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PROGRAM STUDY ON CLIMATE CHANGE

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GEF CLIMATE CHANGE PROGRAM STUDY

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Foreword

One of the key tasks of the GEF Office of Monitoring and Evaluation is to review the progress and results of the focal areas of the Global Environment Facility. Independent studies of the Biodiversity, Climate Change and International Waters focal areas were conducted during 2003-2004. These studies provide the GEF stakeholders with an assessment of how the focal areas are performing and recommendations on how to continue their development. Together, these areas three represent more than 1,100 projects with funding of just over US$4 billion. Obviously, it is difficult to do full justice to the wealth and depth of such a vast portfolio.

The studies report notable contributions from interventions for global environmental benefits. The present study - on climate change - points to achievements in avoiding or reducing greenhouse gas emissions. It provides useful insights in successful strategies to promote, by barrier removal, the development of renewable energy markets and increased energy savings. The greatest progress has been made within the energy efficiency portfolio. Global environmental benefits cannot be achieved and sustained without international and local partnerships. This is of particular importance to renewable energy technologies. Climate-friendly energy remains, in general, more expensive and less accessible than traditional high-emitting energy sources, despite sustained efforts at volume increases, cost reduction and market aggregation. Within these limitations, the GEF has contributed to emerging market changes in specific energy sectors and niches.

The studies report weaknesses that are common to the three focal areas. The impact of GEF efforts could be enhanced by refining strategic frameworks and concepts, tools and processes, as well as communicating these better to stakeholders. Furthermore, there is a call for improvements in monitoring, evaluation, indicators and knowledge sharing.

The three studies were undertaken by staff from Office of M & E and independent and external consultants. The climate change report was written by Siv Tokle and Anton Eberhard. As the study task manager, Ms. Tokle ably led the evaluation team and the development of the evaluation methodology. Professor Eberhard was able to apply his vast experience with the energy sector to provide positive guidance and conceptual clarity to the study work. The report also drew on the expertise of Anna Viggh, who contributed analysis on both cluster and country reviews. Steven Danyo is commended for his patient determination in analyzing greenhouse gas emissions.

Special thanks are due to the GEF Climate Change Task Force, under the leadership of Richard Hosier, with members from the GEF Secretariat, Implementing Agencies and Scientific Technical Advisory Panel. Their constructive suggestions during several workshops were instrumental in guiding the work. The report also benefited from the insights of a large number of other staff within and outside the GEF family. The Office is particularly appreciative of the active support of the country offices and project staff in the countries visited.

The three program studies will serve as inputs the Third Overall Performance Study of the GEF during 2004-05, the GEF Trust Fund replenishment process and the GEF Assembly. The GEF Council will find, in each of the program studies, findings and numerous recommendations ranging from improvements in the definition of GEF policy and mechanisms to maximize impacts and outcomes to recommendations on how to enhance project design, preparation and implementation. The GEF focal area Task Forces have a particularly important role to play in the implementation of the management response to the studies. We also believe that the lessons will be relevant to other international programs in sustainable development, in a collective effort to understand which strategies work best, under which circumstances, in protecting our global environment.

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Abbreviations and Acronyms

ADB	Asian Development Bank
CDM	Clean development mechanism
CEEF	Commercializing Energy Efficiency Finance project
CEO	Chief Executive Officer
CER	Certified Emission Reduction
CFL	Compact fluorescent lamp
CH_4	Methane
CO_2	Carbon dioxide
COP	Conference of Parties
CRESP	China Renewable Energy Scale-up Program
DAC	Development Assistance Committee
DSM	Demand-side management
EA	Enabling activities
EBRD	European Bank for Reconstruction and Development
EE	Energy efficiency
EIT	Economy in transition
ERT	Energy for Rural Transformation project
ESCO	Energy service company
ESD	Energy Service Delivery project
FCB	Fuel-cell bus
FCCC	Framework Convention on Climate Change
FP	Full-size project
FY	Fiscal year
GEF	Global Environment Facility
GEFME	GEF Office of Monitoring and Evaluation
GHG	Greenhouse gas
GNI	Gross national income
HEECP	Hungary Energy Efficiency Co-Financing Program
IA	Implementing Agency
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
IREDA	Indian Renewable Energy Development Agency
JI	Joint implementation
LAC	Latin America and Caribbean Region
LDC	Least developed country
LULUCF	Land use, land use change and forestry
M&E	Monitoring and evaluation
MENA	Middle East and North Africa Region
MSP	Medium-size project
NAI	Non-Annex I country
OECD	Organisation for Economic Co-operation and Development
OP	Operational Program
OPS	Overall Performance Study
PDF	Project development facility
PELP	Poland Efficient Lighting Project
PIR	Project implementation review
ppmv	Parts per million by volume
PPP	Purchasing power parity
PV	Photovoltaics
PVMTI	Photovoltaic Market Transformation Initiative
RAF	Resource allocation framework
RE	Renewable energy
REDP	Renewable Energy Development Project
REEF	Romania Energy Efficiency Fund
RESCO	Rural energy service company
SHS	Solar home systems
SME	Small and medium enterprise
SP	Strategic priority
SPA	Strategic priority on adaptation
STAP	Scientific and Technical Advisory Panel
STRM	Short-term response measure
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

BACKGROUND

The purpose of this study is to provide an overall evaluation of the results and performance of the Global Environment Facility's (GEF) Climate Change Program from its inception in 1991 to mid-2004. The study will contribute to the third GEF Overall Performance Study and serves as a guide to future strategic directions. It draws on information gathered from a comprehensive portfolio review, greenhouse gas (GHG) emission data and development statistics, and two in-depth project cluster reviews within energy efficiency and renewable energy. The analysis was enhanced by several implementing agency reviews, other GEF monitoring and evaluation (M&E) reviews, and select country visits.

The study evaluated results in terms of outcomes and impacts, based on the mandated GEF catalytic role in promoting, by barrier removal, a primary outcome of market transformation that leads to the reduction or avoidance of greenhouse gas (GHG) emissions. This primary outcome can be supported by contributory outcomes such as enabling policies, increased access to finance, adequate business/enterprise capability and infrastructure, increased awareness, and diffusion of technology and innovation. Performance is evaluated in terms of the strategies that contribute to these results. An important element of this study is the identification of strategies that are effective in achieving market transformation and GHG reduction or avoidance.

THE INTERNATIONAL CONTEXT AND THE GEF

The GEF faces a tremendous challenge in its mandate to provide catalytic support for measures in developing countries that minimize climate change damage. There is a large gap between what is required to address the problem and the current commitments that have been negotiated in the international arena. Poorer countries and communities are particularly vulnerable to the impacts of climate change. The United Nations Framework Convention on Climate Change (UNFCCC) stipulates that "Parties should protect the climate system…in accordance with their common but differentiated responsibilities and respective capabilities." While the more wealthy countries (in Annex I) should take the lead in combating climate change, carbon dioxide (CO_2) emissions from fuel combustion in developing countries have increased considerably over the past decade (38.9 percent), resulting in a share of 40 percent of annual global emissions in 2000.

As the financial mechanism of the UNFCCC, the GEF supports developing countries, mainly through long-term mitigation projects. It has also supported short-term measures, many for carbon sequestration, and continues to support countries in fulfilling their Convention commitments through the preparation of "national communications" on climate change. In response to recent UNFCCC Conference of Parties (COP) guidance, the GEF is also developing a pilot funding window for adaptation to climate change effects, introducing a new strategic approach to enhancing capacity building as free-standing activities, and paying increasing attention to synergies between focal areas. It has not, as yet, engaged programmatically in other international trends in the climate change arena, such as carbon trading, although its Implementing Agencies (IAs) have become active in facilitating carbon finance for GHG emission-reduction projects.

The GEF Assembly, the Third GEF Trust Fund Replenishment process, and the GEF Council have made a number of recommendations to enhance GEF performance. They have called for a move toward greater results orientation and, within climate change, a "shift from technology-based towards market-based approaches" (GEF Business Plan). To do so, seven strategic priorities will guide GEF programming from 2003 onward. It is still uncertain how a number of other initiatives will influence the Climate Change Program in the future, including the proposal for a resource allocation framework; initiatives to make the internal GEF processes and systems more responsive and efficient, especially the project cycle; and exploration of knowledge management to promote strengthening and acceleration of cross-learning processes.

THE GEF CLIMATE CHANGE PORTFOLIO

The GEF has allocated US$1.63 million to climate change projects and activities since its official establishment in October 1991, representing close to a third of overall GEF program funding in this period. Many of the 207 full- and medium-sized projects have been approved recently; to date only 43 projects have been completed.

Subsequent to the GEF Pilot Phase (1991–1994), with its focus on technology demonstration, the GEF climate change portfolio has been managed within four Operational Programs (OPs). OP6, renewable energy (RE), accounts for the largest part of the portfolio and currently represents 44 percent of active project allocations. About a third of projects fall within OP5, energy efficiency (EE). OP11 on environment-friendly transport, formally established by the GEF Council only in 2001, and OP7, which aims to reduce the long-term costs of low GHG- emitting energy technologies, have not yet developed into sizable programs. A total of 269 enabling activities (EAs), with 11 percent of the resources, facilitate implementation of effective climate change response measures and preparation of national communications.

The great diversity of the GEF climate change portfolio is best illustrated by the range of project clusters and their evolution over time, although a coherent, consistent categorization of clusters is not available. Projects aiming for electrification through renewable energy account for the most projects, followed by projects promoting energy efficient products or markets. There are also a number of projects aiming for productive uses of RE, including co-generation of electricity and, recently, a growing trend toward stimulating RE products and markets. A smaller group of EE projects aim to develop financial mechanisms or support public energy efficiency. The different clusters have experienced considerable fluctuations in size from year to year. Although programming decisions shift over time (for example, more emphasis on EE financing mechanisms or RE for productive purposes), this is not always obvious in the portfolio project data.

Proactive future planning for the climate change portfolio is difficult. The new strategic priorities are likely to encourage a more focused portfolio from 2004 onward, but it remains unclear how to treat the overlap of strategic priorities in overall market transformation and barrier removal.

OVERALL RESULTS AND PERFORMANCE

Market Transformation

The GEF is mandated to a catalytic role in promoting, by barrier removal, a primary outcome of market transformation that leads to the long-term reduction or avoidance of GHG emissions. This catalytic effect can be gauged by how successfully the GEF barrier removal strategies lead to replication. Market transformation is a long-term challenge and a dynamic process—and is starting to become evident in the GEF Climate Change Program. The greatest progress has been made within the EE portfolio, where achievements can be observed in specific countries and sectors, such as financing markets in Hungary; energy-efficient appliances and products in Mexico and Poland, and industrial boiler conversion in China. For many markets that are evolving, GEF can be seen to help drive changes forward.

The experience of the RE cluster is more mixed, because the GEF is often trying to develop markets from a much lower baseline. RE remains, in general, more expensive and less accessible than traditional high-emitting energy sources, despite sustained efforts at volume increases and market aggregation. Nevertheless, GEF has contributed to emerging market changes in specific energy sectors in specific countries, such as for mini-hydro energy in Sri Lanka and the wind market in India. Although photovoltaics (PV) are not yet affordable by major target groups, particularly the rural poor in Africa, some PV-oriented projects have been successful in niche market areas such as clinics, schools, and where households have adequate levels of disposable income. Global market aggregation of specific renewable technologies, as envisaged in OP7, lies far in the future.

GHG Impact

The portfolio has suffered from mixed and unclear expectations on how to address the tradeoff between long-term catalytic market transformation and immediate GHG impacts. Nevertheless, most of the long-term barrier removal mitigation projects also have GHG targets and achievements. The performance of the GEF portfolio overall in avoiding GHG emissions is satisfactory. It has brought about considerable GHG reductions, at relatively total low incremental costs. For 27 closed projects, estimated avoided direct and indirect emissions amount to 224 million metric tons CO_2 at an incremental cost of US$194 million.

While GHG impacts do not capture the full range and complexity of outcomes from GEF climate change projects, they do provide insights into which program strategies and target areas have the potential to yield greater effect. Some parts of the portfolio, such as energy efficiency and short-term response measures (STRMs), are better at producing GHG impacts. Meanwhile, individual projects may be responsible for high achievements in GHG avoidance, but have little potential for replication or sustained barrier removal. In the future, the 104 active full- and medium-size projects are collectively intended to enable more than 1.7 billion tons of CO_2 avoidance over 10 to 30 years.

The availability and quality of data on GHGs leave much to be desired in the portfolio. Although data quality has improved in recent years, there is considerable room for further improvement to address lack of targets or estimates; unrealistic estimates, especially for replication estimates; and vague or unavailable data. The GEF has missed out on an opportunity to provide timely guidance on GHG potential that could save time and effort for all parties involved in project design and implementation. A coherent, pragmatic and GEF-wide methodology on GHG estimates is urgently needed; it has been discussed in the Climate Change Task Force for some time. This study points to the need for such guidance to be comprehensive, that is, to cover the range of technologies and clusters and the GHG reduction or avoidance calculation method and factors to be used. The systems and approaches to monitoring, reporting, and measurement of GHG impact also need improvements, and should be based on the GHG methodology.

Effectiveness of GEF Strategies

Within the GEF Climate Change Program, a combination of favorable external circumstances, appropriate choice of project strategies, good and flexible implementation, and adequate GEF resources have contributed to the removal of barriers and have facilitated significant investments in sustainable energy technologies and programs. Projects are more successful when they have a clear concept of market development, know which market they wish to transform and which market barriers have to be overcome, have a well-defined target group, are based on a "minimum" level of existing market development, and receive sufficient and sustained support.

The overall policy environment, and power sector reform and regulatory frameworks in particular, are crucial for more widespread and sustainable applications of RE and EE. A number of GEF projects have contributed directly to the development of RE policies through the drafting or revision of national RE strategies and action plans, and GEF projects have been successful in the development of EE and RE standards, testing, certification, and labeling, all of which are vitally important to improve quality, reliability, and consumer acceptance. However, there are as yet insufficient examples of GEF projects that have seized opportunities for new regulatory frameworks, financial instruments, and institutional mechanisms within power sector reform.

The GEF has longer experience in supporting access to finance for RE and EE. The range of finance models promoted within OP5 are more sophisticated. In OP6, the effectiveness of financial mechanisms has often been tempered by problems of affordability, and there is room for more experimentation. Many EE projects are now successfully incorporating financing components, partial guarantees and loans, depending on the specific context and set of market barriers and adaptive management. Experience in this area has been captured systematically in an excellent practitioners handbook. The same needs to be done in other GEF climate change cluster areas.

In all cases, the need for finance is accompanied by the need for technical assistance to support business infrastructure in RE and EE project development. The GEF RE portfolio has explored different business models suitable for rural electrification, with a trend away from fee-for-service to sales models. More still needs to be known about the degree to which sales models provide effective after-sales maintenance and service. Fee-for-service models have a number of potential advantages, especially for poorer households, and it is hoped that the GEF will continue to explore this model. Within EE, energy service company (ESCO) development is still a challenge, but complementary business models—not full-service ESCOs—are possible in underdeveloped markets. There is also need for better integration of GEF projects with country small and medium enterprise (SME) and enterprise-support programs.

Recent RE projects envisage a broader range of technologies and a greater focus on market development, but programmatic learning from these projects is not yet evident in the portfolio. More experimentation and systematic learning is needed, in particular a clearer set of GEF conclusions on PV that will shape future strategic choices for this technology, and new areas such as RE for productive purposes. Within EE, the potential for energy savings and GHG reductions is immense, and the GEF may put its catalytic and innovative role to good use by disseminating and replicating its successful strategies in other circumstances.

Finally, well-designed strategies have to be implemented competently and dynamically. The habitual delays in the GEF project process have particularly severe effects for climate change projects because the projects address rapidly changing markets. GEF projects are often not well equipped to respond strategically and quickly to new policy or market opportunities. GEF work to remove market barriers could be made more effective with clear targeting of sectors and users, correctly balancing and prioritizing barriers, and systematic coordination between projects.

Strategic Response

The GEF has positioned itself strategically to add value in three ways in response to global climate change concerns, national needs, and changes in national development contexts. ***First***, the GEF has been fully responsive to its mandate as defined by the UNFCCC and guidance from successive COPs and has performed its role effectively. The COP to the Convention has been closely involved in major strategic decisions regarding the GEF. The question of whether the guidance has been helpful in defining a clear niche for the GEF is more open. This report seconds the recent study commissioned by the UNFCCC on capacity building, which recommended that "Overall guidance, such as that provided by the UNFCCC framework, should be complemented by a more precise, country-specific definition of needs and priorities."

Second, to what extent has the GEF focused its activities in countries where it is able to maximize impact? GEF climate change allocations are distributed across nearly all eligible countries, and those countries with the highest GHG emissions receive the most funding. In this broad sense, the GEF climate change portfolio is responsive to country needs. However, the pattern does conceal considerable disparities in allocations and focus—both in terms of low potential for maximizing replication effects and missed mitigation opportunities. Although there may be good reasons why some countries receive disproportional allocations in terms of emission reduction potential or do not have a significant portfolio, GEF allocations in medium- and low-emitting GHG countries do not, in general, reveal any evidence of strategic choice.

Third, the current system has led to cases of inconsistent programmatic focus *within* countries where the GEF is not consistently addressing the *major* climate change needs, even in countries with considerable potential for benefits. National communications have, in general, not been valuable in guiding GEF country programming, nor do the agency country programs easily establish GEF priorities. Similar concerns can be raised on the strategic focus and alignment in the composition of the GEF project portfolio. The great diversity in the climate change focal area is also reflected in the portfolio *across* focal areas and countries, with the consequence that the portfolio has had difficulties in reaching a critical mass that helps generate overall results and maximize learning within groups of projects.

FINDINGS AND RECOMMENDATIONS

The GEF has an important role to play in the worldwide efforts to combat climate change. As the financial mechanism for the UNFCCC, GEF has made a significant contribution to both mitigation efforts and capacity building in developing countries.

However, with time GEF has met with increasing expectations with regard to its role and mandate in climate change, so the linkages between GEF's overall mission or goals, its strategic priorities, OPs, project clusters, and performance measurement indicators are no longer conceptually clear nor are they entirely consistent. A more coherent way of formulating GEF's strategic framework would be to make explicit its overarching goal of the removal of market barriers and sustainable market transformation for energy savings or clean technology applications that achieve reduced or avoided GHG emissions. Market transformation outcomes that contribute to this goal are enabling policies, available financing, adequate business infrastructure, information and awareness, appropriate technology, and adequate capacity. GEF strategic priorities could be those strategies that contribute to these market transformation outcomes and associated GHG impacts.

Nevertheless, the GEF has performed a credible job in responding to country needs regarding climate change in the eligible countries, through a complex array of approaches and strategies. The current dispersion of the GEF portfolio, however, does not favor extensive replication and market transformation and reflects cases of missed opportunities in terms of potential impact. The climate change portfolio has by now reached a scope that is, for the most part, sufficient to identify successful project strategies and conditions; this should allow strategic choice of areas, geographically and operationally, that hold most promise of impact on market transformation, barrier removal, replication, and GHG emissions. Any strategic framework, while focused, must contain sufficient flexibility to incorporate innovation and important country-specific circumstances.

Because of the diversity in project clusters within climate change, the challenges to effective learning are great and, at the same time, are a success factor for replication and market transformation. The Climate Change Program has benefited from some good knowledge-sharing initiatives, but could further improve with better communication on GEF priorities, especially at the formulation stage; more exchange within clusters during implementation; and active work with projects to extract portfolio-wide experiences and lessons learned for groups of projects. Without such systematic learning, the GEF innovation and replication will be less effective.

Active knowledge sharing must be supported by M&E systems. Improvements are needed in systems to monitor and evaluate qualitative results such as market transformation, replication, and barrier removal. Although data quality has improved in recent years, the current quality and availability of GHG targets, estimates, calculations, reporting, and M&E are still not satisfactory. To assess performance, guidance would be useful on the relative importance of immediate GHG impacts versus longer-term cumulative results on sustainable market transformation.

Finally, the GEF Climate Change Program has also been influenced by some implementation issues. In particular, the long and cumbersome project approval process seems to yield diminishing returns in terms of quality projects because projects are likely to run into further delays and difficulties during implementation. A project-by-project approval system at the GEF Council level was likely appropriate in earlier times, but cannot be sustained efficiently with the current volume of projects. This study finds that there are currently no effective mechanisms for managing and monitoring the progress of the climate change portfolio as a whole. With the above findings in mind, the study makes the following recommendations:

(1) The GEF Secretariat should take the lead in improving overall strategic coherence by clarifying the overarching goal of market transformation outcomes that contribute to GHG emissions reduction or avoidance, and the manner in which existing Operational Programs and associated strategies contribute to this overall goal.

The GEF should retain its four OPs as the basic programming pillars of its Climate Change Program. Within this framework, issues that require greater clarification include (a) what is understood by barrier removal and market transformation; (b) broad overall desired outcomes and associated market transformation strategies for each OP; (c) identification of priority project clusters and strategic priorities within each OP; and (d) how to monitor and assess strategies (performance) and outcomes/impacts (results) in a conceptually clear and logically consistent framework. The strategic framework needs to be kept current by judiciously debating GEF support options and emerging trends, adjusting strategic priorities in a transparent manner, and communicating the evolving GEF agenda to stakeholders.

(2) The GEF should improve strategic choice and resource allocation within its Climate Change Program, in order to ensure that the bulk of the portfolio is directed toward mitigation efforts in countries with relatively higher levels of GHG emissions and market transformation potential. For countries with significant GEF portfolios, integrated GEF country strategies need to be developed; smaller portfolios require, at least, explicit priorities.

The GEF Climate Change Program is not so extensive as to require an administratively complex financial entitlement system; it is important that GEF retains flexibility in order to respond to opportunities where they arise.

(3) The GEF Secretariat should provide explicit guidance regarding the realistic calculation of GHG avoidance or reduction in project design and implementation and the manner in which impacts should be monitored and reported.

