 bn USD per year for financing of adaptation in non-industrialised countries. Currently, no mechanism can provide financing of such an order of magnitude. The Adaptation Fund under the CDM of the Kyoto Protocol is expected to provide 300–450 hundred million USD in the period 2008.2012. Other sources will not provide more.

Therefore, we are left with an unfulfilled task. This is why Minister Moritz Leuenberger proposed at the twelfth Conference of the Parties of the UNFCCC in Nairobi in 2006, to con-

sider the establishment of a global CO_2 tax to collect the funds necessary for adaptation and mitigation. Besides the financing of measures, it has been proposed to include an insurance mechanism to cover high risks of climate change which cannot be covered by the private insurance sector's market.

We must adapt to the inevitable consequences of climate change, address the risks of high potential damages and reduce them. We will face high damage costs and should therefore establish a global insurance system, fair and with solidarity to all nations.

The project presents an approach for a global burden sharing system to overcome barriers for financing effective climate policy measures, domestically as well as internationally. It shall address the principle of common but differentiated responsibilities of Parties. Emphasis is put on collecting tax revenues from emissions mainly in industrialised countries and allocates these funds for action mainly in developing countries. The establishment of the proposed funding scheme with legally defined contributions marks the transition from a development cooperation type organisation to a legally binding international agreement.

This paper presents a funding scheme for financing adaptation on a global scale. As a first step, chapter 2 presents the underlying objectives and principles on which the funding scheme is based. The following chapter 3 presents the outline of the funding scheme with the general parameters, an overview of financial flows as well as the three pillars of the scheme – National Climate Change Funds (NCCF), an Insurance- and a Prevention Pillar within a Multilateral Adaptation Fund (MAF). Chapter 4 shows a preliminary and illustrative quantitative structure of the scheme as basis for further discussion. This structure includes information on the CO_2 tax revenues of the scheme as well as a proposal for the allocation of revenues to the different world regions. Chapter 5 discusses implementation problems. The paper concludes with a short discussion of further steps needed.

2. OBJECTIVES AND PRINCIPLES

2.1. OBJECTIVES

The overall goal is to strengthen the capability of the Parties to UNFCCC to address the challenges of financing climate change measures – especially for adaptation in vulnerable developing countries, domestically and through international cooperation. The legal frame of reference is the UNFCCC.

In pursuit of this goal the objectives of the proposal are:

› To establish a global burden sharing system in solidarity and fair to all nations, for overcoming barriers for financing effective climate policy measures, in particular for adapting to the unavoidable part of climate change.

› To install a fair and effective global CO_2 tax- and funding scheme for financing climate change adaptation measures needed. The low level tax is not designed as an economic incentive to curb CO_2 emissions, but rather to generate revenues for financing climate change measures in line with the polluter pays principle.

› To establish, with the revenues of the tax, a Multilateral Adaptation Fund component (MAF) for international financing of adaptation measures in vulnerable developing countries and – at national level – National Climate Change Funds (NCCF) to help finance climate change policy of each country according to its own priorities.

› To leave as much room as possible for national decision making to each individual country. Accordingly, a lean but effective international governing and administration structure shall be pursued to complement national actorship, where needed.

2.2. PRINCIPLES

One guiding principle for the design of the funding scheme is to balance out interests between different countries in order to find broad support for action of the whole global community, with widely different economic and ecological situations, interests and responsibilities for action between countries. Furthermore, the funding scheme is based on three major principles which are presented in the following.

Solidarity at global level

› All countries assume a fair share of their common but differentiated responsibilities for addressing climate change issues, in accordance with their share of responsibility for the problem of climate change and their economic capacity.

› To this end, each country shall levy a low CO_2 tax, according to its economic capacity and responsibility for climate change. Industrialised countries (IC/ Annex I) levy a higher CO_2 tax than the Non-Annex I countries (Developing Countries (DCs) and Least Developed Countries (LDCs)).

› Annex I countries contribute a larger fraction (50%) of their tax revenues to the MAF than Non-Annex I countries. The latter keep the largest share (90%, and 95% respectively) of

their national revenues for adaptation and mitigation measures at the national level, according to their own needs and priorities.

Subsidiarity

- Individual nations shall maintain the power and responsibility to cope with problems which can be solved with fairness and solidarity at their national level.
- They shall define their own national solutions for implementing the proposed global CO_2 tax.
- Each country shall define its own solutions to coordinate the global taxing and funding scheme with already existing or emerging national systems.
- Supra- and international level action comes in only where problems cannot be solved by a country alone.

Efficiency and Effectiveness

- A small tax on CO_2 emissions is levied by each country based on national legal frames.
- The tax scheme shall cover CO_2 emissions from production and use of commercial fossil fuel only, according to the guidelines for the Energy Sector emission established for the preparation of greenhouse gas inventories under the UNFCCC. Top down approaches seem to allow the most efficient implementation schemes.
- The CO_2 taxes are intentionally kept small and differentiated between countries, to conform to national circumstances and their specific capacities for efficient and effective implementation.
- To ease implementation, the architecture of the scheme shall be compatible with other facilities and mechanisms already in place for climate change action, at national and international level.
- The proposal takes a long term view, with options for review and – where needed – revision at defined time intervals by the parties.
- An insurance approach is proposed for climate change damage repair measures. This is for reasons of effectiveness.
- For the prevention pillar, it is crucial to avoid an administratively expensive and cumbersome project based approach for adaptation measures.

3. OUTLINE OF A POSSIBLE FUNDING SCHEME

3.1. PARAMETERS OF THE SCHEME

The outline of design parameters shown in Table 1 is not intended to be a fixed proposal. Rather, it is an illustration of one possibility for the concrete profile of the general concept, for the purpose of communicating the lead idea. Each parameter is open for discussion and negotiation among interested parties. The aim of such a negotiation process is to find an effective and efficient solution, acceptable to the parties in the sense of meeting their needs and potentials.

POSSIBLE OUTLINE OF THE FUNDING SCHEME			
Elements	**Description for category**		
	IC / Annex I	**DC/Non-Annex I**	**LDC /Non Annex I**
Characterisation in terms of per capita income (USD/a)	> 9000 USD	From 500 to 9000 USD	UN definition
UNFCC convention status (definition)	Annex I	Non Annex I	Non Annex I
Definition in terms of CO_2 emissions (tons per cap and year)	> 5	Approx. From 1 to 10	Up to about 1
Number of countries in category	39	102	48
Countries applying the tax	All countries		
Regime for national fund (mode of tax collection, allocation of the revenues)	Individual country solution, autonomous decision		
Tax base	CO_2 emissions from commercial production and use of fossil fuels; incl. international bunker fuels (defined by IPCC 2000[1])		
Level of the tax	2 USD/tCO_2	1 USD/tCO_2	1 USD/tCO_2 (possibly 0.5)
Total revenues world wide (2010)	46.4 bn USD		
Total revenue to the global fund per year (Multilateral Adaptation Fund, MAF)	16.05 bn USD	1.4 bn USD	
Total revenue of NCCFs	16.05 bn USD	12.9 bn USD	

Table 1: Outline of main parameters for a possible profile of the proposed funding scheme.

