Caisse desDépôts

Climate Report
Research on the economics of climate change

MISSION CLIMAT

Issue n°17 • April 2009

FINANCING ADAPTATION TO CLIMATE CHANGE

WHAT THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE PROVIDES FOR

Anita Drouet *

Adapting to climate change consists in taking the current and coming effects of climate change into our decision-making now to limit adverse impacts and maximise potential benefits.

The cost of adaptation is estimated at several tens of billions of dollars annually. Developing countries are especially vulnerable and the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) estimates the costs of adaptation for these countries at between 28 and 67 billion dollars per year. This raises several questions: Who is going to finance adaptation measures? What exactly should be financed? How should the financing be organised?

In this Climate Report, we take a look at the mechanisms provided for by the UNFCCC to finance adaptation to climate change.

At the present time, adaptation measures are financed by three international funds managed by the Global Environment Facility (GEF), the financial operating entity of the UNFCCC. The funds have available a total of almost 300 million dollars in resources, which is extremely low in light of the estimated needs. The Adaptation Fund, a new international financing instrument established by the Kyoto Protocol, is expected to be operational in the coming months. In all likelihood, this fund will become the main instrument to finance the adaptation of developing countries and, according to the estimates of the UNFCCC Secretariat, it will be allocated between 80 and 300 million dollars per year from 2008 to 2012, and between 100 million and 5 billion dollars per year for the period 2013-2030. Nevertheless, the continuity of its resources will depend to a great extent on the evolution of carbon markets.

New mechanisms to finance adaptation will nevertheless be indispensable. Several proposals have been put on the negotiating table, but none of them is truly outstanding. The significant financing requirements and the urgent need to start adaptation now expressed by the Intergovernmental Panel on Climate Change have placed the issue of adaptation at the core of the current negotiations on the post-2012 agreement to follow the Kyoto Protocol. Adaptation to climate change and its financing will thus be the major stakes at the next Conference of the Parties to the UNFCCC in Copenhagen in December 2009. No doubt they will be included in the negotiations over mitigation mechanisms and objectives, allowing global consideration of the countries of the South.

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ACKNOWLEDGMENTS

The authors would like to thank all those who assisted them in the preparation of this report, especially Shardul Agrawala (OECD), Philippe Ambrosi (World Bank), Cécile Bordier (OECD), Jan Corfee-Morlot (OECD), Sandrine De Guio (French Ministry for the Economy, Industry and Employment - Treasury and Economic Policy General Directorate), Thomas Groh (GEF), Stéphane Hallegatte (CIRED-Météo France), and Julien Rencki (Representative of France to the Adaptation Fund Board - French Ministry for the Economy, Industry and Employment) for their careful reading of the text and their constructive criticism.

The authors take sole responsibility for any errors or omissions.

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INTRODUCTION

Combating climate change will require introducing two types of complementary action: mitigation, i.e. reducing greenhouse gas emissions to limit climate changes; and adaptation aimed at taking current and coming climate changes into account in our activities. Due to the inertia of the climate system and our economic systems, we have to prepare today to protect ourselves against foreseeable damage and to take advantage of opportunities by adjusting our systems to take new climate conditions into account. Adaptation measures will therefore include, for example, using drought-resistant plant varieties in agriculture, building barriers to limit the impact of the new sea level rise and diversifying our energy sources to ensure production even in the case of extreme weather and climate events.

Unlike the global benefits and drawbacks of any mitigation policy, the effects, both positive and negative, of adaptation policy will be felt at the local level. According to the IPCC's Fourth Assessment Report, developing countries are expected to suffer the most from the effects of climate change, at least in the beginning. This leads to three questions. First of all, who is going to finance the measures to adapt to climate change, particularly in these countries? The developed countries can certainly finance their own adaptation measures but the developing countries cannot entirely do so. Secondly, what should be financed? The line between adaptation aid and development aid is vague. A study by McGray et al. (2007) of a hundred so-called "adaptation" measures in developing countries shows that there is little difference between adaptation initiatives and what is considered "good" development. Finally, how are these measures to be financed? Should the financial mechanisms for adaptation be the same as those for mitigation (carbon markets, funds, taxes)? Which is better: a country-based approach or a project-based approach?

We will take a close look at this last, broader question of adaptation financing. There are currently several sources of financing to support adaptation to climate change: the funds established following international negotiations on climate change, Official Development Assistance (ODA), contributions from international financial institutions such as the World Bank and the International Monetary Fund and aid from bilateral and private-sector agencies. There is no exact assessment of the amount of financing available for adaptation due to the problem of determining the line between adaptation and development.

This Climate Report analyses the mechanisms provided for by the United Nations Framework Convention on Climate Change (UNFCCC) to meet the needs of adaptation financing. The Climate Report begins by reviewing the estimated costs of adaptation to climate change. It then traces the development of international discussions on adaptation within the UNFCCC, and goes on to examine in detail the operation of the three special adaptation funds set up by the UNFCCC and managed by the GEF as well as the recent adaptation fund intended to become the principal financing institution. Finally, it analyses various possible avenues to increase and perpetuate financial resources dedicated to adaptation, whether they are used by the adaptation fund or by other systems introduced subsequently.

I. THE COST OF ADAPTATION TO CLIMATE CHANGE

The global cost of adaptating to climate change are difficult to estimate, in particular on account of the uncertainty linked to the impact of climate change and the wide variety of adaptation measures that must be implemented. Nevertheless, these costs must be estimated to get some idea of the scope of the requirements and to develop appropriate funding instruments.

A. Recent estimates agree on the scope of the requirements

The majority of international organizations involved in issues of funding have conducted evaluations of the cost of adaptation to climate change: World Bank, United Nations Development Program (UNDP), and United Nations Framework Convention on Climate Change (UNFCCC). Other government agencies and nongovernmental organizations (NGOs) also provide an estimate of costs to be borne by developing countries including work by the UK government, which commissioned the Stern Review, Oxfam and Oxford Institute for Energy Studies. Table 1 lists the eight major estimates. They identify annual costs for the developing countries on the order of several tens of billions of dollars.

Table 1 – Estimated annual costs of adaptation to climate change

Assessment	Annual costs	Time frame	Countries included
World Bank *(2006)*	USD 9 - 41 billion	Today	*Developing countries*
Stern Review *(2006)*	USD 4 - 37 billion	Today	*Developing countries*
Oxford Institute for Energy Studies *(2006)*	USD 2 - 17 billion	Today	*Developing countries*
Oxfam *(2007)*	at least USD 50 billion	Today	*Developing countries*
UNDP *(2007)*	USD 86 - 109 billion	2015	*Developing countries*
UNFCCC *(2007)*	USD 28 - 67 billion	2030	*Developing countries*
Stern Review *(2006)*	USD 15 - 150 billion	Today	*Developed countries*
UNFCCC *(2007)*	USD 21 - 104 billion	2030	*Developed countries*
Stern Review *(2006)*	USD 19 - 187 billion	Today	*World*
UNFCCC *(2007)*	USD 49 - 171 billion	2030	*World*

Source: OECD, UNDP and Stern Review.

How were these estimates prepared?

The estimates for the developing countries[1] prepared by the World Bank, the Stern Report, Oxfam and the UNPD employ the same methodological basis. They are based on the three sources of financing received by developing countries: official development assistance (ODA), foreign direct investment (FDI) and gross domestic investment (GDI), also called gross fixed capital formation (GFCF) which accounts for spending on fixed capital growth of the economy plus net changes in stock levels.

[1] For studies of the World Bank, the Stern Report, Oxfam and UNDP, developing countries are beneficiaries of official development assistance (ODA). For the study of the UNFCCC, developing countries are non-Annex I Parties of the UNFCCC. The two categories overlap but do not completely coincide.

First, these estimates assign a percentage to each of these three sources which represent their exposure to the effects of climate change. Then they form a hypothesis about the costs of improving the resilience of these sensitive investments to the effects of climate change. The calculated costs of improvement then give a range for the costs of adaptation to climate change.

These three flows are related to investment potentially susceptible to the effects of climate change. A risk is assigned to each to determine how much investment is threatened by climate change. Then it considers the costs of improving resistance to climate change in these sensitive investments. Once aggregated, these costs are calculated to improve the range of costs of adaptation to climate change. Box 1 details the methodology for the study of the World Bank.

Box n°1. Methodology of the World Bank to estimate the costs of adaptation to climate change in developing countries.

Estimates of three sets of financial flows in developing countries:

ODA : USD 100 billion per year ; **FDI** : USD 160 billion per year ; **GDI** : USD 1 500 billion per year

α_{ODA}, α_{FDI} and α_{GDI} are the percentage of each of flows that would be exposed to the effects of climate change. The World Bank estimates that:

α_{ODA} = 40 % ; α_{FDI} = 10 % ; α_{GDI} = **2 to 10 %**

Flows exposed to the effect of climate change are estimated between:

40 % x **ODA** + 10 % x FDI + **2 %** x GDI = **USD 86 billion**

and

40 % x **ODA** + 10 % x FDI + **10 %** x GDI = **USD 206 billion**

Hypothesis about the costsof improving the resilience to the effects of climate change:

10 to **20 %** of flows exposed to the effect of climate change

So estimated range of costs of adaptation to climate change for developing countries:

10 % x **USD 86 billion** = USD 8.6 billion approximately **USD 9 billion**

20 % x **USD 206 billion** = USD 41.2 billions approximately **USD 41 billion**

Source: OECD.

The UNFCCC employs a different methodology. It analyzes the costs of adaptation taking a sectoral approach. For infrastructure projects, agriculture, forestry and fishing, the UNFCCC uses the same type of method as the World Bank and estimates the costs of improving resilience to climate change in the flows exposed to the effects of climate change. However, for water supply, human health and the protection of coastal zones, it uses specific sectoral models that take the climate risk into consideration.

Box 2. Estimate of costs of adaptation to climate change by sector under the UNFCCC.

Agriculture, forestry and fishing	USD 14 billion
Water supply	USD 11 billion
Human health	USD 5 billion
Coastal protection	USD 11 billion
Infrastructure	USD 8 to 130 billion

Source: UNFCCC.

In total, the study of UNFCCC figure financial needs for adaptation to climate change between USD 49 to 171 billion per year. The costs of adapting infrastructure stand out as they have the widest range and their upper bound is at least ten times higher than costs in other sectors[2].

[2] To estimate the cost of infrastructure, the study relies on the same percentage that adaptation is going to cost, between 5-20% of the total infrastructure investment, which was assumed in the World Bank study. The uncertainties on the sector remain the largest.

B. Limits to the methodologies employed

Of course, these estimates are subject to major limitations. For the World Bank study, uncertainties appear on the impacts of climate change: scale of physical impacts and economic evaluation, part of the assets and financial flows potentially exposed to the climate risk, costs of improving the resilience to climate change in the assets exposed. For the sectoral approach used by the UNFCCC, problems of duplication may also be encountered. For example, infrastructure can be counted both in the "infrastructure" and in the "coastal protection" categories. In addition, the projections on the worldwide scale are based on data that are often limited and local. Uncertainties arise in the discount rate chosen for the estimates in 2015 and 2030. Finally, the cost of adaptation depends on the type of strategies. Those taken into account in the estimates generally correspond to "structural" adaptation measures such as the construction of dikes, rather than "behavioral" measures, such as the planning of land use or the definition of new construction standards. The cost of the "structural" measures is by definition easier to estimate.