This should include clear and comprehensive guidelines and methodologies for calculating and estimating GHG impacts for various technologies and various assumptions and serve to establish realistic expectations and goals for the portfolio. The GEF Secretariat should be provided with additional resources to implement and maintain improved M&E and data management systems in this area.

(4) The GEF Secretariat, together with the IAs and assisted by the GEF Office of Monitoring and Evaluation (GEFME) and the Scientific and Technical Advisory Panel (STAP), should develop a strategic and pragmatic approach to capturing and sharing information and knowledge within the climate change area, both among projects and between headquarters and the field and supported by electronic knowledge systems.

(5) The GEFME should provide support to the suggested task of improving the strategic coherence of the Climate Change Program by providing guidance, tools, and indicators for assessing GHG impacts, market transformation outcomes, and the effectiveness of associated strategies in specific OPs and priority areas.

(6) The GEF should move toward a greater decentralization in project-by-project approvals, based on clear design principles for climate change project cluster types and a focus on *results.*

Such principles need not be prescriptive or narrow so as to limit innovation, but should rather reflect lessons learned from the portfolio and elsewhere and help to facilitate analysis during the project design process. This should be coupled with a more active management of the portfolio as a whole, through the Climate Change Task Force, led by the GEF Climate Change Team. The purpose is to support the progress of the Climate Change Program by sharing knowledge, facilitating a timely decision making process, and communicating transparently with stakeholders.

To maximize its impact and reach its potential as a strategic partner for developing countries and a more effective agent at the global level, the GEF faces challenges in ensuring programmatic and strategic coherence and solving the conundrum of RE. The GEF financial contribution, although not negligible, cannot by itself generate all the changes stakeholders desire within climate change. Its future success depends on the GEF's

ability to maximize the generation and use of ideas and knowledge from experience, innovation, and risk-taking to promote behavioral change.

1. INTRODUCTION

1.1 Background and Purpose of the Study

The purpose of this study is to provide an overall evaluation of the results and performance of the Global Environment Facility's (GEF's) Climate Change Program from its inception in 1991 to mid-2004. The program constitutes the largest and most comprehensive global portfolio of investments in energy efficiency, renewable energy and other climate-friendly projects. This evaluation presents a unique opportunity for deepening our understanding of which strategies work best, under which circumstances, and with what results. The portfolio of projects offers a rich source of information and a potential set of lessons that can inform more effective project design and implementation as well as the strategic development of the GEF portfolio in the future. Many of the lessons will also be relevant for other international programs in sustainable energy development.

The GEF Climate Change Program[1] is the second-largest GEF portfolio, after the Biodiversity Program, and consists of more than 500 projects and activities[2] amounting to GEF allocations of US$1.63 billion.

In addition to this study, the Office of Monitoring and Evaluation of the GEF (GEFME) has also reviewed the focal areas of biodiversity and international waters. These three independent studies will support the Third Overall Performance Study (OPS3) of the GEF, to be conducted in 2004–05 as a contribution to the GEF Trust Fund replenishment process.

This study is based on the goal of the Climate Change Program, as expressed in the GEF Operational Strategy (1995), namely that "The overall strategic thrust of GEF-financed climate change activities is to support sustainable measures that minimize climate change damage by reducing the risk, or the adverse effects, of climate change. The GEF will finance agreed and eligible enabling, mitigation, and adaptation activities in eligible recipient countries."

The GEF has pursued this goal though a mixed strategy wherein projects meet either one of the long-term program priorities or one of the short-term program priorities."[3,4] The GEF Operational Strategy emphasizes the long-term mitigation measures, grouped into four climate change Operational Programs (OPs):

- OP5: Removal of barriers to energy efficiency and energy conservation
- OP6: Promoting the adoption of renewable energy by removing barriers and reducing implementation costs
- OP7: Reducing the long-term costs of low-GHG-emitting energy technologies
- OP11: Promoting environmentally sustainable transport (added in 1999).

1.2 Past Studies and Lessons Learned

The GEF climate change portfolio has evolved considerably since its conception over a decade ago, in pursuit of a strategic focus that at the same time would maximize impact and the GEF catalytic role. Initially, the GEF approach, guided by the GEF Scientific and Technical Advisory Panel (STAP), was based on demonstration of many relevant climate-friendly technologies and applications. The Evaluation of Pilot Phase (1991–94) determined that such an approach was spreading resources too thin.

Consequently, there is a considerable distinction to be made between the programs of the Pilot Phase and subsequent GEF replenishment periods. The GEF Operational Strategy (1995) and Programs (developed from 1996–2000) served as the basis of programming for GEF-1 (1995–97) and GEF-2 (1998–2002). The First Overall Performance Study found that these changes had articulated the GEF mission, focused GEF investments, and improved the management of GEF operations. On climate change, it recommended greater emphasis on combining barrier removal projects and cost buy-down projects, and pointed out that "projects must

ultimately succeed or fail within the high-emitting countries and they should be the main focus of GEF climate funding."[5]

The last comprehensive Program Study of Climate Change was presented to the GEF Council in May 2001. It did not make recommendations, but identified a number of emerging lessons concerning indirect GEF impacts, including contributions to poverty alleviation; replication of project results; project risk management; transfer of technological know-how; long-term programmatic approaches, and the potential for GEF projects to influence policy.

The Second Overall Performance Study (OPS2) of the GEF (2002) stressed, among other things, the importance of replication, private sector involvement, coordination of GEF projects with national strategies and needs, and fully utilizing the potential for influencing policy. The OPS2 recommended focusing of the climate change portfolio to create enabling environments for market transformation and to promote innovative approaches to productive uses of energy in rural economies. It also pointed out that the catalytic role of the GEF needs more attention, and that the GEF does not systematically monitor replication impact. A major thrust of the OPS2 conclusions was that the GEF should demonstrate a shift from an "approval culture" to a "culture of quality and results." Many of these issues are still in the process of being addressed and are also covered in this study.

The Third Replenishment of the GEF Trust Fund (in 2002) emphasized the need for the GEF to continuously seek to be more effective and efficient. It called for a set of strategic targets for the GEF program to be developed that, while fully consistent with climate change Convention guidance, would provide the basis for additional project criteria beyond the existing eligibility checks.

The GEF Climate Change Task Force, with members from the GEF Secretariat and the Implementing Agencies (IAs), responded by shaping "strategic priorities" that will apply to the GEF-3 phase from 2003 onward. Thus, the GEF's current business plan identifies six Strategic Priorities for the climate change portfolio:[6]

SP1: Transformation of Markets for High-Volume Products and Processes - to catalyze both demand and supply sides with relatively small resource input, resulting in a significant and lasting market penetration or transformation;

SP2: Increased Access to Local Sources of Financing for Renewable Energy and Energy Efficiency - to provide capital for investment in (near-) commercial energy-efficient equipment, energy conservation, or renewable energy technologies for modern energy services;

SP3: Power Sector Policy Frameworks Supportive of Renewable Energy and Energy Efficiency - to incorporate clean energy into energy policy frameworks;

SP4: Productive Uses of Renewable Energy - to provide income generation and other essential social services;

SP5: Global Market Aggregation and National Innovation for Emerging Technologies - to support the reduction of cost in the long run of emerging clean energy technologies; and

SP6: Modal Shifts in Urban Transport and Clean Vehicle/Fuel - to emphasize public transit (such as bus rapid transit), nonmotorized transport (such as bicycles and pedestrian areas), and nontechnology measures (such as traffic demand management and economic incentives).

This study considers these Strategic Priorities within the context of looking forward. Although they reflect a vision of a future comparative advantage of the GEF, they build on lessons learned regarding demonstrated past performance and potential impact and can also be observed in past projects.

1.3 The Evaluation Framework

This study evaluates results—namely, what has been achieved, and performance—how it was achieved. Results may be evaluated at different levels: outputs, outcomes, and impact.[7] Projects produce direct outputs, which in turn lead to certain developmental outcomes that should have an impact on market barriers and contribute to the overall objective of reducing or avoiding greenhouse gas (GHG) emissions in the long term. Given the size of

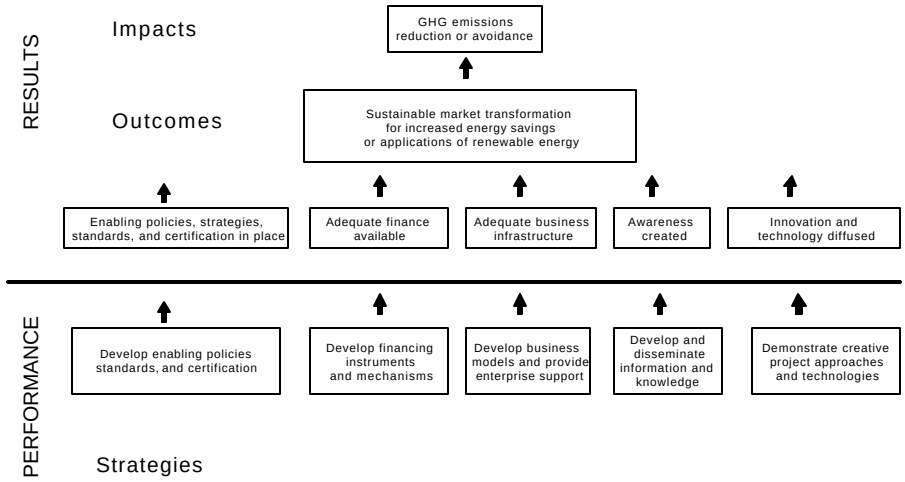
the GEF portfolio and the need to identify *overall* lessons, this study focuses on outcomes and impacts of groups of mitigation projects, rather than detailed or immediate project outputs.

For the first time, a concerted and comprehensive attempt has been made to quantify the overall impacts of the GEF Climate Change Program in terms of reduction or avoidance of GHG emissions. However, it is recognized that GEF's role is mostly a catalytic one: new strategies and approaches are explored that have long-term or indirect benefits once there has been sufficient replication or sustainable market transformation. The study thus gives a great deal of attention to assessing outcomes.[8] This approach is reflected in the GEF Operational Programs which seek "to expand, facilitate, and aggregate the markets for the needed technologies…by removing barriers to implementation and reducing costs.[9] The emphasis on market transformation was further developed in the GEF (2000) report "Measuring Results from Climate Change Programs" and the GEF Strategic Priorities listed above.

This study also aims to assess how achievements were obtained, in order to draw lessons of use for replication on what worked and why, and to evaluate the performance of the GEF Climate Change Program. This implies an analysis of the strategies applied in achieving results. The study has examined a variety of strategies applied by GEF projects that consistently lay emphasis on removal of market barriers to increase market transformation and penetration; building policymakers' capacity with the purpose of developing climate-friendly sectoral policies, laws, regulations or relevant power sector policies; building business infrastructures by triggering financing or demonstrating business viability; adding to social reservoirs of knowledge and awareness; and demonstrating creative project approaches that promote climate-friendly growth.[10]

The evaluation framework is shown in Figure 1.1. Results are evaluated in terms of outcomes and impacts. Performance is evaluated in terms of the strategies that contribute to these outcomes and impacts. The framework reflects the mandated GEF catalytic role in promoting, by barrier removal, a primary outcome of market transformation that leads to the long-term reduction or avoidance of GHG emissions. This primary outcome can be supported by contributory outcomes, such as enabling policies, or increased awareness and diffusion of technology. Each of these outcomes is achieved through effective employment of relevant strategies that encompass the various market barriers the GEF addresses. The catalytic effect of the GEF can be gauged by how successful its barrier removal strategies are in creating a ripple effect in the market.

Figure 1.1: Evaluation framework



The evaluation framework facilitates analysis at the *program* level; the results and strategies generally cut across the goals of the OPs, project clusters, technologies, and local circumstances. Perhaps more importantly, the framework captures both past approaches and future strategies of the GEF. For the purposes of the study, the

analysis will concentrate on the first three strategies and outcomes: enabling policies, availability of finance, and adequate business infrastructure.

Furthermore, most GEF climate change projects have involved either energy efficiency (EE) or renewable energy (RE) technologies. This study will thus focus on OP5 and OP6. Annex A presents further details on the study's scope and methodology as well as on the process of data collection and analysis.

1.4 Methodology and Process

A comprehensive portfolio review was undertaken to capture the current nature and composition of the portfolio, as well as the status of OPs, project clusters, and country focus. This was complemented by emissions data and development statistics.

Two in-depth project cluster reviews were undertaken within EE (OP5) and RE (OP6), respectively: one addressed rural electrification with RE, and the other EE programs with an emphasis on access to finance. They were enhanced by IA reviews, other GEFME reviews including the Local Benefits Study, and country visits.

The field visits were important for a more in-depth understanding of certain key projects as well as assessing the effectiveness of country strategies for market transformation for the adoption of renewable/energy-efficient technologies. The 2003–04 visits informing the study include five Eastern European countries, Senegal, Ghana, China, Pakistan, the Philippines, India, and Cuba. The visits were not intended to evaluate project performance at a detailed operational level. The emphasis was on overall vision of achievements and key issues at the country level, impacts, market transformation outcomes and strategies, and primarily focusing on a comparative review of which strategies are more effective in achieving specific outcomes and impacts. Focused interviews and data searches provided valuable information and insights that would not have been possible simply through a desk review.

The study was developed by staff of the GEF Office of Monitoring and Evaluation and independent consultants, with the support of the GEF Climate Change Task Force. It was enriched by consultations, interviews, and stakeholder meetings, including workshops on the methodology and brainstorming on the key findings.

1.5 Organization of the Report

The structure of this report reflects its varied audiences. The report presents overall trends, findings, and lessons of interest to GEF policymakers and stakeholders. Chapter 2 highlights some key trends in global efforts to combat climate change within the context of the UNFCCC, the Kyoto Protocol, and the development of carbon markets. This is the framework within which the GEF fulfills its mandate. Chapter 3 describes the GEF climate change portfolio and highlights important trends. Chapter 4 presents the main analysis of results and performance, and chapter 5 outlines key findings and recommendations for the future.

2. CLIMATE CHANGE OVERVIEW

The purpose of this chapter is to place the evaluation of the GEF portfolio of climate change projects in the context of the broader effort of addressing climate change and to understand how GEF's role in the area has evolved and developed over the past decade. The chapter begins with a brief review of the state of knowledge of climate change science and impacts as assessed by the Intergovernmental Panel on Climate Change (IPCC). Next it reports on the status of the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. Trends in climate change mitigation and adaptation funding and programs are also discussed. Finally, the chapter summarizes GEF's role as the financial mechanism supporting the Convention and highlights the evolving priorities within GEF programs and partnerships.

2.1 Review of Climate Change Science and Impacts

The major greenhouse gases (GHGs) that are being released into the atmosphere are CO_2 from energy use and from changes in land use patterns, methane (CH_4) and nitrous oxide (N_2O) from agriculture, and "trace gases" or artificial chemicals including halocarbons and sulfur hexafluoride. The concentration of CO_2 has already increased from about 275 parts per million by volume (ppmv), prior to the commencement of the Industrial Revolution in the 18th century, to 368 ppmv in 2000,[11] an increase of 34 percent. Carbon that has been stored in the earth's crust (in the form of oil, coal, and other fossil fuels) over millions of years is being released into the atmosphere relatively rapidly.

Rising levels of GHGs in the atmosphere are causing climate change. If growth in emissions continues, global temperatures are expected to rise between 1.4 and 5.8ºC by the end of the 21st century.[12] This is 2 to 10 times more than observed global warming in the 20th century. Land areas are expected to warm more than oceans. The mean average surface temperatures over the 20th century increased by about 0.6ºC (± 0.2ºC).[13] Different scenarios for the growth of GHG emissions in the future are shaped by a number of major drivers, in particular economic growth, demographic changes, and technological innovation.[14]

Climate change is likely to have a significant impact on the global environment. In general, the faster the climate changes, the greater will be the risk of damage. The mean sea level is expected to rise 15–95 centimeters[15] by the year 2100, causing flooding of low-lying areas and other damage. The list of impacts is long, but a few examples will convey the scale of the problem: the viability of key ecosystems is put at risk by a temperature change of only 1–2ºC, including coral reefs, arctic ecosystems, and coastal wetlands; the Greenland ice sheet, which contains sufficient water to raise sea levels by about 7 meters, would become unstable with a local warming of 3ºC, and gradually lose its ice mass.[16]

Regional impacts have been studied by the IPCC, which finds that poor countries and communities are most vulnerable to the impacts of climate change because of their higher sensitivity to climate disruptions, lower capacity, and limited resources to adapt.[17] Human society will face new risks and pressures on food security, water resources, and physical infrastructure and from extreme events—floods, droughts, and storms. Adaptation is needed for both human and ecosystems to cope with future climatic regimes.

What matters for future climate change is cumulative emissions in the future. Reductions that will be required in this century are in the order of magnitude of 1,100–1,500 billion metric tons of CO_2-equivalent, while mitigation potential ranges from 13.2–18.3 billion metric tons of CO_2-equivalent per year.[18] There is a large gap between what is required to address the problem and the current commitments that have been negotiated in the international arena.[19]

The uneven contribution of different regions of the world to global warming is shown graphically in Figure 2.1, which redraws the map of the world with areas proportional to historic cumulative CO_2 emissions (1900–90) from fuel combustion.

Note: if the map and table are not in landscape format, the following paragraph should come after the map and before the table.

Regional analysis as shown in the map hides significant differences between countries (and indeed within countries). Since most countries are Parties to the UNFCCC and the Kyoto Protocol, some indication of *national*-level efforts made to control GHG emissions is appropriate. The Global Governance Initiative report to the World Economic Forum provides some useful—albeit imperfect—indicators for some major countries (see Table 2.1), both industrialized and developing.[20] The notion of responsibility is captured in relation to several indicators, while national income gives some sense of capability to mitigate. It also records the share of renewable energy and status in ratifying the Kyoto Protocol and submitting national communications. The current and historical situation presented in these figures provides the context for considering future targets and scenarios.

Figure 2.1 Contributions to Global Warming *Source:* World Resources Institute, 2001

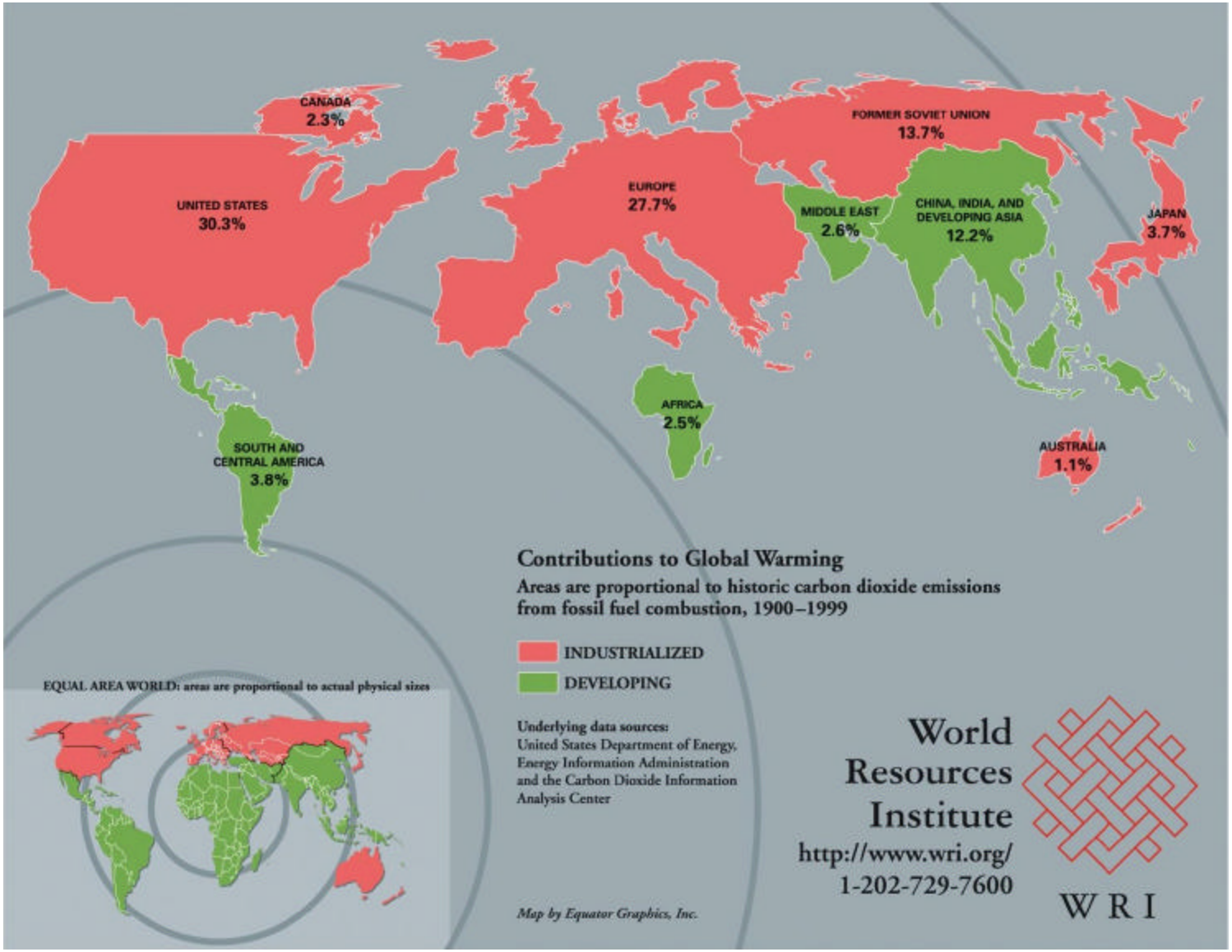


Table 2.1 Climate Change Indicators for Select Countries

	Responsibility / Emissions					Capability	Renewables	Status in negotiations	
Country	Contribution to the global CO_2 concentration increase (1950–2000)	Change in CO_2 emissions (1990–2000)	Emissions per capita (tons of carbon equiv., 2000, all gases)	Carbon intensity (tons of carbon per US$ GDP-PPP, 2000)	Change in carbon intensity (1990–2000)	GDP per capita (USD PPP, 2000)	Share of renewables in electricity mix (2000)	Kyoto Protocol ratification	Submission of national communications
Australia	1 %	26 %	6.6	193	-11.4 %	25,693	9 %	No	Yes
Canada	2 %	22 %	6.0	172	-7.8 %	27,840	61 %	Yes	Yes
European Union	17 %	0 %	2.9	99	-18.1 %	23,645	15 %	Yes	Yes
Japan	5 %	12 %	2.8	104	-2.4 %	26,755	10 %	Yes	Yes
Russia	9 %	-32 %	3.8	427	2.6 %	8,406	19 %	No	Yes
United States	26 %	18 %	6.6	162	-14.5 %	34,142	9 %	No	Yes
China	10 %	39 %	1.1	201	-46.8 %	3,976	17 %	Yes	No
Brazil	1 %	53 %	1.8	73	17.6 %	7,604	90 %	Yes	No
India	3 %	64 %	0.5	99	-3.6 %	2,358	14 %	Yes	No
South Korea	1 %	85 %	3.0	185	2.1 %	17,470	2 %	Yes	Yes
Mexico	1 %	25 %	1.5	125	-11.3 %	8,985	19 %	Yes	Yes
South Africa	1 %	17 %	2.6	200	-1.7 %	9,466	1 %	Yes	No
World	**100%**	**14 %**	**1.6**	**147**	**-13.1 %**	**7,295**	**18.7 %**	**-**	**-**

GDP, gross domestic product; PPP, purchasing power parity

Source: Adapted from Global Governance Initiative, 2004; data from World Resources Institute, 2003.

