

## **Leveraging Investments for Coal Mine Methane Mitigation with Climate Change Funds**

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### **Abstract**

Global attention is increasingly focused on ways to mitigate and avoid the release of the greenhouse gases that foster climate change. With a recently revised (IPCC 2001) global warming potential 23 times that of carbon dioxide when measured over a 100-year period, methane (CH<sub>4</sub>) is one of the principle greenhouse gases (GHGs) responsible for climate change. Methane is unique among GHGs in that it can be captured and used in energy production that is environmentally preferable to its release to atmosphere. Coal mine methane (CMM) can be captured and used for power at mines throughout the world, providing the dual benefits of GHG reductions and energy provision. Recovery of CMM and other GHG reduction or mitigation projects can have multiple environmental and social benefits, but in the near term they face barriers that can hinder implementation, principal among which is financing. In recognition of this fact, international conventions have established systems that encourage preferential funding, which in turn have fostered the growth of markets for projects that reduce or mitigate GHGs. This paper will identify and discuss some of the methods and sources of financing for alternative energy projects that mitigate or reduce climate change.

### **I. Overview of the Global Carbon Market**

The financial mechanisms established under the United Nations Framework Convention on Climate Change (UNFCCC) offer important means for implementing GHG-mitigating projects. The UNFCCC has, at its core, the key principle of stabilizing GHG emissions to prevent climate change while encouraging sustainable and equitable global development. The Global Environment Facility (GEF) serves as the primary financial mechanism of the UNFCCC. The GEF allows for the transfer of public sector funds from developed countries to developing countries (DCs) and economies in transition (EITs) to meet the requirements of the UNFCCC, mitigate GHGs, and adapt to climate change. Those countries involved in the Kyoto Protocol (KP) will be able to use its flexibility mechanisms as a means of enhancing GHG mitigation project revenues thus supporting project implementation. The two project-based flexibility mechanisms established by the KP are the Clean Development Mechanism (CDM) and Joint Implementation (JI). The CDM and JI allow for the transfer of both public and private funds and technologies from developed countries to DCs and EITs for the mitigation of GHGs. In return, the emission

reduction credits can be transferred to developed countries to allow these countries to offset their domestic GHG emissions. To date, numerous carbon funds have been established, with investments repaid in carbon credits. These credits can then be used to meet future commitments or sold on the emerging carbon markets.

Since the KP carbon trading mechanisms were first conceptualized in 1997, 200 million metric tons (MMT) of carbon (valued at around US\$500 million) have been traded with recent prices on the open market reported as high as US\$14.00 per tonne, and expectations are that annual carbon trading will grow to over 65 million tonnes this year (CNN, 2002). In addition, many funds have been established that are tied to sustainable energy outside of the carbon market.

There are two broad classes of funds seeking climate change benefits:

***Carbon-Based Finance***—Discussed in Section IV below, this class of funding can provide significant advantages for projects that seek market-based sources of finance tied to a stream of emission reductions (ERs) or energy supply. Within the carbon market there are two types of projects that are emerging: 1) those that are modeled after the KP project-based mechanisms, and 2) those that are based on voluntary or region-specific carbon trading. A project proponent seeking to use the KP mechanisms may face more stringent requirements than those seeking other sources of carbon finance; however, the payoff can be higher by US\$1-3 per MT of CO<sub>2</sub>e.

Project proponents seeking to capture the added benefits of the KP-related project-based mechanisms will be required to secure the services of a third-party company, or operational entity, in order to first validate their project (including its assumed baseline and proposed monitoring plan) and subsequently to verify and get certified the resultant emission reduction credits. The CDM project cycle and entities involved in securing certified emission reductions (CERs) are shown in Figure 1.

***Other Environmental Funds***—The second class of funding, discussed in Section V of this paper, includes sources of assistance-based finance for energy and environmental projects that reduce the potential for negative environmental impacts such as those related to climate change. These funds are managed by various development agencies and multi-laterals, and may also be linked to international social or environmental treaties.

## **II. The CDM Project Cycle and Financial Requirements**

The key aspect of the CDM procedures and modalities established to date are outlined in Figure 1. The CDM project cycle involves stringent requirements of due diligence and third party verification and certification of ERs. Of paramount importance are issues of the “additionality” of the proposed project with reference to an “expected baseline”, ER quantification, possibilities of leakage, and the subsequent validity and quality of the ERs that are accrued. The requirements to

meet project cycle needs can be onerous, but should not be so high as to restrict investments and project development. This is one reason, among others, that many investors seek early market experience in the CDM. In addition, streamlined procedures are being developed for small-scale projects so that they can avoid the magnitude of transaction costs that is typical of larger projects and thereby increase their likelihood of economic viability.