The estimates must therefore be taken with a grain of salt. For example, the UNFCCC estimates that the cost of protecting coastal areas on the worldwide level would be 11 billion dollars a year from now through 2030. New Orleans, however, would already have had to spend more than 32 billion dollars to protect itself against a Category 5 hurricane such as Katrina (Schwartz, 2005). The estimates must also include the costs of maintaining these installations. Many institutes like the World Bank and OECD do research on local adaptation. The proliferation of such research will improve estimates of the overall cost of adaptation to climate change.

The costs of adaptation to climate change in developing countries are estimated at a minimum several tens of billions of dollars annually. Multiple flows of funding exist to support these needs: funds established by international negotiations on climate change, official development assistance, international financial institutions[3], bilateral development agencies and the private sector. We are interested here in the first group.

II. The place of adaptation within the United Nations Framework Convention on Climate Change

A. Adaptation: an issue present at the creation of the UNFCCC

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted and opened for signature at the Rio de Janeiro Conference in 1992. The Convention has currently been ratified by 192 countries. The highest-level authority of the UNFCCC is the Conference of the Parties (COP). This body, which consists of all the signatory countries, meets once a year to make decisions relative to the implementation of the Convention.

The ultimate objective of the UN Framework Convention on Climate Change and the related agreements is the *"stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system... within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."*

Adaptation to climate change is cited in Article 4 of the Convention and requires the signatory countries to:

- define and implement national and regional measures to facilitate adequate adaptation to climate change.

[3] Following the G8 summit at Gleneagles in 2005, he was asked financial institutions to promote investment in clean energy in developing countries. The World Bank established a framework for investment in clean energy for development (Clean Energy Investment Facility, CEIF). One of the three pillars is to support adaptation and vulnerability to climate change.

- cooperate in preparing for adaptation to the impacts of climate change and to develop appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods;
- assist developing countries that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation to those adverse effects.

Over the years, emissions reductions have been given priority over adaptation measures. However, key decisions relative to adaptation have been made at the most recent meetings of the Conference of the Parties (COP) to the Convention.

B. Decision-making point on climate change adaptation

A three-step approach to adaptation actions was defined in 1995 at the first Conference of the Parties (COP-1) in Berlin. Steps I and II consist of identifying the most vulnerable countries or regions, preparing policy options for enhancing adaptation capacities. Step III consists of concrete measures to facilitate adaptation.

In 1998, the Global Environment Facility (GEF)[4] was designated the operational entity for the UNFCCC financing mechanism. It will be the body managing the funding of adaptation from the UNFCCC. These are started in 2001 at COP-7 in Marrakesh, which sets up three funds for the adaptation:

- the Special Climate Change Fund (SCCF)
- the Least Developed Countries Fund (LDCF)
- the Adaptation Fund (AF)

Moreover, the National Adaptation Programs of Action (NAPAs) were also launched. These programs are designed to analyze priority actions in the area of adaptation in the least developed countries.

The Buenos Aires Program of Work on Adaptation and Response Measures was adopted at COP-10 in Buenos Aires in 2004. This program includes financial estimates of the risks and necessary adaptations.

At COP-11 in Montréal in 2005, the Parties adopted a five-year program of work on impacts, vulnerability and adaptation to climate change, which was renamed the “Nairobi Work Program" at COP-12 in Nairobi. This program has two objectives. On one hand, it assists the least developed countries and developing small island countries to improve their assessment of the impacts of climate change and their understanding of the challenges of adaptation. On the other hand, it assists them in making decisions on practical adaptation measures on a technical, scientific and socio-economic basis.

The Bali Conference in 2007 (COP-13) took place following the publication of the most recent report of the IPCC[5] in 2007. This report establishes the challenges of adaptation which are at the core of the COP's concerns. The "Bali Road Map" establishes a process of negotiating the conditions for combating climate change after 2012 in the form of four blocks: mitigation, adaptation, technologies and the provision of financial resources. The GEF was also designated to act as the Secretariat of the Adaptation Fund and the day-to-day management of this Fund's financial resources was entrusted to the World Bank, the latter on an interim basis. Southern countries were given a majority position on the Fund's Board of Directors, with 10 members out of 16[6].

The roles of the GEF and of the World Bank in the management of the Adaptation Fund were confirmed at COP-14 in Poznań in 2008. The priorities, strategic policies and guidelines of the Fund were also defined[7].

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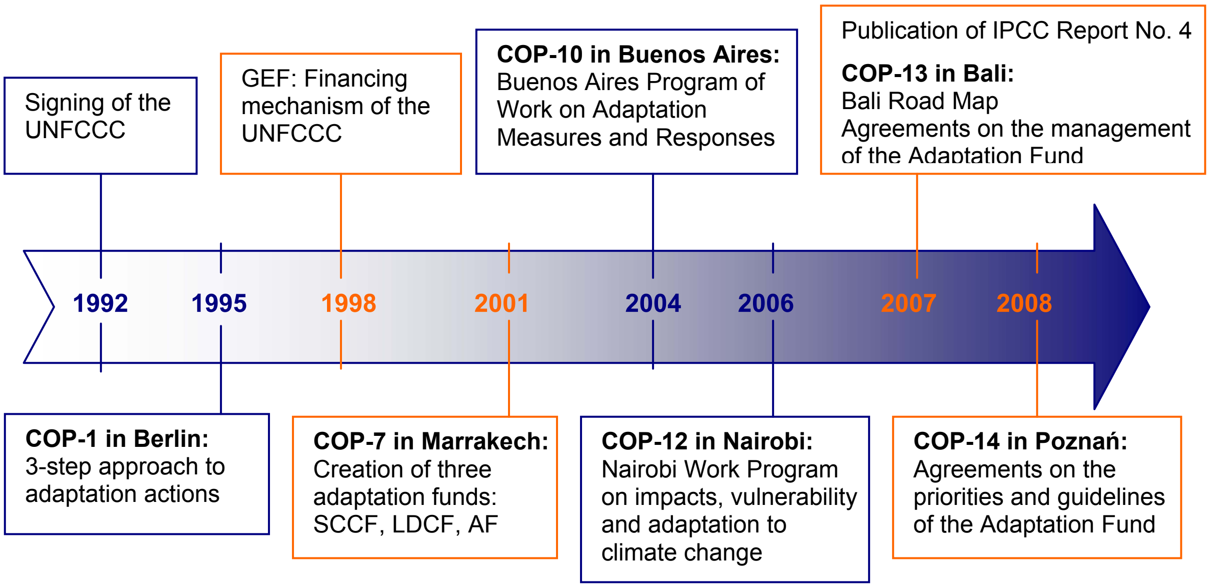
[4] The Global Environment Facility will be defined in Section III.A

[5] IPCC: Intergovernmental Panel on Climate Change

[6] The other 6 are 4 representatives of the industrialized countries and 2 representatives from Eastern Europe.

[7] See Section III.C.

Figure 1 – Dates of key decisions relative to adaptation made at meetings of the Conference of Parties to the UNFCCC



Source: UNFCCC.

Adaptation has been a factor in the documents of the UN Framework Convention on Climate Change from the outset. Over the years, however, priority has been given to measures to reduce greenhouse gases emissions. Adaptation has become a real priority only recently, thanks among other things to the publication of the most recent report from the IPCC and the Bali Road Map. These documents produced a significant increase in research on the subject. The publication of estimates of the costs of adaptation have focused attention on the efforts required and demonstrated to the decision-makers the urgency of stable long-term financing of the funds dedicated to adaptation. It also opens the door to new avenues of negotiation by taking adaptation into serious consideration. This increased consideration of adaptation is also a response to one of the major demands of the countries of the developing world which will not sign a post-2012 agreement unless adaptation and means of financing it are a fundamental component of the document.

III. Current financing of adaptation to climate change within the United Nations Framework Convention on Climate Change

A. *The operational entity of the financial mechanism of the UNFCCC: the GEF*

Adaptation: 4 % of GEF projects

Created in 1991, the Global Environment Facility (GEF) has 178 member countries. The GEF serves as financial mechanism for the implementation of international conventions on biodiversity, persistent organic pollutants, desertification and climate change. In 1996, the Conference of the Parties to the UNFCCC appointed the GEF to manage the financial mechanism defined by Article 11 of the Convention[8], a role that is re-examined every four years. The purpose of the financial mechanism in question is to provide resources to developing countries in the form of donations or loans on favorable terms. With regard to

[8] A mechanism for the provision of financial resources on a grant or concessional basis, including for the transfer of technology is defined by Article 11 of the United Nations Framework Convention on Climate Change, p. 14, http://unfccc.int/resource/docs/convkp/conveng.pdf, website accessed 18 March 2009.

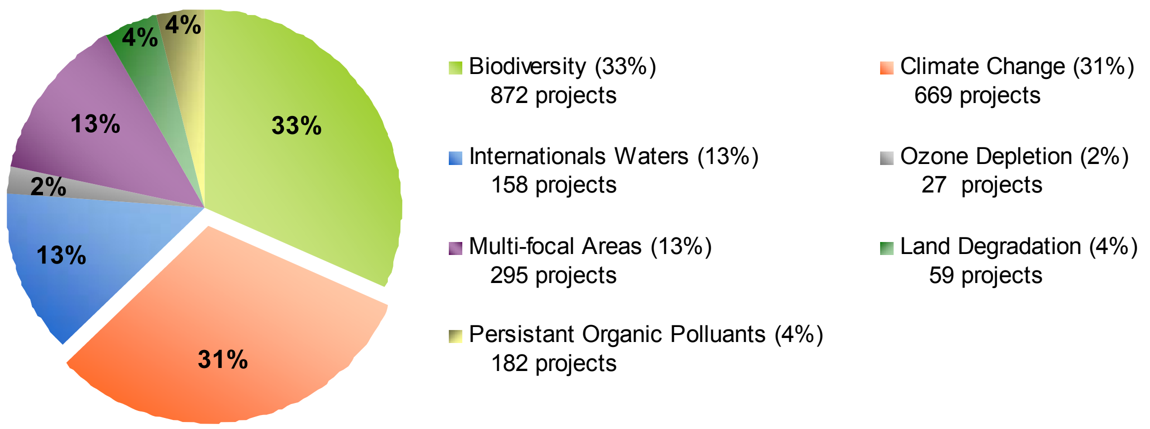
adaptation to climate change, the purpose of the GEF is to financially offset the increased costs imposed on vulnerable countries due to the harmful effects of climate change.

The projects are carried out in partnership with international institutions, non-governmental organizations and the private sector. The GEF also includes ten organizations, including the United Nations Environment Program (UNEP), the World Bank and the European Bank for Reconstruction and Development (EBRD).

Since its creation, the GEF has distributed grants totaling USD 8 billion[9], to which must be added USD 32.6 billion in the form of cofinancing[10], for almost 2,300 projects in more than 165 countries. The funds come from a number of donor countries. In 2006, 32 donor countries committed USD 3.13 billion to finance projects between 2006 and 2010. The five largest beneficiaries are China, Brazil, India, Mexico and the Russian Federation.