2.2 Status of Climate Agreements and Negotiations

The global response to climate change was initiated with the adoption of the UNFCCC at the 1992 Rio Earth Summit. The ultimate objective of the UNFCCC is to stabilize GHG concentrations at levels to prevent dangerous climate change, while allowing ecosystems to adapt, ensuring food security and allowing sustainable economic development (UNFCCC, Article 2). This will require significant effort. Given an expanding world economy and growing populations, dramatic improvements in energy efficiency are needed, as well as a switch to cleaner sources of energy and fundamental changes in other economic sectors.

The COP is the decision making body of the UNFCCC. All states (currently 188) that have ratified or acceded to the Convention are Parties to the Framework Convention on Climate Change (FCCC). The COP meets annually, with its two subsidiary bodies —the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation— meeting between sessions. The COP and subsidiary bodies are serviced by a secretariat. The COP can review existing commitments or adopt new commitments such as those agreed under the Kyoto Protocol in 1997. Although the Convention includes commitments, these are not binding.

The first principle of the FCCC is that "Parties should protect the climate system…in accordance with their common but differentiated responsibilities and respective capabilities." (UNFCCC, Article 31). Under the Convention, both developing and developed countries accept commitments to submit national communications, including GHG inventories. They agree to adopt national programs for mitigation and adaptation. Cooperation in technology transfer is another broad commitment. All Parties agree to take climate change considerations into account in policies, to cooperate on scientific matters, and to promote education and public awareness related to climate change. It is recognized that implementation of the above commitments by developing countries will depend on financial and technical assistance from the developed countries (UNFCCC, Article 4.1). See Box 2.1 on Convention Parties.

Box 2.1. Convention Parties

- UNFCCC Annex I parties (35 countries): To take the lead in combating climate change (essentially Europe, North America, Japan, Australia)
- UNFCCC Annex II Parties: The 24 richest countries among Annex 1, with commitments to provide additional funding
- UNFCCC Non-Annex I Parties: The developing countries (138 or so) with commitments to submit National Communications, but no emissions reductions
- Kyoto Annex B parties: Essentially the same as Annex I, with target commitments to reduce emissions.

In line with the differentiated responsibilities, the developed[21] country Parties and other Parties included in Annex I should take the lead in combating climate change. These countries had more specific commitments under Article 4.2 to take measures aimed at returning their emissions to 1990 levels by the year 2000, but this goal was not achieved by many countries. The richest countries agree to provide "new and additional financial resources" and facilitate technology transfer. Annex II countries pay the "agreed full cost" of non-Annex I national communications under Article 4.3. They also help fund transfer of environmentally sound technologies, particularly for developing country Parties.

Specific mitigation commitments for industrialized countries were negotiated and included in the subsequent Kyoto Protocol. The Parties agreed by consensus that Kyoto Annex B countries would have a legally binding commitment to reduce their collective emissions of six GHGs by 5 percent on average compared with 1990 levels during the period 2008–012. The Protocol establishes three flexible mechanisms: an emissions trading regime that allows assigned amounts to be traded under Article 17; Joint Implementation (JI), a project-based mechanism involving Annex I parties under Article 6; and the Clean Development Mechanism (CDM), which allows investment by Annex I parties in projects in developing countries under Article 12. These mechanisms assist Annex I parties in achieving their emission reductions at least cost.

The CDM includes a second objective of assisting developing countries in achieving sustainable development, as the Kyoto Protocol was also structured to assist in generating funding to address adaptation needs. Parties to the Protocol have agreed, in its Article 12.8, "to ensure that a share of the proceeds from certified [CDM] project

activities is used to…assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation."

The Kyoto Protocol has not yet entered into force. To do so, it must be signed and ratified by 55 countries, with total emissions accounting for at least 55 percent of the CO_2 emissions from Annex I countries in the year 1990.[22] The emissions (CO_2 only) for the base year (mostly 1990) are listed in Annex B of the Protocol. As of June 2004, 122 countries had ratified the agreement, but only 44.2 percent of Annex I emissions were included. Ratifying Parties include many major developing countries as well as the European Union (and its members), Japan, Canada, and a few other industrialized countries. Absent are the United States, Australia, and Russia, although the Russian Cabinet signed off on the Protocol in September 2004.

2.3 Future Scenarios and Responsibilities

Industrialized countries have contributed most to GHG emissions over time. Figure 2.1 shows this graphically, and this fact underlies the Convention's first stated principle, which requires developed countries to take the lead.

> The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof. (UNFCCC, Article 3.1)

Hence, the Kyoto Protocol quantified emission reduction targets only for Annex I (under the Convention, or Annex B, under the Protocol) Parties. Clearly, annual emissions from developing countries (non-Annex I, hereafter NAI) are increasing. According to data from the World Resources Institute, CO_2 emissions from fuel combustion in developing countries have increased 38.9 percent over the 1990–2000 period, resulting in a share of 40 percent of annual global emissions in 2000.[23] However, CO_2 emissions *per capita* were 11.9 tons of CO_2 for Annex I and 2.0 tons of CO_2 for NAI countries in 2000.

Future emissions and "cross-over" dates (when NAI emissions would exceed those of Annex I as a group) are highly sensitive to the assumed emissions scenario[24] and the basis and units of comparison. Cross-over will occur soon if one looks at annual CO_2 emissions of developing countries and emerging economies. If the analysis is based on cumulative CO_2 emissions and contributions to global temperature increases, cross-over is much later. Another issue complicating this analysis is the fact that Annex I countries emit primarily CO_2, while developing economies with large agricultural and forestry sectors can be expected to have a higher share of methane and nitrous oxide in their total emissions.

Whatever analytical approach is taken, it is clear that the contribution of developing countries *as a group* will constitute a growing share in the future. It is equally evident that Annex I responsibility will remain higher for a long time to come if the analysis is based on per capita emissions, critical if the analysis is to be fair,[25] or if cumulative emissions are considered, which are the ones that matter most to the climate.[26]

The gap between current targets and the projected emissions means that greater mitigation effort is needed. The IPCC's second assessment report summarized the implications of continued emissions and required effort as follows.

> "If net global anthropogenic emissions (i.e. anthropogenic sources minus anthropogenic sinks) were maintained at current levels (about 7 GtC/yr including emissions from fossil fuel combustion, cement production and land-use change), they would lead to a nearly constant rate of increase in atmospheric concentrations for at least two centuries, reaching about 500 ppmv (approaching twice the pre-industrial concentration of 280 ppmv) by the end of the 21st century. Carbon cycle models show that immediate

stabilisation of the concentration of carbon dioxide at its present level could only be achieved through an immediate reduction in its emissions of 50–70% and further reductions thereafter."[27]

Continuing the established FCCC principle that Annex I countries take the lead, deeper cuts in emissions by these countries will be required in the future.[28] Annex II commitments under the Convention and Protocol to assist developing countries financially will also continue. Indeed, as the need for quantified mitigation targets in the more rapidly industrializing developing countries grows, the requirements for funding may increase.

2.4 The Role of the GEF in Supporting the UNFCCC

GEF started initially in 1991 as a pilot within the World Bank and then later was officially established in the lead-up to the Rio Earth Summit in 1992. The GEF Council, with 16 members from developing countries, 14 from developed countries, and 2 from economies in transition, develops, adopts, evaluates, and funds projects in support of a number of international environmental conventions and agreements. The GEF has three implementing agencies: the United Nations Environment Programme (UNEP), UNDP, and the World Bank.

After the adoption of the UNFCCC, the GEF became the Convention's financial mechanism and a key channel for climate change funding for developing countries.[29] The climate change focal area is one of six GEF focal areas, and the second largest in terms of financial investment. The other focal areas include biodiversity, international waters, and ozone depletion. In addition, the areas of land degradation and persistent organic pollutants were recently included (in 2002).

Article 11 of the FCCC establishes a financial mechanism, which can be entrusted to one or more international entities with "an equitable and balanced representation of all Parties within a transparent system of governance." The COP entrusted the operation of the financial mechanism to the GEF, initially as an interim measure and since 1999 on a continuing basis. The financial mechanism is accountable to the COP, which reviews it every four years. The COP provides guidance on policies, program priorities, and eligibility criteria.

Although the GEF is sometimes regarded as the exclusive financial mechanism for the UNFCCC, the term "financial mechanism" correctly refers to the totality of legal, institutional, and procedural arrangements that regulate and make possible the flow of financial resources mandated by the Convention. The purpose of the financial mechanism is to give effect to the resource commitments set out in Articles 4.3, 4.4, and 4.5 of the Convention. The purpose of the GEF is broader; it supports the Convention but it can also fund climate activities outside of the Convention's framework.[30] There are also additional financial flows, other than the GEF, that support the FCCC.

The Kyoto Protocol, in its Article 11, refers back to the financial mechanism of the Convention and applies the same guidance. The Protocol directs the financial mechanism to "provide new and additional financial resources to meet the agreed full costs" of Kyoto Protocol Article 10 and FCCC Article 4.1a (reporting on inventories, emission factors, etc.). Annex II parties are to provide the "agreed full incremental costs" of items in Protocol Article 10, which include mitigation and adaptation programs.

At the first UNFCCC COP, the Parties decided to adopt a mixed set of priorities for the GEF climate change focal area, including support for long-term projects, short-term response measures, and enabling activities.[31] Subsequently, the largest share of GEF resources has been assigned to long-term mitigation projects. These were envisaged to have "much greater impact because the projects would drive down costs, build capacity, and start to put in place the technologies that can ultimately avoid GHG emissions" (FCCC/CP/95/4 to COP-1). These climate change mitigation projects fall under the four OPs approved by the GEF Council, on barrier removal to energy efficiency and energy conservation (OP5); renewable energy (OP6); reducing the long-term costs of low-GHG-emitting technologies (OP7); and environmentally sustainable transport (OP11).

A smaller share of funds has been committed to short-term response measures (STRMs. These include projects that "maximize short-term cost-effectiveness, by for example, …sequestering or abating the emissions of carbon dioxide that have the lowest unit incremental costs" (FCCC/CP/95/4). The Third Replenishment negotiations pointed out that strategic targets for the GEF program "may involve limiting further commitments in the mature programs such as…short-term measures…" The relative importance of the STRMs was consequently reduced in the last GEF Business Plan.

Finally, although limited in financial terms, GEF-supported enabling activities (EAs) form a key part of Convention adherence by the Parties. "The requirement for all Parties to report on their greenhouse gas emissions and climate change activities is one of their most important obligations, providing the basis for the COP to assess the implementation of the Convention and its effectiveness."[32] The GEF provides funding, on an agreed full cost basis, for the preparation of national communications, as well as for capacity building activities.

Of the 40 national communications from Annex I countries, GEF supported three (Belarus, Croatia, Slovenia). Of the 115 national communications from NAI countries, only 10, mainly small island states or newly industrialized countries, were not supported by the GEF. In addition, 23 countries with EAs in various stages of progress have yet to submit their first national communication. Based on a 2000 Review of Climate Change Enabling Activities, the GEF is improving the consultative process for formulation of the procedures for subsequent communications.

2.5 The Evolving Climate Change Agenda: Response Measures

2.5.1 Mitigation

Debates and discussions on mitigation strategies and priorities have evolved over time. Initially the emphasis was on demonstrating technologies and bringing down the cost of climate-friendly technologies, as reflected in the GEF Pilot Phase and OP7. Renewable energy and energy efficiency were seen as the most promising areas. The first two OPs (OPs 5 and 6) of the GEF reflect this focus, and market barrier removal was thought to promote win-win situations in terms of meeting local needs and achieving global environmental benefits.

In the UNFCCC negotiations, the exclusion of specific technologies was resisted. "Negative lists" of technologies to be excluded (for example, cleaner coal or nuclear energy technologies) were not endorsed in COP decisions. Parties were reluctant to pick technology winners. EE and RE were, in part, no-opposition, no-regret options.

Supporting research and literature also supported investigation of different technologies and policies.[33] The IPCC reviews key developments in the knowledge around technological options to mitigate GHG emissions.[34] These analyses, and those of the GEF STAP, provide a useful framework for informing GEF strategic choices.

As its second decade begins, GEF aims to "accelerate the shift from technology-based towards market-based approaches, emphasizing policies and institutions…" (GEF Business Plan FY04–06, presented to the GEF Council in document GEF/C.21/9). In broad terms, there has been a discernable shift from technology demonstration to the removal of barriers to RE and EE penetration, then market aggregation and the removal of economic barriers. Transport was added as an additional operational program.

The debates on climate change mitigation have broadened to include linkages with sustainable development.[35] Choosing a more sustainable development path implies that GHG emissions should be lower than in other possible futures. The IPCC's Third Assessment Report found this choice of future "world" as important as other drivers determining GHG emissions. A key finding of this report is that "…low-emission futures are associated with a whole set of policies and actions that go beyond the development of climate policy itself."[36]

However, shifting development paths require transitions in larger systems, not least energy economies, including those in developing countries and emerging economies. A future negotiation round on quantified mitigation commitments for the larger emerging economies is not on the official agenda, but increasingly is being discussed by research organizations.[37] However, with a review of "demonstrable progress" due in 2005 (under Protocol Article 3.2) these discussions may become formal in the next few years. Inevitably, the spotlight begins to fall on the larger developing countries that are significant total GHG emitters, such as China, India, Brazil, and Indonesia (taking account of methane and CO_2). It is interesting to note what energy savings have already been achieved in China as a result of structural change in its economy.

2.5.2 Sequestration

Mitigation has tended to focus on reducing emissions from sources. The other side of the carbon cycle, removal of GHGs from the atmosphere by sinks,[38] has recently gained more attention. Allowances for existing sinks in Annex I countries were critical in finalizing the Marrakech Accords, with significant concessions to Russia, Japan, and others under Article 3.3. and 3.4 of the Protocol (FCCC/CP/2001/13/Add.1). Methodological questions on calculations and reporting were addressed by the COP-9 in 2003, which agreed on modalities and procedures for land use, land use change, and forestry (LULUCF) projects. It also agreed to rules for sequestration/sink projects under the CDM. These rules now need to be given operational effect, a process made more difficult by the greater complexity of the underlying issues, such as permanence and biodiversity. All Parties to the Convention have committed themselves to promote sustainable management of sinks and reservoirs of all GHG gases not controlled by the Kyoto Protocol (UNFCCC Article 4.1). The GEF OP12 on Integrated Ecosystem Management includes natural resource management interventions that could, in part, respond to these challenges. GEF has also funded STRMs in the area of sequestration.

The above discussion has focused on biological sequestration or sinks. Carbon capture and storage by nonbiological means is also receiving increasing scientific attention. The IPCC is compiling a special report on carbon capture and storage, considering options such as storage in geological formations, re-injecting CO_2 into oil and gas fields, and even storage in the deep ocean. The GEF portfolio has not, as yet, addressed these kinds of projects, with the possible exception of the China Yantai integrated gasification combined cycle (World Bank), approved as an OP7 PDF-B under the condition of zero CO_2 emissions.

2.5.3 Adaptation

The Convention and Protocol include a number of references to adaptation. All Parties to the Convention have agreed that "the specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change…should be given full consideration" (UNFCCC, Article 3.2). The earliest guidance given to the GEF, at COP-1 in Berlin, provided for a staged approach to adaptation (Decision 11/CP.1, 1995). In this decision, the financial mechanism was asked to consider criteria for supporting planning and studies of climate change impacts under the first stage. The second stage would explore measures to prepare for adaptation. The third, and most advanced stage, is concerned with measures to facilitate adaptation. The staged approach has influenced activities that received GEF support under NAI National Communications.

The issue of adaptation has recently received more attention in the negotiations. At COP-7, Parties agreed there was a need for new and additional funding beyond contributions that are allocated to the climate change focal area of the GEF and to multilateral and bilateral funding for the implementation of the Convention. COP-7 established an Adaptation Fund under the Protocol and two funds under the Convention, the Least Developed Country (LDC) Fund and the Special Climate Change Fund. All three funds are to be operated by the GEF on the basis that each fund remains distinct from the existing GEF Trust Fund used for climate change activities.

Many assessment and planning activities have already been funded by GEF, mostly in conjunction with National Communications, and the challenge is to define concrete implementation activities. Significant progress has

been made, notably in prioritizing adaptation activities through a participatory process of the National Adaptation Programme of Action by LDCs. Under the LDC Trust Fund, GEF has provided US$200,000 per LDC.

In response to guidance from COP-7, the GEF Council approved in November 2003 a seventh strategic priority on adaptation (SPA) within the climate change focal area, "Piloting an Operational Approach to Adaptation," within the GEF Trust Fund. The scheme is limited to pilot projects worth US$50 million during 2005–07. Pilots should show how adaptation planning and assessment can be practically translated into projects that will provide real benefits. Full costs are to be paid only for small grants, while large and medium-sized projects will require cofinancing. The pilot began in July 2004 and will end when the LDC and Special Climate Change Funds start.

A paper on "assistance to address adaptation" for the GEF Council in May 2004 indicates that adaptation activities must be country driven and integrated into national sustainable development planning and poverty-reduction strategies. It links local adaptation to GEF's mandate in that the "need to adapt to adverse impacts of climate change is an incremental burden to developing countries, generated by a global environmental impact." Capacity building can be incremental and targeted and also have "a global dimension as they help vulnerable countries and communities to address the global environmental impact of climate change."[39] These principles are to be operationalized in the SPA pilot.

A key challenge will be the development of secure, adequate, and predictable funding streams for priority adaptation needs, as well as equitable frameworks for access to this funding. Apart from funds, tiered national and regional insurance schemes have been proposed. They form part of an approach that emphasizes managing and spreading the risk to developing countries of climate impacts such as extreme weather events, aiding recovery efforts and contributing to sustainable development.

2.5.4 Flexible Mechanisms and the Development of Carbon Markets

Investment and funding for climate change activities comprise a larger set of sources of which GEF funding is one part. These mechanisms provided for by the Convention and the Protocol might complement the GEF efforts and include JI, the CDM, and carbon trading to facilitate efficient investment to meet GHG emission reduction targets.

Prior to the Marrakech Accords, Parties to the Convention piloted mitigation programs under the notion of "Activities Implemented Jointly." Initiated at COP-1 in 1995, this pilot phase explicitly did not award carbon credits, and included both developing countries and economies in transition. The main aim was to gain experience with mitigation projects, and more than 150 projects were registered in over 40 countries.[40] The future of these pilot projects under the CDM and Article 6 JI remains unclear.

JI under Article 6 of the Kyoto Protocol[41] allows investment in projects in countries with economies in transition. The fundamental difference with the CDM is that, in this case, both countries have caps on their national emissions under Kyoto. The overall limitations mean that any errors in estimating real emission reductions at the project level would reflect in the national GHG registries.

The COP decided in 2001 to facilitate a prompt start for a CDM (Decision 17/CP.7) although the Protocol is still not ratified. Early movers in the CDM have included the Dutch government through ERUPT (JI) and CERUPT (CDM); and the World Bank, through the Prototype Carbon Fund. Some of these funds aim at particular niches. For example, the Community Development Carbon Fund (Austria, Canada, Italy, and the Netherlands plus seven companies) is aimed at small-scale mitigation projects that also improve the livelihoods of local communities. The BioCarbon Fund for LULUCF includes mitigation projects combined with environmental benefits, adaptation, and poverty reduction.[42] Countries such as Austria, Denmark, Finland, Germany, Italy, Japan, and the Netherlands have also set up separate CDM funds. Investment by early movers in the CDM is at least in part intended to influence the future market by setting de facto technical standards and occupying market position.

The CDM generates credits that are tradable ("fungible" in climate jargon) in the international emissions trading system under Article 17 of the Kyoto Protocol. The CDM Executive Board is accrediting operational entities, formulating methodologies, and considering the first round of project submissions under provision for a prompt start. A wide range of actors—Kyoto Protocol Parties, state and local governments, individual companies, brokers and international financial institutions, GEF IAs—are becoming involved in carbon trading projects.[43]

More than 75 projects have already been developed, representing allocations worth US$800 million for CDM investments or purchases of Certified Emission Reductions (CERs).[44] Most of these allocations have been from public funds, but have not yet all been disbursed. There is a leveraging effect in that total project investment is higher than the fund contributions, so investment in actual projects should be about US$800 million times six to eight.[45] Total project investment can be expected to increase over time, including more private sector investment.

