
The Global Environment Facility: Financing and Regulatory Support for Clean Energy*

Alan S. Miller and Eric Martinot

The 1992 Rio Earth Summit set forth the issues and principles for addressing the challenges of sustainable development. The need to identify solutions to global problems that meet local needs, the importance of the precautionary principle, and other tenets necessary for balancing economic growth with environmental constraints were incorporated in environmental agreements on biodiversity and climate change. However, implementing these broad principles in practice has proven to be an enormous challenge. One obstacle is the need for resources to pay for the added costs of global environmental protection; while the benefits of biodiversity and reduced climate change accrue worldwide, the costs are incurred locally. Another frequent barrier is the need to change legal and regulatory systems that promote the inefficient use of resources, discourage technological innovation, or otherwise impede environmental superior practices.

One response to these challenges was the creation of the Global Environment Facility (GEF). First initiated as a pilot program in the World Bank in 1991, the GEF was formalized by international agreement in 1994 and given a mandate to finance the incremental costs of global environmental measures in developing countries. About \$3 billion in grants has been a catalyst for more than 600 projects with a total value of more than \$6.5 billion, ranging from national biodiversity conservation programs to support for energy efficiency business development to the commercialization of solar thermal power plants, fuel cells, and other emerging technologies. A substantial number of these projects have also helped to address legal and regulatory barriers such as the need for power purchase agreements to market wind energy systems and efficiency standards to promote improved lighting and appliances.

This article provides an overview of the GEF's role as a catalyst for financing and legal and regulatory reforms necessary for advancing sustainable development in developing countries. The first part describes the GEF's governance, financial resources, and operating principles. The second part provides some illustrative examples of GEF projects, focusing on clean energy technologies for mitigating climate change. The third part highlights the evolving role of the GEF in addressing legal and regulatory barriers, also focusing on climate change projects.

Governance, Financial Resources, and Operation

The GEF is structured as a unique partnership of the World Bank and the UN system. As set forth in the GEF Instrument, governance is provided by a Council of 32 countries which meets twice a year organized into representative constituencies. The largest donors and China have individual seats. Contested votes require 60 percent of both countries by number (the UN system of one country one vote) and contribution (the World Bank principle of one dollar one vote). Operational oversight is provided by a Chief Executive Officer and small Secretariat, which was housed administratively in the World Bank to avoid the creation of a new institution.

* This article appeared in *Natural Resources and Environment* 15(3): 164-167; 206 (2001). Mr. Miller is team leader and Mr. Martinot is a program manager of the climate change program of the GEF Secretariat in Washington, DC. They may be reached at amiller2@worldbank.org and emartinot@worldbank.org.

Financial resources are obtained by pledges from donor governments on roughly a four year cycle, starting with \$1 billion in the pilot phase and increasing to \$2 billion in 1994 and \$2.6 billion in the most recent replenishment in 1998. In recent years the United States has failed to appropriate as much as its pledge, triggering similar delays in payments by other donors.

The GEF formally serves as a financial mechanism for the Conventions on Biological Diversity and Climate Change. Consequently, basic guidance on policies and program priorities is provided by Convention decisions. For example, both Conventions mandate full cost funding of national communications by developing countries, while financing for measures to protect biodiversity and reduce greenhouse gas emissions is based on incremental cost principles. Thus, the GEF pays for the added cost of GHG reducing wind energy system relative to the least cost alternative (e.g., a coal plant), but does not compensate for baseline costs. The GEF also provides financing related to cleaning up international and transboundary waters and sometimes goes beyond treaty mandates, e.g., supporting projects in economies in transition that are not eligible by the terms of the Climate Convention.

GEF projects must be approved by the recipient countries and funding can only be provided through one of three Implementing Agencies, the World Bank, UN Development Programme (UNDP), and UN Environment Programme (UNEP). The Instrument reflects an expectation that these agencies offer substantially different strengths – investment project management from the World Bank, technical assistance and capacity building from UNDP, and environmental science and convention linkages from UNEP. The International Finance Corporation (IFC), the private sector arm of the World Bank, also provides a means for directly financing private sector initiatives. In the past year, access to GEF support has been extended through a wider range of cooperating agencies including four regional development banks (African, Asian, and Inter-American development banks and the European Bank for Reconstruction and Development), the UN Industrial Development Organization (UNIDO), and the UN Food and Agricultural Organization (FAO).