Figure 2 illustrates the distribution of subsidies from the GEF by area of activity as of February 3, 2009. Climate change is the second largest area of activity in terms of the number of projects with 669 out of a total of 2,262 projects. It represents almost one-third of the GEF's financing, i.e. approximately USD 2.5 billion, and almost one-half of the cofinancing, i.e. approximately USD 15 billion.

Figure 2 – Distribution by area of activity of the USD 8 billion committed by the Global Environment Facility as of February 3, 2009



Source: GEF

In the field of climate change, the GEF finances activities for different purposes:

- to overcome obstacles to energy efficiency;
- to promote renewable energies by eliminating obstacles and by reducing the cost of renewable energy;
- to reduce the long-term costs of low greenhouse gas emission technologies;
- to promote sustainable transportation;
- to assist countries in preparing their National Communications[11] and their National Adaptation Programs of Action (NAPAs);
- to strengthen capacities in the most vulnerable areas.

[9] Source: GEF.

[10] The cofinancing of the GEF is composed of all of the resources in cash and in kind committed by governments, other multilateral or bilateral sources, the private sector, NGOs, project beneficiaries and the GEF Executing Agencies in question.

[11] The National Communications submitted to the Secretariat of the UNFCCC are documents that describe the actions and measures taken by each Party to the Convention to achieve the objectives assigned to it to combat the greenhouse effect as well as the visible results of its policy.

Of the 669 projects relative to climate change, 98 projects (or one project out of six) concern adaptation and are financed by the funds managed by the GEF (Strategic Priority on Adaptation, SCCF, LDCF)[12]. In addition, more than five out of six projects in the area of climate change are greenhouse gas emissions reduction activities.

Governance by the UNFCCC and the GEF for the financing of adaptation measures

Projects are selected on the basis of a specific system of governance between the developing country, the UNFCCC and the GEF. This system is illustrated in Figure 3 and is valid for the three funds managed by the GEF: Strategic Priority on Adaptation, the Special Fund for Climate Change and the Fund for the Least Developed Countries[13].

Developing countries are negotiating with both the UNFCCC and the GEF on the general guidelines for the use of funds.

The Conference of Parties to the UNFCCC expresses to the governing bodies of the GEF (the GEF Council[14], the Assembly[15] and the Secretariat of GEF) its orientations with regard to the employment of the funds earmarked for adaptation. In response, the governing bodies of the GEF translate the instructions received by the UNFCCC via the planning documents they provide to its implementing and executing agencies. They also disburse the funds earmarked for the approved adaptation projects.

Developing countries also propose projects in response to their adaptation needs to the GEF's executing and implementing agencies. These 10 agencies are responsible for the creation of proposals for projects and project management: UNDP, UNEP, the World Bank, AfDB, ABD, EBRD, IDB, IFAD, FAO, UNIDO[16]. The developing country and the executive agency chosen then together build a "Project Identification Form" (PIF) which describes the project. They must also provide a document called a "Project Preparation Grant" (PPG) which includes a description of the proposed activities and corresponding budgets. Finally, the executing agencies of the GEF carry out the approved projects that meet the adaptation needs indicated by the countries.

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[12] See Paragraph III.B.

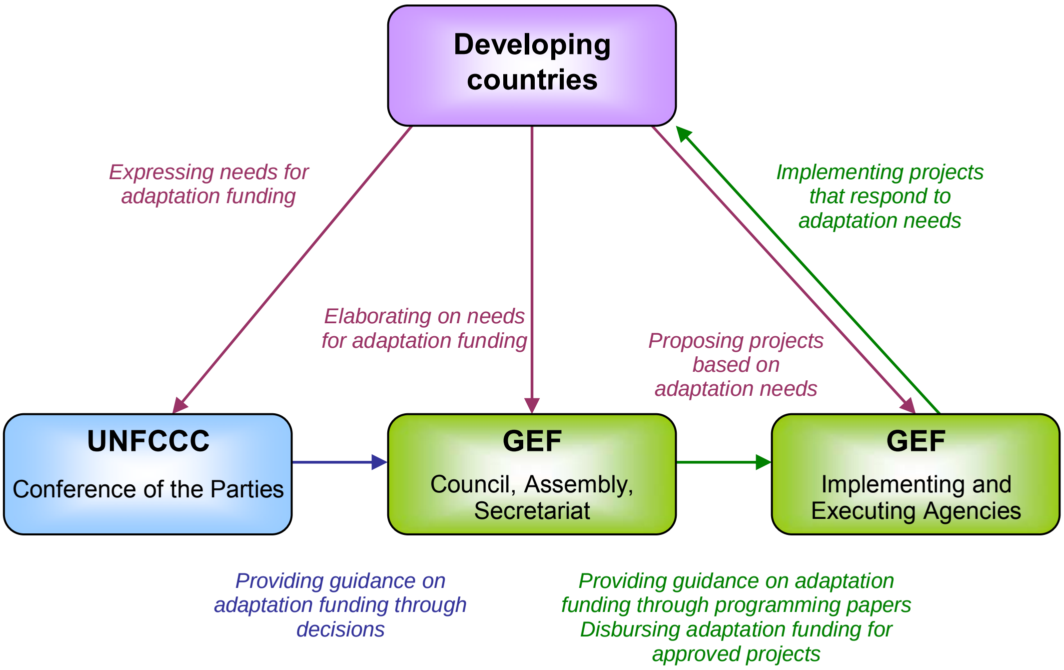
[13] See Paragraph III.B.

[14] The GEF Council is the principal body of the GEF. It operates as an independent board, whose primary responsibility is the development, adoption and evaluation of the programs of the GEF. Council members representing 32 constituencies (16 from developing countries, 14 developed countries, and two from countries with economies in transition). Decisions are made by consensus.

[15] The Assembly is a body of the GEF as the representatives of 177 member countries. It is responsible for reviewing and evaluating the policy of the GEF, the GEF, and its members.

[16] See Glossary.

Figure 3 – Governance of financial instruments for adaptation under the UNFCCC and the GEF



Source: Mission Climat of Caisse des Dépôts, adapted from Möhner and Klein (2007)

B. *The special adaptation funds managed by the GEF*

Strategic Priority on Adaptation (SPA)

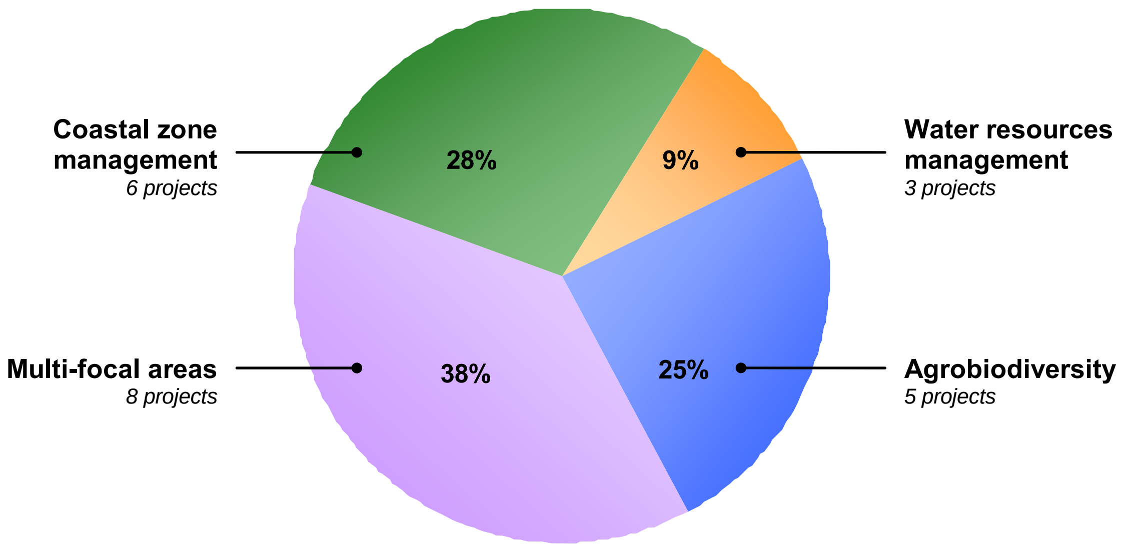
Backed by the GEF Trust Fund, the Strategic Priority on Adaptation Fund could be quickly implemented. Operational since 2004, the Strategic Priority on Adaptation stopped accepting project proposals in November 2008 following the commitment of all of its initial funding of USD 50 million. It served as the precursor of the adaptation funds by financing pilot and demonstration projects that respond to local adaptation requirements[17].

Besides responding to the problem of adaptation to climate change, projects fund by the SPA should also have positive effects on the global environment. The main areas of intervention are coastal zone management, water resources management, agrobiodiversity[18] and multi-focal areas, as illustrated in Figure 4.

[17] All the projects financed by the Strategic Priority on Adaptation are presented in Annex 1.
Report on the Completion of the Strategic Priority on Adaptation, GEF/C.34/8, http://www.gefweb.org/uploadedFiles/Documents/Council_Documents__(PDF_DOC)/GEF_C34/C.34.8%20Report%20on%20the%20Completion%20of%20the%20SPA.pdf, website accessed 18 March 2009.

[18] Agrobiodiversity is the component of biodiversity related to food and agricultural production; it encompasses the variety and variability of animals, plants and micro-organisms used directly or indirectly to food and the agriculture, including crops, livestock, forestry and fisheries. Source: FAO.

Figure 4 – Allocation of USD 50 million committed by the SAP by domain of intervention

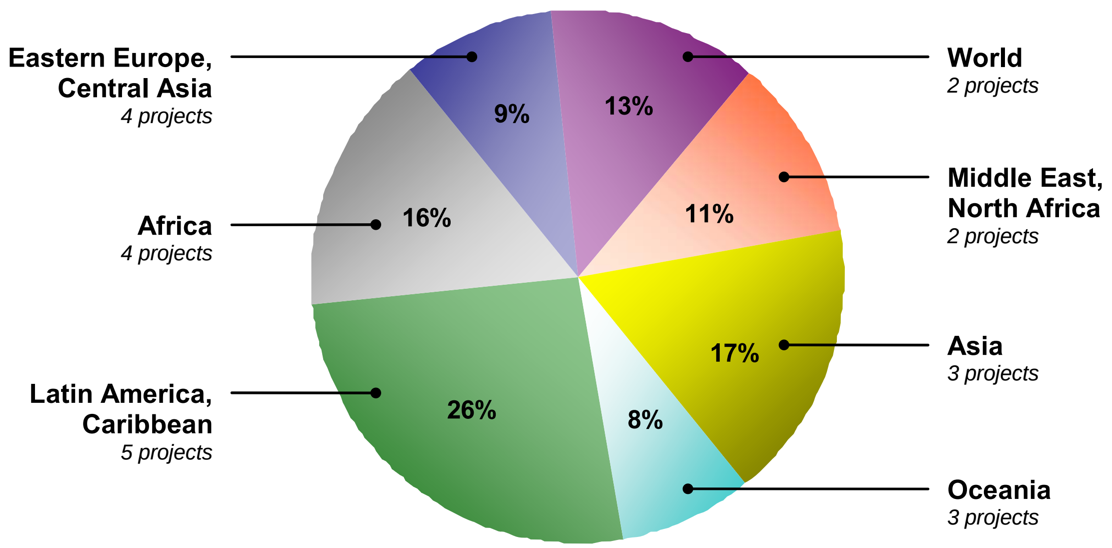


Source: Mission Climat of Caisse des Dépôts, based on the GEF

For example, the SPA financed a USD 2.6 million project which assisted Dominica, St. Lucia and Saint Vincent and the Grenadines in the application of pilot adaptation measures in response to the effects of climate change on the region's natural heritage. It has focused on the preservation of biodiversity, the sustainable management of soils in coastal zones. These pilot activities have established a basis for the acquisition of knowledge and experience and the strengthening of the necessary adaptation capacities not only in the countries that benefit directly from the project, but in the entire Caribbean region. The most expensive project, at USD 78 million, USD 76 million of which is in the form of cofinancing, involves the management of coastal zones and marine resources in the Coral Triangle in Southeast Asia.