Within the GEF family, the possibilities of greater coordination between GEF and carbon finance have been discussed. The World Bank Group has been particularly active in its stated mission "to catalyze a global carbon market through the purchase of high quality emission reductions in climate-friendly projects in developing countries and economies in transition." For example, the world's first trade fair and conference for emissions trading aimed at reducing CO_2, Carbon Expo, was organized in 2004 by the World Bank and the International Emissions Trading Association. The Bank's Carbon Finance Business Unit has made significant progress in a short time in developing a viable end-game that may allow the GEF to focus more strongly on market barrier removal activities.

The GEF has so far not received guidance on carbon finance from the COP or the GEF Council. Nevertheless, developments in CDM investments and carbon trading could begin to have an impact on the GEF portfolio. For example, GEF funding for mitigation projects might focus on various market transformation activities that facilitate initial financing of sustainable energy projects. The long-term viability of some of these projects might be enhanced through ongoing financial flows from CDM emission reduction credits over the project's lifetime.

2.6 Recent GEF Internal Developments and Trends

The above discussion has provided a context for understanding the development of the GEF climate change focal area. In addition, some aspects of a more internal nature, emanating from the GEF Council and discussions within the GEF family, will guide future GEF climate change support.

2.6.1 Strategic Priorities and Results Orientation

Over the past eight years or so, the GEF climate change portfolio was governed by the GEF Operational Strategy (1996), which emphasizes mitigation measures for climate change within the four climate change OPs. A number of factors are now contributing to sharpen this programmatic focus.

The Third Replenishment of the GEF Trust Fund (in 2002) advanced policy recommendations with a view to "increasing the GEF's emphasis on quality and results, to improving GEF's responsiveness to country needs and to the guidance of the global environmental conventions, and to making its processes more expeditious, streamlined and efficient so as to maximize impacts achieved with consideration of country performance through the resources of the third replenishment of the GEF." The Third Replenishment suggested developing strategic targets for each GEF program for the approval of Council.[46]

The GEF Business Plan for 2004–06 captures these recommendations and confirms that GEF aims to "accelerate the shift from technology-based towards market-based approaches."[47] To do so, seven Strategic Priorities will guide GEF programming within the OPs from 2003 onward (see table 2.2). Priorities SP1–SP3 are perceived to have superior impact on the basis of past experience. The other priorities (SP4–SP6) are expected

to yield enhanced impact within GEF OPs 6, 7, and 11, respectively. Some represent aspects of market development that were underrepresented in the GEF portfolio (power sector policies, productive uses); or promise particularly efficient use of GEF resources (increased access to local sources of financing) or a particular niche of comparative GEF advantage (market transformation). The Strategic Priority on adaptation (SPA), was added by the GEF Council in November 2003,[48] based on new Convention guidance. The Strategic Priorities constitute the first time that allocations and aggregate targets have been set for the GEF focal areas.[49,50]

Table 2.2 Climate Change Strategic Priorities and Future Targets

Strategic priorities	Indicators and GEF-3 targets (FY03–06)	Funding (US$ million)
SP1. Transformation of markets for high-volume, low-GHG products or processes	12,000 gigawatt hours annual energy savings	78
SP2. Increased access to local sources of financing	Funding volume of public and/or private financier lending for applications targeted by projects: US$700 million	84
SP3. Power sector policy frameworks supportive of RE and EE	Expected 4,000 megawatt additional power sector investments 10 additional countries with explicit RE/EE power sector policies	128
SP4. Productive uses of renewable energy	2 million additional people served with renewable energy 20,000 additional social service institutions using RE 10,000 additional income-generating businesses from RE	95
SP5. Global market aggregation and national innovation for emerging technologies	Actual and planned/committed additional global investment in targeted technologies, measured in number of business plans (targets depending on STAP report on OP7)	65
SP6. Modal shifts in urban transport and clean vehicle/fuel technologies	20 cities with integrated sustainable transport plans in place 15 cities with bus rapid transit plans completed 3,000 kilometers of additional bikeways constructed	79
SP7. Piloting an operational approach to adaptation	Funding for FY05–07. Targets not determined.	50

Furthermore, the Third Replenishment also asked the GEF to explore the possibilities of a "system for allocating scarce GEF resources within and among focal areas with a view towards maximizing the impact of these resources...."[51] Significant work still remains to finalize an operational resource allocation framework system that would allow GEF to prioritize projects and facilitate changes in the mix of project proposals. The implications for resource allocations among recipient countries are not yet clear. [52]

The GEF Council has confirmed that "…equal opportunity for all recipient countries [to obtain funding under the Convention] should be an underlying principle in designing the performance based framework."[53] The nature of funding differs. The new strategic approach to enhancing capacity building, approved by the GEF Council in November 2003, allows GEF for the first time to support free-standing, capacity building activities in or across focal areas, as well as specific support to LDCs and small island development states.

In the future, the implementation of the Strategic Priorities will be facilitated by the process to review the OPs, by May 2005, with a view to rationalizing their number and objectives.[54] One aspect of such reform is the increasing attention to synergies between focal areas, in response to the work within the environmental conventions on joint programs between the different conventions (biological diversity, desertification, climate change). Of particular relevance to the climate change program are the linkages with biodiversity, land degradation, ozone depletion, and water systems. [55]

Combined with a greater focus on results, initiatives are under way to make the internal GEF processes and systems more responsive and efficient. Simplification of the project cycle is envisaged in a number of GEF planning documents.[56] The adverse effects of the complexity and length of the GEF project cycle, which includes both the time in approval by the GEF Secretariat and Council as well as by the IAs, have been pointed out in several evaluations. Because climate change projects are mainly market based, they are particularly

susceptible to delays in formulation, implementation, and procurement because markets evolve rapidly and often change the project rationale. The GEF project orientation does not seem to lend itself well to the programmatic planning approaches of the IAs and their efforts to "mainstream GEF activities into national planning frameworks."[57] The proposed piloting of programmatic approaches in 2001 has so far not been systematically applied.[58] The system's inability to respond flexibly, timely, and coherently to national needs has consequences for performance.

The Second Overall Performance Study and the Third Replenishment also encouraged the strengthening and acceleration of cross-learning processes, particularly on an interagency basis, and called for a formal "feedback loop" to improve planning and subsequent activities. This increased demand by GEF stakeholders for more systematic learning and replication is driving proposals on knowledge management in the GEF. The two largest IAs, the World Bank and UNDP, both have such knowledge management systems, and the UNDP-GEF has been particularly active in bringing new learning approaches to its climate change portfolio. The climate change focal area is likely to be one of the pilots for a GEF knowledge-sharing strategy; the potential gains are considerable for the climate change portfolio with its diverse approaches in varied project clusters.

2.6.2 Evolution in Roles, Responsibilities, and Policies of GEF Partners

The GEF has always relied on a collaborative partnership in which each entity plays its role effectively and in accordance with its comparative advantage.[59] Whereas the latter has remained stable and the IAs undertake projects within their sphere of interest, the environmental priorities of the IAs have evolved over time, as have the priorities of the GEF.

Since the Millennium Summit in 2000, development agencies, including the IAs, have focused on the Millennium Development Goals as the way to poverty eradication and sustainable development. UNDP sees energy as "an important entry point for achieving the goals of all three of the pillars of sustainable development: social equity, economic growth, and environmental protection."[60] The World Bank Group sees its main task "to help bring about a sustainable and rapid growth in incomes and to alleviate poverty. Within this process, {their} role is to ensure that energy is supplied at least economic cost and that it is used in the most efficient and sustainable way possible."[61]

The GEF has not, as yet, explicitly reflected this paradigm shift in its climate change policies and programs. The notion of "concentrating on global issues that involve local and national benefits" (World Bank policy), may be implicit, but it has not been underpinned by practical guidance. Not relating GEF work to the Millennium Development Goals may inhibit mainstreaming environment into country and IA programming. However, the availability of the GEF Trust Fund and the GEF mandate in supporting global environmental benefits provide opportunities for the IAs to pay more attention to global environmental issues.

UNDP found that "The predominance of GEF programme funding [in energy and climate change] has in some regions—particularly in Africa—limited programme development to addressing local poverty linkages. Further efforts are needed to link regular resources to GEF programme development."[62] The recent Operations Evaluation Department (OED) evaluation of the World Bank environment portfolio stated that "These [GEF] projects have sometimes been isolated operations responding to the global mandate of GEF and not integrated into coherent national strategies."[63]

A possible entry point that unites the interests and mandates of the GEF and its IAs is the linkage between the environment and governance. With its new Strategic Priority (SP3) on favorable policy frameworks, the GEF potentially joins its IAs in integrating environmental and energy dimensions into poverty reduction strategies and creating frameworks for environmentally sound energy sector development.[64] Win-win opportunities for local and global benefits include energy sector reform and restructuring and integrating local environmental and social externality costs into either their energy pricing or investment decisions.[65] Similarly, SP2 and SP4 are formulated such as to support local income-generating opportunities, and SP1 offers capacity building for energy cost reduction measures in businesses and households.

About 2 billion poor people in the world lack access to modern energy. The partners unite in the challenge of developing energy services that are affordable and are working to address concerns on renewable energy. At the Bonn Renewable Energy conference in June 2004, the World Bank announced that one of its primary strategies in this area is to ensure that RE and EE are seen as "economically viable and essential ingredients in the energy choices of our member nations, not marginal considerations." It has also given more attention to energy services in its Infrastructure Action Plan (2003). The provision of access to energy for rural people is based on principles of consumer choice, cost-reflective pricing, local participation, good sector policies, and overcoming the first high-cost barrier. UNDP also sees the promotion of rural energy services as a vehicle to support growth and equity and prioritizes the strengthening of national policy frameworks and increasing access to financing, among other things.[66] The dimension of global benefits is incorporated through ensuring that energy services are environmentally sustainable. UNDP has been active in stimulating learning around photovoltaic (PV) energy, especially in the Africa region.

These efforts on renewable energy within the IAs go beyond the GEF. The World Bank Group, for example, has long been active in energy and financial sector reform measures in which the GEF traditionally has not provided support. Significant challenges remain for both on-grid and off-grid RE for the rural poor, in large part due to problems with affordability. The IA efforts may provide an opportunity for seeking a clear comparative advantage for GEF support within the context of the GEF Strategic Priorities.

Expanding the availability of modern energy is dependent on vibrant and commercially viable energy markets, with effective market regulation and private participation. Among the GEF focal areas, the climate change portfolio depends the most on effective private sector participation. Yet, related reports from the various agencies consistently point to weaknesses in the cooperation with and engagement of the private sector partners.[67] Following the request by the Third Replenishment, a paper reviewing private sector participation was developed for the May 2004 Council meeting.[68] Unfortunately, the dynamic role that the private sector could play in partnership with the GEF was not fully explored or analyzed.

The GEF and its IAs operate in a complex and shifting policy environment. This chapter has sought to provide a broad overview of the context within which GEF operates, including the roles and activities of complementary institutions and organizations. This chapter has shown how the mandate and strategic focus of GEF's Climate Change Program has been progressively shaped over the past decade to tackle the transformation of markets for sustainable energy in order to achieve reduction or avoidance of GHG emissions. In overcoming market barriers and market failures, GEF has to work effectively with governments, other agencies, and the private sector. Clearly, GEF's effectiveness is enhanced through a strategic understanding of the nature and direction of shifts in the policy environment and in markets.

3. GEF PORTFOLIO OVERVIEW

The GEF has allocated US$1.63 billion to climate change projects[69] and activities since its official establishment in October 1991. The GEF-III replenishment provided an additional US$1 billion for climate change allocations for the period 2003–07. The climate change portfolio represents close to a third of overall GEF program funding of US$8.59 billion, but the amounts allotted have fluctuated considerably between the different GEF phases, ranging from US$207 million in the GEF pilot phase (1991–94), to almost US$600 million for the GEF-II replenishment (1998–2002). Table 3.1 shows the number of climate change projects and levels of funding (excluding EAs and project development facilities [PDFs]) for the different GEF replenishment phases.

Table 3.1 Climate Change Project Allocations in GEF Phases

GEF phases	Number of projects	GEF funding (US$ million)
Pilot phase	30	207.24
Phase 1	40	425.71
Phase 2	103	592.27
Phase 3 (by April 2004)	34	205.11
TOTAL	**207**	**1,430.33**

Note: This excludes allocation for enabling activities and project development facilities of US$202.55 million.

3.1 Evolution of the Portfolio

Figures 3.1 and 3.2 show the growth of the GEF climate change portfolio. There is a pattern of high project approval levels during the first two years of a funding phase and then a steady decline as funding is exhausted. The situation is somewhat different for GEF-III (2003–07). Unlike previous phases, only 28 percent of the total funds had been committed up to the second year of the replenishment phase. To reach the expected US$1 billion, active development of the project pipeline will be needed.

The peaks in financial allocations (1996 and 1999) were mainly caused by incorporation of relatively costly OP7 projects; four OP7 projects accounted for half of the 1999 allocation.

Over the past five years, 20 to 30 climate change projects have been approved annually. The average elapsed time between GEF Council approval and the commencement of full-size project ranges from 12 months to more than two years.[70] Thus, a significant proportion of the portfolio comprises projects that are just starting or for which results are still emerging.

Figure 3.1 Number of GEF Climate Change Projects in Work Program

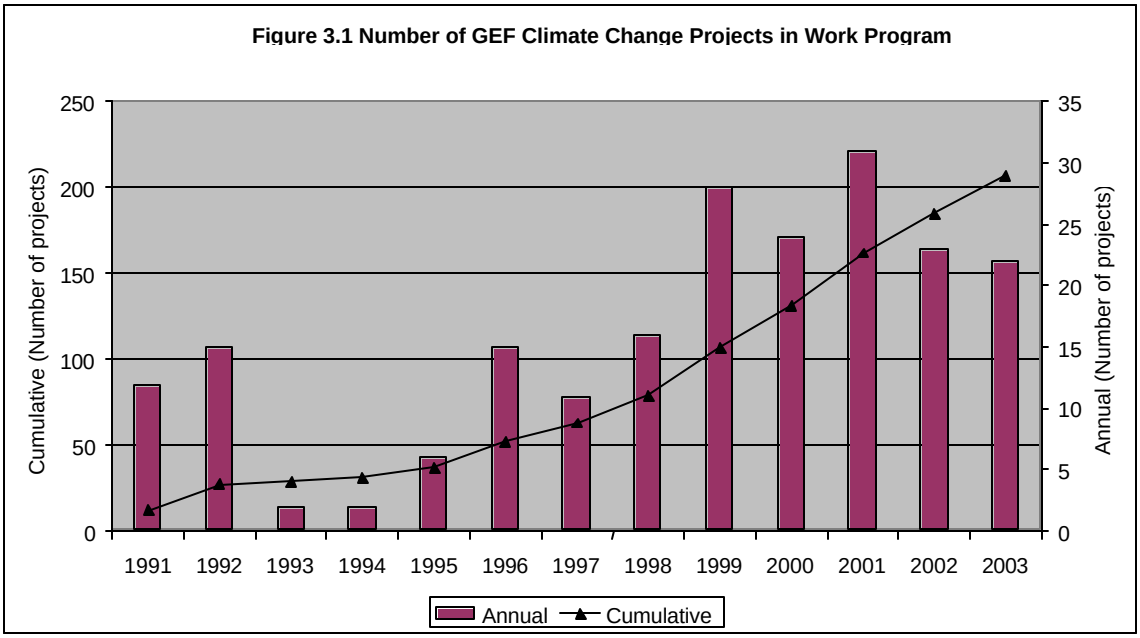
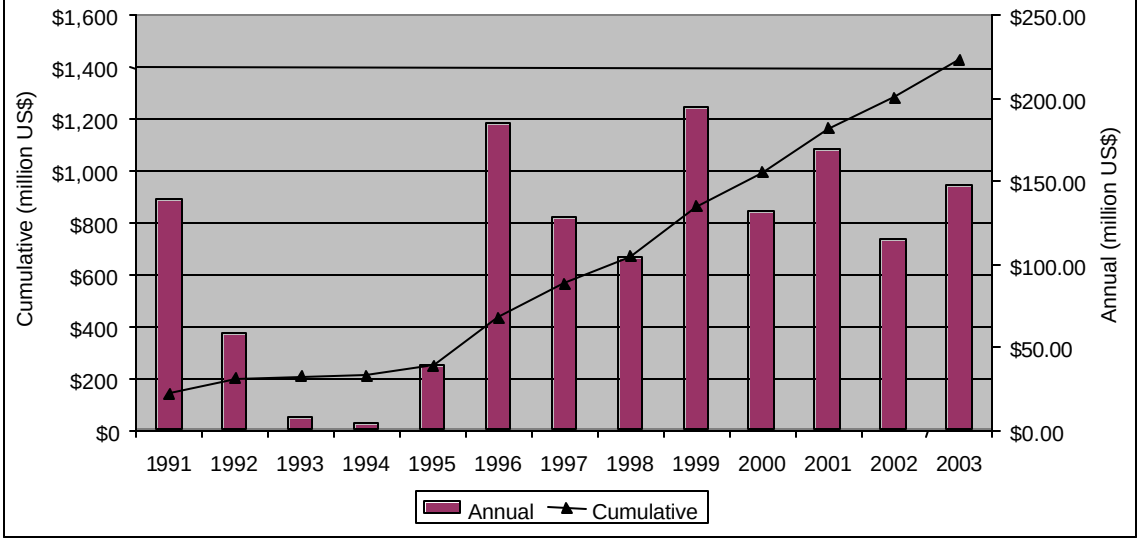


Figure 3.2 Financing of Climate Change Approved Projects in Work Program



3.2 Current Status

The climate change portfolio includes projects in 143 countries. The bulk of the GEF climate change grants have gone to mitigation projects. As of April 2004, 144 full-size projects (FP) have been approved, accounting for 79 percent of the total financial allocation for climate change. Since the introduction of medium-size projects (MSPs) in 1998, 40 such projects have entered the GEF Work Program, accounting for only 2 percent of total financial allocations. The current status of the approved portfolio is presented in Figures 3.3 and 3.4.

Fig 3.3 GEF climate change approved funding by projects type (million US$)

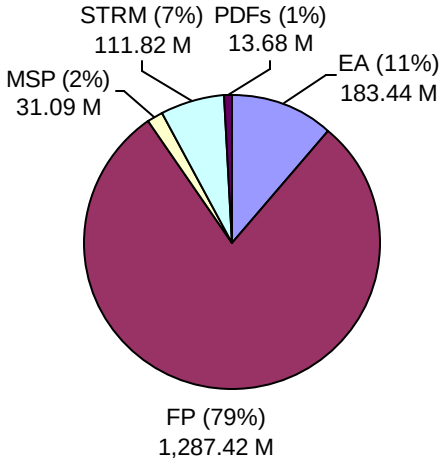
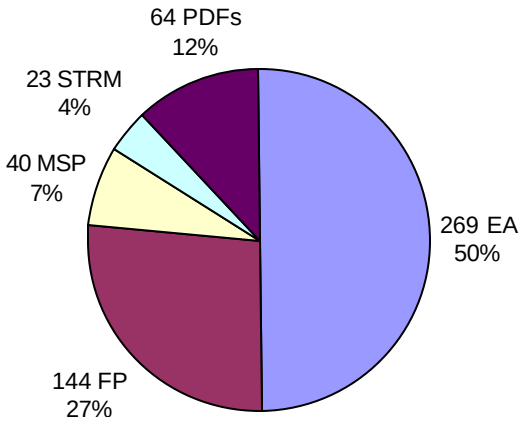


Fig. 3.4 Approved climate change projects by type

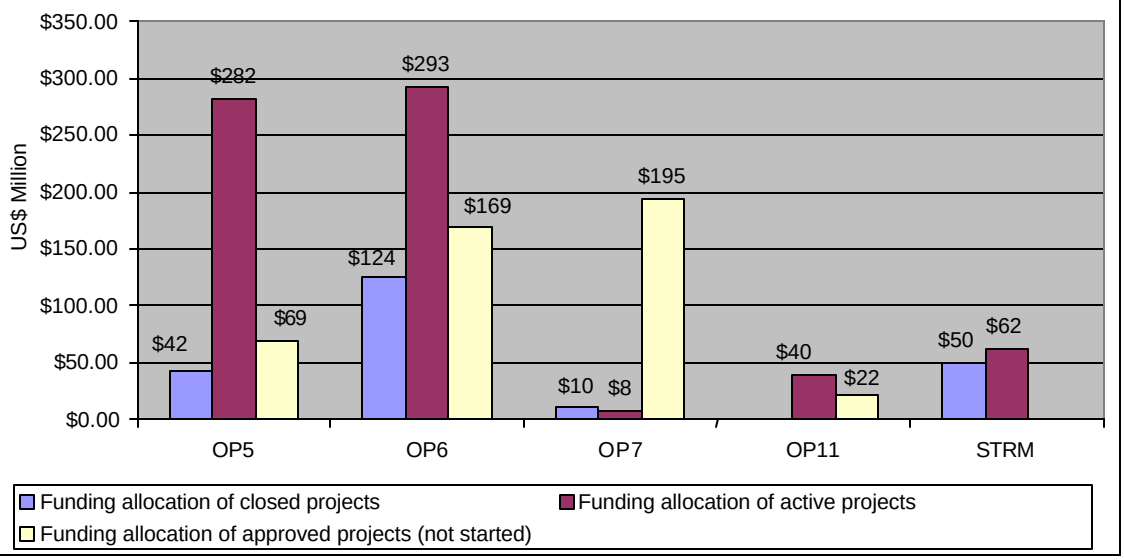


Short-term response measures. STRMs are projects that are likely to successfully and cost-effectively reduce GHGs in the short term. Although their rate of entry into the GEF Work Program has declined somewhat (one or two per year), they account for 7 percent of total resources and 4 percent of projects. Ten STRMs have closed, and 13 are ongoing.

Enabling activities. EAs facilitate implementation of effective climate change response measures and preparation of national communications to the UNFCCC. A total of 269 EAs account for 11 percent of the resources.[71] The 1996 Operational Strategy anticipated that "because enabling activities are the foundation for much of the GEF portfolio, they will be emphasized initially. As the GEF builds on this foundation, the emphasis will gradually shift to the other types of activities." This has not happened; many countries have now launched their second or third EA and second national communication to the UNFCCC. In GEF Phase 2, 106 EAs were launched, and since 2002 a further 64 enabling activities have been approved.