The table differentiates between three different categories of countries because of vastly different economic capacity and levels of CO_2 emissions, different degrees of vulnerability to climate change damages, as well as different responsibilities for the causes and the dimension of climate change problems. The classification of countries in IC/Annex I, Non AnnexI/DC and LDC is a

1 IPCC GHG inventory good practice guidance

preliminary proposal and can be adjusted in the negotiation process. Further information on the specific design of the funding scheme will be presented in chapter 3.3.

Both, the tax level and the fraction of the nationally collected revenues to be contributed to the MAF, are significantly higher for Annex I countries than for Non-Annex I countries. In contrast to other studies which have analysed a global CO_2 tax (e.g. Bürgenmeier 2007), a low tax rate is chosen as starting point.

The purpose of the NCCF and the MAF shall be complementary to the adaptation fund established with the 2% proceeds rule under the Kyoto Protocol.[2] In line with the principles of solidarity and effectiveness, international bunker fuels for sea and air transport shall be included in the scheme.

3.2. FINANCIAL FLOWS

The proposed Funding Scheme is funded through a CO_2 tax levied by the countries, but with different levels. It generates financial resources for alimentation of the NCCF in each country on the one hand, and the MAF on the other hand. The general structure of the financial flows is illustrated in Figure 1.

Based on the assumed parameters of the funding scheme, the total revenues for funding the MAF amount to 17.5 bn USD, of which 16.1 bn. USD come from Annex I, and 1.4 bn. USD come from non-Annex I countries. This revenue of the MAF flows back to non-Annex I countries, half of it for financing adaptation measures, the other half in form of insurance payments. The NCCFs are fed with 16.1 bn. USD/a in Annex I countries and 12.9 bn. USD/a in non-Annex I countries. Total revenues world wide amount to 46.4 bn USD/a (based on data of 2010).

[2] The current CDM pipeline is equivalent to 2.3 bn CER. Assuming between 2008 and 2012 a deal flow of 500–600 mio CER/year at a price of 10–15 USD/CER would generate a resource flow to the adaptation fund of 100 to 180 million USD per year. This fund will operate in a project mode. This fund will contribute to create skills and capacities to absorb the DRR and adaptation resources from the global adaptation carbon tax.

FINANCIAL FLOW DIAGRAM OF THE FUNDING SCHEME

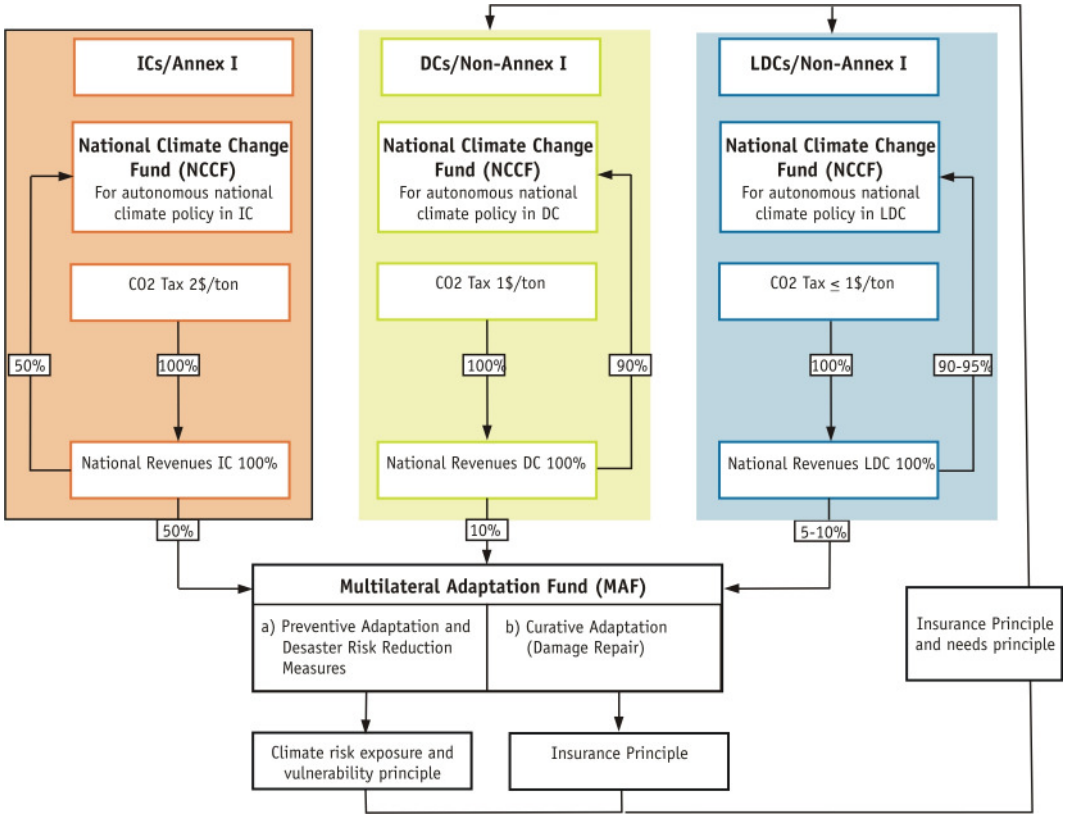

Figure 1: Financial flows of the proposed Funding Scheme. The numbers are illustrative only, and need to be discussed and negotiated among the participating countries.

3.3. PROPOSED ELEMENTS OF FUNDING SCHEME

3.3.1. GENERAL OUTLINE OF OPTIONS

The architecture of the proposed funding and financing scheme encompasses three different pillars (See figure 1 and table 2):

- The national climate change funds (NCCF)
- The insurance pillar of the Multilateral Adaptation Fund (MAF)
- The prevention pillar of the Multilateral Adaptation Fund (MAF).

The revenues from these three pillars will be channelled into two funds: the NCCF on the one hand, and the MAF with its two pillars on the other hand.

In this section the 3 pillars of the funding scheme's architecture are summarized. Table 2 gives an overview of the different elements of the funding scheme. The following sub-chapters give more specific information on the three different pillars and illustrate how the three pillars could be designed to create synergies within the overall funding scheme.

THE THREE PILLARS OF THE FUNDING SCHEME			
	NCCF: **National Climate Change Funds**	**MAF: Multilateral Adaptation Fund**	
		Insurance pillar	**Prevention Pillar**
Type of measures	Mitigation and adaptation	Insurance against climate change damages (extreme events)	Risk reduction and adaptation
Share of national CO_2 tax revenues	50% in ICs 90% in NICs/DCs 90-95% in LDCs	25% of tax revenue from ICs 5% of tax revenue from NICs/DCs 2.5-5% of tax revenue from LDCs	25 % of tax revenue from ICs 5% of tax revenue from NICs/DCs 2.5-5% of tax revenue from LDCs
Governance of revenue allocation	As per National legislation	"Multilateral Climate Change Adaptation Fund". Design according to the model of the "Multilateral Fund" of the Montreal Protocol. Executive Committee with equal representation (7 representatives) from Annex I and non Annex I countries	
Effective allocation of revenues	"OECD/IPCC type" of good practice guidance from "Multilateral Climate Change Adaptation Fund"	Funding of regional insurance coverage for damages of non-insurable risks caused by extreme weather events (storms, floods, droughts) to infrastructure/productive capital assets etc. Mandated Insurance takes care of claims in case of damage (non Annex I only)	Financing contribution to national climate change funds according to per capita and damage potential: fixed share (non Annex I only)
Regulation needs	Compliance with lean set of criteria for Non Annex I national Climate Change Funds to become eligible for funding from global fund	Clear insurance policy defining eligible extreme events and insured damages (legal basis for claims)	Agreements between global and national funds on use of global contribution for disaster risk reduction and adaptation

Table 2: Main characteristics of the three pillars of the proposed Funding Scheme: The National Climate Change Funds (NCCF) and the two pillars of the Multilateral Adaptation Fund (MAF): The Prevention Pillar for funding risk reduction and adaptation measures; and the Insurance pillar for damage repair.