The SPA has financed a total of 22 projects. The geographic distribution of the projects financed, represented in the Figure 5, is well balanced among all the regions of the world.

Figure 5 – Distribution by region of projects financed by the SPA



The region "World" is a program of community adaptation in several countries of the world, and a project to develop tools to improve the dissemination of knowledge about adaptation.

Source: Mission Climat of Caisse des Dépôts, based on the GEF

Because it has reached its conclusion, the SPA will be the subject of an independent assessment. The initial findings relate to problems encountered in making a distinction between traditional projects to preserve biodiversity and combat soil degradation and projects that include a dimension of adaptation to climate change.

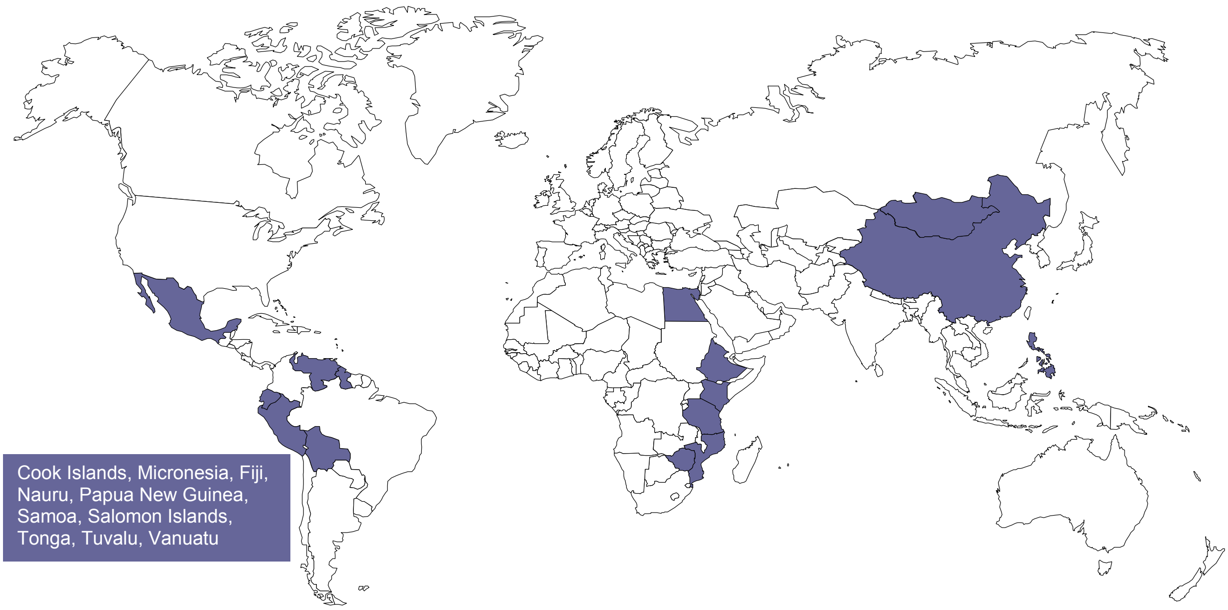
The Strategic Priority on Adaptation is currently closed to new project proposals because it has committed all the funds at its disposal. However, two other funds managed by the GEF and created in 2001 under the UNFCCC are still financing adaptation activities.

Special Climate Change Fund (SCCF)

Since the creation of this fund in 2001, priority in the allocation of its resources has been given to adaptation activities in the developing countries[19]. Initially, the SCCF financed only two programs: adaptation and technology transfer. Since the COP-12 in Nairobi in 2006, it has also entered other areas such as energy, transportation, industry, agriculture, forestry, waste management and diversification of the economy. Adaptation, however, remains its absolute priority.

As of October 2, 2008, of the USD 94 million contributed to the SCCF by 13 developed countries, USD 78 million had been allocated for the Adaptation Program and the remaining USD 16 million for the Transfer of Technology Program[20]. 14 projects under the Adaptation Programs were registered as of February 3, 2009, and 1 project is in the pipeline.

Figure 6 – Geographic distribution of projects financed under the SCCF



Source: Mission Climat of Caisse des Dépôts, based on the GEF

One third of the projects involve the management of water resources. For example, a project for USD 55 million, including USD 50 million in cofinancing, has been put in place in the 3-H region in China. This area is experiencing reduced flow in the rivers and a low rate of replenishment of the groundwater, consequences of climate change and the high demand for water. More specifically, the project consists of defining and testing an entire range of demonstration adaptation formulas organized around the search for new sources of water, increased efficiency of irrigation and the promotion of substitute crops that consume less water.

[19] All of the projects financed by the Special Climate Change Fund are presented in Annex 2.

[20] No projects have yet been registered in the GEF database under the Technology Transfer Program.

The majority of the projects financed in East Africa are designed to respond to the lack of water. A major project for USD 54 million, almost USD 15 million of which has been provided by the SCCF, relates to adaptations by small Pacific islands (Cook Islands, Micronesia, Fiji etc.).

Currently, nearly USD 60 million of the SCCF's funds have been committed to the 14 projects that have been accepted. Only one project is in the pipeline for an amount of almost USD 24 million, USD 5 million of which is expected from the SCCF. The SCCF's resources for the Adaptation Program total USD 78 million and are currently able to cover all its projects.

Least Developed Countries Fund (LDCF)

As its name indicates, this fund is dedicated exclusively to the least developed countries. It was created in 2001 at the COP-7 in Marrakech specifically to respond to the problems encountered by these countries: extreme vulnerability and limited adaptation capacity coupled with a high population density and limited financial capacities. Thanks to voluntary contributions from 19 developed countries, the LDCF finances the preparation of National Adaptation Programs of Action (NAPAs) and their implementation[21].

In addition to National Communications, the least developed countries have been encouraged by the UNFCCC to prepare their National Adaptation Plans of Action (NAPAs) to prioritize the adaptation actions to be taken. As of February 3, 2009, 48 out of the 49 eligible countries had received funds to prepare their NAPA.[22] Each country receives USD 200,000 from the LDCF to prepare its NAPA. Moreover, 12 NAPA[23] implementation projects have been approved for an amount of USD 122 million, USD 40 million of which comes from the LDCF. However, developing countries have cited the red tape of the program and the slow registration of projects.

Box 3. The main steps to elaborate a National Adaptation Program of Action (NAPA).

❶ Synthesis of available information.
❷ Participatory assessment of vulnerability to current climate variability and extreme events and of areas where risks would increase due to climate change.
❸ Identification of key adaptation measures.
❹ Identification of criteria for prioritizing activities.
❺ Selection of a prioritized short list of activities.
❻ Elaboration of short profiles of projects and/or activities intended to address urgent and immediate adaptation needs.

Source: UNFCCC.

As of October 2, 2008, the LDCF had received USD 131 million of the USD 172 million promised by 19 developed countries. The fund's resources cover all of its projects, since the LDCF is projecting a total of USD 47.5 million for their implementation.

Conclusions regarding the special funds managed by the GEF

As the operational entity of the financing mechanism of the UNFCCC, the GEF currently manages three funds earmarked for financing adaptation measures: the Strategic Priority on Adaptation (SPA), the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF). However, the call for projects for SPA is now closed. In spite of the absolute priority assigned to adaptation to climate change, the Special Climate Change Fund should be also active in other areas. The Least Developed Countries Fund is dedicated exclusively to projects in the least developed countries, i.e. in 49 countries

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21 All the projects financed by the Least Developed Countries Fund are presented in Annex 3.

22 50 countries are classified as "Least Developed Countries". However Somalia is not a Party to the UNFCCC.

23 To see the NAPA implementation activities for each country: http://unfccc.int/adaptation/napas/items/4583.php, website accessed 18 March 2009.

representing 12 % of the world population[24]. These latter two funds are therefore not dedicated exclusively to adaptation to climate change in developing countries, although they make a valuable contribution to it.

The objective of these three funds is not to finance all costs of adaptation as other financing channels exist as bilateral development agencies and the private sector. However, they are currently the only operational funds. Also counting in addition to the SCCF and the LDCF the Strategic Priority on Adaptation (SPA), which disbursed its initial USD 50 million before being closed, the resources for adaptation to climate change in the developing countries totaled USD 259 million, as of October 2, 2008.

Table 2 – The Special Funds managed by the GEF to promote adaptation to climate change in the developing countries

Name	Mandated by	Types of projects	Contributions	Current level of funds * (USD million)
Strategic Priority on Adaptation **(SPA)**	GEF**	Pilot and demonstration projects that address local adaptation needs end generate global environmental benefits	GEF Trust Fund	50
Special Climate Change Fund **(SCCF)**	UNFCCC in 2001 (COP-7) Operational in 2005	Adaptation and mitigation projects in all developing countries, with a large emphasis on adaptation	Voluntary contributions from **13 developed countries**	94 which 78 for adaptation (106 pledged)
Least Developed Countries Fund **(LDCF)**	UNFCCC in 2001 (COP-7)	Support the preparation and implementation of NAPAs	Voluntary contributions from **19 developed countries**	131 (172 pledged)

** as of February 10, 2008.*
The call for proposals is closed since late 2008.
Source: GEF.

The FSCC and LDCF are subject to voluntary contributions from developed countries. Regarding the Special Climate Change Fund, 13 countries are contributors. The largest contributors are the United Kingdom with USD 18.6 million, Norway with USD 16.4 million and Germany with USD 14.2 million. Regarding the Least Developed Countries Fund, 19 developed countries have contributed. The top three contributors to the LDCF are Germany with USD 56.1 million, the United Kingdom with USD 19.4 million and the Netherlands with USD 16.3 million.

[24] Source : United Nations, 2005.
Developing countries represent 90 % of the world population (Source: World Bank, 2006)

Table 3 – Status of Pledges from developed countries to the SCCF and LDCF, as of October 2, 2008

Pledges to **SCCF**	
Contributing Participant	*USD Million*
United Kingdom	**18.6**
Norway	**16.4**
Germany	**14.2**
Canada	12.9
Italy	10.0
Denmark	9.0
Spain	6.9
Sweden	6.1
Finland	3.4
Netherlands	3.1
Switzerland	3.0
Ireland	1.6
Portugal	1.3

Pledges to **LDCF**	
Contributing Participant	*USD Million*
Germany	**56.1**
United Kingdom	**19.4**
Netherlands	**16.3**
Denmark	16.0
France	15.3
Norway	6.7
Australia	6.6
Canada	6.5
Finland	6.1
Ireland	6.0
Luxembourg	5.7
New Zealand	3.9
Switzerland	2.4
Italy	1.0
Spain	1.0
Sweden	0.9
Austria	0.6
Japan	0.3
Portugal	0.1

Source: GEF.