Forty approved projects, representing a financial allocation of US$455 million, have not yet started (Figure 3.5**)**. While many of these are recent approvals awaiting project clearance by the IAs or for official project launch, 43 percent are OP7 projects that have been pending for some time. This study focuses on the results of the 43 closed projects and the 124 projects under implementation.

Fig. 3.5 OP funding allocation for GEF climate change projects



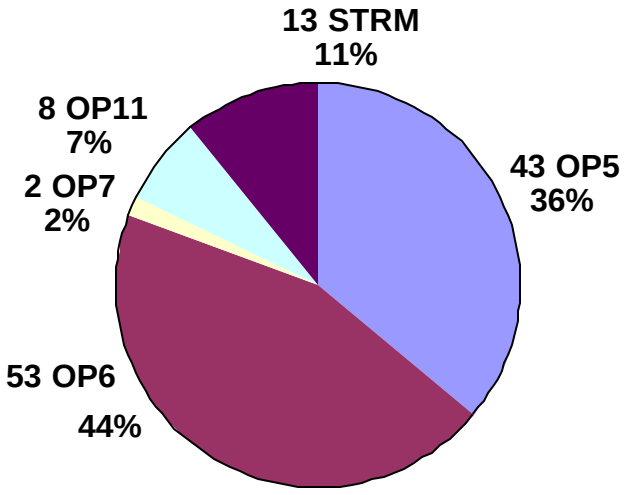
Note: Funding allocations for projects in Figure 3.5 amount to US$1,367.56 million. The Figure does not include approved multi OP projects.

3.3 Operational Programs and Project Clusters

Renewable energy projects (OP6) account for 54 percent of closed project allocations and 44 percent of active project allocations (53 projects). See Figure 3.6. (Note: Figure includes 119 projects, which in addition to 5 multi OP projects amounts to 124 projects under implementation.)

About a third of projects fall within OP5 (Energy efficiency). The OP11, on environment-friendly transport, was formally established by the GEF Council only in 2001, and is limited to eight approved projects. OP7, which aims to reduce the long-term costs of low-GHG-emitting energy technologies, has only two projects under implementation and six approved projects pending.

Figure 3.6 Number of Active Projects



There is considerable variation in types of projects within each OP. A coherent, consistent clustering of projects still needs to be developed and agreed to within the GEF. Table 3.2 below depicts a range of project clusters within OP5 and OP6, with a brief description of clusters in Annex A. Besides the large group of electrification projects utilizing RE, the current portfolio reflects a focus on market development both for RE and for EE.

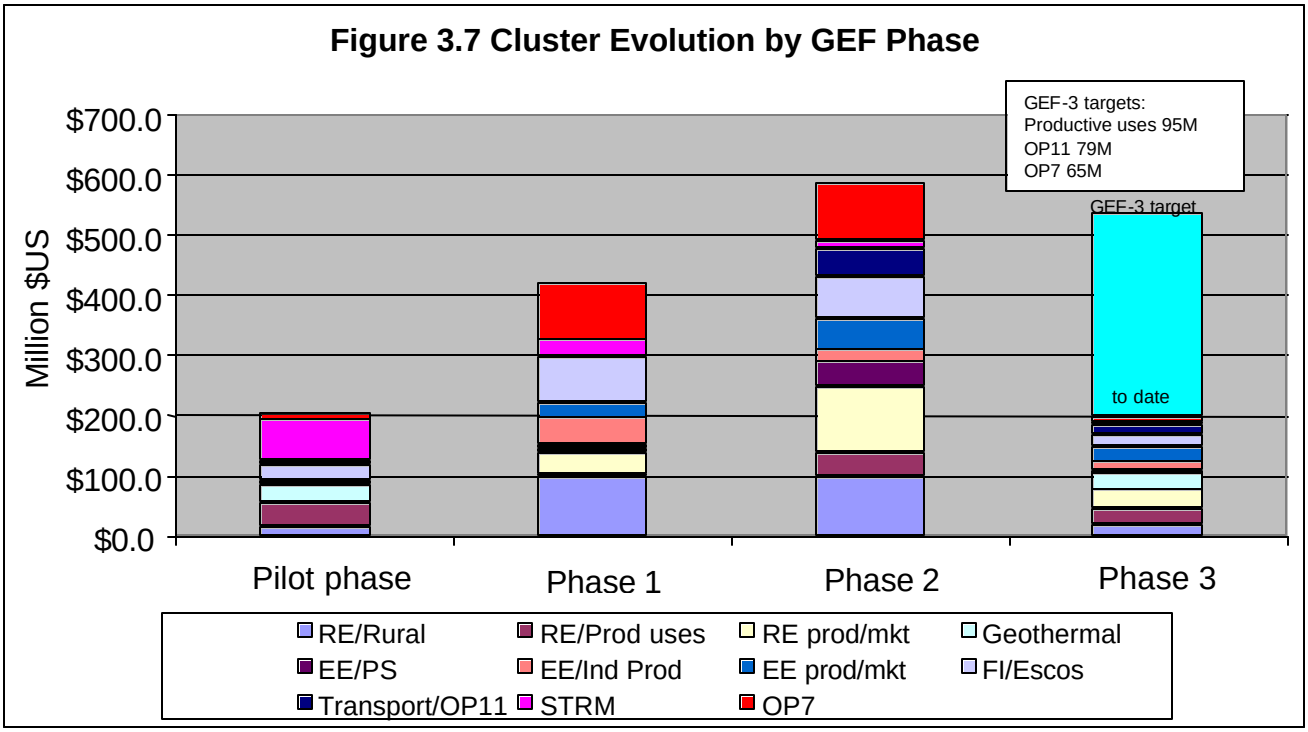
Table 3.2 Distribution of Closed and Active Projects per Cluster

(enabling activities, project development facilities, short-term response measures, and multi OPs excluded)

	Closed projects		Active projects	
Cluster description	**Number of projects**	**GEF funds allocation US$ million**	**Number of projects**	**GEF funds allocation US$ million**
OP5 - Energy efficiency				
Energy-efficient products and market development (EE prod/mkt)	6	30.50	15	66.46
Financial intermediaries and mechanisms for energy efficiency (FI/ESCOs)	3	9.4	9	94.8
Energy efficiency in industrial production (EE/IndProd)	1	1	8	65.39
Energy efficiency in the public sector: municipal heating, lighting and hot water (EE/PS)	1	0.74	11	55.64
TOTAL	**11**	**41.64**	**43**	**282.29**
OP6 - Renewable energy				
Renewable energy in electrification, through PV, wind, biomass, small hydro, etc. (RE/Rural and RE/Urban)	8	52.54	24	149.42
Renewable energy for productive uses, in industries or institutions (RE/Prod uses)	3	32.6	15	66.33
Renewable energy products and market development (RE prod/mkt)	2	2.28	13	76.12
Geothermal development	2	36.9	1	0.98
TOTAL	**15**	**124.32**	**53**	**292.85**
Other OPs				
OP7 - Reducing the long-term costs of low-GHG-emitting technologies	3	10.35	2	7.78
OP11 - Promoting environmentally sustainable transport	0	0	8	39.69
TOTAL	**30**	**178.31**	**106**	**622.61**

Note: Table does not include STRMs and multi OP projects (10 STRMS and 3 multi OP projects are closed, and 13 STRMs and 5 multi OP projects are under implementation).

The composition of the present GEF climate change portfolio has been influenced by lessons from earlier projects and strategic shifts in funding allocations during different phases. To illustrate the historical development of the Climate Change Program, Figure 3.7 shows the varying proportions of funding that have been allocated to different project clusters (in accordance with definitions in Table 3.2) in subsequent GEF phases.[72]



Some trends are evident. There is a sharp drop in STRMs from the Pilot Phase; from 33 percent to 2 percent of resources in the present GEF-III. Most of the STRMs were carbon sequestration projects; many projects on land degradation and carbon sequestration are currently being addressed under OP12 on Integrated Ecosystem Management. The portfolio on geothermal development used 14 percent of resources in the Pilot Phase, virtually disappeared in GEF Phases 1 and 2, to rebound again in the current Phase with 13 percent of resources by the end of April 2004. Since its launch in 2001, OP11 on transport has accounted for 8 percent of resources in both Phase 2 and 3. OP7 has dropped since Phase 1 (22 percent of resources) to 17 percent and 5 percent in Phase 2 and 3, respectively.

Within RE and EE, however, it is difficult to discern clear trends. Projects promoting renewable energy for rural electrification form the largest cluster, with solar, hydro, wind and biomass technologies. The cluster has decreased in *relative* importance since Phase 1 when it accounted for a fifth of the resources. In GEF-III, it still accounts for 10 percent of total allocations. The RE for productive uses cluster has increased slightly in recent years. Different technologies have been promoted within the clusters in different phases. In GEF Phase 2, a significant proportion of OP6 projects involved PV systems. There was also an increase in biomass projects. In Phase 3, there are clear trends toward multi-technology projects, increased wind promotion, and fewer PV projects. Within EE, a majority of projects incorporate activities that focus on financing mechanisms.

Some of the movements described above stem from GEF decisions or initiatives, but other changes are more difficult to explain. Whatever the cause, a portfolio that suffers from a fluctuating effect over time will have difficulties in reaching a critical mass to generate clear results and maximize learning. For example, the fluctuations do not always seem to mirror a quest for potential "success areas." Clusters that experience problems at a given time are observed to shrink, but that change is not necessarily accompanied by growth of the clusters that are perceived to be relatively successful.

3.4 Regional Distribution

The GEF has a mandate to respond to all eligible countries with projects that are country driven and based on national priorities.[73] Developing countries are eligible for GEF climate change grants under the financial

mechanism if they have ratified the UNFCCC, or for other grants if they are eligible to receive World Bank loans or UNDP technical assistance funds.[74]

The GEF is also asked to "…ensure the cost-effectiveness of its activities to maximize global environmental benefits."[75] In the Beijing Declaration, the Second GEF Assembly asked the GEF to "enhance its strategic business planning for allocating scarce GEF resources to high priority areas within and among focal areas, taking into account national priorities." The GEF is mandated to address the need for innovation, experimentation, demonstration, and replicability, which obliges it to support projects where the circumstances and needs are appropriate for this.[76]

The programming of GEF resources is a complex process, influenced by political, economic, and institutional factors. GEF allocations have so far been made project by project, based on submissions of proposals from the Implementing and Executing Agencies in accordance with eligibility criteria. "Among eligible countries, this system does not privilege any specific ones for the allocation of GEF resources; rather it puts the emphasis on a project's potential positive impact on the global environment."[77] The portfolio tends to evolve where long-term interventions might be appropriate and politically feasible no-regret options, while at the same time minimizing overlap and conflict with other sources of financing and maximizing efficiency.

Country capacity, internal agency resources, and absorptive capacity to undertake climate change efforts also play a role in the need for GEF incremental support. The extent of willingness for sector reform also influences opportunities for progress in countries. Strategic partnership efforts within the GEF family has, at times, also shaped involvement in a specific country and sector.

Within this context, there are some clear patterns in the regional and country distribution of GEF climate change projects, as shown in Table 3.3.[78]

- **In general, the regions and countries with the highest aggregate levels of GHG emissions receive more GEF projects and higher allocations**. The Asian region has received the most; Sub-Saharan Africa the least. The exception is Eastern Europe and Central Asia, which is the second-highest region in terms of regional CO_2 emissions, but has received proportionately less GEF funds. However, the portfolio there is relatively young, and several of the European countries are UNFCCC Annex I parties.

  In Asia, China and India together are responsible for 78 percent of the region's emissions (excluding Japan) and they receive 70 percent of GEF's funds for the region. The countries within each region with the highest total CO_2 emissions are among the top 10 recipients of GEF grants, although there is not always a direct correlation between a country's rank in emissions and its funding. For example, in the Eastern Europe and Central Asia region, Russia is the largest GHG emitter, but Poland has received the most funds (28 percent of regional total) and projects. Another example is in Africa, where South Africa contributes 78 percent of regional emissions, but has received only 7 percent of the region's GEF resources. It should be borne in mind that the need for GEF funds is also affected by the country's own capacity for implementing mitigation projects. GEF is also not particularly active in the high-emission countries in the Middle East. In countries such as Saudi Arabia and Nigeria, emissions are largely oil and gas related, sectors that have not been supported by the GEF since the end of the Pilot Phase.

Table 3.3 Population, Gross National Income, and CO_2 Emissions in Countries with GEF Climate Change Projects

Region	Country	Total CO_2 Emission million metric tons 2000	CO_2 Emission per capita metric tons 2000	Popul. millions 2000	GNI $ billions 2000	GNI per capita $ 2000	Total GEF approved climate change enabling activities		Total GEF funds for EE and RE closed, active and future approved projects US$ million		Total number of EE and RE closed, active and future approved projects		Total GEF funds for closed, active and future approved projects US$ million	Total number of closed, active and future approved GEF projects	Total GEF approved alloc. US$ million	Total GEF allocations US$ million (includes funds earmarked but not yet approved)
							$ mill	Number	RE	EE	RE	EE				
Sub Saharan Africa Total		475.3	0.7	658.2	$310.0	$470.0	$17.42	90	$85.68	$6.42	22	3	$106.44	32	$126.01	$172.08
	Nigeria	36.1	0.3	126.9	$32.7	$260.00	$0.26	1	0	0	0	0	$0.00	0	$0.26	$0.26
	South Africa	327.3	7.6	42.8	$129.2	$3,018.7	$0.32	1	$1.76	$0.00	3	0	$2.05	3	$2.67	$12.02
	Rest of Sub-Saharan Africa*	111.9	0.2	488.5	$148.1	$348.2	$16.8	88	$83.9	$6.4	19	3	$104.39	29	$123.08	$159.80
Asia Total		4968.6	1.6	3162.8	$2,557.0	$826.8	$16.25	45	$330.34	$208.82	29	20	$613.16	60	$631.77	$823.54
	China	2790.5	2.2	1262.5	$1,062.9	$841.9	$3.60	1	$109.86	$152.05	6	10	$308.21	21	$312.16	$438.21
	India	1070.9	1.1	1015.9	$458.8	$451.6	$3.50	2	$98.61	$12.03	6	2	$126.11	12	$129.61	$134.84
	Indonesia	269.6	1.3	210.4	$119.9	$569.9	$0.33	2	$24.30	$0.00	1	0	$27.41	2	$27.74	$29.74
	Thailand	198.6	3.3	60.7	$121.6	$2,003.3	$0.29	2	$6.83	$12.60	1	2	$19.43	3	$19.71	$19.71
	Korea DPR	188.9	8.5	22.3	na	$755 or less	$0.15	1	$0.77	$0.00	0	0	$0.00	0	$0.92	$0.92
	Malaysia	144.4	6.2	23.3	$78.8	$3,382.0	$0.47	1	$4.03	$7.30	1	1	$11.33	1	$11.93	$18.93
	Pakistan	104.8	0.8	138.1	$61.0	$441.7	$0.37	2	$0.00	$0.00	0	0	$7.00	1	$7.72	$11.22
	Rest of Asia**	200.9	0.5	429.6	$654.0	$1,966.6	$7.5	34	$85.9	$24.8	14.0	5	$113.67	20	$121.97	$169.96
ECA Total		3166.4	6.8	465.8	$959.4	$2,059.7	$6.47	26	$45.27	$82.12	15	21	$160.19	41	$168.07	$242.48
	Russian Fed.	1435.1	9.9	145.6	$241.0	$1,655.2	$0.00	0	$0.73	$4.38	1	2	$11.61	6	$12.18	$37.18
	Ukraine	342.8	6.9	49.5	$34.6	$699.0	$0.00	0	$0.00	$2.03	0	1	$2.06	1	$2.08	$5.33
	Poland	301.3	7.8	38.7	$161.8	$4,180.9	$0.00	0	$6.38	$21.68	2	4	$54.39	8	$54.39	$68.19
	Turkey	221.6	3.3	65.3	$202.1	$3,100.0	$0.00	0	$0.00	$0.00	0	0	$0.00	0	$0.00	$0.00
	Kazakhstan	121.3	8.1	14.9	$18.8	$1,261.7	$0.00	0	$2.90	$0.00	1	0	$3.16	1	$3.42	$9.02
	Czech Republic	118.8	11.5	10.3	$53.6	$5,203.9	$0.00	0	$0.00	$6.25	0	2	$6.25	2	$6.25	$6.25
	Rest of ECA***	625.5	4.1	141.5	$247.5	$1,749.1	$6.47	26	$35.26	$47.78	11	12	$82.73	23	$89.75	$116.50
LAC Total		1357.4	2.7	516.0	$1,895.0	$3,670.0	$14.60	59	$209.61	$40.24	23	8	$289.95	36	$307.78	$406.48
	Mexico	424	4.3	98	$497.0	$5,071.4	$0.31	1	$95.26	$10.00	5	1	$116.77	8	$117.08	$173.48
	Brazil	307.5	1.8	170.4	$610.1	$3,580.4	$1.50	1	$52.34	$15.00	3	1	$79.96	5	$82.31	$93.81
	Venezuela	157.7	6.5	24.2	$104.1	$4,301.7	$0.35	1	$0.00	$0.00	0	0	$0.00	0	$0.35	$1.60
	Argentina	138.2	3.7	37	$276.2	$7,464.9	$1.14	1	$10.12	$0.74	1	1	$10.85	2	$11.99	$11.99
	Rest of LAC****	330.0	1.8	186.4	$407.6	$2,327.5	$11.30	55	$51.89	$14.50	14	5	$82.36	21	$96.04	$125.59
MENA Total		1227.2	4.1	295.3	$618.0	$2,090.0	$5.34	24	$64.14	$22.01	5	6	$97.21	16	$105.01	$169.80
	Saudi Arabia	374.3	18.1	20.7	$149.9	$7,230.0	$0.35	1	$0.00	$0.00	0	0	$0.00	0	$0.35	$0.35
	Iran	310.3	4.9	63.7	$106.7	$1,675.0	$0.45	2	$0.00	$0.00	0	0	$2.75	2	$3.59	$8.39
	Egypt	142.2	2.2	64	$95.4	$1,490.6	$0.45	2	$0.00	$0.00	0	0	$7.26	2	$9.45	$67.65
	Rest of MENA^	400.4	2.7	146.9	$266.0	$1,925.2	$4.09	19	$64.14	$22.01	5	6	$87.21	12	$91.62	$93.41

*Emissions for Lesotho and Somalia, and GNI for Congo DR, Liberia, Somalia, and Sâo Tomé and Principe for 2000 not available Source of population, GNI and emissions data: WDI 2004.
**Data for Niue and Tuvalu, GNI for Palau, Korea DPR and Myanmar not available for 2000 ***Population and GNI for Serbia and Montenegro not available for 2000
****GNI for Cuba and Dominica not available for 2000 ^GNI for Bahrain, Libya, Oman, and UAE not available for 2000

- **There are wide discrepancies around allocations to medium- and low-emitting countries**. Aside from the high-priority emission countries, GEF allocations are not correlated in any obvious way with country emission levels representing potential global environmental benefits. This is shown in Table 3.4 below. Countries' GHG emission levels might differ by a factor of 1,000, but they may receive similar levels of GEF funding or projects. At the same time, a few low-emission countries have received high levels of GEF support. Uganda, for example, a country with relatively high official development assistance, has received allocations of US$32.53 million, yet has annual emissions of only 1.5 megatons. In other cases, such as for Sri Lanka, the portfolio has been driven by partnership approaches that were supposed to be models for testing practices so that they could be replicated in other countries with a more efficient use of resources. There may be good reasons for GEF not having a significant portfolio in some countries. Equally, it may be attractive for GEF to concentrate resources in particular countries where innovative and comprehensive approaches might be piloted for replication elsewhere. Nevertheless, it is apparent that GEF allocations in medium-and low-emitting GHG countries do not, in general, reveal any evidence of strategic choice.

Table 3.4 Countries with Largest Allocations of GEF Climate Change Funds, 1991–2004

Rank	Country	Total approved allocations (US$ million)	GEF funds (US$ million) total including pipeline	Total CO_2 megaton emissions (2000)
1.	China	312.16	438.21	2790.5
2.	India	129.61	134.84	1070.9
3.	Mexico	117.08	173.48	424.0
4.	Brazil	82.31	93.81	307.5
5.	Philippines	63.75	66.88	77.5
6.	Poland	54.39	68.19	301.3
7.	Morocco	47.76	47.76	36.5
8.	Uganda	32.53	32.53	1.5
9.	Tunisia	28.66	29.66	18.4
10.	Indonesia	27.74	29.74	269.6
11.	Thailand	19.71	19.71	198.6
12.	Cuba	19.08	19.08	30.9
13.	Croatia	18.47	18.47	19.6
14.	Vietnam	17.41	39.66	57.5
15.	Sri Lanka	15.64	16.39	10.2
16.	Chile	15.55	15.55	59.5
17.	Peru	15.24	15.24	29.5
18.	Lithuania	13.95	13.95	11.9
19.	Romania	12.31	12.64	86.3
20.	Russian Federation	12.18	37.18	1435.1

- **There are notable variations in programmatic focus *within* countries**. For the GEF to capture the opportunities for climate change mitigation and maximize the likelihood for replication, its projects need to address potential for impact as well as major climate change mitigation needs *and* priorities that reflect local circumstances. As countries become more industrialized and their gross national income (GNI) increases, energy consumption also grows and projects focusing on energy efficiency increase in priority. In general, the portfolio reflects this. The African region, with its lower levels of development and energy consumption, mainly includes renewable energy projects such as PV (which has low mitigation potential), while Eastern Europe has a large energy efficiency portfolio (84 percent of regional resource allocations). However, within countries there are some anomalies, partly as a result of the evolutionary and project-by-project nature of GEF programming. For example, although South Africa is a highly energy-intensive economy, it does not have an EE portfolio.