Illustrative Climate Change Projects

A few examples from the GEF portfolio of more than 80 energy efficiency and renewable energy projects (receiving GEF support in excess of \$850 million) illustrate the diversity of strategies and measures being supported:

Wind power in India. In India, World Bank/GEF support for wind power occurred in parallel with explosive market growth during the mid-1990s fuelled by favorable investment tax policies. By 1998, almost 1,000 MW of wind capacity had been installed in India and dozens of domestic wind turbine manufacturers had emerged, many with foreign partners. During the 1990s, a World Bank/GEF project directly financed 41 MW of wind turbine installations in India. The project strengthened the capabilities of the India Renewable Energy Development Agency (IREDA) to promote and finance private-sector investments, and more than 270 MW of wind projects were financed through IREDA. The project also helped to raise awareness among investors and banking institutions of the viability of wind power technology. As a result of the project and the generally favorable market conditions, many financial institutions decided to offer financing for wind farms, which was a key project goal.

Rural energy services from solar PV in Sri Lanka. A World Bank/GEF project is promoting the market for “solar home systems” for rural households in Sri Lanka. Local dealers assemble, sell and service systems, using a combination of domestic and imported components. Local technicians have been trained in the technology and consumer education conducted. Consumer credit is being provided through local

microfinance organizations. Sales by 1999 exceeded 1000 systems, and were expected to greatly accelerate during 2000. In addition, two events in 1999 were indirectly influenced by the project: Shell International Renewables entered the solar PV market and a nationwide department store chain began to sell PV systems. The national electric utility is now explicitly considering the role of off-grid PV in rural electrification policy and planning.

Solar water heaters in Morocco. A UNDP/GEF project in Morocco aims to install 80,000 m² of solar hot water collectors. Technical capabilities are being strengthened in many ways. The project will train government agencies and private firms to promote, evaluate, and install solar hot water systems. The project will also develop norms, standards, testing procedures and trained test personnel, certification and labeling, and associated enforcement mechanisms. The project will introduce assemblers and manufacturers to improved standards and specifications to facilitate compliance, train architects and engineers to apply the standards and procedures, and develop codes of practice for constructors, installers, and plumbers along with training to facilitate compliance. The project will also design and lobby for practical mechanisms that would allow permanent reductions in value added tax and import duties on solar water heaters.

Bagasse power generation in Mauritius. A World Bank/GEF project in Mauritius indirectly catalyzed dramatic changes in electricity generation from biomass fuels in Mauritius. The project dispersed \$6 million for efficiency investments in sugar mills to provide surplus bagasse for power generation. The project also provided technical assistance and technology demonstrations to promote private/public sector cooperation in power plant ventures, to promote regulatory frameworks for independent power producers using bagasse, and to optimize the use of sugar cane for power generation. Electricity generation from bagasse increased from 70 GWh/yr in 1992 to 118 GWh/yr by 1996. Several sugar mills completed or embarked upon bagasse power plant investments on their own, independent of the project. A project completion report states that “extensive dialogue between the public and private sector on design work, the least-cost power development plan, and power purchasing agreements have directly or indirectly led to the development of other power plants.”

Energy-efficient lighting in Poland. During 1995-1997, in two separate promotions, Polish consumers bought 1.2 million compact fluorescent lamps (CFLs) through an IFC/GEF market development project (CFLs are much more efficient than conventional residential lighting). More than 40 different CFL models were represented in the promotions. Five manufacturers, including the one domestic Polish manufacturer, participated in an innovative subsidy program with joint manufacturer and GEF contributions (although two manufacturers dominated it). Retail prices of CFLs decreased by approximately 30% in real terms after the project. A global manufacturer of CFLs and foreign companies from Germany, China, and Japan have all entered the Polish market as a result of the project. The project led to a large change in consumer awareness about CFLs and the number of households with CFLs almost doubled, from 11.5% to 19.6% of all households.

Energy-efficient building technologies in West Africa. A UNDP/GEF project in Côte d'Ivoire and Senegal strengthens capabilities to design and construct more efficient buildings, drawing upon international experience and technologies for efficient buildings. The project is helping finalize an existing energy-efficiency code for air-conditioned buildings and implement the code: the project is consulting with affected parties, testing the application of the code to several building projects, training construction operators to understand and apply the code, and introducing the code into building permit procedures. In addition to the energy efficiency code, the project is drafting a thermal comfort code for buildings without air conditioning and assisting with its implementation. One representative building from each country is being audited and retrofitted, with an emphasis on air conditioning and lighting.