Several questions have been raised about the operations and long-term prospects of these special funds managed by the GEF:

- The dividing line between development and adaptation can be a bit fuzzy. In fact, adaptation is an integral part of the development process in the developing countries. As such, many ask whether the financing of adaptation should remain separate from financing for development aid, and constitute an additional source of funds directed to the developing countries? In this context, the eligibility criteria for adaptation funds such as the SCCF would then have to be more clearly defined: what is the additionality of the project? What is the additional cost due to adaptation in the project?
- The SCCF and the LDCF depend exclusively on voluntary contributions. Their resources are not predictable. It would be desirable to engage the developed countries to provide resources to supplement these funds predictably and consistently. It is therefore possible to imagine a regular replenishment of funds, as exists for the equity of the GEF, which would oblige States to bail out every four years the Fund if their contributions do not respect during this period their commitments original.

In view of the meager resources of these funds, it is necessary to increase considerably the capacity for adaptation. Established in 2001, the Adaptation Fund, which is not yet operational, will meet these requirements.

C. The Adaptation Fund

The Adaptation Fund (AF) was created at the COP-7 in Marrakech in 2001, in the context of the Kyoto Protocol, and is scheduled to become operational in 2009. It is intended to become the principal instrument for financing adaptation in the framework of the UNFCCC by financing concrete programs and adaptation projects for developing countries. At COP-14 in Poznań, the legal nature of the Adaptation Fund was discussed and accepted. However, the terms are not yet clearly defined.

In contrast to the SCCF and the LDCF described above, the Adaptation Fund is within the framework of the Kyoto Protocol. Therefore only the Parties to the Kyoto Protocol have access to this fund. The fund intends to allow more room for developing countries in its governance by giving them majority representation on its Board[25]. The fund also makes possible direct access to financing by countries that submit projects without requiring them to go through an executing agency of the GEF.

The Adaptation Fund represents an economic link between adaptation and mitigation. In effect, it is powered by a 2% levy on carbon credits actually generated under the Clean Development Mechanism (CDM). This levy applies to all CDM projects, projects that reduce emissions of greenhouse gases in developing countries, except for those implemented in one of the least developed countries. Generated credits (Certified Emission Reductions or CER) can then be monetized. Mitigation projects are thus in part to finance adaptation projects.

However, the long-term sustainability of the Fund's resources is then highly dependent on the price of the CER credits, and thus on the European market for greenhouse gas CO2. Finally, the CER credits that feed the Adaptation Fund are generated by projects that reduce emissions of greenhouse gases in developing countries; the resources thus come from a financial flow for the countries of South. So it is indirectly a transfer "South-South".

Management of the Adaptation Fund

The management of the Adaptation Fund has been the source of conflicts between the developed countries and the countries of the South. From the outset, the industrialized countries wanted the Fund to be administered by the Global Environment Facility, while the developing countries wanted to retain a significant degree of control over the Fund. Decisions on the administration of the Fund were adopted at the COP-13 in Bali in 2007. A Board was created for the Fund, 10 of its 16 members are representatives of southern countries. The Secretariat of the Fund is provided by the GEF and the day-to-day management of its financial resources has been entrusted to the World Bank on an interim basis; this system will be examined every three years.

Table 4 – The respective temporary roles of the Global Environment Facility and the World Bank in the management of the Adaptation Fund

Global Environment Facility (GEF)	World Bank*
Secretariat	*Trustee*
- Provides all secretarial services including during project cycle	- Executing contracts of sale with the relevant third party CER purchasers. - Holding the Trust Fund which contains the proceeds from the sale of CERs. No CER is held in the Trust Fund.

** Specifically, the administration of the Fund is assigned to the International Bank for Reconstruction and Development (IBRD), the principal organization of the World Bank.*

Source: UNFCCC.

Strategy and guidelines of the Adaptation Fund

Three strategic priorities for the Adaptation Fund were defined at the COP-14 in Poznań in late 2008:

- To assist developing countries that are Parties to the Kyoto Protocol and are particularly vulnerable to the adverse effects of climate change.
- To finance concrete projects and programs submitted by individual countries, based on the requirements, vision and priorities of eligible countries.

[25] List of Board members at the 1st meeting of the Board and alternates, http://www.adaptation-fund.org/images/AFB.B.5.Inf.3_Adaptation_Fund_Board_Members,_Alternates.pdf, website accessed 19 March 2009.

- To take into consideration, in its assessment of the projects and programs it finances, national sustainable development strategies, strategies to reduce poverty, National Communications, National Adaptation Programs of Action etc.

The strategic policies and guidelines of the Adaptation Fund were also adopted in Poznań. They are described in the Table 5.

Table 5 – Strategic policies and guidelines of the Adaptation Fund

Eligible Parties	Developing country Parties to the Kyoto Protocol that are **particularly vulnerable** to the adverse effects of climate change: low-lying and other small island countries, countries with low-lying coastal, arid and semi-arid areas, areas liable to floods, drought and desertification, developing countries with fragile mountainous ecosystems.
Call for projects	Eligible Parties can submit project proposals **directly** to the Board of the Adaptation Fund. Implementing and executing entities chosen by governments to implement the projects funded can approach the Board of the Adaptation Fund directly.
Levels of projects funded	Funding for projects and programmes will be available for projects and programmes at **national**, **regional** and **community** levels.
Criteria for evaluating projects	▪ **Consistency** with national sustainable development strategies, including national development plans, poverty reduction strategies, national communications and national adaptation programmes of action and other relevant instruments; ▪ Economic, social and environmental **benefits** from the projects; ▪ Meeting national technical **standards**, where applicable; ▪ **Cost-effectiveness** of projects and programmes; ▪ Arrangements for **management**, including for financial and risk management; ▪ Arrangements for **monitoring** and **evaluation** and impact assessments; ▪ **Avoiding duplication** with other funding sources for adaptation for the same project activity; ▪ Moving towards a **programmatic approach**, where appropriate.
Decision criteria for allocating resources among eligible Parties	▪ Level of **vulnerability**; ▪ Level of **urgency** and **risks arsing from delay**; ▪ Ensuring access to the fund in a **balanced** and **equitable** manner; ▪ Lessons learned in project and program design and implementation to be **captured**; ▪ Securing **regional co-benefits** to the extent possible, where applicable; ▪ **Maximising** multi-sectoral or cross-sectoral benefits; ▪ **Adaptive capacity** to the adverse effects of climate change.

Source: UNFCCC.

Currently, the Adaptation Fund has not yet received any project proposals. Nor has any specific procedure for submitting requests for financing been defined. Moreover, no Scientific Council has been established to evaluate the projects and the evaluation criteria have not been defined. The beginning of the operation of the Fund is planned for 2009. However, given the large number of decisions still to be taken, it is expected that the official launch will be delayed.

Projected resources of the Adaptation Fund

The Secretariat of the UNFCCC projects that the Adaptation Fund could have from USD 80 million to 300 million dollars annually between 2008 and 2012, depending on the number of CDM projects and the value of the CER allowances on the carbon markets. Taking into account the impact of the global economic crisis, the Mission Climat of Caisse des Dépôts estimates at 30 March 2009 that the Fund's resources could attain at most USD 312 million per year between 2008 and 2012 and at least USD 63 million[26].

The Fund's resources for the post-2012 period will depend on whether or not CDM projects are pursued and the level of demand on various carbon markets. If demand is weak, the UNFCCC estimates that resources may range from USD 100 million to 500 million annually between 2013 and 2030. If demand is strong, the UNFCCC estimates a range from USD 1 billion to 5 billion annually for the period 2013-2030.

Table 6 – Resources of the Adaptation Fund

	Created by	Types of projects	Contributions	Current level of funds (USD million)
Adaptation Fund (AF)	Kyoto Protocol in 2001 (COP-7)	Financing concrete adaptation projects and programmes	Financed with a share of proceeds from CDM projects activities + voluntary contributions	*72*** if monetization of CERs today (nearly 5.5 billion CERs) Estimates of UNFCCC : *- 80 to 300 per year during 2008-2012* *- 100 to 5 000 per year during 2013-2030* *(if the CDM process is maintained)* Estimates of Mission Climat of Caisse des Dépôts : *- 63 to 312 per year during 2008-2012* *- 125 to 1 560 per year during 2013-2030*

***estimate as of March 30, 2009, if allowances are valued at the price of CER of 10€.*
The number of CER's owned by the Adaptation Fund is available at the following URL: http://cdm.unfccc.int/Registry/Issuance/SOPByProjectsTable.html

Source: Mission Climat of Caisse des Dépôts, UNFCCC.

Limits on the long-term replenishment of resources

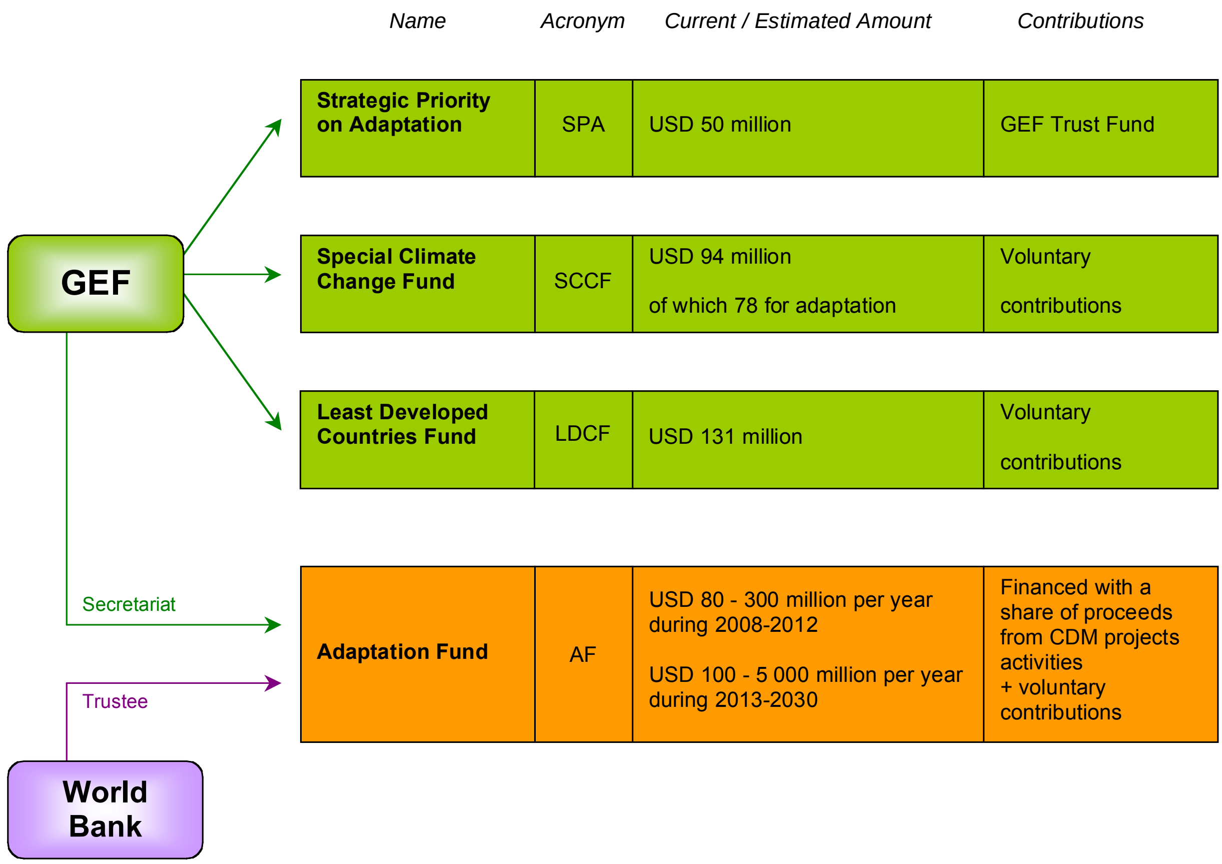
The Adaptation Fund is fed via Certified Emissions Reduction (CER) allowances. In this context, the existence of a post-2012 agreement takes on particular importance, because 2012 marks the end of the first compliance period of the international CO_2 market. Indeed, if there is no international agreement, the post-2012 supply of CER credits will develop little in the face of a limited demand in regional emission permits markets, such as the European trading CO2 quotas. In this case, the projections regarding future sources of financing of the Adaptation Fund would have to be revised significantly downward.