The Third GEF Replenishment made policy recommendations for effective and transparent allocation of GEF resources to countries that would use them best to deliver global environment benefits, and the Beijing Declaration asked for "strategic business planning for allocating scarce GEF resources…, with a view to maximizing the impact of these resources on global environmental improvements." The patterns above point to possible areas of improvement in the pursuit of such impacts, which are discussed in the next chapter.

3.5 GEF Allocations and Implementing Agencies

From the outset, the three IAs were designated to play different roles in project development and management: the World Bank's primary role would be in investment projects and in mobilizing the private sector, whereas UNDP would focus on capacity building and technical assistance. UNEP would contribute with its expertise in scientific and technical analysis.[79] Although the mandate and roles of these organizations have evolved considerably since 1991, their climate change involvement still reflects these perceived comparative advantages.

Table 3.5. Approved Projects by Implementing Agency

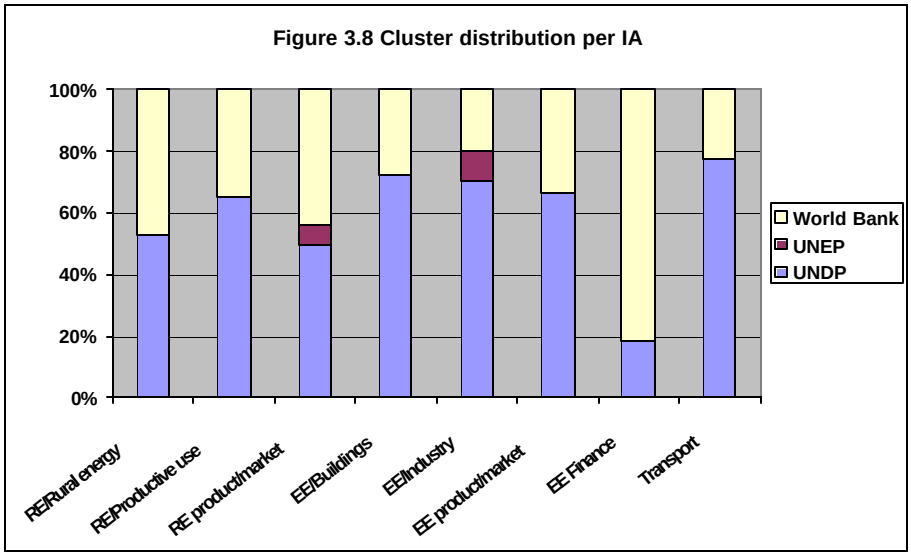
Project types	UNDP		UNEP		World Bank	
	#	M USD	#	M USD	#	M USD
Full-sized	67	$325.37	4	$16.85	66	$896.40
Medium sized	23	$18.01	5	$4.37	11	$7.72
STRMs	11	$44.04	0	$0.00	11	$56.38
Enabling Activity	209	$81.44	51	$27.41	7	$13.95
PDFs	37	$6.34	12	$2.58	13	$4.18
Total	347	$475.20	72	$51.21	108	$978.63

The UNDP is implementing the most GEF climate change projects, but the World Bank has received the largest financial allocation (see Table 3.5). UNEP accounts for 3 percent of approved resources, most of which are for global projects involving research support for GEF issues or promoting networking and learning. In addition to projects featured in the table, nine projects and two PDFs have been approved for implementation by Executing Agencies or by more than one IA, representing allocations of US$61.21 million. The full list of climate change projects is included in Annex B of this report.

EAs include both assistance to countries to prepare national communications and any additional financing for capacity building in priority areas. This category also includes some full-sized and medium-sized EAs that mostly address adaptation. In addition, two global EAs have been approved for implementation by more than one IA, representing an allocation of US$60.64 million for climate change national communications and support.[80]

For all three agencies, the average GEF grant is higher for ongoing than for closed projects (closed average grants ranged from US$0.72 million for UNEP, US$3.1 million for UNDP, and US$7.97 million for the World Bank). Projects have tended to increase in size and complexity; this trend would be further accentuated when counting increasing cofinancing demands. However, smaller projects close earlier, while some large projects approved in the GEF Pilot Phase are still ongoing.

The distribution of different kinds of projects undertaken by the GEF IAs is illustrated in Figure 3.8. The World Bank undertakes the majority of projects involving financial intermediaries for energy efficiency, often through the International Finance Corporation (IFC). UNDP is active in energy efficiency in the public sector, with a large portfolio in Eastern Europe of projects focusing on municipal heating, lighting, and hot water (EE buildings). It is also most active in OP11 with its fuel-cell bus (FCB) program. For the main part, however, IAs work in similar areas and clusters, although their strategies and approaches often differ based on their organizational strengths (see chapter 4 on performance and results).



Since the 1999 introduction of the Expanded Opportunities scheme, seven Executing Agencies[81] have received Council approval to participate directly in GEF activities, of which the Asian Development Bank (ADB) and the Inter-American Development Bank (IADB) have direct access to GEF funds for full- and medium-sized projects.[82] However, the opportunity of tapping additional agency expertise has not yet become significant in the climate change focal area. A review of the GEF project database shows that of 106 projects put forward by these new agencies, only 19 (18 percent) are within climate change. Of these, 11 have been withdrawn, not recommended, or are pending. Only three projects have been approved or endorsed by the GEF Chief Executive Officer (CEO endorsed): Wind Power with UNDP/ADB and Efficient Utilization of Agricultural Wastes with World Bank/ADB, both in China, and Poland Energy Efficiency in Public Buildings with World Bank/European Bank for Reconstruction and Development.

3.6 Looking Toward the Future

Proactive future planning for the climate change portfolio is difficult. While the IAs generally have some sense of coming projects, the GEF Secretariat does not have a thorough knowledge of what may emerge from the country level. Future projects are only registered by the GEF Secretariat once they officially enter the GEF pipeline. The GEF Secretariat is currently undertaking a much needed review of available pipeline data, eliminating pre-pipeline projects and clarifying the status of pending projects. It is thus likely that a number of such projects in the pre-pipeline will be dropped or withdrawn before they officially enter the Work Program. A more systematic management of the relatively large group of future projects would increase efficiency and liberate resources for priority activities. The intent of the GEF is that as projects progress further down the preparation path, the chances of their being rejected drastically declines.

The portfolio of possible future activities presented in Table 3.6 includes those that have been approved by the GEF Council but have not yet started, PDFs, and amounts earmarked for the subsequent projects, as well as pipeline, pre-pipeline, deferred, and pending projects.[83]

Table 3.6 GEF Future Climate Change Projects by Status[84]

Project status	Number of projects	Total GEF allocations and earmarkings (US$ million)
CEO endorsed/approved (not started yet)	40	465.34
PDF A, B, and C	64	280.8
Other (pipeline /pre-pipeline/deferred)	31	110.4
Pending	27	189.33
TOTAL	**162**	**1,045.87**

Among the projects that are endorsed, some are about to start and others are awaiting fulfilment of necessary conditions (several OP7 solar thermal and OP11 fuel cell bus projects). The majority (21 of 40) are renewable energy projects. Of these, three projects aim to develop wind energy markets, though the majority promote mixed technologies (microhydro, demonstration of stand-alone renewable energy technologies (RETs) or diesel/hybrid RETs in mini-grid situations, with components to support PV systems in general). Often, these projects also include components for addressing legal and regulatory barriers.

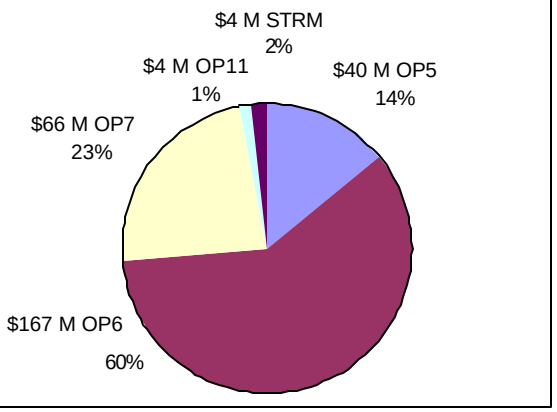
Project Development Facilities (PDFs) allow for concept and proposal development, project appraisal, or technical design and feasibility work for large projects. They receive relatively limited resources (US$13.68 million).[85] However, the potential investment they represent is not insignificant: US$267.12 million, amounting to a total allocation of US$280.8 million. The majority of PDFs focus on renewable energy (see Figure 3.9). The category of PDF-A is dominated by OP11 projects, several of which concern the SP6 of modal shift to climate-friendly transport. If the PDF-Bs lead to full projects, the OP6 portfolio would contain more projects promoting a range of technologies, including PV, mini-grids and off-grid, with a focus on electricity access and energy reform. The PDFs within OP5 are focused mainly on industry and public sector energy efficiency, and less on financial intermediaries or municipal heating.

The PDFs are intended as tools for project design and preparation. Of the 206 projects approved so far, about 25 percent can directly be traced back to a PDF. Not all PDFs culminate in projects; historically, climate change PDFs resulting in projects indicate rates of 34 percent for PDF-A and 49 percent for PDF-B and Cs. A more in-depth field analysis would be necessary to ascertain the determining factors.[86]

The GEF portfolio is shaped, in many respects, from the bottom up. Guidance and overall strategic direction from the GEF Council, GEF Secretariat, or the IAs have ripple effects for the GEF programming partners. On the one hand, the challenges in turning and redirecting GEF programming reflect stability in pipeline commitments to the program countries. On the other hand, a more dynamic and brief project development process would allow program countries to incorporate emerging lessons and priorities in a timely manner.

Figure 3.9 Future Allocations From PDFs

Total: US$ 280.8 million
(including earmarkings and PDF amounts)



Given the time necessary for project preparation, projects are expected to fully reflect the new Strategic Priorities of 2003 only from 2004 onward. Will these priorities bring about a tighter portfolio than what has been the case so far? It remains unclear how to treat the obvious overlap of Strategic Priorities in overall market transformation and barrier removal. This has operational implications. For example, potential projects that address both market transformation and increasing access to finance may have a harder time in receiving allocations of GEF funds depending on what category they are put into. Only 17 percent of the approved projects since November 2002 show mixed Strategic Priorities, and only 7 percent aim for market transformation (SP1). Nor do the Strategic Priorities serve to actually prioritize the portfolio, as virtually all "old" types of projects still fit under one or more priority, especially under SP2 and SP3. The category of productive uses (SP4) is of an exploratory nature, with 17 percent of the 53 projects approved since November 2002. So far, it includes projects promoting microhydro, wind, and biomass, as well as solar energy projects that are prevalent in the past portfolio. The question of the affordability of renewable energy remains.

The above overview of the GEF climate change portfolio provides insights into its evolution, scale, scope, and focus. We turn now to an evaluation of its impact and performance.

4. OVERALL RESULTS AND PERFORMANCE

This chapter evaluates overall GEF Climate Change Program results and performance. First, it calculates the impact of GEF projects in terms of reduced or avoided GHG emissions. Second, the chapter presents overall outcomes in terms of barrier removal and market transformation for sustainable energy technologies and programs that lead to GHG reduction and avoidance. Third, the overall performance of the portfolio is evaluated by analyzing the range of strategies employed by GEF projects. Last, the chapter assesses the overall strategic response, positioning, and effectiveness of the GEF Climate Change Program.

4.1 Key Results: Greenhouse Gas Impact

4.1.1 Background and Approach

The objective of the UNFCCC is the stabilization of GHG concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system. As the financial mechanism of the Convention, the GEF provides new concessional funding to eligible countries to meet incremental costs of projects to achieve agreed global environmental benefits in climate change. After more than a decade in operation, it is thus reasonable to assess the GEF portfolio in terms of its GHG impact.

The GEF supports some STRMs whose main goal is to reduce GHGs in the short term; however, this kind of GEF support remains limited. The GEF is mandated to support capacity building, demonstration, and market transformation projects, and these activities are not necessarily expected to generate *immediate* effects on GHG emissions. The GEF's main potential impact is its contribution to catalyzing the sustainable transformation of markets and programs such that GHG emissions are reduced or avoided in *the long term.* The rationale for GEF support lies in innovation and removal of barriers for market transformation, not simply in direct GHG reduction. The GEF Operational Strategy (1996) states that "removing a barrier must promote sustainability; it does not mean merely subsidizing a few projects so that they can surmount a barrier while leaving it in place," implying that GEF should not seek immediate project impact to the detriment of long-term mitigation effects. Working Group I of the IPCC has emphasized that it is the cumulative effect of emissions over time, rather than when emissions take place, that determines the impact of GHGs on climate.

This study is sensitive to the above arguments that GEF's impact is primarily catalytic and long term. Nevertheless, many GEF projects test strategies that have both direct GHG emissions reduction effects and more indirect long-term effects. Although these achievements do not form part of UNFCCC commitments, they represent global environmental benefits. The primary purpose of the analysis in this section is to provide a sense of what program strategies and target areas have the potential to yield greater impact within the portfolio. The cumulative and absolute values of emissions are less relevant, given the mixed expectations of different project types and the concerns above. The key question is how the GEF can maximize its comparative advantage of catalytic, innovative, and incremental support in ways that change markets to more climate-friendly behaviors.

The study analyzed actual GHG reductions for 43 closed climate change projects and targeted GHG emissions for 124 active projects. It applied an evolving GHG impact measurement methodology, initiated within the GEF Secretariat in 2003, and currently under refinement by the GEF Climate Change Task Force, in consultation with the IAs. The methodology also reflects guidance given by the GEF Council in May 2003. The project impact aggregates are measured in metric tons of CO_2 equivalents, and consist of both direct and indirect reduced or avoided emissions. "Direct reduction" is defined as tangible CO_2 reductions directly attributable to specific project activities and the lifetime of technology promoted by the project, while "indirect reduction" is the estimated replication effect catalyzed by the GEF intervention. The assessment has applied a conservative approach to estimates; replication had to show a credible link to GEF support. The assessment is also based on standard assumptions on project duration, replication ratios for different project clusters, and lifetime (that is,

tangible, cumulative effects from project activities during project implementation and past the project closing, for a planning horizon of 10–20 years). Data sources include consultations with stakeholders, project documents, mid-term reviews, project implementation reports, data from field visits, and final evaluations where available. Ideally, detailed post-project evaluations would be needed to accurately verify concrete achievements.[87]

At the early stage in the GEF portfolio, data estimates and planning for GHG avoidance could be considered experimental in nature. The analysis shows that (a) many projects lacked GHG targets altogether; (b) GHG emission calculation methodologies lacked consistency; (c) initial reduction or avoidance targets were generally too optimistic; and (d) a systematic connection was lacking between project design and impact evaluation (several projects did not estimate GHG targets, but obtained impacts anyway; some projects had targets, but evaluations failed to report on attainment). Fortunately, the situation improves for projects under implementation. Because of the variation in data availability and inconsistent assumptions in existing project documentation, a number of data gaps were filled with conservative assumptions, or were excluded from the calculation if a best guess could not be exercised with reasonable accuracy. While recognizing the limitations in measuring all GHGs, all methane and carbon figures were converted to CO_2 equivalents using IPCC guidance, as the most feasible metric term currently available. Indirect and/or direct contribution was at times extracted from a given total CO_2 reduction estimate if found appropriate. Details on the CO_2 assessment approach used and discussion on data gaps are available in Annex A.

4.1.2 Greenhouse Gas Impact of Closed Projects

As of April 2004, only 43 full- and medium-size projects and STRMs had been completed. The majority of these (53 percent, 23 projects) were launched in the GEF Pilot Phase from 1991–94, and as such the closed portfolio is more oriented toward technology demonstration and does not mirror the nature of the current and mature portfolio. GHG impact has been analyzed for 27 of the closed projects, for which CO_2 estimations were available in the project document and final evaluation. These projects fall within four areas: STRMs on carbon reduction, sequestration, and fugitive emissions; energy efficiency (OP5); geothermal exploration; and other renewable energy projects (OP6).[88]

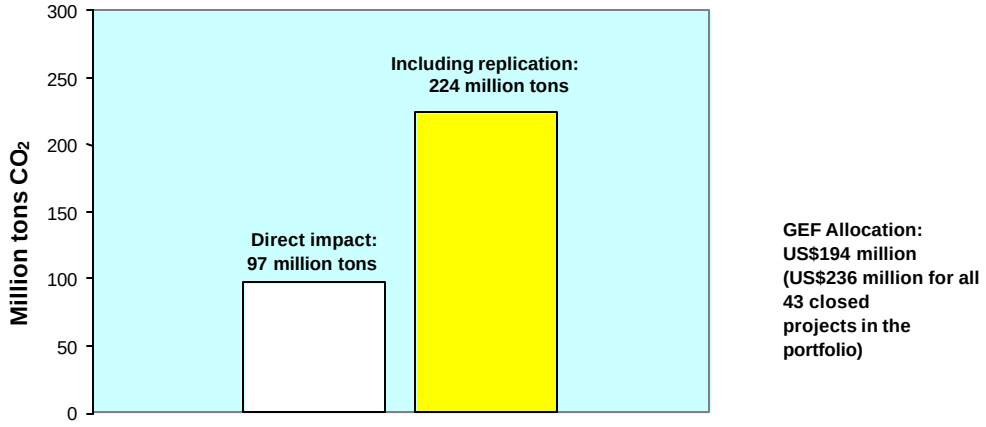
Certain projects did not contain GHG targets (16 projects). Many of these did not aim for direct GHG reductions; they were concerned with other types of results such as capacity building, research or studies, establishing information networks, or they identified and promoted new subprojects or modalities that would later reduce emissions if implemented. Six were global projects. Nevertheless, although not a design requirement at that time, GHG estimates could have been possible for an additional seven projects with mitigation-type activities.

Although several of the closed projects (14) appear unlikely to meet their intended lifetime reductions, this is mostly due to inflated targeting rather than poor project design or execution. In fact, several projects that fell short of their intended targets have achieved notable GHG reductions at a low cost. Furthermore, four projects achieved CO_2 reductions in the absence of any explicit GHG targeting. At least two of these are considered quite successful: Energy Services Delivery (ESD) in Sri Lanka (World Bank) and the Hungary Energy Efficiency Co-Financing Program (HEECP; IFC, phase 1). It is thus more relevant to focus on the actual and projected achievements than on target compliance of these early GEF projects.

In terms of impact, a total GEF allocation of US$194 million (for 27 projects with CO_2 estimates, US$236 million for all 43 closed projects) is projected to result in a total direct and indirect lifetime CO_2 reduction of 224 million tons (see Figure 4.1). Installed capacity, technology life, and other tangible project outputs average roughly 14 years, well beyond a typical project duration, although some lifetime impacts occur over a 25-year horizon.

The direct lifetime reduction alone will amount to 97 million tons of CO_2, assuming continuation of post-project activities that are directly attributable to GEF interventions. Last, if all 43 projects had reported on CO_2 performance, the total contribution to CO_2 reduction made by GEF allocations would likely be significantly higher.

Figure 4.1 CO_2 Reductions for Closed Projects*



*For 27 closed projects having CO_2 avoidance estimates (one of these eliminated due to uncertainty of large estimate).

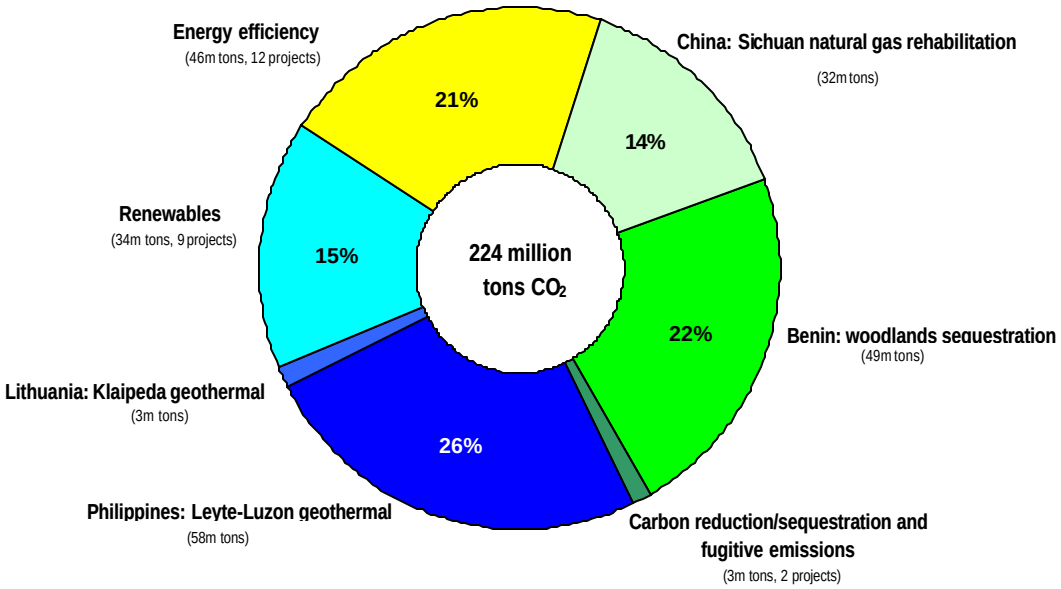
Because of the different nature of various project clusters within the GEF climate change portfolio, project performance is best assessed for similar projects, not across the entire portfolio. As seen in Figure 4.2 on CO_2 reduction by project cluster, carbon sequestration initiatives are responsible for almost a third of the total, which is to be expected because these were STRMs intended to provide immediate and positive GHG effects.[89] The two geothermal projects in the portfolio also performed well in GHG emissions avoidance, and together were responsible for more than a quarter of total CO_2 reductions (the Philippines and Lithuania, both World Bank).