Project costs associated with meeting the CDM requirements are estimated to range up to US\$250,000 through project implementation, to US\$650,000 by project completion (PCF, 2002). For smaller projects this expense can be prohibitive and could inhibit development and implementation. Thus the CDM Executive Board has established streamlined requirements for small-scale projects. Small-scale projects in this context are renewable energy projects with maximum output of up to 15 MW, energy efficiency projects that reduce energy consumption by up to 15 GWh per year, or other projects that reduce anthropogenic emissions and directly emit less than 15 kilotonnes of CO<sub>2</sub>e per year (UNFCCC 2003). Though most CMM projects can be expected to exceed these 15/15 parameters, smaller CMM projects may qualify for the streamlined procedures.

Regardless of the source of carbon funding, a project proponent may benefit from the experience and assistance of a carbon-project development firm and a carbon-brokerage firm. These services can provide the advantages of resolving the complexities of defining baselines, establishing additionality, and estimating project emission reductions, developing a monitoring and reporting protocol, finding and meeting the requirements of a buyer, structuring an emissions reduction sale, and arriving at an equitable price for the resulting emission reductions.

### **III. Characteristics of Coal Mine Methane Projects**

CMM projects can be classed according to the concentration of CH<sub>4</sub> in the gas recovered, the volume that can be recovered, and the technology employed to convert the methane to energy.

***High Concentration Gas***—The highest concentration coal mine methane originates from pre-mining degasification (gas drainage) activities. In nations with gassy coal mines, there is generally a safety-based requirement to reduce the concentration of this gas in the coal mine air, which can be accomplished through degasification and/or ventilation. Often drained gas is of high enough quality to be injected into a natural gas pipeline or otherwise used profitably, and thus a drained gas project may not necessarily need additional carbon-based funding.

***Medium Concentration Gas***—CMM from gob areas (gob gas) can have concentrations in the range of 20-80 percent methane. Depending upon the technologies used, the location, and the gas concentration, projects utilizing this type of gas may need carbon-finance options to become financially viable.

**Low Concentration Gas**—Ventilation air methane (VAM) generally has very low concentrations of CH<sub>4</sub>, typically less than 1 percent, but accounts for the majority of coal mine emissions by volume (USEPA 2003). Due to the low gas concentrations, these emissions are difficult to use and more expensive to capture and convert to energy. However, due to the high volumes of methane released, the environmental benefits of capturing this gas are significant.

In many countries the proportion of high-concentration gas captured is lower than it is in the US, so a greater potential may exist in those countries for projects capturing and utilizing higher-quality gas. The capture and use of high-concentration gas thus represents a near-term opportunity for those countries, serving the dual benefits of CH<sub>4</sub> mitigation and added mine safety.

#### **IV. Carbon-Based Financing**

In some cases where the cost of recovering CMM exceed the financial benefits associated with its direct use, revenues potentially available from the sale of carbon emission reduction credits may improve a project's return on investment to the point where it becomes attractive to investors. Carbon fund investments vary in form and structure, with the majority concentrated in either (1) financing based on the project carbon ER flows, or (2) in more traditional equity-based financing. The types of financing typically available are described as follows.

**Equity-Based Carbon Project Financing**—With current financial market conditions, funds taking equity positions typically look for projects that offer competitive returns before the carbon component is taken into account. Funds may provide full or partial equity depending upon the type of technology involved, the relative size of the capital investments, or the nature of the cash flow. The negotiated financial agreement would include details on the ownership of the resultant ERs, and may stipulate additional financial returns. The level of investor involvement is proportional to the amount of equity and the perceived project risks. These sources would be good for high-concentration CMM projects and some medium-concentration projects that likely will have significant energy revenues.

**ER-Based Carbon Project Financing**—Carbon project financing can be based strictly on the flow of expected ERs. Payments in exchange for the ERs may take different forms based upon timing of the investment, with the ER value adjusted accordingly, as discussed below.

**Capital Financing**—The investor may provide up-front financing for a portion of the incremental cost of reducing carbon emissions. This financing may be based on capital flows to increase the internal rate of return on equity over the investment threshold, or may be based in programs for product marketing and training that can remove market barriers. This type of financing is ideal for projects where the incremental costs of producing the ERs can be readily identified. Investments of this

type usually contribute from 2-10 percent of the total project cost in return for ownership of the ERs as they are accrued (PIAD 2002).