In addition, the monetization of CER allowances is currently linked to the trend of prices on the European carbon market, which is the largest market for CERs in the world today. However, the level of these prices has made changed significantly since the start of the market in 2005. It is important in this context to develop a management strategy to optimize cash resources available to the Fund. The World Bank has decided to simply store the appropriations, to sell at regular intervals and in small quantities so as not to disturb the market, and to limit the risks to price changes.

The Adaptation Fund should become the main international financial instrument to help developing countries adapt to climate change. Resources, estimated at several hundred million dollars annually to tens of billions of dollars annually, are much closer to the estimated needs, contrary to the resources of funds currently managed by the GEF (SCCF, LDCF, SPA). A summary chart of these funds under the UNFCCC is shown in Figure 7. However, the financial effort is still considerable. It will be necessary to find new solutions to increase these resources.

[26] For the period 2008-2012, the Mission Climat of Caisse des Dépôts estimates that between 240 and 480 million CER's will be sold per year at a price between 10 and 25 € per CER. For the period 2013-2030, it is estimated that between 480 and 2400 million CER's will be sold per year at a price between 10 and 25 € per CER.

Figure 7– Financial instruments for adaptation provided by the UNFCCC



Source : Mission Climat of Caisse des Dépôts.

IV. How can we increase the resources earmarked for adaptation?

A. Develop existing financing mechanisms

The Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF) discussed above depend on voluntary and unpredictable contributions. The objective of these funds is to respond to the specific requirements of individual regions or even countries rather than to adaptation requirements on a worldwide scale. The funds' resources are therefore tiny in comparison to the estimated needs of developing countries as a whole to adapt to climate change. The UNFCCC Conference of the Parties has only the authority to ask the developed countries to contribute to these funds. To keep these funds viable and well-provisioned, it could be envisaged to ask firm and legally binding commitments from developed countries.

The principal source of revenue for the Adaptation Fund is the 2% share of the CER allowances issued for each registered CDM project. This source of revenue could be increased by increasing this percentage, a proposal of developing countries that has been abandoned. A second option is to change market conditions to increase the price and / or volume of CERs. The international climate agreement post-2012 could provide an expansion of the level of use of these credits in return for more ambitious greenhouse gas reduction reduction targets for developed countries or emerging countries: the increase in demand for CERs, permitting an increase in their price, would be beneficial for the Adaptation Fund. Strengthening regional commitments (Regional Greenhouse Gas Initiative, EU ETS, etc.) may also have a positive impact on the Adaptation Fund.

At the COP-14 in Poznań, the developing countries reiterated their request for an expansion of the system of levy on carbon allowances to include other mechanisms such as the Joint Implementation (JI) mechanism or the international market of assigned amount units (AAUs). Such an expansion would involve significant "North-South" financial transfers.The developed countries are currently opposed to this idea and prefer a more general financing mechanism.

B. The World Bank Pilot Program for Climate Resilience (PPCR)

In July 2008, the World Bank created the Climate Investment Funds (CIF), which concerns both emissions reduction and adaptation. The objective of these funds is to promote energy efficiency and low-CO_2 emitting technologies, to test new approaches to increasing resilience to climate change in vulnerable countries and to promote investments in forests and the development of renewable energies.

These CIFs consist of two funds: the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF). As of January 23, 2009, of the USD 5.7 billion commited by industrialized countries[27] for the CIF, USD 1.6 billion (28%) will be allocated to the Strategic Climate Fund. One of the objectives of the SCF is to provide incentives for the implementation of emissions reduction and adaptation measures that complement other multilateral financing mechanisms and bilateral sources of financing, such as official development assistance. The SCF has three programs:

- the Pilot Program for Climate Resilience (PPCR) detailed below;
- the Forest Investment Program (FIP), under development, aimed at financing large-scale investments for implementation of policies and measures arising from the participatory planning process of REDD[28] at national level;
- the Program for Scaling up Renewable Energy in Low Income Countries, under development, aimed at driving programmatic interventions in some low-income countries to increase the use of renewable energy in order to support economic development and improve access to energy.

Figure 8 – The World Bank's Climate Investment Funds as of January 23, 2009

Climate Investment Funds (CIF) *USD 5,7 billion*	**Strategic Climate Fund (SCF)** *1,6 billion USD*	Pilot Program for Climate Resilience (PPCR) *208 million USD*	Forest Investment Program (FIP) *57 million USD*	Program for Scaling up Renewable Energy in Low Income Countries *70 million USD*	Unallocated *1,3 billion USD*
	Clean Technology Fund (CTF) *4,1 billion USD*				

Source: Mission Climat of Caisse des Dépôts.

Via this Strategic Climate Fund, the Pilot Program for Climate Resilience (PPCR) has been launched to assist in the adaptation to climate change in the form of grants or concessional loans[29]. Its resources were USD 208 million as of January 23, 2009. This is currently the largest international fund for adaptation in developing countries, but to-date, no project proposals have yet been submitted. The Pilot Program

[27] Australia, Canada, France, Germany, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, United States.

[28] REDD: Reduction Emission from Deforestation and forest Degradation. See Climate Report n°14 : http://www.caissedesdepots.fr/IMG/pdf_08-09_Research_report_n14_-_Deforestation_and_carbon_markets-2.pdf, website accessed 18 March 2009.

[29] A concessional loan is either a cancellation of part of debts, or a rescheduling of the debt over a longer period at an interest rate below the appropriate market rate.

aims to support projects launched at the initiative of the individual countries and based on the National Adaptation Programs of Action (NAPA) as well as on other pertinent studies, plans and national strategies.

The objectives of the Pilot Program are threefold:

- Provide financing for large-scale programs in eight highly vulnerable countries (Bangladesh, Bolivia, Cambodia, Mozambique, Nepal, Niger, Tajikistan, Zambia)[30] to assist them in modifying their national development planning so that they can take climate risk into consideration;
- Supplement the existing sources of financing for adaptation measures and support the Adaptation Fund;
- Provide crucial information on how to invest in programs to increase resilience to the effects of climate change with national planning consistent with the objectives of reducing poverty and promoting sustainable development.

The fundamental difference between the PPCR and the Adaptation Fund is the type of activities financed by each of these funds. The PPCR attempts to bring an integrated approach to climate change via development plans. The Adaptation Fund, on the other hand, seeks to finance concrete projects and programs. Nevertheless, there is some risk of duplication.

C. Proposed new mechanisms

Several countries have proposed new and innovative mechanisms to increase the financial resources devoted to adaptation in developing and/or developed countries. These financial instruments are listed in greater detail in Annex 4, but the most important ones are described below. It should be noted firstly that none of the following proposals include loans, concessional or not, or grants of the nature of official development assistance (ODA). These types of mechanisms are strongly criticized by developing countries. They consider that assistance for adaptation must be an additional financial effort and is a duty as a result of the significant role of developed countries in historical emissions of greenhouse gases and therefore in climate change.

Contributions by countries

Two proposals of Mexico and Switzerland aim to obtain new and additional income to ODA for the financing of adaptation to climate change. These payments would be dependent on the wealth and population of the countries concerned.

- Mexico has recommended the creation of a Multilateral Climate Change Fund (MCCF) which would finance climate programs. The Fund's resources would come from a national contribution by all countries based on their greenhouse gas emissions, their population and their ability to pay. The total annual income of this fund could reach tens of billions of dollars each year. The share of the fund that could be earmarked for adaptation in developing countries is estimated at between USD 0.2 billion and 1.9 billion dollars (Müller, 2008). In practice, developing countries would not contribute to the MCCF. Emerging countries should provide voluntary contributions to qualify for its revenue.
- According to the G77 and China, developed countries should provide at least 0.5% of their GDP to finance measures to help developing countries cope with climate change, and this, in addition to already existing ODA. This measure would produce annual revenues of USD 185 billion, USD 46 billion of which could go for adaptation (Müller, 2008), which is consistent with the estimated costs of adaptation in developing countries. Nevertheless, given that the majority of the developed countries have not yet come up with the UN-recommended contribution of 0.7% of their GDP for ODA, it appears unlikely that this proposal will be adopted.

[30] The need has been raised to constitute a group of experts to undertake further analysis to identify pilot countries of the Middle East and North Africa, and groups of countries to participate in regional programs in the Caribbean and South Pacific.

- Switzerland has put forward the idea of a world carbon tax based on the polluter-pays principle. The tax for each country would be USD 2 for each metric ton of CO_2 emitted with a quantitative per capita deductible of 1.5 metric tons of CO_2 equivalent. For example, the United States would pay USD 1.9/tCO_2, the European Union USD 1.8/tCO_2, China USD 1.5/tCO_2 and India USD 0.5/tCO_2. The revenue would be divided between a National Climate Change Fund (NCCF) and a Multilateral Adaptation Fund (MAF). The first fund, with USD 30.1 billion per year, would finance adaptation and emission reductions measures for all countries. The second fund, with USD 18.4 billion per year, would be earmarked for adaptation measures only in low-income countries (with a GDP below USD 20,000 per capita).

The adoption of these three proposals hardly seems possible given the current climate negotiations.

Levies on economic sectors

Levies on various revenues can supplement a fund for adaptation actions. Three proposals are presented below, for the transport sector. This sector is often put forward because of its significant contribution to emissions of greenhouse gases and its international character:

- Tuvalu has proposed a tax at differential rates, country by country, on international air and maritime transport which would raise almost USD 40 million annually (Müller, 2008) for adaptation measures.

- The International Maritime Organization recommends a tax on each metric ton of bunker fuel (5% of the current fuel price), which would allow a collection of USD 4 billion in 2012 and USD 8 billion in 2020 (Stochniol, 2008).

- An International Air Travel Adaptation Levy (IATAL) would collect between USD 8 and 10 billion per year. The principle is to charge USD 6 per passenger in economy class and USD 62 per passenger in business class, for 94% of airlines providing international flights.

The idea is that the levy is borne by people having a high carbon footprint[31] and who have the ability to pay. Ensuring proper calculation of the levy and its correct boundaries are fundamental to ensure the feasibility of this measure. In particular, if such a measure were adopted, it would be necessary to implement levies on both sea and air sectors to avoid distortion of competition between transport modes.