Energy efficiency (EE) interventions were not abundant in the early GEF period. The closed EE projects show limited GHG effects, but this trend is reversed for active EE projects. Encouragingly, a recent World Bank Post Implementation Impact Assessment of the Poland Efficient Lighting Project (PELP) found that the estimated direct CO_2 reduction attributed to the project is 3.62 million tons of CO_2, a substantially higher figure than the 2.79 million tons estimated by the final evaluation in 1999. The difference is essentially due to a larger than originally estimated market saturation level for compact fluorescent lamps (CFLs) in Poland.[90]

Three varied and ambitious projects, atypical of the overall GEF portfolio and located in three strikingly different investment environments, account for almost two-thirds of all CO_2 reductions from closed projects. A carbon reduction effort in China that aimed to rehabilitate a natural gas network (World Bank/UNDP) and a community woodlands sequestration initiative in Benin (UNDP) have secured notable GHG achievements as presented in their final evaluations. The closed project with the highest GHG impact is a high-profile World Bank initiative in the Philippines that has established a large geothermal plant. As far as GHG impact is concerned, large infrastructure improvements funded by the GEF may seem to have excellent results, but the achievement is less impressive when counting the large total financial investment needed or the lack of market transformation and barrier removal with broader replication effects. Adding cofinancing to the assessment changes the picture dramatically; for example, GEF provided US$31 million of the US$1.3 billion cost of the Philippines Leyte-Luzon geothermal plant. For all 27 closed projects, the US$194 million in GEF allocations was matched by US$1.96 billion in cofinancing from IAs, for a combined total of US$2.15 billion.

Figure 4.2 Projected Total Lifetime CO_2 Reduction From Closed Projects, by Cluster*

(large projects extracted)



*For 27 closed projects having CO_2 avoidance data estimates, plus replication

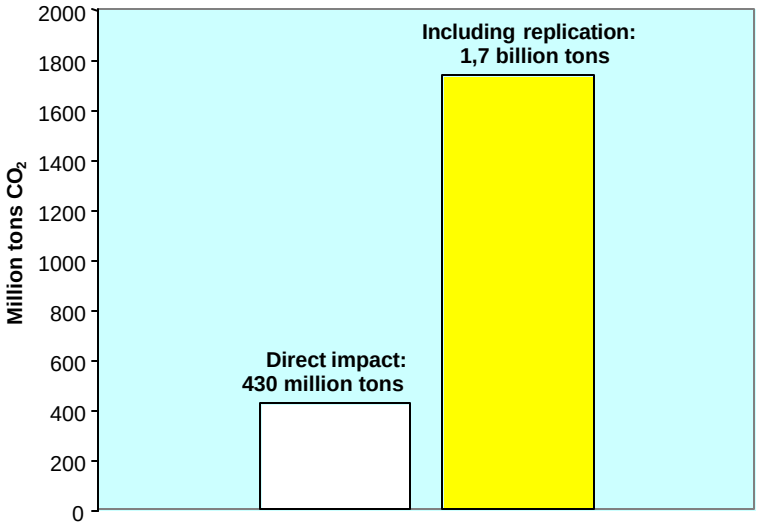
Not counting the STRMs and geothermal projects, renewable energy projects utilized 43 percent of the resources of the closed projects in the set and produced roughly 15 percent of the GHG emissions avoidance, that is, 34 million tons. Twelve energy efficiency projects produced 21 percent of the GHG reduction or avoidance, with 25 percent of the resources (US$49 million).

4.1.3 Greenhouse Gas Impact Targets for Active Projects

Over the past years, the GEF climate change portfolio has grown dramatically with 124 full- and medium-size projects currently being implemented, backed by US$730 million in GEF funding. This outlay is collectively intended to enable more than 1,7 billion tons of carbon dioxide avoidance over 10–30 years, depending on individual project and replication assumptions.

When compared with the set of closed projects, the active projects have improved GHG estimates and underlying assumptions in project design. Not counting projects without intended GHG effects, the analysis encompasses 104 ongoing projects with CO_2 estimates in project documentation. The aggregate estimated direct impact amounts to around 430 million tons CO_2 avoided and 1,7 billion tons with replication—a replication factor of almost four. See Figure 4.3 below.

Figure 4.3 Projected CO_2 Reductions for Active Projects*



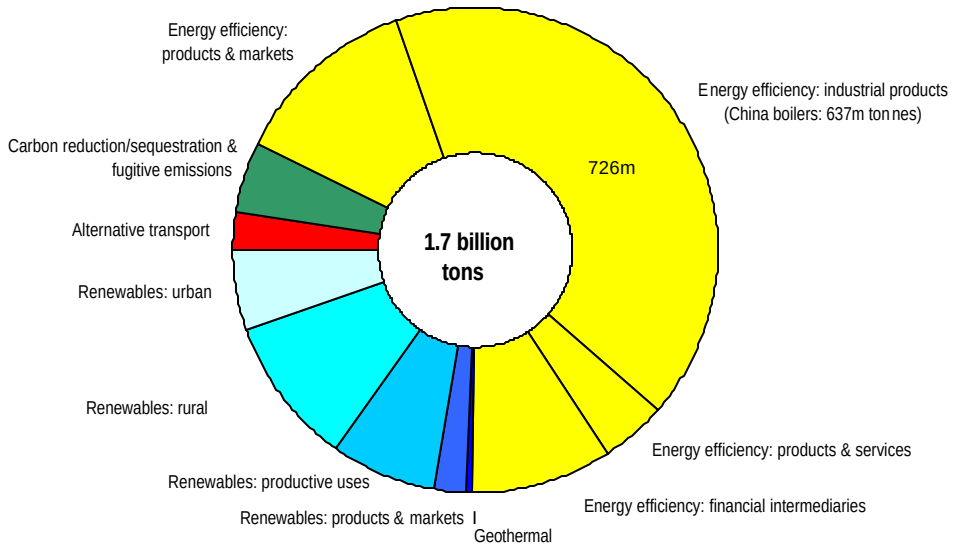
Total GEF investment:
US$ 605 million
(US$ 730 million

for all
124 active projects
in the portfolio)

*For 104 projects having CO_2 estimates

Cluster-level intended results. From Figure 4.4 below, it is apparent that GEF anticipates greater GHG performance from EE projects than from any other cluster. Roughly 40 percent of the financial allocation for active projects has been distributed among 40 EE initiatives that are projected to account for two-thirds of the total lifetime reductions of 1,7 billion tons of CO_2. As with closed projects, a large infrastructure or industrial project can account for much of the total anticipated savings. Here, half of the emission reductions of the EE cluster are contributed by the World Bank China Efficient Industrial Boilers project. The OP on EE also includes interventions focusing on market transformation for energy-efficient consumer products and appliances and financial intermediaries, which have historically been cost-effective routes to GHG reductions.

Figure 4.4 Projected Total Lifetime CO_2 Reduction for Active Projects
(104 projects with estimates, by cluster)



The renewable energy project cluster contains the largest number of projects (48), with a slightly larger share of the financial allocation pie than EE, yet with a third of the aggregated anticipated GHG impact. RE (OP6) projects account for 44 percent of GEF funding but will likely generate only a quarter of future intended CO_2

reduction. Although RE projects may be relatively low in GHG performance at this stage, they play an important role in helping countries deliver local and global benefits by diversifying national energy mixes, raising public awareness of clean energy, laying the groundwork for future possible economies of scale, growing competitive niche markets, and helping commit governments to cleaner energy paths. These variables cannot be adequately captured in any CO_2 impact study.

Trends are also emerging for other groups of projects. STRMs under implementation—carbon reduction/sequestration—are projected to continue to perform well, albeit with smaller-scale initiatives than closed carbon reduction projects. Geothermal exploration makes a small showing with only two modest interventions in the active set of projects, despite the successful GHG performance of the completed Leyte-Luzon plant in the Philippines. The climate-friendly transport cluster is heavily weighted by four FCB projects, in particular by the replication potential of the FCB project in China.

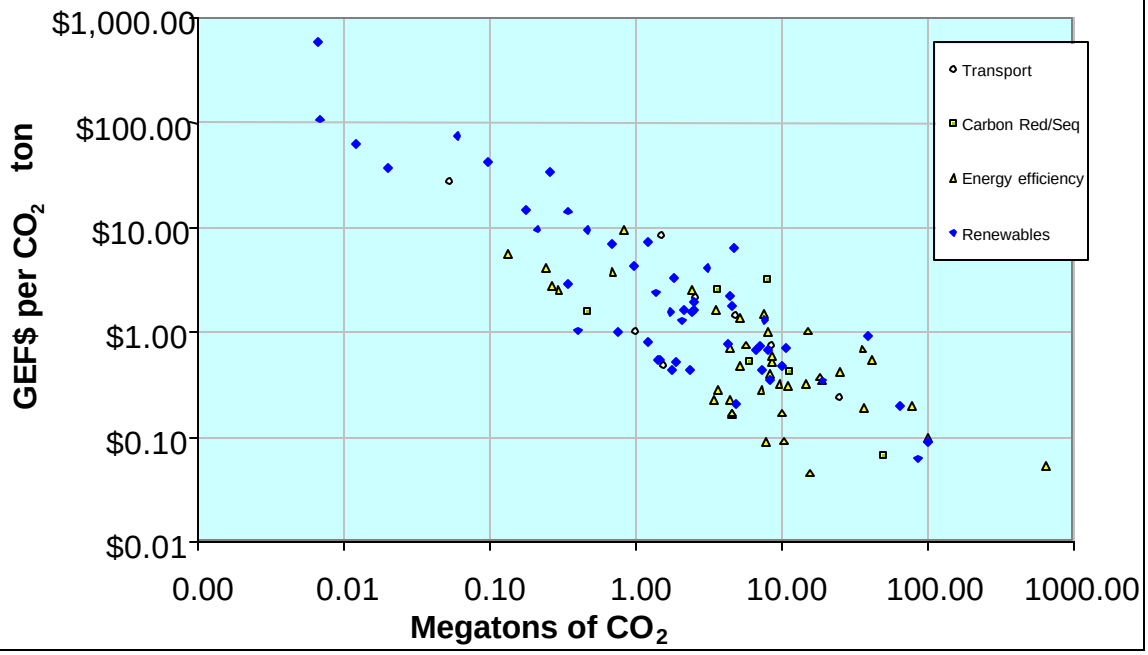
Project-level intended results. The intended GHG impacts vary widely across clusters, investment levels, country typology, and individual projects. For example, more than half of the total lifetime CO_2 reductions may be attributable to just four projects in China; a third of the total comes from a single project that is modernizing industrial boilers throughout China. The projects with highest GHG avoidance expectations at project inception are listed in Box 4.1.

As with the closed projects, the correlation between the size of GEF project allocations and the intended GHG impact is uncertain. There is a wide range of costs and GHG benefits (see Figure 4.5 below). On the high-cost end (top left of Figure), the projects are all renewable energy (PV projects in Peru, Bolivia, Sudan – all UNDP; Lao PDR – World Bank).

Box 4.1 Nearly 75 Percent of Reductions Are from 12 Projects, Mostly in China

1. China: Boilers (World Bank)
2. China: Methane from waste (UNDP)
3. China: Commercialization of RE (UNDP)
4. China: Fridges (UNDP)
5. Brazil: EE (World Bank)
6. Cuba: Bagasse (UNDP)
7. Russia: Coal mine methane (UNDP)
8. China: Energy conservation (World Bank)
9. China: RE development (WB)
10. India: EE in steel mills (UNDP)
11. China: Beijing environment (WB)
12. China: Fuel-cell buses (UNDP)

Figure 4.5 Intended CO_2 reductions per dollar of GEF allocation
(104 active projects)



Energy efficiency projects are anticipated to produce relatively higher results in terms of both tons of CO_2 and GEF cost, although the GEF portfolio also includes a handful of potentially high-impact, cost-effective RE projects. Even so, few active projects (roughly a quarter) cost more than US$10 per ton of carbon (or US$2.73/ ton CO_2). While this cutoff point only applies to STRMs, the GEF long-term barrier removal projects generally fall within this ceiling. Table 4.1 illustrates the GEF incremental cost per cluster or area: the average for all active projects is US$0.35 per ton CO_2, or US$1.28 per ton of carbon in projected total avoidance. (If the potential replication effect is ignored, the costs are US$1.39 and US$5.10, respectively). EE projects are most cost-effective, with industrial EE and products yielding the best estimates. The most cost-effective active project, as per intended targets and costs, is the Tunisia Barrier Removal to Encourage and Secure Market Transformation and Labeling of Refrigerators, a UNDP project with a GEF budget of about US$710,000.

Table 4.1 Greenhouse Gas and GEF Incremental Cost by Cluster

Clusters	Total CO_2 million tons	GEF US$ million	GEF US$ per ton CO_2	GEF US$ per ton carbon
Alternative transport	45	40.59	0.90	3.30
Carbon reduction	80	46.45	0.58	2.12
Energy efficiency	1180	247.84	0.21	0.77
Geothermal	9	6.38	0.69	2.53
Renewable energy	422	264.03	0.63	2.29
TOTAL	**1736**	**605.28**	**0.35**	**1.28**

4.1.4 Key Issues

The assessment of GHGs is a complex, and at times controversial, field. This is especially the case—as with GEF—where projects cover a vast range of approaches and situations that call for nuanced review methodologies. The GEF, with its relatively young portfolio, and limited experience in GHG calculations for closed projects, is also still learning in this area. Yet, key findings emerge from the impact analysis.

- **The performance of the GEF portfolio overall in avoiding GHG emissions is satisfactory**. It has brought about considerable CO_2 reductions, at relatively low overall cost. For closed projects, the figures for avoided emissions range from US$2/ton (direct reductions) to US$0.87/ton (direct and indirect), only factoring in GEF allocations. For active projects, costs range from US$1.39/ton (direct) to US$0.35/ton (direct and indirect), again only factoring in GEF allocations.[91] Because GEF support has covered the full incremental costs for the global benefits, which would likely not have been addressed without GEF assistance, the impact of GEF is manifest. It is also evident that STRMs deliver on their aim to provide significant GHG effects in the short term, and that EE is more effective overall in terms of GHG impact than are GEF RE projects. Large-scale infrastructure or industrial projects, such as geothermal exploration, may have large GHG effects, but the role of GEF may only be nominal and the sheer size of required funds deters replication.

- **The portfolio has suffered from mixed and unclear expectations on how to address GHGs**. In designing projects, promoters are faced with meeting the barrier removal goals of the OPs, the Strategic Priorities, a plethora of performance indicators, plus expectations of direct GHG reduction or avoidance. There is an obvious tradeoff between immediate GHG impacts and long-term catalytic market transformation, for which an overall GEF strategic direction would have been useful. These mixed expectations appear to have led to a tendency to overestimate GHG at project design, linked to the complex incremental cost analysis of global benefits. The GHG target setting for future projects has raised expectations, but has not provided a clear message on the relative importance of different types of GEF projects such as capacity building. For projects that do not aim at avoidance of GHG within the measurable time horizon, it is inappropriate to include GHG goals in project design.

- **Given the great variety of types of projects, local situations, project goals, and GEF investment, it is difficult to assess cost benefits across the GEF Climate Change Program**. GEF provides incremental

costs for global environmental benefits, and levels of IA or parallel financing vary considerably. GEF funding constitutes only a part of the resources that underlie a result and should thus *not* be confused with full abatement costs. An analysis of GEF financial contributions and CO_2 reductions may only indicate broad potential for carbon avoided emissions "per incremental GEF dollar," provided the introductory caveats and qualifications are heeded. The marginal costs of abatement of CO_2 vary greatly between countries and circumstances and cannot serve as an easy measure for GEF portfolio performance.

- **GHG data availability and quality in the GEF portfolio are far from adequate.** Beyond the general weaknesses in GEF documentation and data management systems, GHG measurement is hampered by specific problems. Although the data quality has improved in later years, there is considerable room for further improvement to address lack of targets or estimates; unrealistic estimates, especially for replication; and vague or unavailable data. The GEF has missed an opportunity to provide timely guidance on GHG potential that could save time and effort for all parties involved in project design and implementation.

- **A coherent, pragmatic, and GEF-wide methodology on GHG estimates is urgently needed.** It has been discussed in the Climate Change Task Force for some time. This analysis points to the need for such guidance to be comprehensive (that is, to cover the range of technologies and clusters and the GHG reduction or avoidance calculation methods and factors to be used). Advice is also needed on how to handle multistrategy projects, projects with several technology components, and projects without immediate GHG goals. Problems are also noted in the consistency of supporting assumptions, unclear time frames, and project duration. The provisional methodology has attempted to assign a GEF causality factor to replication; more guidance of credible replication would be more constructive than an inherently subjective causality attribution. Furthermore, the GEF project design process is not favorable to a consistent approach across different agencies, countries, project designers, clusters, and technologies. Any guidance should thus be accompanied with appropriate dissemination and training tools.

- **The systems and approaches to monitoring, reporting, and measurement of impact also need improvements, for barrier removal, market transformation, replication, and the effect on GHGs.** Linked to overestimation of initial project targets, the analysis revealed that project mid-term reviews tend to revise targets downward, and final evaluations tend to report shortfalls in meeting those targets. However, not all evaluation reports provided a satisfactory analysis of GHG avoidance, raising questions both on the underlying GHG assessment framework and the ability of evaluators to assess these aspects. Yearly monitoring of progress in GHG is not practicable, but more effort is needed on appropriate proxy indicators, especially to assess removal of barriers, their catalytic effect, and market transformation. An adequate review system could be based on yearly monitoring of progress toward results, periodic reporting on GHG avoidance, quality standards of mid-term and final evaluations, and conduct of select ex-post evaluations. Ultimately, reduction or avoidance of GHGs depend on the achievement of substantive projects results.

GEF cannot report accurately on the GHG impact of its portfolio unless the above matters are dealt with urgently.

4.2 Key Results of Market Transformation

4.2.1 Background

The notion of "market transformation" is central to the GEF climate change portfolio. The key to catalyzing impact lies in barrier removal and replication that promote sustained market transformation for energy efficiency and renewable energy.

The 1996 GEF Operational Strategy designed OP5 and OP6 "…to expand, facilitate, and aggregate the markets for the needed technologies and improve their management and utilization, resulting in accelerated adoption and

diffusion." The first step in market aggregation for the long-term mitigation measures was removing barriers to implementation of climate-friendly, commercially viable renewable or energy-efficient technologies.

When the GEF Council established new Strategic Priorities from 2003 onward, the primary priority was "Market transformation approaches that permanently shift the market equilibrium to a higher level of product or technology application, leading to sustained GHG reductions at relatively low program costs (SP1)… Market transformation projects typically do not require substantial capital spending but consist of capacity building, marketing and awareness raising, standards and labeling programs, dealer incentives, and manufacturer technology transfer and product design" (GEF/C.21/Inf.11). The report "Measuring Results from Climate Change Programs (2002) sees market transformation as the "level of market penetration of sustainable technologies and practices in given country markets."

This study finds that while the notion of market transformation is intuitively applicable to the EE products (in SP1), it is equally useful for the entire climate change portfolio. Ultimately, the removal of a market barrier is demonstrated by its effect on the market. However, the level of market transformation that can be expected must be commensurate with the complexity of the market and the GEF resources involved. In general, a higher degree of market transformation is likely within OP5; within renewable energy, the GEF is often trying to develop markets from a much lower baseline.

Some climate change projects attempt to address market barriers directly through policy interventions or through institutional capacity building or awareness raising. The majority of projects also contain components with direct investments in renewable energy or energy savings. These projects aim, in the first instance, to have a direct effect on GHG avoidance and thereby demonstrate successful strategies. Second, energy savings and GHG avoidance are also expected to be achieved through replication of similar initiatives. Finally, with sufficient replication, a sustainable environmental impact is intended to be achieved through removing one or more barriers for market transformation.

4.2.2 Emerging Results

GEF's Operational Strategy defines market transformation as a *long-term* challenge and a continuous and dynamic process. Clearly, many EE and RE markets remain undeveloped and experience significant barriers. As the previous section has demonstrated, overall GHG impacts from these sectors are still small. However, after a little more than a decade of GEF activity, there are situations where a combination of favorable external circumstances, appropriate choice of project strategies, effective implementation, and adequate GEF resources have contributed to the removal of barriers and have facilitated significant investments in sustainable energy technologies and programs. The section below provides a number of examples where GEF is achieving results. These examples are not exhaustive or comprehensive; rather, they are meant to be illustrative of the kinds of areas where GEF is making progress.

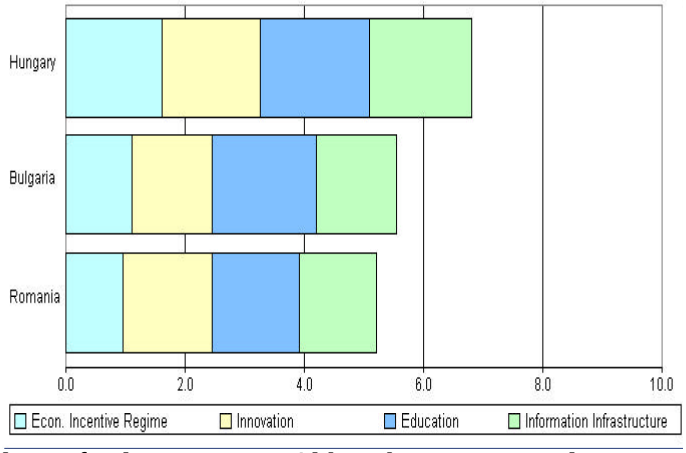
The greatest progress has been made within **energy efficiency** (EE), where achievements in market transformation can be observed in specific countries and sectors, including energy-efficient products (lighting and refrigerators), industrial EE (boilers), public sector EE (street lighting and district heating), and also in difficult areas such as transforming financing markets for EE investments.

An example of the latter is the IFC HEECP project, the first loan guarantee program financed by the GEF, which is contributing to the commercialization of EE finance and the growth of a local energy service company (ESCO) industry in Hungary. The project established active partnerships with a number of the largest Hungarian banks in the municipal market. Participating banks have reduced their collateral, downpayments, and equity requirements for certain types of EE projects. Banks have improved their risk management, and some lend for demonstrated transaction models without purchasing the GEF/IFC loan guarantee.