3.3.2. NATIONAL CLIMATE CHANGE FUNDS (NCCF)

Each country will autonomously operate its own NCCF. The NCCFs are encouraged to address the priorities of national climate change programmes and to closely coordinate with other national climate policy financing facilities, depending on the national circumstances such as vulnerability to climate change and economic development. The NCCFs of the proposed scheme are seen complementary to the project based implementation mechanisms established under the Marrakesh Accord. Reporting ensures transparency on the financial flows.

In contrast to the finances coming from the MAF – to non-Annex I countries only – the NCCF resources are allocated according to the priorities of the party and – besides adaptation and disaster risk reduction – can include mitigation measures.[3] The scheme can also finance capacity building and public awareness raising, depending on the national needs and priorities. Adaptation could comprise the full range of sectoral measures from agriculture, forestry and fisheries, to water resource management and supply, health, coastal management and infrastructure.

When defining guidelines for the design and implementation of the NCCF, relevant lessons on institutional architecture learned from other existing funds with similar purposes could be taken on board. Such examples are the funds established under Green Investment Schemes (GIS) or the China CDM fund. The idea of the GIS was developed between Russia and potential AAU buyers to guarantee that the revenue from selling "hot air" is linked to global or local environmental benefits (Kokorin 2003, Gorina 2006). The China CDM fund promotes an innovative financial mechanism to support a reasonable international price for carbon offsets and addressing climate change activities at the national level.

3.3.3. MULTILATERAL ADAPTATION FUND: PREVENTION PILLAR

The global cost of adaptation to climate change is difficult to estimate, first, because climate change adaptation measures will be widespread and heterogeneous and due to limited scientific knowledge on climate change impact at the regional and sub-regional level. Different climate futures are possible. More analysis of the cost of adaptation at the sectoral and regional level will be required to design and fine tune an effective and appropriate international response to the adverse effects of the impacts of climate change. What can be stated with certainty is: adaptation in non Annex I parties will require significantly higher resources than the approximately 0.2–0.3

3 Mitigation could comprise measures such as improving the energy- and climate efficiency of buildings, transport infrastructure/cars, electrical equipment, or power plants as well as promoting renewable energy.

bn. USD per year which are projected to flow annually under the Marrakech Accord Funds in the period 2008–2012 (UNFCCC 2007).

According to World Bank estimates, the financial needs for adaptation in non-industrialised countries lie between 10 and 40 bn. USD per year. These costs however only include investments on the macro-level, investments on the local scale are not included (World Bank 2006, Oxfam 2007).

The proposed transfers from the Multilateral Adaptation Fund (MAF) supporting preventive climate change adaptation action and disaster risk reduction programmes of National Climate Change Funds shall have the form of financing contributions in line with the OECD Paris declaration on aid effectiveness. The MAF is hence **not** operating in project by project mode. Each Non-Annex I Party which wishes to participate in the adaptation funding scheme, will enter into an agreement with the Multilateral Adaptation Fund which specifies the adaptation programme of action supported under the prevention pillar. This agreement will also specify the implementation modalities of operations under the insurance pillar as well as the coordination efforts under taken between the insurance pillar and the national adaptation and disaster risk reduction programme implemented by the Party through its NCCF. National policies should play an important role in ensuring that the use of adaptation resources, allocated for adaptation purposes, both private and public, is optimized. In particular there is a need for:

- Domestic policies that provide incentives for private sector investors to adapt new physical assets to the potential impacts of climate change;
- National policies that integrate climate change adaptation in key line ministries such as Agriculture/Forestry/Fisheries, Water Resources, Health, Energy/Transportation/ Telecommunication, Urban Planning/Housing and last but not least Finance;
- Provincial and local government adaptation policies in key sectors.

The contributions from the MAF shall accordingly support the adaptation priorities specified in the national climate change policies and the operation guidelines for the National Climate Change Funds.

3.3.4. MULTILATERAL ADAPTATION FUND: INSURANCE PILLAR

The **objective** of the insurance pillar will lie on compensating or insuring otherwise non-insurable extreme, climate change related weather events (storms, floods and droughts) to infrastructure and productive capital assets in non-Annex I countries. A regional differentiation allows a customised approach for the different world regions considering their specific climate change risks. Furthermore, the insurance pillar will develop pilot projects for weather risk insurances (e.g. for agriculture) at sub-regional level by linking regional authorities, micro insurance initiatives and private insurers to design common solutions. Also, a small amount of the insurance pillar budget will be used for developing the data basis required for such schemes (technical assistance).

The insurance pillar is based on the following **principles**:

- The fund shall operate complementary and with clear advantages compared to the GEF trust fund and the funds established under the Marrakech Accord as well as to development assistance, as it releases funds within a legally clearly defined framework. Competition with other donor funding and fiscal priorities of Annex I countries do not come into play (Bals et al. 2006).
- An optimal form of private public partnership with the insurance sector shall be developed, while guaranteeing the interests of affected groups in vulnerable developing countries.
- The resources of the fund are reserved for the adjustment of market failures. Relevant market failures are:
  - Extremely high damage potential for one single “low probability- high-risk” event e.g. due to extreme weather events exceeding assets of any existing insurance pool.
  - Insufficient purchasing power to pay for insurance premiums of businesses and households in DCs and LDCs as a barrier to the development of an efficient insurance market.
  - High transaction costs of micro structure of risks and damages as a barrier to the development of an insurance market.
- The problem of moral hazard shall be prevented in the insurance pillar. This includes both the moral hazard to "lean back" because potential damages are covered by insurance and the moral hazard to over-estimate the potential damages due to climate change within the process of the risk analysis.

The highest share of revenues from the insurance pillar will flow into covering **low probability-high damage risks** of climate change which are defined as damages to core infrastructure (mostly public property) or compensation of lost assets/life of the most vulnerable groups of the population (refunding of disaster relief and rehabilitation action by Partner Government). Low probability risks include for example a one hundred year flood becoming a thirty year flood[4]. In order to ensure an effective use of revenues, the insurance pillar would indirectly support affected groups in DCs and LDCs in paying insurance premiums (insurance contract either between MAF and private sector, between groups or subregion and MAF, or between groups or subregions and private sector).

The insurance cover should be specified on a regional level and should be managed via public-private partnerships in which a vertical risk sharing can be considered: while the private sector covers risks up to a certain amount, the public sector covers the climate-induced risks which exceed the possible risks that the private insurance sector can take over. The threshold, above which the risks exceed the coverage which the private insurance at the micro level would cover, needs to be clearly defined. In this process a close cooperation with the private sector is proposed.