**Loans**—Investors may provide full or partial project funding in return for the ERs over time. This type of financing is appropriate for projects that are small, that face capital acquisition barriers, or that are otherwise financially disadvantaged. This could be applicable for more remote CMM projects that result in local rural energy benefits, or CMM projects in countries that may need educational or training programs for technical and governmental awareness. Loans are used principally by the carbon investment funds managed by the multilateral development banks.

**Purchase Agreement**—A carbon purchase agreement (CPA) is modeled after a power purchase agreement (PPA), whereby the purchaser of the ERs agrees to pay the project proponent for the credits as they accrue, are certified (if necessary), and are delivered over time. Such an agreement is generally secured prior to project implementation and may be used to leverage additional project funding. The pricing structure may be fixed or varied over time according to escalation rates or commitment periods. Additional models include carbon futures or options whereby an investor secures the right to purchase future ERs at a competitive rate in exchange for a negotiated up-front investment. These structures are the common trading mechanism used by carbon brokers (such as CO2e.com and Natsource) and within carbon exchange boards (such as the Chicago Climate Exchange).

The World Bank, the Asian Development Bank, the International Finance Corporation, the Danish Government, the Dutch Government, and others are spearheading carbon funds based on the KP mechanisms. Both funds have offered carbon prices higher than what has been offered by other investors. Typical prices for transboundary trades in CO<sub>2</sub>e average around US\$2.00 per MT, while the World Bank upper end price is slightly over US\$4.00 (for projects that offer little or no risk to the Bank (Sinha, 2003)) and the Dutch prices are reported as high as US\$8.00 per MT (Lecocq and Capoor, 2002). These funds are highlighted as follows; Table 1 outlines these and other such funds.

**The Prototype Carbon Fund (PCF)**—<http://www.prototypecarbonfund.org>—includes contributors from six governments and 17 companies, with US\$180 million in contributions (Nichols, 2002). The PCF has already placed over US\$90 million in CDM and JI projects.

**The Community Development Carbon Fund (CDCF)**—<http://www.communitycarbonfund.org>—will finance small-scale carbon reduction projects that provide significant and measurable community development benefits in developing countries. The fund currently is being established.

**IFC-Netherlands Carbon Facility (INCaF)—**

<http://www.ifc.org/enviro/EMG/CarbonFinance/carbonfinance.htm>—The Dutch have allocated US\$40 million over the next three years, which will be used by the International Finance Corporation (IFC) to purchase ERs.

**CERUPT/ERUPT—**<http://www.caboncredits.nl>—The Dutch Government will purchase 100 MMT of CO<sub>2</sub>e from international KP qualifying projects. The first JI tender resulted in the acquisition of 3.2 MMT of CO<sub>2</sub>e for a total investment of US\$26 million. The second JI tender and first CDM tender will result, respectively, in an additional 5.3 and 32 MMT of CO<sub>2</sub>e at around US\$4.75/MT.

## **V. Other Environmental Funds**

In seeking other (non-carbon-based) environmental funding, distinctions such as the sustainability of the energy source and the resulting socio-environmental benefits can play an important role in determining the eligibility of the project for funding. Due to the fact that CMM is drawn from a fossil source it does not strictly qualify as renewable energy. However, CMM is generally considered an alternative energy source, may be considered a sustainable practice, and certainly represents an efficiency improvement in energy resource utilization. Because different agencies and organizations may define “sustainable” differently, their ability to provide finance for CMM-based projects may vary.

There are a number of multilateral, bilateral and private sector programs that will help support projects in sustainable development through equity, debt, or grant financing. Generally, these funds seek projects that utilize sustainable technologies, have low relative environmental impacts, and contribute socio-economic benefits. A full list of sources is available in the USEPA’s “Catalog of Coal Mine Methane Project Finance Sources” (USEPA 2001). A few key sources are described below.

**Regional Development Banks (RDBs)**—Banks such as the Asian Development Bank (ADB) and Inter-American Development Bank (IDB) primarily provide debt financing, and may also provide minority equity financing.