Using financial and carbon markets

Three proposals are based on present or future characteristics of existing carbon markets for financing of adaptation at the international level.

- One of the European Commission's proposals is the creation of a Global Climate Financing Mechanism (GCFM). This mechanism is intended to quickly raise funds from the financial sector by issuing a bond. Supplementing the mechanism would remain reasonable. For example, for a loan of USD 1 billion per year over five years (2010-2014) with an interest rate of 4%, annual repayments over 20 years starting from 2011 would reach 380 million euros. The guarantee of these resources and their repayment would be linked to future official development assistance and, where appropriate, the revenues generated by carbon markets, for example from the auction of allowances. The funds would be provided in the form of grants to help vulnerable countries adapt to climate change.

- The United States and the European Union have proposed using the revenues from the auction of emissions allowances in the framework of their carbon market. A portion of the revenue would be allocated to developing countries and another portion to the United States or to the member countries of the European Union, as appropriate. Estimated annual receipts would be several billion USD[32].

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[31] The carbon footprint of a business or organization is defined by the emission of greenhouse gases directly and indirectly induced by their activity. Direct emissions are the result of the activities controlled by the business or organization; indirect emissions result from all that is upstream (suppliers) and downstream (customers) of the business or organization.

[32] For the European market, 375 MtCO_2 should be auctioned over the period 2008-2012. Over 2013-2020, the amount auctioned will depend whether a satisfactory international agreement is reached: for the whole period, if no agreement is

- Norway suggests levying a part of the AAUs allocated to signatories of the Kyoto Protocol. The allowances set aside would then be sold at auction by an appropriate international institution to finance adaptation or other measures. The annual revenue could reach USD 14 billion[33] (Müller, 2008), which is close to the estimated funding needs for climate change adaptation in developing countries.

The first proposal is seen as an emergency measure, to get immediate funds to finance operations now[34]. Several questions arise regarding the application of such a mechanism: should we borrow for the quick implementation of adaptation measures when the criteria for acceptability of adaptation projects have yet to be defined? Doesn't the use of official development assistance for this loan go against the commitments of the UNFCCC to create new and innovative mechanisms, additional to ODA? How will development aid be ensured in the future with diminished financial resources?

Regarding proposals for the use of European and American carbon markets, the main obstacle that must be confronted is the unwillingness of countries to use the proceeds of the auction for a particular purpose. This is particularly true with European countries who do not wish to see the EU take over their right to dispose of as they see fit withdrawals from their national economies. This allocation of income, also known as "earmarking", would mean giving up a national right, with the risk that this could be extended to other areas.

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reached there will be a minimum of 6.36 $GtCO_2$, if agreement is reached there will be a minimum of 6.32 $GtCO_2$ (Source: Mission Climat of Caisse des Dépôts, according to the Climate Energy Package).

[33] The detailed calculation is as follows:

- Goal to reduce emissions of greenhouse gases of Annex 1 countries in the Kyoto Protocol: 5.2% compared to 1990 emissions.
- Average annual emissions of Annex 1 countries over 2008-2012 in accordance with the Kyoto commitment: 17.2 GtCO2.
- If the share of emissions auctioned is 2%, then 17.2 $GtCO_2$ x 2 = 344 $MtCO_2$ are auctioned annually. For a price of USD 40/t, the auction would generate annually 344 x 40 = USD 13.7 billion.

[34] This mechanism is based on the International Financing Facility (IFF) proposed by the British government in 2003 and implemented in 2005 to provide resources to the campaign of the Global Alliance for Vaccines and Immunization (GAVI) to quickly develop vaccines to children around the world.

CONCLUSION

Adaptation to climate change was mentioned early on in the official UNFCCC documents concerning climate change, but it did not become a core issue in international negotiations until rather late. The 2006 and 2007 estimates of annual adaptation costs concur on a figure of some tens of billions of dollars in additional investment to be spent in developing countries. The latest IPCC report emphasises the urgent need to prepare for the foreseeable effects of climate change. All this has brought the struggle against climate change back into the limelight.

The United Nations Framework Convention on Climate Change has already set up funds to finance adaptation measures in developing countries, which are the ones most affected by short-term climate change. These funds are managed by the Global Environment Facility, the financial arm of the UNFCCC. At present, however, the resources come from voluntary contributions and are woefully inadequate to meet estimated needs. The Adaptation Fund is the most significant both in terms of its financing method – a percentage on carbon credits generated by the CDM – and the amount it is likely to generate; it is expected to be operating more smoothly by the end of 2009. Nevertheless, the continuity of its resources will depend to a great extent on the evolution of carbon markets.

Financing adaptation measures on an international scale will therefore remain a highly topical issue, despite the recent development of new systems. The needs are still enormous. Adaptation to climate change and its financing will thus be the major stakes at the next Conference of the Parties to the UNFCCC in Copenhagen in December 2009. No doubt they will be included in the negotiations over mitigation mechanisms and objectives, allowing global consideration of the countries of the South.

GLOSSARY

Acronym	Wording
ADB	Asian Development Bank
AF	Adaptation Fund
AFDB	African Development Bank
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
COP	Conference of the Parties, supreme body of the UNFCCC
EBRD	European Bank for Reconstruction and Development
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
GEF	Global Environment Facility
GFCF	Gross Fixed Capital Formation
IADB	Inter-American Development Bank
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
LDCF	Least Developed Countries Fund
NAPA	National Adaptation Programmes of Action
ODA	Official Development Assistance
PPCR	Pilot Program for Climate Resilience
SCCF	Special Climate Change Fund
SCF	Strategic Climate Fund
SPA	Strategic Priority on Adaptation
UNDP	United Nations Development Programme
UNEP	United Nations Environement Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization

ANNEX 1. PROJECTS FINANCED BY STRATEGIC PRIORITY ON ADAPTATION (SPA)

Country/Region	Project Title	Agency	GEF funding (USD million)	Co-financing (USD million)	Total financing (USD million)
Albania	Identification and Implementation of Adaptation Response Measures in the Drini-Mati River Deltas	UNDP	1.1	1.0	**2.1**
Armenia	Adaptation to Climate Change Impacts in the Mountain Forest Ecosystems of Armenia	UNDP	1.0	0.9	**1.9**
Colombia	Integrated National Adaptation Plan: High Moutain Ecosystems. Colombia's Caribbean insular Areas and Human Health	World Bank	6.2	9.5	**15.7**
Global	Adaptation Learning Mechanism: Learning By Doing	UNDP	0.8	0.6	**1.4**
Global (Bangladesh. Bolivia. Niger. Samoa. Guatemala. Jamaica. Kazakhstan. Morocco. Namibia. Vietnam)	Community Based Adaptation Programme	UNDP	5.5	4.5	**10.0**
Hungary	Lake Balaton Integrated Vulnerability Assessment. Early Warning and Adaptation Strategies	UNDP	1.1	3.1	**4.2**
India	Sustainable Land and Ecosystem Management Partnership Program	World Bank	4.4	0	**4.4**
Kiribati	Kiribati Adaptation Program - Pilot Implementation Phase	World Bank	2.1	4.8	**6.9**
Mozambique	Zambezi Valley Market Led Smallholder Development	World Bank	1.7	21.2	**22.9**
Namibia	Adapting to Climate Change through the Improvement of Traditional Crops and Livestock Farming	UNDP	1.1	5.8	**6.9**
Regional (Senegal. Gambia. Guinea-Bissau. Mauritania. Cape Verde)	Adaptation to Climate Change - Responding to Coastline Change and its Human Dimensions in West Africa through Integrated Coastal Area Management	UNDP	4.4	9.7	**14.1**
Regional (Dominica. St. Lucia. St. Vincent and Grenadines)	Implementation of Pilot Adaptation Measures in Coastal Areas of Dominica. St. Lucia and St. Vincent & the Grenadines	World Bank	2.6	3.4	**6.0**
Regional (Argentina. Bolivia. Brazil. Paraguay. Uruguay)	Sustainable Management of the Water Resources of the "la Plata Basin" with Respect to the Effects of Climate Variability and Change	UNEP	1.1	51.9	**53.0**
Regional (Kenya. Madagascar. Mozambique. Rwanda. Tanzania)	Integrating Vulnerability and Adaptation to Climate Change into Sustainable Development Policy Planning and Implementation in Southern and Eastern Africa	UNEP	1.1	1.3	**2.4**
Regional (Bolivia. Brazil. Colombia. Ecuador. Guyana. Peru. Suriname. Venezuela)	Integrated and Sustainable Management of Transboundary Water Resources in the Amazon River	UNEP	2.2	43.8	**50.8**
Regional (Papua New Guinea. Solomon Islands. Palau. Federated States of Micronesia. Fiji. Timor Leste. Vanuatu)	Coastal and Marine Resources Management in the Coral Triangle of the Pacific	ADB	2.0	15.2	**17.2**
Regional (Indonesia. Malaysia. Philippines)	Coastal and Marine Resources Management in the Coral Triangle: Southeast Asia	ADB	2.0	76.0	**78.0**
Sri Lanka	Participatory Coastal Zone Restoration and Sustainable Management in the Eastern Province of Post-Tsunami Sri Lanka	IFAD	2.1	7.6	**9.7**
Tajikistan	Sustaining Agricultural Biodiversity in the Face of Climate Change	UNDP	1.1	4.0	**5.1**
Tunisia	Land and Water Optimization Project	World Bank	0.7	75.7	**76.4**
Uruguay	Implementing Pilot Climate Change Adaptation Measures in Coastal Areas of Uruguay	UNDP	1.1	2.9	**4.0**
Yemen	Adaptation to Climate Change Using Agrobiodiversity Resources in the Rain Fed Highlands of Yemen	World Bank	4.6	4.1	**8.7**
TOTAL			**50.0**		

As of November 13, 2008.

Source: Mission Climat of Caisse des Dépôts, based on data from the GEF.

ANNEX 2. PROJECTS FINANCED BY SPECIAL CLIMATE CHANGE FUND (SCCF)

Country/Region	Project Title	Agency	Expected SCCF Grant (USD million)	Co-financing (USD million)	Total Financing (USD million)
China	Mainstreaming Adaptation to Climate Change Into Water Resources Management and Rural Development	World Bank	5.8	50	**55.8**
Ecuador	Adaptation to Climate Change through Effective Water Governance	UNDP	3.7	6	**9.7**
Egypt	Adaptation to Climate Change in the Nile Delta	UNDP	4.5	5.2	**9.7**
Ethiopia	Coping with Drought and Climate Change	UNDP	1.1	1.9	**3.0**
Guyana	Conservancy Adaptation Project	World Bank	4.1	46.2	**20.3**
Kenya	Adaptation to Climate Change in Arid Lands	World Bank/ UNDP	7.4	44.8	**52.2**
Mexico	Adaptation to Climate Change Impacts on the Coastal Wetlands in the Gulf of Mexico through Improved Water Resource Management	World Bank	5.3	21	**26.3**
Mongolia	Mongolia Livestock Sector Adaptation Project	IFAD	1.8	3.6	**5.4**
Mozambique	Coping with Drought and Climate Change	UNDP	1.0	0.9	**1.9**
Philippines	Climate Change Adaptation Project	World Bank	5.8	25.4	**31.2**
Regional (Bolivia. Peru. Venezuela)	Design and Implementation of Pilot Climate Change Adaptation Measures in the Andean Region	World Bank	8.9	21.7	**30.6**
Regional (Cook Islands. Micronesia. Fiji. Nauru. Papua New Guinea. Samoa. Salomon Islands. Tonga. Tuvalu. Vanuatu)	Pacific Islands Adaptation to Climate Change Projects	UNDP	14.8	39.0	**53.8**
Tanzania	Mainstreaming Climate Change in Integrated Water Resources Management in Pangani River Basin	UNDP	1.1	1.6	**2.7**
Zimbabwe	Coping with Drought and Climate Change	UNDP	1.1	1.1	**2.2**
TOTAL			**67.5**	**241.1**	**308.6**

Projects approved as of February 3, 2009.