A further refinement of this proposal shall investigate the options for an insurance policy and operational mode of tendering insurances on a regional/sub-regional level based on agreements between the MAF and the Parties in a region. The insurance itself would be run by the overall operator of the system (public private partnership). Actors from the private sector could be commissioned to manage the insurance pillar on a regional/sub-regional basis. A close cooperation with the private sector will be necessary to bring in the experience on risk analysis and the concrete handling of the insurance claims to private actors with experience in the relevant world regions. As the private sector can play a vital role in climate insurance systems for developing countries, a public private partnership is also recommended by the biggest reinsurance companies as per their Climate Adaptation Development Programme (Swiss Re) and Climate Inurance Initiative (Munich Re).

Subregional "micro weather risks" are comparatively small damages (e.g. to small businesses or poor households in DCs and LDCs) due to weather anomalies which are increasing in frequency and scale due to climate change. These risks are currently difficult to cover by the private insurance sector as both the spending capacity for risk premiums and the knowledge about the risks are too low. A share of the revenue from the insurance pillar should be used for

4 Events likely to occur on an annual - 10 yearly basis shall be addressed through the prevention pillar or through micro level insurances.

capacity building to develop (private) insurance markets in DCs and LDCs for evolving "micro weather" risks due to Climate Change and for developing the necessary data basis

4. ALLOCATION OF REVENUES

4.1. REVENUES

The revenues of the proposed funding scheme are directly linked to the taxation level of the carbon content of commercial fossil fuels and to global CO_2 emissions from the energy system. In order to obtain a tentative quantitative structure of the funding scheme, data from the Energy Information Administration (EIA) was used. It includes data for the most important world regions for which a differentiation of data and analysis of net financial flows seems useful. Data from the Energy Information Administration was also used by other important sources (e.g. reports of the World Resource Institute) so that it can be classified as a reliable data basis. The CO_2 emissions for the reference economic growth case are depicted in Table 3.

ENERGY-RELATED CO2 EMISSIONS BY REGION, REFERENCE CASE 1990-2030 (MIO. TONS)						
	Actual data			**Projections**		
(Million. tons)	1990	2002	2003	2010	2020	2030
OECD Europe	4'089	4'203'	4'264	4'474	4'747	5'123
OECD North America	5'753	6'687	6'797	7'505	8'513	9'735
East Asia (Japan, South Korea)	1'245	1'653	1'676	1'808	1'941	2'062
Oceania (AUS, NEZ)	291	410	415	462	515	576
Russia	2'334	1'546	1'606	1'799	2'117	2'374
China	2'241	3'273	3'541	5'857	8'159	10'716
India	5'78	1'011	1'023	1'369	1'799	2'205
Middle East	7'04	1'152	1'182	1'463	1'811	2'177
Africa	649	850	893	1'188	1'477	1'733
Latin America	673	993	1'006	1'270	1'586	1'933
Others (non-OECD)				3'167		
Global	21'223	24'314	25'028	30'362	36'748	43'676

Table 3 Source: Energy Information Administration: International Energy Outlook 2007, Reference Case. Light shade: Annex I/Industrialised countries; dark shade: Non Annex I (DC, LDC)

Based on this data basis for CO_2 emissions and the assumption of a tax rate of 2 USD/t CO_2 in industrialised countries and 1 USD/t CO_2 in non-industrialised countries, the funding scheme

generates in 2010 an overall revenue of 46.4 bn. USD, of which 17.5 USD flow into the MAF. Table 4 shows the revenue of the NCCF and the MAF per world region.

REVENUE OF THE NATIONAL CLIMATE CHANGE FUND AND THE MULTILATERAL ADAPTATION FUND							
	CO2-Emissions in 2010 (in Mio. t)	Tax rate	Revenue (in Mio.)	Contribution to NCCF in %	Revenue of NCCF in Mio. USD)	Contribution to MAF in %	Revenue of MAF in Mio. USD
OECD North America	7505	2	15010	50	7505	50	7505
OECD Europe	4474	2	8948	50	4474	50	4474
East Asia (Japan, South Korea)	1808	2	3616	50	1808	50	1808
Oceania (Australia, New Zealand)	462	2	924	50	462	50	462
Russia	1799	2	3598	50	1799	50	1799
China	5857	1	5857	90	5271.3	10	585.7
India	1369	1	1369	90	1232.1	10	136.9
Non-OECD Asia	1853	1	1853	90	1667.7	10	185.3
Middle East	1463	1	1463	90	1316.7	10	146.3
Africa	1188	1	1188	90	1069.2	10	118.8
Latin America	1270	1	1270	90	1143	10	127
Rest of the World	1314	1	1314	90	1182.6	10	131.4
Total World	**30362**		**46410**		**28930.6**		**17479.4**
Annex I	**16048**		**32096**		**16048**		**16048**
Non-Annex I	**14314**		**14314**		**12882.6**		**1431.4**

Table 4 Revenue of the National Climate Change Funds and the MAF per world region and differentiated for Annex I /non-Annex I countries.

If a further differentiation between newly industrialising, developing and least developing countries concerning the tax rate is considered, the overall revenue would be reduced: If, for example, least developed countries would only charge a tax of 0.5 USD, instead of 1 USD per tonneCO_2, total revenues would decrease by about 0.5 bn. USD (see Annex for further details). However, as the data structure on world regions now available does not allow a detailed analysis for least developed countries, further illustration is based on a differentiation between industrialised and non-industrialised countries only.

4.2. USE OF REVENUES

Both the prevention pillar and the insurance pillar of the Multilateral Adaptation Fund have available funds of about 8 bn. USD per year. For both pillars these resources would mark a starting point: hurricane Katrina alone has led to damages of over 40 bn. USD. With economic growth in developing and newly industrialised countries the levels of potential economic damage are likely to rise. Post 2020 adjustments would need to be assessed in due time. Thanks to the intended close interaction between the prevention- and the insurance pillar of the scheme, future climate exposure to such extensive damage risks should be reduced.

It is assumed that the proposed funding architecture enters into force with the ratification of a post 2012 international climate agreement. While financing of the prevention pillar can start directly with the coming into force of the agreement, financing of the insurance pillar needs to include an agreement for a transition period until the fund has accumulated enough reserves to cover climate related damages (e.g. based on a reinsurance arrangement with the private sector). As a basis for the legal agreement of the insurance pillar, damage scenarios are to be worked out and refined in co-operation with the private insurance sector.

4.2.1. USE OF REVENUES – INSURANCE PILLAR

In order to illustrate the payments from the insurance pillar and the total financial flows, a rough estimation for payments from the insurance pillar is based on the following assumptions:

- Two thirds of the insurance payments are allocated on the basis of projected GDP losses. Countries with high projected GDP losses have a high vulnerability to climate change and will thus obtain payments from the insurance.
- One third of the insurance payments are allocated on the basis of the population, because highly populated areas are more vulnerable, thus obtain higher payments.

Table 5 gives an estimation for the payments from the insurance fund if the above mentioned assumptions are taken as basis.