High efficiency boilers in China. A World Bank/GEF project is providing technology transfer and technical assistance to nine competitively selected boiler manufacturers to allow them to develop high-efficiency boiler models. As part of the technology transfer, the project is acquiring advanced equipment from abroad to upgrade these firms' designs to new boiler models. The project is also providing technical assistance to the nine boiler manufacturers to develop, produce, market, and finance the new models and to strengthen customer service programs. It is also providing technical assistance and training for industrial enterprises to understand, procure, and operate higher-efficiency boilers, and for design and research institutes and government agencies to disseminate the technologies to other boiler manufacturers.

In these and many other projects, the private sector participates directly in GEF projects as manufacturers and dealers, local project developers, financial intermediaries, recipients of technical assistance, technology suppliers and contractors, and project executors. In addition, several managed investment funds executed by the IFC are designed to directly mobilize private-sector financing—five such funds are designed to leverage \$375 million in financing from the private sector with \$95 million in GEF grants. One example is the IFC/GEF Renewable Energy and Energy Efficiency Fund (REEF), which makes debt and equity investments in private-sector renewable energy and energy efficiency projects. The fund targets projects in the \$1-30 million range, a range that is often considered too small, too complex, or too risky by institutional investors. The fund is co-financed from other private-sector sources.

Legal and Regulatory Frameworks and Skills

Along with financing and technical assistance, GEF projects promote legal and regulatory frameworks and skills in several ways. These frameworks and skills are designed to overcome the most pervasive “barriers” to sustained adoption and investment in cleaner energy technologies. The GEF is helping to foster the growing recognition that legal and regulatory reforms and strengthened regulatory capabilities are often important for achieving sustained and widespread gains in adoption of these technologies. Some examples of the types of GEF support:

Utility power production regulatory frameworks. Several projects promote or pilot new regulatory frameworks for independent power producers (IPPs) to assist public and private project developers in installing grid-connected wind, biomass, small hydropower and geothermal power generation technologies. Key to these frameworks is assistance to regulators and utility managers for establishing transparent power-purchase tariffs and model power-purchase agreements (PPAs) for small renewable energy producers. Notable project examples are currently taking place in Cape Verde, China, India, Mauritius, and Sri Lanka,

Energy-service concessions for off-grid rural electrification. Several projects pilot a “regulated energy-service concession” model in which a private-sector firm is competitively selected to exclusively provide off-grid electrification to designated rural areas. The terms of these concessions may last up to 15 years. Projects train national and regional regulatory agencies in rural energy-service concession bidding and contracting, tariff setting, and monitoring and regulation of concessions. The first project of this type has started in Argentina, where eight provinces are targeted.

Solar powered home lighting equipment codes and standards. Dispersed rural markets for individual solar-powered home lighting systems can benefit from equipment standards, installation codes, creation or strengthening of certification and testing agencies, and assistance to dealers for testing and quality improvement. Most of the 23 GEF projects supporting these types of systems contain some forms of support for standards, codes and certification.

Appliance standards, product labeling, and consumer information. Projects in several countries, including Argentina, the Czech Republic, Hungary, Latvia, Peru, Poland, the Philippines, and South Africa, promote product labels and consumer education for efficient lighting and refrigerators. A project in Thailand promotes efficiency standards and certification and testing institutions for industrial motors and other industrial and commercial equipment and buildings.

Energy-efficient codes and standards for buildings. A few projects establish building codes and standards and establish new agencies or institutional mechanisms to enforce the standards and/or certify building equipment. The West Africa project mentioned above is an example. Another project in Tunisia is designed to validate a newly developed set of efficiency standards for buildings. The Morocco solar hot water project described above also targets equipment standards and practices within architect communities and construction industries.

Utility demand-side management regulatory frameworks. Projects in Mexico, Thailand and Jamaica have piloted demand-side management programs by regulated electric utilities. These programs provide financial and other incentives for utilities to actively finance and promote energy efficiency improvements among their customers.

Regulatory and institutional frameworks for centralized district-heating systems. Two UNDP/GEF Projects in Russia and Bulgaria develop regulatory frameworks for metered heat consumption in residential buildings, including new institutions for consumption-based heat-meter reading and billing. The Russia project studies unresolved regulatory, institutional, and technical questions surrounding installation of autonomous, decentralized heat-production units in buildings, and the implications of customers disconnecting from large centralized heating networks.