Source: Mission Climat of Caisse des Dépôts, based on data from the GEF

ANNEX 3. PROJECTS FINANCED BY LEAST DEVELOPED COUNTRIES FUND (LDCF)

Country/Region	Project Title	Agency	Expected LDCF Grant (USD million)	Co-financing (USD million)	Total financing (USD million)
Bangladesh	Community based adaptation to climate change through coastal afforestation	UNDP	3.4	6.1	**9.5**
Bhutan	Reduce climate change-induced risks and vulnerabilities from glacial lake outbursts in the Punakha-Wangdi and Chamkhar-Valleys	UNDP	3.6	3.5	**7.1**
Burkina Faso	Strengthening Adaptation Capacities and Reducing the Vulnerability to Climate Change in Burkina Faso	UNDP	3.0	6.3	**9.3**
Cape Verde	Building Adaptive Capacity and Resilience to Climate Change in the Water Sector in Cape Verde	UNDP	3.1	13.7	**16.8**
Congo DR	Building the Capacity of the Agriculture Sector in DR Congo to Plan for and Respond to the Additional Threats Posed by Climate Change on Food Production	UNDP	3.1	4.0	**7.1**
Djibouti	Reducing Impacts and Vulnerability of Coastal Productive Systems in Djibouti	UNEP	2.1	1.9	**4.0**
Eritrea	Integrating climate change risks into community based livestock management in the northwestern lowlands of Eritrea	UNDP	3.1	3.5	**6.6**
Malawi	Climate Adaptation for Rural Livelihoods and Agriculture	AfDB	3.3	24.5	**27.8**
Sierra Leone	Integrating Adaptation to Climate Change into Agricultural Production and Food Security in Sierra Leone	IFAD	2.6	2.8	**5.4**
Sudan	Implementing NAPA Priority Interventions to Build Resilience in the Agriculture and Water Sectors to the Adverse Impacts of Climate Change	UNDP	3.1	3.0	**6.1**
Tuvalu	Increasing Resilience of Coastal Areas and Community Settlements to Climate Change	UNDP	3.1	3.1	**6.2**
Zambia	Adaptation to the effects of drought and climate change in Agro-ecological Zone 1 and 2 in Zambia	UNDP	3.6	7.0	**10.6**
TOTAL			**37.1**	**79.4**	**116.5**

Projects approved as of February 3, 2009.
Implementation projects NAPAs are not included in this table.

Source: Mission Climat of Caisse des Dépôts, based on data from the GEF

ANNEX 4. PROPOSED NEW MECHANISMS FOR FINANCING ADAPTATION MEASURES

	China	Mexico	United States of America	European Union
Mechanism	-	Multilateral Climate Change Fund (MCCF)	Fund for international adaptation to climate change and national security	-
Aim	Supporting action by developing countries to fight against climate change	Increasing efforts of mitigation at the global level	Protecting national and economic security of the United States to address to the impacts of climate change. In developing countries the most vulnerable, reducing vulnerability and promoting the ability to cope with the impacts of climate change.	Mitigation, Adaptation, Financing commitments for the EU in 2020, Carbon Capture and Storage Research and development.
Contribution	At least 0,5 % of GDP	National contributions in terms of emissions of greenhouse gases, population and ability to pay	Progressive levy on the auction of emission permits trading scheme U.S. emissions. 1% in 2012 to 7% in 2050.	Use of auction revenues of the EU-ETS in 2013-2020. 50% for the EU member states 50% for an international fund for developing countries, half of which for Adaptation
Funders	Developed countries	Developed countries and few developing countries	U.S. industrial installations subject to the U.S. system of emissions trading	Industrial installations subject to the EU-ETS
Beneficiaries	Developing countries	Developing countries	United States of America + Developing countries	Member States of the European Union + Developing countries
Governance	-	Structure with all the funders, representative of the various beneficiaries	U.S. Treasury Fund + International Funds in accordance with the UNFCCC or with an agreement negotiated under the UNFCCC	European Union + new international fund
Estimated total annual revenue	USD 185 billion	USD 95 billion *(in 2030, CCNUCC 2007)*	USD 1 billion in 2012 USD 2 billion in 2020 USD 6 billion in 2030 Nearly 60% of the revenue would go to international funds. *(Waskow 2008)*	EUR 24 - 67 billion *(Mission Climat - Caisse des Dépôts according to data from the European Commission)*
Estimated total annual revenue for Adaptation	USD 46 billions *(Müller 2008)*	USD 0,2 - 1,9 billion *(in 2030, Müller 2008)*	USD 1 billion in 2012 USD 2 billion in 2020 USD 6 billion in 2030 Nearly 60% of the revenue would go to international funds. *(Waskow 2008)*	For the states of EU : ? For developing countries : EUR 6 - 17 billion *(Mission Climat - Caisse des Dépôts according to data from the European Commission)*
Additional information	In addition to existing ODA	Developing countries that do not contribute to the Fund are not subject to penalties but will not be beneficiaries. The revenue for adaptation is intended to the Adaptation Fund of Kyoto Protocol	This Fund would finance the Program for international adaptation to climate change and national security from 2012 to 2050.	-

Source: Mission Climat of Caisse des Dépôts, based on Müller 2008.

	Switzerland	**Norway**	**Tuvalu**	**International Maritime Organization (IMO)**
Mechanism	Global Carbon Tax for Adaptation	-	"Burden Sharing" Mechanism	International Maritime Emission Reduction Scheme (IMERS)
Aim	Financing adaptation measures according to the polluter - pays	Financing adaptation measures or other purposes such as technological development	Providing innovative financing to funds managed by the Global Environment Facility: FSCC and LDCF	Mitigating emissions of greenhouse gases in the maritime sector and financing adaptation in developing countries
Contribution	Fee of $ 2 / tonne of CO2 emitted with an excess of 1.5 teqCO_2 per capita	At the international level, retaining a small portion of the national allocations of emission allowances and auctioning them by an appropriated international institution	Differential contribution across countries on the international aviation and maritime transport	Levy on tonnes of marine fuel (5% of the real price of fuel)
Funders	All emitters in excess of 1.5 teqCO_2 per capita	Countries subject to international market for carbon credits	Buyers of fuel for air and sea operating in countries Annex II of the UNFCCC + Non-Annex I countries except the least developed and small island states	All vessels > 400 gross gigatonnes
Beneficiaries	Distribution of income in National climate change fund (NCCF) for each state and participating in a Multilateral Adaptation Fund (MAF) intended for countries with income <20 000 USD / capita.	Developing countries	Developing countries	Developing countries
Governance	NCCF : by the state concerned MAF : functions undertaken by the Adaptation Fund of the Kyoto Protocol (AF) until a significant number of countries involved, then new international institution complementary to AF	AAU credits could be pooled in an account and be monetized by the Adaptation Fund	SCCF and LDCF	**International Maritime Organization** (IMO) Revenue for adaptation are paid to the Adaptation Fund and the LDCF, managed by the Global Environment Facility
Estimated total annual revenue	USD 48.5 billion	USD 14 billion *(Müller 2008)*	USD 39.6 million *(Müller 2008)*	USD 4 billion in 2012 USD 8 billion in 2020 *(Stochniol 2008)*
Estimated total annual revenue for Adaptation	USD 18.4 billion for MAF USD 30.1 billion for all NCCF (adaptation and mitigation) *(Schwank 2008)*	USD 14 billion *(Müller 2008)*	USD 39.6 million *(Müller 2008)*	USD 4 billion with 30% for the Least Developed Countries in 2012 USD 8 billion with 30% for the Least Developed Countries in 2020 *(Stochniol 2008)*
Additional information	-	-	Levy of 0.01% on airline tickets and international ocean freight for the countries of Annex II and 0.001% for non-Annex I.	-

Source: Mission Climat of Caisse des Dépôts, from Müller 2008.

REFERENCES

- Agrawala and Fankhauser (2008), *Economic Aspects of Adaptation to Climate Change: costs, Benefits and Policy Instruments*, Organisation for Economic Cooperation and Development.
- Gagnon-Lebrun and Agrawala (2007), *Implementing adaptation in developed countries: an analysis of progress and trends*, Climate Policy 7 (2007) 392–408.
- Haites (2008), *Negociations on Additional Investment and Financial Flows to Address Climate Change in Developing Countries*, United Nations Development Programme.
- IMO (2007), *Prevention Of Air Pollution From Ships: A global levy on marine bunkers, primarily to be applied for the acquisition of CO2 emission quotas through the purchase of CO2 credits*, Submitted by Denmark, Marine Environment Protection Committee 57th session, MEPC 57/4/4.
- J.T. Klein and Persson (2008), *Financing adaptation to climate change: issues and priorities*, European Climate Platform.
- Lisa, Schipper, Paz Cigaran and McKenzie Hedger (2008), *Adaptation to climate change: the new challenge for development in the developing world*, UNDP.
- McGray, Hammill & Bradley (2007), *Weathering the Storm: Options for Framing Adaptation and Development*, World Resources Institute.
- Möhner and J.T. Klein (2007), *The Global Environment Facility: Funding for Adaptation or Adapting to Funds?*, Stockholm Environment Institute.
- Müller (2008), *International adaptation finance: the need for an innovative and strategic approach*, Oxford Institute for Energy Studies.
- Porter, Bird, Kaur and Peskett (2008), *New Finance for Climate Change and the Environment*, WWF Macroeconomics Program Office and Heinrich Böll Foundation.
- Schwartz (2005), *Full flood safety in New Orleans could take billions and decades*, The New-York Times, available at: http://www.nytimes.com/2005/11/29/national/nationalspecial/29flood.html, website accessed 18 March 2009.
- South Centre (2009), *Developed country climate financing initiatives weaken the UNFCCC*, South Centre's Global Governance Programme for Development.
- United Nations Framework Convention on Climate Change (2007), *Investment and Financial Flows to address Climate Change*, United Nations Framework Convention on Climate Change, available at: http://www.un.org/ga/president/62/ThematicDebates/gpicc/iffacc.pdf, website accessed 18 March 2009.
- US Senate (2008), *Lieberman-Warner Climate Security Act of 2008* (Boxer-Lieberman-Warne Substitute to the Lieberman-Warner Climate Security Act, S. 2191)
- World Bank (2006), *Clean Energy and Development: Towards an Investment Framework*, World Bank, available at: http://siteresources.worldbank.org/DEVCOMMINT/Documentation/20890696/DC2006-0002(E)-CleanEnergy.pdf, website accessed 18 March 2009.

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