ALLOCATION OF REVENUE OF THE FUND FROM THE INSURANCE PILLAR ACCORDING TO A MIXED GDP/PER-CAPITA APPROACH									
	GDP in 2010 (in bn USD)	projected climate change damages in %	Projected climate change damages absolute (in bn. USD)	% of absolute damages in non-Annex I	GDP-based contribution from insurance pillar (in bn. USD)	Populaton in 2010 (in million)	% of population in non-Annex I countries	per-capita based contribution from insurance pillar (in bn. USD)	Total contribution from insurance pillar (in bn. USD)
OECD North America	15503	1.4	217.0			457			
OECD Europe	12713	1	127.1			543			
East Asia (Japan, South Korea)	4824	5.8	279.8			177			
Oceania (Australia, New Zealand)	791	3.7	29.3			25			
Russia	2531	0.6	15.2			140			
China	10116	3.7	374.3	31.9	1.86	1355	24.6	0.72	**2.6**
India	5162	5.8	299.4	25.5	1.49	1183	21.5	0.63	**2.1**
Non-OECD Asia	5856	5.8	339.6	29.0	1.69	1054	19.2	0.56	**2.2**
Middle East	1946	0.8	15.6	1.3	0.08	216	3.9	0.11	**0.2**
Africa	3073	2	61.5	5.2	0.31	1007	18.3	0.53	**0.8**
Latin America/Caribbean	4136	1	41.4	3.5	0.21	486	8.8	0.26	**0.5**
Rest of the World (non Annex I)	1784	2.3	41.0	3.5	0.20	198	3.6	0.10	**0.3**
Total World	68435		1841			6841			
Total non-industrialized countries	32073		1173	100	5.83	5499	100	2.91	**8.74**

Table 5 Source: Energy Information Administration (2007). Assumptions: 2/3 of the payments of the insurance are determined through GDP losses, 1/3 are determined on a per-capita basis.

4.2.2. USE OF REVENUES – PREVENTION PILLAR

The global resources of the MAF channelled to the prevention pillar shall be earmarked for disaster risk prevention and adaptation measures. For this preliminary study the authors have assessed two alternative allocation modalities. The options are tool kits for further investigation.

Approach A: Allocation in proportion to estimated economic damages 2050

This approach is easy for illustrating quantitative effects for regions. Based on studies on GDP losses due to climate change, the distribution of climate change damages in non-industrialised countries can be assessed. In approach A, the resources of the prevention pillar are allocated

according to the distribution of projected damages (see Table 6 and background information in the Annex).

REDISTRIBUTION OF THE FUND FROM THE PREVENTION PILLAR ACCORDING TO GDP LOSS					
	GDP in 2050 (in bn. USD)	**Projected climate change damages in %**	**Projected climate change damages absolute (in bn. USD)**	**% of absolute damages**	**Contribution from fund for adaptation (in bn. USD)**
OECD North America	50984	1.4	713.8		
OECD Europe	30150	1	301.5		
East Asia (Japan, South Korea)	9616	5.8	557.7		
Oceania (Australia, New Zealand)	2056	3.7	76.1		
Russia	7130	0.6	42.8		
China	50543	3.7	1870.1	37.3	3.3
India	23279	5.8	1350.2	26.9	2.4
Non-OECD Asia	21650	5.8	1255.7	25.0	2.2
Middle East	6133	0.8	49.1	1.0	0.1
Africa	10745	2	214.9	4.3	0.4
Latin America/Carribean	12279	1	122.8	2.4	0.2
Rest of the World (non Annex-I)	6701	2.3	154.1	3.1	0.3
Total World	**231267**		**6708.7**		
Total non-industrialised countries	**131330**		**5016.9**	100.0	**8.7**

Table 6: Information on climate change damages is taken from results with the model WIAGEM/Kemfert 2005 as cited in Thalmann (2007). For Africa, an average for North-Africa and Subsaharan Africa is taken with a higher weight for Subsaharan Africa.

As there is no internationally accepted integrated assessment model such as WIAGEM or PAGE 2002, difficulties could emerge if such data would have to be generated for some 170 countries. Under this approach, a solution needs to be found to use international statistical databases (e.g. from the World Bank or the UN) for assessing the economic damages per country. However, up to now, GDP has not been used in international environment agreements and experienced negotiators advise to avoid GDP as indicator. The indicator GDP favours newly industrialised countries with high GDP growth and puts those countries that are already put at economic disadvantage though climate and poverty at disadvantage. This phenomenon can be observed in Table 6

where China, India and Non-OECD Asia obtain a much higher share from the fund than for example Africa.[5]

Approach B: Allocation on a per capita basis, corrected by a country vulnerability indicator

As an alternative, resources of the fund used for preventive measures could be allocated on the basis of two indicators, including a per capita- and a vulnerability indicator. Vulnerability Parameters cannot be generated on short term basis, but the information provided in the IPCC AR4 (IPCC 2007a and 2007b) should allow the generation of a simplified set of indicators. For illustration, the vulnerability indicator is based on the potential GDP losses which were depicted for approach A and could lead to a vulnerability scale such as illustrated below (the proposal would yet be modified by considering additional vulnerability indicators than GDP).

- Low vulnerability: Between 0.5 and 2% of GDP is lost due to climate change, vulnerability factor = 1
- Medium vulnerability: Between 2 and 4% of GDP is lost, vulnerability factor = 1.5
- High vulnerability: Loss of GDP is higher than 4%, vulnerability factor = 2.

Table 7 shows that this approach leads to a more equitable allocation of revenues of the fund than approach A.

5 This problem is also discussed in the Stern Review on the Economics of Climate Change under the name of "equity rating".

REDISTRIBUTION OF THE FUND FROM THE PREVENTION PILLAR BASED ON A PER CAPITA/VULNERABILITY APPROACH					
	World Population 2010	Vulnerability factor (based on GDP)	Weighted Population	% of weighted population	Contribution from fund (in bn. USD)
OECD North America	457				
OECD Europe	543				
East Asia (Japan, South Korea)	177				
Oceania (Australia, New Zealand)	25				
Russia	140	1			
China	1355	1	1355.0	17.0	1.5
India	1183	1.5	1774.5	22.3	1.9
Non-OECD Asia	1054	2	2108.0	26.5	2.3
Middle East	216	2	432.0	5.4	0.5
Africa	1007	1.5	1510.5	19.0	1.7
Latin America/Carribean	486	1	486.0	6.1	0.5
Rest of the World (non-Annex I)	198	1.5	297.0	3.7	0.3
Total World	6841				
Total non-industrialised countries	**5499**		**7963**	100	**8.74**

Table 7 Source for world population: Energy Information Administration (2007), own calculations.

If this approach is further developed, the vulnerability factor might need to include other factors besides GDP losses, especially factors which cannot be monetised (e.g. the loss of human lives).

5. IMPACTS AND IMPLEMENTATION

5.1. INITIAL ESTIMATION OF IMPACTS

Overall impacts of the funding scheme

On a global scale, it needs to be assessed if the funding scheme leads to any clearly undesirable economic or distributional impacts. Especially, it is important to check if the overall impacts go along with the principles of the funding scheme or if any of the principles are undermined.

› **Impacts on economic growth:** As only a low CO_2 tax is introduced, it can be assumed that the introduction of this tax will not have any negative effects on economic growth and GDP in

industrialised countries. Also, in DCs and LDCs negative economic impacts are not likely, especially if the CO_2 tax is adjusted with the development stage (e.g. 1 USD/t CO_2 in DCs, 0.5 USD/t CO_2 in LDCs). Much more, the funding scheme can lead to positive economic impacts in DCs and LDCs as adaptation measures can reduce the potential GDP damages caused by climate change.