**International and Bilateral Development Agencies**—Agencies such as the United Nations Development Program (UNDP), the Danish Development Assistance Agency (DANIDA), and other country agencies can and do provide grant assistance for sustainable energy projects. Thus, these agencies can support capacity building for CDM but they cannot support any project development or investments with grant funds that would result in CDM credits. It is important to note that the KP stipulates that the CDM is prohibited from getting overseas development assistance or grant support from donors. Thus, these agencies can support capacity building for CDM but they cannot

support any project development or investments with grant funds that would result in CDM credits. The US Trade and Development Agency (TDA) and the Export-Import Bank (Ex-Im Bank) may finance studies or projects where US technologies or companies are involved.

**Foundations**—A number of philanthropic agencies such as the Ford Foundation and the Rockefeller Foundation have, on occasion, provided grant funds for projects that have demonstrated environmental and social benefits.

**National And Local Agencies**—Many countries provide support for sustainable energy projects through subsidies, incentives, preferential tariffs, or by establishing regional requirement or trading systems.

Key United Nations and World Bank programs are summarized below. Table 2 provides a short list of additional multi-lateral sources of funding and carbon brokerage firms.

**The United Nations Development Program (UNDP) Thematic Trust Fund (TTF) on Energy for Sustainable Development**—<http://www.undp.org/trustfunds>—focuses on utilizing sustainable energy as a means of reducing poverty.

**The United Nations Foundation (UNF)**—<http://www.unfoundation.org>—In the climate change area, the Foundation assists in the implementation of relevant agendas that result from the continued work of the UNFCCC, supporting activities on the use of market mechanisms and sustainable energy technologies. Only United Nations agencies can apply for support directly to the Foundation. Further, UNF encourages collaboration between two or more agencies of the United Nations when applying for support.

**Global Environment Facility (GEF)**—<http://www.undp.org/gef>—The Global Environment Facility (GEF) is a financial mechanism of international environmental agreements including the UNFCCC. The three implementing agencies of the GEF are the United Nations Development Program (UNDP), the United Nations Environment Program (UNEP), and the World Bank. GEF resources are used to support the incremental cost, relative to the cost of the baseline project, of environmentally beneficial projects. The GEF provides grants and concessional financing for project development activities, enabling activities, and full projects. Projects supported by the GEF must be country driven and based on national development priorities.

**GEF CMM in China (GEF (ND))**—The GEF sponsored a particularly successful CMM project in China. The US\$10 million project ran from 1991 to 1997. The results of this project have fostered additional work through the ADB, and currently the China Coalbed Methane Clearinghouse is assessing options for an additional World Bank/GEF project.

**Energy Sector Management Assistance Program (ESMAP)**—<http://www.esmap.org>—is a global technical assistance program sponsored by the World Bank and the United Nations Development Program (UNDP). ESMAP focuses on the role of sustainable energy in economic development with the objective of contributing to poverty alleviation and economic development, improving living conditions, and preserving the environment in developing countries and economies in transition.

**Asia Alternative Energy Program (ASTAE)**—<http://www.worldbank.org/astae>—ASTAE's mission is to mainstream alternative energy (renewable energy and energy efficiency) services in the energy and non-energy lending operations of the World Bank, with priority emphasis on the Asia region. Since its inception, ASTAE has increased the lending portfolio for alternative energy projects in Asia from about US\$2 million in FY1992 to over US\$1 billion (FY93-03).

A number of additional multilateral and other organizations around the world can provide financing for projects that are consistent with environmentally sound energy sector development, balanced natural resource management, and/or sustainable development.

## **VI. Conclusions**

A variety of funding sources are available that may be able to provide financial assistance for CMM recovery and use projects. Proponents of these projects must determine the benefits and desired outcomes from both a socio-environmental (i.e. climate change) and a financial standpoint, and then identify the initiatives or funds that are most appropriate. CMM project proponents must take into account the regulatory requirements, country-based initiatives, and local conditions, as well as technology, market, and other barriers. An additional consideration for project proponents wishing to participate in the CDM or JI mechanisms is the level of host country participation in and readiness for implementation of the rules and modalities set under the pertinent UN-based secretariats.