Other macroeconomic conditions. Some projects indirectly assist governments in evaluating and adjusting import duties, energy prices, and public -sector procurement guidelines that may promote energy efficiency or renewable energy.

Power sector reforms that “level the playing field” for energy efficiency and renewable energy. There is a growing recognition of the need to focus on power sector reforms and their implication for energy efficiency and renewable energy technologies, possibly through a more sectoral or programmatic approach to GEF projects. This area is currently being further explored by the GEF and its partners—particularly for ways that the GEF can assist governments in shaping regulatory frameworks that put renewable energy and energy efficiency on an equal footing with conventional energy technologies.

There is also a growing recognition that the GEF needs to focus even more on the regulator—to improve regulatory skills and assist the regulator in understanding clean energy technologies and ways that legal and regulatory frameworks can support sustainable development.

Emerging Lessons

One lesson from the India windpower case is that it is difficult to separate the influence of GEF interventions from other trends and forces at work. The net result in India, in terms of existing manufacturing capacities, financing, and volume of installed capacity, comes from a complex set of many influences, of which the GEF is just one. Investment tax credits have been a powerful stimulus to technology transfer and market development while they have existed. But longer term market sustainability may rest on the awareness, capabilities, supportive regulatory conditions, and commercial financing arrangements put in place, in part through World Bank/GEF assistance. The experience from

India shows that supportive regulatory frameworks for renewables can have a large influence on the market—policies such as transmission wheeling according to pre-established norms and tariffs, energy “banking” of renewable-generated power, and third-party sales by renewable-based independent power producers (see A. Jagadeesh, “Wind energy development in Tamil Nadu and Andhra Pradesh, India: Institutional dynamics and barriers—A case study,” *Energy Policy* 28(2000): 157–168).

Tariff setting is a critical issue. One of the lessons from a World Bank/GEF mini-hydroelectricity project in Sri Lanka is that variable power-purchase tariffs can hinder market development for small renewable energy producers. This project has opened up the market to third-party mini-hydro developers and has been developing regulatory frameworks for IPPs, including standardized “non-negotiable” power-purchase tariffs and contracts. But in this case, tariffs were tied to *short-run* avoided utility costs based on the international price of oil. In 1997 and 1998 tariffs were set at the equivalent of 5 cents/kWh and mini-hydro development flourished. However, because of the downturn in oil prices in 1998-99, tariffs were only the equivalent of 3.5 cents/kWh in 1999. As a result, most development stopped in 1999. And this fluctuation has seriously hurt the longer-term interest of private mini-hydro developers in Sri Lanka (R. D. Bandaranaike, “Grid Connected Small Hydro Power in Sri Lanka: the Experience of Private Developers,” Ecopower Limited, Colombo, Sri Lanka).

Another lesson from Sri Lanka is that attention must be paid to proper structure of power-purchase tariffs so that renewable energy receives credit for the value it creates, in terms of both energy (i.e., kilowatt-hours produced) and capacity (i.e., kilowatts available). The original power-purchase arrangements negotiated with the national utility called for energy-based tariffs only, with no credit given for capacity, which can also penalize renewable energy developers. The experience in Sri Lanka shows how even one of the very basic steps—allowing IPPs and PPAs into a previously monopoly utility system—can face many challenges.

One of the lessons from the Mauritius project is how creating an investment climate for renewable energy power projects, and creating public-private partnerships, can lead to supportive regulatory frameworks. In this case, the project led to the establishment of an IPP framework for biomass power generation. A project evaluation states that “the project’s major accomplishment was progress in helping to establish an institutional and regulatory framework for private power generation in Mauritius and the provision of technical studies and trials to support technologies for improved bagasse production and improved environmental monitoring.”

In its relatively short existence, the GEF has proven to be an innovative source of financing for sustainable development. Funding strategies have evolved significantly from the early pilot phase and increasingly emphasize the need for sustainable business models, country partnerships, and financial leverage. The importance of legal and regulatory issues is also taking on a higher profile, especially with respect to the linkages between power sector reform and the use of clean energy technologies. The GEF continues to learn and to share that learning. Although most approved projects are still being implemented, emerging project experiences, impacts and lessons can benefit governments, firms, and international organizations in achieving sustainable development.

Additional information about GEF strategies, projects, and procedures for obtaining support are available from the GEF website, www.gefweb.org, and from the publication Promoting Energy Efficiency and Renewable Energy: GEF Climate Change Projects and Impacts by Eric Martinot and Omar McDoom (Global Environment Facility, Washington, DC, 2000), also available on the website.