- **Impacts on competitiveness:** As the CO_2 tax will be introduced on a global scale, a distortion of international competition is not relevant. The difference between the tax level in IC/Annex I and DC/LDC/non-Annex I countries could even be enhanced without affecting competitiveness in a decisive manner. Furthermore, the low CO_2 tax is designed for a financing function only. Mitigation impact seems low and will thus not lead to any significant changes in prices of goods.
- **Global solidarity:** The fund will raise resources which are about 50 times higher than the transfers under current funding mechanisms (GEF; LDC funds). This marks a first significant step toward a common approach to fund climate change related adaptation needs and to finance climate change related damages. On the basis of a preliminary assessment, both the principles of global solidarity and subsidiarity are met and existing climate change activities are not at risk.
- **Financing vs. steering effect:** The proposed global CO_2 tax has a financing function only, and is not apt to induce a steering effect towards the reduction of CO_2 emissions. Using an emission factor of petrol of 2.3 kg CO_2/litre, a tax of 2 USD per tonne CO_2 would lead to a tax of about 0.5 US cents/litre in IC/Annex I countries. In non-Annex I countries the tax level would only be 1 USD per tonne CO_2 corresponding to a fuel price increase of about 0.25 US cents/litre. While the price increase due to the tax in Annex I countries will clearly not have a steering impact, the price increase in non-Annex I countries will be perceptible especially in regions and households with low purchasing power. The same is due for an increase of electricity prices, especially for carbon-intensive electricity production through coal or oil.

In the further design, it needs to be closely analysed whether the tax might lead to unwanted social effects on the poor population. A further differentiation of the tax rate, with e.g. a tax level of 0.5 USD/t CO_2 in LDCs might have to be considered.

Revenues flowing through national climate change funds

The impact of the part of the revenue which is used on the national level (50% of revenues in Annex I/ICs), 90% of the revenue in non-Annex I/DCs, 95% in LDCs) is determined by national

legislation. It could be possible that a special requirement is included in the legal basis of the system which commits countries to use the largest part of the revenue for mitigation or adaptation measures within their national territory. This leads to the following impacts:

› If the tax is not re-distributed to private households, their income decreases and the welfare level is reduced, even though on the basis of individual fuel consumption.
› The adaptation measures financed through the revenue can prevent damages due to climate change and thus are expected to increase welfare levels.
› The second effect can (partly) compensate the direct welfare loss of the tax. However, the negative and positive effects might arise at different points in time (negative effect through tax is directly perceptible, positive effects are realised in the future/2050).

Revenues flowing through the Multilateral Adaptation Fund: insurance pillar

50% of the MAF is used for the insurance of severe events due to climate change. The distribution of the fund depends on the occurrence of unforeseen climate change events and cannot be predicted in advance. However, it is highly probable that countries with high vulnerability and high projected GDP damages have a higher probability for the occurrence of severe events and resulting payments from the insurance pillar. Also, the population density will partly determine the probability of payments from the insurance pillar as climate change damages in highly populated areas will exceed the damages of areas with low population densities (see Table 5).

Revenues flowing through the Multilateral Adaptation Fund: prevention pillar

50% of the MAF is used for financing prevention measures, i.e. disaster risk reduction and adaptation measures in DCs and LDCs. Different options for redistribution of this global contribution shall be further investigated while working out the proposed funding mechanism in more detail. Approach 1, which follows the proposal applied by Thalmann (2007), the fund is distributed according to expected economic damages of climate change in % of GDP in 2050, leads to a distribution of the fund as depicted in Table 6. The second approach avoids GDP as an indicator and distributes the resources on a per-capita basis, modified by a vulnerability factor (see Table 7).

Approach 2 based on a per-capita redistribution clearly seems to lead to a more equitable distribution of fund resources, as GDP as indicator puts countries with a low GDP at clear disadvantage. The distribution on the per-capita/vulnerability approach redistributes the revenue of the prevention pillar more equitable between the regions and thus also guarantees a higher share for Africa. Based on the second approach, the net financial flows between world regions would

lead to positive net flows for all non-industrialised countries, giving them a clear incentive to participate in the funding scheme.

Net finance flows

Table 8 gives an overview of the net finance flows of the funding scheme between the participating regions. The last column illustrates the total receipts from both the NCCF and the MAF in the different region. The transfer of finances from industrialised to developing countries is shown in the last but one column, showing the positive net payments from the MAF for developing countries.

INDICATIVE FINANCIAL FLOWS BETWEEN PARTICIPATING REGIONS						
		Multilateral Adaptation Fund (MAF)				NCCF + MAF
	Total revenue of tax	Revenue going to MAF	Funding obtained from adaptation pillar	Payments obtained from insurance pillar	Net payments to and from MAF	Receipts from NCCF, plus contribution from the MAF
OECD North America	15010	7505	0.0	0.0	-7505.0	7505
OECD Europe	8948	4474	0.0	0.0	-4474.0	4474
East Asia (JPN, KOR)	3616	1808	0.0	0.0	-1808.0	1808
Oceania (AUS, NZL)	924	462	0.0	0.0	-462.0	462
Russia	3598	1799	0.0	0.0	-1799.0	1799
China	5857	585.7	1487.2	2577.4	3478.9	9336
India	1369	136.9	1947.6	2114.2	3924.9	5294
Non-OECD Asia	1853	185.3	2313.6	2245.8	4374.1	6227
Middle East	1463	146.3	474.1	191.8	519.6	1983
Africa	1188	118.8	1657.8	838.8	2377.9	3566
Latin America/Carrib.	1270	127	533.4	463.0	869.4	2139
Rest of the World	1314	131.4	326.0	308.7	503.3	1817
Total World	46410	17479	8739.7	8739.7	17479.4	46410.0

Table 8 Source: Energy Information Administration (2007), own calculations. Data basis is the year 2010.

Figure 2 illustrates the contribution of IC/Annex I and DC/Non-Annex I countries to the different funds as well as the revenues received from the funds in form of USD per capita. Looking at the MAF on this per capita basis, it can be seen that industrialised countries contribute some 40 times more than developing and least developed countries, while the DC and LDCs receive all the funds from the MAF. This expresses the solidarity principle and the different shares of responsibility for the climate change problem. At the same time, because of the low level of the

tax it is a moderate financial burden even for industrialised countries (2 USD/ton CO_2 corresponds to some 0.5 US cents/litre of gasoline).