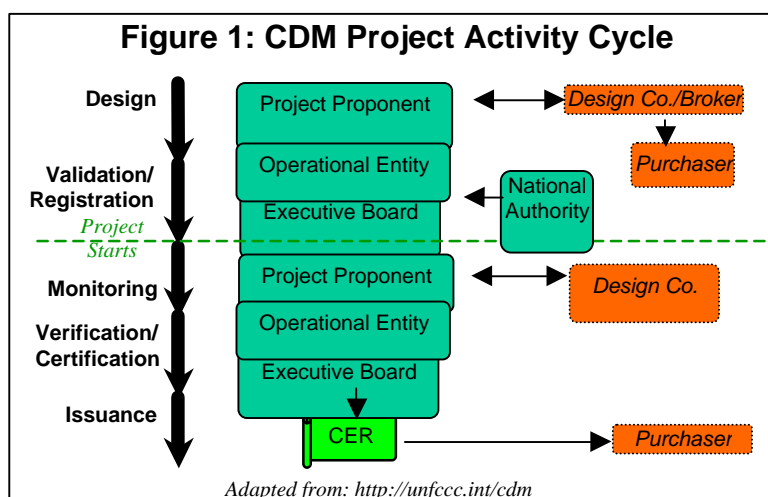
CMM projects that demonstrate methane emission reductions and are close to an attractive investment threshold may want to investigate the carbon-based finance sources discussed in Section IV. Projects that are further from an attractive rate of return on investment but can demonstrate considerable ERs and are located in a CDM or JI host country may consider the funding available through sources such as the World Bank's PCF and the Dutch CERUPT/ERUPT programs or other rapidly emerging opportunities to access CDM or JI finance. Projects utilizing new technologies and facing considerable implementation barriers but that can demonstrate a high potential for the reduction of GHG emissions should seek preferential funding through the GEF or other sources of environmental assistance-based funds. Finally, project proponents considering CMM projects that have less attractive financial returns but that can demonstrate rural energy, environmental, or economic benefits should consider the other environmental funds discussed in Section V. The range of finance options

established by internationally negotiated mechanisms and the markets that they have fostered are quite substantial and growing in scope. With careful consideration of these options, most CMM proponents should be able to find sources of funding to implement their projects and reduce global emissions of greenhouse gases.

## TABLES AND FIGURES

<b>Table 1: Carbon Funds</b>		
<b>Name</b>	<b>Holdings</b>	<b>Focus</b>
<b>ER-BASED CARBON FUNDS</b>		
Prototype Carbon Fund (PCF)	US\$180M	JI/CDM-based ERs
ERUPT/CERUPT	Not yet finalized	JI/CDM-based ERs
IFC-Netherlands Carbon Facility	Targets 10MT ERs	JI/CDM-based ERs
CAF-Netherlands CDM Facility	Targets 10MT ERs	Public and private sector transactions, located in countries in Latin America and the Caribbean
Australian GHG Friendly/GHG Free Programme	Dependent on sales of BP premium petrol	Energy projects in Australia
Natsource 'pure' carbon fund	Not yet finalized	ERs
<b>EQUITY-BASED CARBON FUNDS</b>		
Dexia-FondElec Energy Efficiency and Emissions Reduction Fund	US\$71M	Energy efficiency projects in Central and Eastern Europe
REEF	US\$65M	Renewables and energy efficiency in countries with emerging economies
FondElec Global-ASEAN Clean Energy Services Fund	US\$150-200M targeted	Global energy efficiency, renewables and distributed generation
C-Tech Fund	US\$150-200M targeted	Alternative energy firms and projects primarily in Europe and North America

Table 2: Illustrative Sources of Climate Change Project Funding	
Asian Development Bank (ADB)	<a href="http://www.adb.org">http://www.adb.org</a>
Canadian International Development Agency (CIDA)	<a href="http://www.acdi-cida.gc.ca/gettingfunding.htm">http://www.acdi-cida.gc.ca/gettingfunding.htm</a>
CDC Capital Partners	<a href="http://www.cdcgroup.com">http://www.cdcgroup.com</a>
European Bank For Reconstruction And Development (EBRD)	<a href="http://www.ebrd.org">http://www.ebrd.org</a>
European Investment Bank (EIB)	<a href="http://www.eib.org">www.eib.org</a>
Japan International Cooperation Agency (JICA)	<a href="http://www.jica.go.jp">www.jica.go.jp</a>
Industrial Development Corporation of South Africa, Ltd. (IDC)	<a href="http://www.idc.co.za">www.idc.co.za</a>
Inter- American Development Bank (IADB)	<a href="http://www.iadb.org">http://www.iadb.org</a>
International Finance Corporation (IFC)	<a href="http://www.ifc.org/enviro/EPU/index.html">http://www.ifc.org/enviro/EPU/index.html</a>
KfW	<a href="http://www.kfw.de">www.kfw.de</a>



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