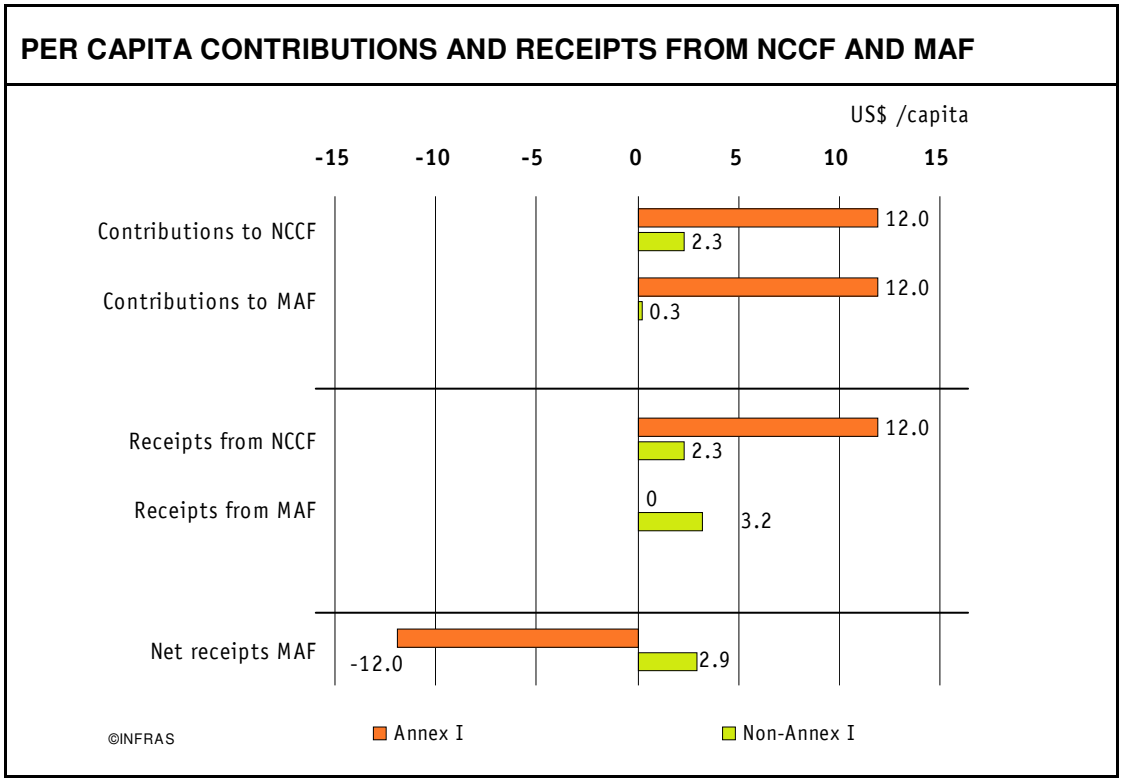

Figure 2 How many USD/capita on average does an IC/Annex I country and a DC/Non-Annex I country contribute to, and receive from the MAF and its own NCCF. For the MAF, IC countries contribute12 USD/cap, but do not receive any funds. DC countries contribute 0.3 ESD/cap to the MAF, and receive some 3.2 USD/cap.

5.2. IMPLEMENTATION

When implementing the global funding scheme, several specific implementation questions arise. These questions include both organisational as well as legal aspects and need to be answered in order to ensure an effective functioning of the funding scheme. This chapter depicts some important implementation questions and identifies questions for further investigation and discussion.

Collection of the CO_2 tax

The collection of the fossil fuel based CO_2 tax is not conceived as a centralized scheme but shall be defined by parties on a national basis building on the taxation systems already in place. Industrialised countries already charging energy or CO_2 with the help of market-based instruments

may directly link the new tax to existing mechanisms in order to reduce administrative costs. According to 135 initial national communications submitted by non Annex I countries almost all these parties levy customs and duties on imported fossil fuels. Non-Annex I countries, in particular LDCs may wish to introduce a CO_2 tax in a step by step approach taking advantage of reforms of their fuel taxation systems, minimizing adverse economic impacts and taking into consideration regionally coordinated approaches to minimize additional regulations in cross boarder trade.

Integration of least developed countries into the funding scheme

A key issue concerns the possible lack of economic capacity of some least developed countries (LDC) to contribute to the Multilateral Adaptation fund. Transition periods or exemptions from this obligation could be foreseen for certain countries, in order to not exclude them from being eligible to receive support from the MAF.

The integration of international bunker fuels

The proposed integration of international bunker fuels into the Multilateral Adaptation Fund is justified by the polluter pays principle. It may however catalyse distributional issues. The emissions of bunker fuels are not allocated through the territoriality principle but by the sales point of fuelling. Transportation hubs such as international airports or ports thus will generate sizable revenue from the CO_2 tax[6]. A question for further discussion could be to gradually harmonise the treatment of CO_2 emissions from international bunker fuels in Annex I and non Annex I countries. Depending on development of the transportation industry the share of the revenue being channelled to the multilateral adaptation fund could gradually approach 50% also in non Annex I countries.

Risks and possible perverse incentives

Mechanisms based on the insurance principle always include the risk of moral hazard which can lead to a "lean-back" attitude and prevent countries from taking direct action. Through its two-pillar mechanism, the adaptation funding scheme could reduce the risk of moral hazard as the adaptation pillar ensures that preventing adaptation measures and curative insurances are work-

6 For important international aviation hubs at the Gulf in West Asia or City states such as Singapore to significant revenue for the National Climate Change Fund from international air transportation. Considering that only 10% of the revenue is channelled to the Multilateral Fund, there the resource gain for the NCCF could be seen as an incentive to introduce the tax also in important non Annex I countries. This would maintain a level playing field for the air transportation industry.

ing hand in hand. Disasters guide the need for urgent disaster risk reduction measures, which should be undertaken with priority. This would prevent that the re-occurrence of the same event leads to the same pattern of damages. A close cooperation with the private insurance sector with a long-term knowledge in risk assessment will enhance the effectiveness and credibility of operations.

Minimally required regulation and legal arrangements

A sound legal arrangement of the Scheme will be vital for gaining Parties to participate in the scheme. The implementation modalities may foresee a grace period for which full participation in the scheme with regard to taxation of CO_2 emissions could be voluntary. Although the NCCFs is governed through the subsidiarity principle, the legal arrangement should include guidelines or best-practice measures for the use of revenue from the NCCFs.

In order to reduce administrative costs, clear thresholds which trigger a payment from the insurance need to be defined upfront in the bilateral agreements between Parties and the MAF. Managing of damage compensation should be delegated to consortia of insurances mandated by the MAF and the participating Parties on a regional/subregional basis.

Institutional development

Possibilities on how to best involve actors of the private sector into the funding scheme, especially within the management of the insurance pillar, shall be subject to further investigation. The insurance pillar shall use the experience of the private insurance sector to the extent possible, especially for risk analysis and the broad pooling of risks. At the same time, the legitimate interests of the affected developing population shall be ensured.

6. ADDITIONAL WORK

This paper outlines cornerstones of a climate change programme financing scheme with a clear focus on adaptation within the multilateral funding mechanism. At this stage the level consultation and investigation on this proposal is limited. Hence this paper presents a leading idea and a tool box of instruments for refinement and discussion.

Open questions which do need further investigation are

› Issues related to how best this proposal can be integrated in the current negotiation process for a post 2012 international agreement.

› Do the leading idea and the proposed design parameters attract sufficient support from other parties to justify comprehensive assessment process? The proposed level of taxation is indicative to allow for such an additional consultation process.
› A core challenge will be the design of the insurance and the prevention pillar of the Multilateral Adaptation Fund. On the basis of which indicators shall the resources of the MAF be allocated to beneficiaries? The IPCC (2007b) Assessment Report does not quantify current/future economic impact or vulnerability of different regions in a single indicator, though it complies the available relevant information.
› Issues related to implementation modalities how the CO_2 tax can be best levied.

Next steps

Interested Parties are invited to cooperate in a process to further develop the proposed scheme.

ANNEX

CO2 EMISSIONS OF LEAST DEVELOPED COUNTRIES (IN THOUSAND TONS)			
Country	CO2 emissi-ons (in 1000)	Country	CO2 emissions (in 1000)
Afghanistan	1'096	Madagascar	1'202
Angola	5'163	Malawi	725
Bangladesh	14'487	Maldives	304
Benin	744	Mali	480
Bhutan	392	Mauritania	2'950
Burkina Faso	971	Mozambique	1'110
Burundi	224	Myanmar	8'493
Cambodia	513	Nepal	2'026
Cape Verde	121	Niger	1'107
Central African Rebublic	242	Rwanda	495
Chad	110	Samoa	132
Comoros	66	Sao Tomé and Principe	77
Democratic Rebublic of Congo	2'334	Senegal	3'133
Djibouti	366	Sierra Leone	465
Equatorial Guinea	612	Solomon Islands	161
Eritrea	0	Somalia	15
Ethiopia	7'894	Sudan	3'620
Gambia	216	Timor-Leste	0
Guinea	1'092	Togo	802
Guinea-Bissau	231	Tuvalu	5
Haiti	1'389	Uganda	1'070
Kiribati	22	Tanzania	2'466
Lao People's Democratic Rep.	352	Vanuatu	62
Lesotho	636	Yemen	16'162
Liberia	333	Zambia	2'455
		Total LDC	89'123

Table 9 Source: United Nations, http://www.cyberschoolbus.un.org/infonation/index.asp?theme=env.

WORLD POPULATION BY REGION, REFERENCE CASE, 1990-2030				
(in Mio.)	**1990**	**2002**	**2003**	**2010**
OECD North America	366	424	427	457
OECD Europe	497	529	530	543
East Asia (Japan, South Korea)	167	175	175	177
Oceania (Australia, New Zealand)	20	24	24	25
Russia	148	145	145	140
China	1155	1296	1299	1355
India	849	1064	1070	1183
Non-OECD Asia	743	940	946	1054
Middle East	137	185	187	216
Africa	636	861	869	1007
Latin America	360	439	442	486
Rest of the World	200	198	198	198
Total World	5278	6280	6312	6841

Table 10 Source: Energy Information Administration (2007).

GROSS DOMESTIC PRODUCT, GDP, IN BIO. USD								
(in Bio. USD)	**1990**	**2002**	**2003**	**2010**	**2030**	**Growth rates 2003-2030**	**Growth rates 2030-2050**	**2050**
OECD North America	8477	11968	12273	15503	27733	3.07	3.07	50984
OECD Europe	8017	10647	10799	12713	19394	2.19	2.19	30150
East Asia (Japan, South Korea)	3228	3992	4058	4824	6654	1.85	1.85	9616
Oceania (Australia, New Zealand)	428	637	657	791	1270	2.47	2.47	2056
Russia	2241	1658	1780	2531	5005	3.90	1.95	7130
China	1807	5494	5994	10116	28833	5.99	3.00	50543
India	1684	3160	3429	5162	14102	5.38	2.69	23279
Non-OECD Asia	2289	3905	4093	5856	13772	4.60	2.30	21650
Middle East	810	1295	1357	1946	4085	4.17	2.08	6133
Africa	1461	2074	2173	3073	6970	4.41	2.21	10745
Latin America	2174	3011	3075	4136	8328	3.76	1.88	12279
Rest of the World	1145	1013	1098	1784	4185	5.08	2.54	6701
Total World	33761	48854	50786	68435	140331	3.84		231267

Table 11 Source: International Energy Administration (2007); Assumptions: Non-industrialised countries have a higher growth rate until 2030 (as projected by IEO) but converge to growth rates of industrialised countries between 2030 and 2050. Thus, growth rates of 2002-2030 are reduced by 50% for the period 2030-2050.

REFERENCES

Bals, Ch., I. Burton, S. Butzengeiger, A. Dlugolecki, E. Gurenko, E. Hoekstra, P. Höppe, R. Kumar, J. Linneroth-Bayer, R. Mechler, K. Warner 2005: Insuranc-Related Options for Adaptatioin to Climate Change, The Munich Climate Insurance Initiative, 2005.

Bals, Ch, K. Warner, S. Butzengeiger 2006: Insuring the uninsurable: design options for a climate change funding mechanism, Climate Policy 6 (2006), p. 637-647.

Bürgenmeier B. 2007: Étude sur la faisabilité d'une taxe mondiale sur les émissions anthropiques de gaz à effet de serre, Version mai 2007.

Energy Information Administration 2007: International Energy Outlook.

Gorina, N. 2006: Cooling down hot air, Green Investment Schemes, Global Carbon, May 2006.

IPCC 2000: GHG inventory good practice guidance

IPCC 2007a: Climate Change 2007: The Physical Science Basis, Summary for Policymakers, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

IPCC 2007b: Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Confidential draft in preparation for Final Government Review and Summary for Policymakers, www.ipcc.ch.

IPCC 2007c: Climate Change 2007: Mitigation of Climate Change, Summary for Policymakers Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

Kemfert, C. 2002: An Integrated Assessment Model of Economy-Energy-Climate – The Model WIAGEM, in: Integrated Assessment 2002, Vol. 3, No. 4, S. 281-298.

Kemfert, C. 2007: Persönliche Kommunikation und Übermittlung von Daten zum Modell WIAGEM.

Kemfert, C. 2007a: Cost of Action and Inaction – Integrated Assessment Model. DIW Präsentation am BAFU internen Workshop in Bern vom 3. April 2007

Kokorin, A. 2003: Green Investment Schemes as a Way of Promoting Environmentally-Sound Cooperation among Russia, Canada, Japan and Other Nations under the Kyoto Protocol, World Wide Fund for Nature (WWF), Russian Climate Change Programme, 2003.

Mechler R. and J. Linneroth-Bayer 2006: Disaster Insurance for the Poor? A Review of Microinsurance for Natural Disaster Risks in Developing Countries, ProVention/IIASA, July 2006.

Oxfam 2007: Adapting to climate change - What's needed in poor countries, and who should pay, Oxfam Briefing Paper, May 2007.

Stern, N. 2006: Stern Review on the Economics of Climate Change, Cabinet Office, HM Treasury, United Kingdom.

Thalmann, P. D. Bicchetti, L. Drouet, R. Gainza, M. Vielle 2007a: Simulations for a World Carbon Tax, Research lab on the Economics and Management of the Environment, Ecole Polytechnique Fédérale de Lausanne, May 2007.

Thalmann, P., D. Bicchetti, L. Drouet, M. Vielle 2007b: The Climate Dollar, Research lab on the Economics and Management of the Environment, Ecole Polytechnique Fédérale de Lausanne, November 2007.

UNFCCC 2007: Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention, Dialogue working paper 8, August 2007.

World Bank 2006: Clean Energy and Development: Towards an Investment Framework', World Bank Environmentally and Socially Sustainable Development and Infrastructure Vice Presidencies, Washington DC: World Bank, September 2006.