Other EE finance projects in the region, with slightly different country circumstances (for example, Bulgaria and Romania), are not so far along the transformation curve. In Hungary, it was possible to pursue market

transformation with a guarantee scheme; in Bulgaria the GEF/World Bank project includes both a partial credit guarantee and direct loans for municipal EE investments; and in Romania the GEF/World Bank project is designed to provide loans directly. The different needs and project designs are in part explained by the different levels of liquidity and competition in the banking systems of the different countries, and the relative status of their respective ESCO markets. However, project outcomes are also influenced by structural, economic, and cultural characteristics of national economies. As seen in Figure 4.6, using a knowledge management index of the three countries, Hungary has the most favorable economic incentive regime (tariffs, regulations), education and human resources; innovation system (patents, scientific activity), and information infrastructure, which is useful for replication. If well managed, the other regional projects may also contribute to promoting more EE through addressing lack of finance, but with a longer time horizon.[92]

Figure 4.6 Knowledge Management Economies



Access to finance has also played a role in the changes in the Eastern European market for municipal heating and hot water. The oldest project within this group, in Bulgaria—Energy Efficiency Strategy to Mitigate Greenhouse Gas Emissions: Demonstration Zone in the City of Gabrovo (UNDP)—directly supported one municipal investment, trained others, and helped establish a municipal EE network. Now, 156 municipalities (60 percent of all municipalities in the country) are involved in the activities of the network, EE plans have been prepared by 37 municipalities, and 18 (7 percent of total municipalities) are under implementation, mainly from governmental or donor funding sources. Although country results vary considerably depending on local conditions, project strategy, and external factors, the group of projects as a whole has provided the elements for transforming regional markets for municipal heating.

From the first Climate Change Program Study, it was already evident that there are market achievements for energy-efficient products in areas such as lighting and refrigeration, and boilers in industry.[93] The markets for efficient lighting World Bank projects in Thailand, Mexico, and Poland were dramatically changed toward greater penetration of EE products such as CFLs, prices fell, and codes and standards were introduced.[94] The GEF/UNDP lighting project in China addresses the largest global lighting market in the world and a large export industry. Sales of CFLs have penetrated a significant proportion of the lighting market in China, and the number of local manufacturers of energy-efficient lamp units has increased from fewer than 100 to more than 180 since the project start.

In Poland, five years after the completion of PELP, a World Bank Post Implementation study found that the CFL market encompasses a wide range of types, wattages, and prices of energy-efficient light bulbs. However, the sustainability of the market is in question, as consumer confidence is eroding due to lower-quality products imported from Asia. Consumers are aware of the benefits of CFLs, but there is a need to continue efforts to raise awareness and knowledge of the difference between high- and low-quality CFLs, and the links to the global environment.

Dramatic results have been achieved in EE in specific industrial sectors. In the case of the China Boiler Conversion project, an estimated 40 percent (about 440) of all coal-fired boilers in the Beijing urban districts have been converted to gas, and the cost of the gas boilers dropped by 50 percent due to rapid market development. The impact on GHG reduction has been huge. In Thailand, boiler conversion has continued after the GEF/World Bank project. Another GEF project there helped increase the share of energy-efficient air conditioners to 38 percent and single-door efficient refrigerators to 96 percent (1998). In Cuba, 18,000 efficient refrigerators produced were sold by project end, but sustainable market transformation outcomes are unlikely in

the absence of policies, consumer awareness, and financing for continued production (UNDP). Less-efficient refrigerators continue to be imported into the Cuban market.

A frequent strategy within GEF projects has been the development of business infrastructure in the EE sector as a means to promote EE investments, engage the private sector, and overcome several market barriers simultaneously (lack of finance, perceived high risks, lack of technical knowledge, etc.). GEF support has certainly helped strengthen ESCO industries where they are emerging, but is rarely sufficient to launch such an industry "from scratch." One exception may be the World Bank Energy Conservation project in China. With its development of three pilot energy management companies, the potential of an energy performance contracting market in China has been demonstrated, albeit with generous GEF grants and a line of credit from the World Bank. The energy management companies have concluded more than 285 energy performance contracts with an aggregate investment of US$70 million.

GEF projects have made a demonstrable difference in the development of standards, testing, certification, and labeling both for EE and RE. The consequence has been a significant improvement in the quality and reliability of energy-efficient appliances (in China, Cuba, Tunisia, Lithuania, by UNDP), energy-efficient buildings (in Tunisia, Lebanon, Mongolia, Czech Republic, all by UNDP), and PV systems (Indonesia – World Bank, Uganda - UNDP, China Renewable Energy Development Project [REDP] – World Bank).

GEF projects have provided effective incentives to adopt standards and to certify products at approved testing laboratories. Innovative mechanisms have facilitated concrete improvements in products, such as providing project support, subsidies, or tax breaks only to companies with certified products. These measures show impacts within a short time span in an environment that is serious about changes in market behavior. However, this approach works best in countries with sufficient product volume, regulatory frameworks, national standards authorities, and existing business and finance capacities. They also depend on capacity development. There is a potential to replicate these successes in a wider range of large and medium-sized developing countries, although it is more difficult in smaller countries where the economies of scale for testing facilities are less evident.

The results of the **renewable energy** (RE) cluster are patchy. Full transformation of renewable energy markets is difficult considering that despite many efforts of market aggregation by GEF and others, many RE technologies remain, in general, more expensive and less accessible than traditional high-GHG-emitting energy sources. Even in developed countries—where financial and policy barriers are generally lower—renewable energy markets are not yet mature or fully competitive.

However, there is evidence of emerging market transformation toward increased use of RE in specific sectors in specific countries, such as for mini-hydro systems in Sri Lanka, the wind market in India, and sugar biomass in Mauritius (World Bank). Although PVs are not yet affordable by most of the rural poor, some PV-oriented projects have been successful in niche market areas. The experience of the rural electrification cluster also shows that mini-grids are moving from pilot demonstration projects to being policy options for rural villages. The use of RE for productive uses is a new Strategic Priority with the rationale that new income flows can facilitate repayments on the RE investments. Experience with these projects is still new, and obvious successes have yet to emerge. Market penetration of RE technologies has been more successful in projects that combine elements of policy, finance, and business development. Some examples follow.

The completed Sri Lanka ESD World Bank project contributed to the commercialization of PV, village mini-hydro, and wind energy. The project stimulated private sector participation in PV development by providing consumer credit through microfinance institutions. An enabling environment for private sector participation in grid-connected RE projects was created by facilitating development of small power purchase agreements and by channeling long-term credit through licensed commercial and licensed specialized banks. During the course of the project the number of solar companies increased from 2 fledging dealers to 4 established companies, and 15 village hydro and 11 mini-hydro developers. The momentum of interest from the private sector and financial institutions is continuing.

In several GEF-supported countries, a considerable domestic manufacturing base for RE components or products has developed, partly linked to GEF support. Examples are found in India, Indonesia (World Bank), and Malaysia (UNDP). India has a considerable and increasing domestic manufacturing base for wind equipment and PV components. This does not mean that there is necessarily a direct link to the country's rural electrification; 40 percent of its PV output is exported.

GEF support in selected countries has helped propel PV market development from precommercial levels to a pioneer market, generally with a few PV shops in cities and emerging interest in solar home systems (SHS) in specific areas where GEF has implemented programs. The next step is moving from a pioneer market to an emerging market, with an expanding dealer network in rural areas, increased use of appliances, and awareness of the advantages of PVs. While there is some evidence of emerging PV markets, most still depend on high subsidy levels or high-value markets where affordability is not a problem.[95] After a decade of significant investment and market aggregation, PV costs have still not fallen to levels that are affordable by the majority of those who remain without electricity in developing countries.

India has an emerging RE market, with the fifth-largest wind power installed capacity in the world. About 96 percent of the total wind capacity of 1,700 megawatts has come about through commercial projects utilizing private investment, stimulated by large depreciation benefits and preferential feed-in tariffs. The Indian Renewable Energy Development Agency (IREDA) has been dominant in stimulating finance for RE. GEF contributed to the strengthening of IREDA's capacity to promote private investment in the sector, through the completed Alternative Energy GEF/World Bank project.

The World Bank REDP and the UNDP Rapid Commercialization of Renewable Energy project in China are achieving good results, and some areas, such as industrial biogas, have demonstrated financial viability. However, wind and PV systems still depend on subsidies. In terms of SHS systems supplied, the REDP is the largest program in the world (although a Government of China program will soon install even more systems). Nearly 100,000 systems have been installed, and four times that number will have been installed by the end of the project. One of the niche consumer groups are livestock herders in western China, whose periodic sales of herd provide enough liquidity to purchase PV systems. A significant outcome of the project has been the development and institutionalization of standards for PV systems and components and testing centers. In addition, a significant number of commercially viable PV system and component companies have been established that offer warranties and after-sales service. Approximately 30 million Chinese remain without access to electricity and will not be reached through grid connections. There remains a significant market, but sustained market penetration is likely only with ongoing subsidization.

GEF's first experience in promoting PV systems was the UNDP project in Zimbabwe, which not only reached its installation target, but also stimulated demand for PV systems. The project had a relatively solid foundation to build on, established by several pioneer companies that were assembling or selling and installing PV systems. The project affected positively all steps of the supply chain, from increased number of local manufactures and dealer networks; consumer loans through the national agriculture bank at subsidized interest rates; standards for certifying systems; reduced market prices (partly through elimination of import duties on imported components through the project); and greater end-user awareness. While a 1998 [96] survey established that 4.6 percent of rural households own PV systems, the market has since been influenced by adverse political and economic trends that have reduced purchasing power, depleted loan funds, and decimated companies.

Demonstration of the commercial feasibility of new technology is key for projects that focus on productive uses of RE (for example, in Mexico by the World Bank, in the Philippines by UNDP). The project in Mexico has installed nearly 1,000 RE systems such as solar- and wind-powered pumps and solar-powered refrigerated milk storage tanks on selected farms as demonstration units.

The project portfolios of both **OP7 and OP11** are not yet sufficiently developed to yield obvious market transformation results. While some of the projects in these two programs are addressing national or local markets, the strategy for many of the technologies is *global* market penetration. OP7 was refocused in 2003 into

SP5: Global Market Aggregation and National Innovation for Emerging Technologies. The portfolio comprises mainly large-scale biomass gasification and high-temperature solar-thermal power projects. The projects are mainly at the demonstration stage. A small number of projects have consumed large amounts of GEF resources, and it could be debated whether GEF can, or should, attempt serious market transformation in these areas.

STAP reviews and the 2003 Council paper on strategic business planning (GEF/C.21/Inf.11) state that progress would depend on (a) the local political-institutional environment; (b) creating country commitment for innovation and win-win situations for country and global benefits; (c) building market development alliances more vigorously; and (d) parallel technology development in industrialized countries. A specific strategy for operationalizing these recommendations has not been developed, because the focus is still on financing and project implementation issues. The exception may be the fuel cell bus initiative in OP11, which faces technical implementation challenges, but benefits from an emerging market and a strong partnership at the local and international level.

In other cases, there may be a tradeoff between immediate results and market transformation. For **STRMs**, the rationale is primarily the expected reduction in GHGs rather than its programmatic impact.[97] Several carbon sequestration projects (Benin and Sudan - UNDP; Senegal - World Bank) reached or surpassed their objectives in abatement and generated considerable local benefits in terms of increased income for rural poor and improved natural resource capital. Yet the projects failed to reach their goals of transforming the firewood/charcoal market, which would have had a more significant and lasting impact. In other words, excellent immediate results do not imply that market transformation will take place, and lack of observable immediate impact does not mean that market transformation will not happen. Ultimately, a number of factors contribute to the achievement of this objective.

4.2.3 Factors Influencing Results

Projects that are successful in transforming markets were found to have certain characteristics:

- **Projects are more successful when they have a clear concept of which market they wish to transform, and which market barriers have to be overcome and have a well-defined and narrow target group**. Examples of focused projects are the HEECP, which targets the financial market through banks as the primary target group; China's Energy Conservation project focusing on industrial boilers; and projects targeting EE products for specific market segments or aiming to develop a submarket—the ESCO industry or the municipal market—or projects that target key manufacturers with a dominant market share. Projects that target different and varied groups (for example, any promoter wanting EE measures, or all stakeholders for different RE technologies in a country) tend not to be as effective.

- **Projects are more successful when they build on a basic level of existing market development.** This is observed, for example, in strengthening existing ESCOs versus creating a new ESCO industry or the success of EE products in countries with a middle-income and relatively informed consumer group (Thailand, Mexico, Poland). RE projects generally start from a lower level of market development and show low rates of market penetration.

  GEF climate change projects, more often than not, are supply oriented. The assumption that demonstrating delivery of new technology will generate demand only holds true if a number of complementary market-supporting elements are in place, such as enabling policies, available finance, and adequate business infrastructure and capacity. The HEECP has been successful because Hungary has a competitive and liquid banking sector; the ESCO market was well developed; and energy policies were conducive for energy efficiency. The project was then able to target a specific market barrier (perceptions of risk in the banking sector) while building on these other positive market features.

- **Market transformation does not happen without sustained programmatic support, either from the GEF or other partners**. Examples of an isolated project producing market changes are rare. Influencing markets requires a long-term commitment, with support that is extensive enough to make a difference in the market. GEF support is more likely to make a difference where (a) a group of GEF projects together pool resources and attack barriers in a complementary manner (or several phased GEF projects); (b) the project acted in synergy with parallel projects (bilateral, governmental, or private sector); or (c) the GEF project is large in scope and financial contribution.

  The GEF achievements in EE in China are associated with extensive government efforts such as the Green Lights program. Even in a relative advanced economy such as Hungary, with structural transformation, market liberalization, and private sector growth, the achievements in energy efficiency required considerable GEF and IA investment. In countries with higher barriers, the needs will be yet higher. Within renewable energy, the progress in market development is greater in countries where GEF has financed several World Bank and UNDP projects (Uganda, Sri Lanka); or where GEF has financed one project, but the country has benefited from a great deal of past assistance (Kenya, Tanzania). Pilot or demonstration projects, by themselves, are insufficient to produce replication, remove barriers, and transform markets.

Durable changes in markets require a combination of enabling policies and regulations, available finance, adequate business capacities, and end-use knowledge. Where one project cannot address all of these aspects, the combination of complementary GEF resources in different projects seems a logical approach.

4.3 Evaluating Performance: The Effectiveness of GEF Climate Change Strategies

As emphasized a number of times above, GEF projects aim not simply to make an immediate impact on GHG emissions. They aim to achieve sustainable market transformation that leads to a reduction or avoidance of GHG emissions over the long term. This emphasis is captured in GEF's Strategic Priorities for the climate change focal area. The first Strategic Priority aims at the "transformation of markets for high volume products and processes—to catalyze both demand and supply sides with relatively small resource input, resulting in a significant and lasting market penetration or transformation."[98] GEF's two main climate change operational programs reinforce this primary strategy: OP5 focuses on the removal of barriers to EE and energy conservation; and OP6 focuses on the promoting the adoption of RE by removing barriers and reducing implementation costs.

GEF's performance in the climate change focal area thus needs to be analyzed and evaluated in relation to the range of strategies that aim at removing particular market barriers or overcoming particular market failures. GEF barrier removal and market transformation strategies can grouped into five or six broad categories: developing enabling policies; financing instruments and mechanisms; business models and providing enterprise support; disseminating knowledge/information and creating awareness; demonstrating creative project approaches and technologies; and building capacity. We shall focus primarily on the first three performance areas or strategies, that is, enabling policies, availability of finance, and adequate business infrastructure. These match GEF's Strategic Priorities of "transformation of markets…, increased access to local sources of finance for renewable energy and energy efficiency, [and]… power sector policy frameworks supportive of renewable energy and energy efficiency."[99]

Given the size of the GEF climate change portfolio, we cannot possibly go into detailed performance or operational issues, let alone individual project evaluations. This study is primarily a comparative review that looks across the portfolio to determine which strategies work best, under which circumstances, and with what results. The GEF portfolio offers a wonderful, even unique, opportunity to do this—to study and evaluate clusters of projects in a particular technology area, market segment, or region. The GEF climate change portfolio offers a rich source of information and a potential set of lessons that can inform more effective project design and implementation, not only for future GEF funding, but also for sustainable energy projects globally.

This study has focused on two clusters of projects: those employing multiple strategies to remove barriers for energy efficiency—especially those incorporating financing and business infrastructure development strategies—and projects that promote the use of renewable energy for electricity production. We have supplemented these cluster studies with briefer reviews of projects that focus on EE products; industrial EE; and public sector EE projects, mainly in the area of district heating and hot water. We have also reflected on recent experiences with methane, landfill, and biomass energy projects. Finally, the chapter briefly assesses the status of OP7—reducing the long-term costs of low-GHG-emitting energy technologies and OP11—promoting environmentally sustainable transport.

4.3.1 Energy Efficiency (OP5)[100]

The purposes of this OP are to remove barriers to the large-scale application and dissemination of least-economic-cost, commercially established, or newly developed, energy-efficient technologies; to promote more efficient energy use where a reduction in GHG emissions would result; and to help ensure the sustainability and to facilitate learning. (Operational Strategy, 1996)

The huge improvements in energy efficiency that have been achieved in a number of emerging economies and rapidly industrializing developing countries over the past decade have been induced by structural change in their manufacturing and industrial sectors. Foreign direct investment in new competitive industries, often oriented to export markets, has brought leading-edge technology, which is more efficient in the use of number of factors of production, including energy inputs. In 10 years, Hungary has more than halved the energy intensity of its industrial output. China is achieving equally remarkable results. EE projects are also particularly vulnerable to changes in macroeconomic conditions and international energy prices. These phenomena serve as a reminder that broader economic and industrial policies can be the most important determinant in improved energy efficiency. Nevertheless, there remains huge potential for targeted EE policies, financing mechanisms, and business development efforts to achieve significant gains in EE in industry, the public sector and a range of consumer products.

GEF energy efficiency projects fall into four broad clusters: promoting EE products and markets (such as lights and fridges); EE in industry; EE in the public sector (including district heating and hot water); and projects that focus primarily on the development of financial instruments and ESCOs to transform EE markets. Although we draw brief findings and lessons from the first three clusters, we focus primarily on the last cluster. A growing number of GEF projects focus on the development of financing mechanisms for EE investments. Many of these projects also incorporate multiple strategies, including enabling policies, business infrastructure, information and awareness, and capacity building.

Enabling Policies and Market Support Activities

The success of energy efficiency projects is greatly enhanced if the policy and regulatory environment is favorable. Issues that affect EE projects include overall energy policy; power sector reform; utility demand-side management programs; EE policies, laws, and targets; the establishment of EE agencies; support and promotion of energy audits; and standards, codes, testing, certification, and labeling.

Energy prices can be a major deterrent or incentive for EE investments. **Energy policy** and choices around the degree of state intervention in energy prices versus competitive energy markets form a critical backdrop to EE programs. Yet few GEF EE projects have interacted directly with broader energy policymaking processes. For example, when Brazil faced emergency power shortages in 2001, the GEF/World Bank EE project in Brazil did not appear to have seized the possibility for development of national or sector strategies for emergency energy savings measures. A case could be made for GEF projects providing more flexible space and resources for "policy entrepreneurship"—a point repeated in the section on renewable energy below. If projects—or project staff—are sensitive and connected to the policymaking process, they have the potential to influence national energy and energy efficiency policies in incremental but significant ways through sharing project expertise and experience, including international access to relevant policy examples.

There have also not been many attempts by GEF projects to insert specific energy efficiency concerns in power **sector reform** and restructuring. New power sector reform policies and legislation create opportunities to embed regulatory, financing, and institutional mechanisms to promote EE. For example, a non-bypassable systems benefit charge on the national transmission system could create funding for utilities to invest in public-interest EE or to implement demand-side management (DSM) programs. A number of projects have had DSM components in their design (for example, in Thailand, Mexico, Jamaica, Sri Lanka, Brazil, Lithuania, Vietnam, all World Bank), but it has been difficult to demonstrate significant impact. Projects have had to deal with mixed incentives for utilities to implement DSM, poor or inconsistent management support for these programs, inadequate or inappropriate skills in the DSM units, changing energy consumption and peak load patterns, pricing and tariffs that do not reflect costs, and confusing relationships with ESCOs. However, potential EE gains through utility DSM remain huge. In addition to a supportive policy environment and appropriate pricing reforms, utilities need to be incentivized through regulation or cost-recovery measures. DSM investments need to be supported by a range of financing programs. Sustainability would also be enhanced if these programs are backed with adequate management and skills and well-designed public awareness campaigns. Early and visible successes can also cement government and utility management support.

Although GEF projects may not have had much impact at the broader energy policy and power restructuring level, a number have contributed to the development of specific **EE policies, laws, targets, and plans**, sometimes indirectly through raising awareness, training, and strengthening institutions. For example, the UNDP Bulgaria project supported the development of the Energy and Energy Efficiency Act (1999) and the National Energy Efficiency Program (2002) by providing information about municipal priorities. In India, the IREDA II GEF/World Bank project has coincided with increased power sector decentralization, and the establishment of a national bureau for EE. The World Bank has decided to support those Indian States that demonstrate positive conditions for and commitment to reform; this may give impetus to EE initiatives as well.

A widespread strategy for many GEF projects has been the establishment or support of **national EE institutions**, for example, in Eastern Europe and the Arab region in particular. A clearer vision is needed of the optimal role of "energy centers." Is the primary role regulatory oversight or enforcement? Is it a more general promotional or information and awareness role? Should they be involved in market transformation activities, including preparation of codes and standards, labeling, manufacture negotiations, or bulk procurement? Or should these centers be service providers in EE training or in actually performing energy audits and, if so, do they not then become "private sector substitutes?"

Many projects address **energy audits** (Bulgaria, Hungary, Lebanon, Romania, Syrian Arab Republic). Activities include (a) developing national standards for energy audits and certification of auditors; (b) improving the development of EE policy for the public sector through energy audits; (c) training energy auditors; and (d) supporting the actual conduct of such audits. In some cases, such audits have led to actual EE investments. The UNDP, with its focus on capacity building, has been particularly involved in the above activities.

Moving down to more detailed levels within the EE policy framework, a number of GEF-supported projects have contributed significantly to the development of **EE standards, codes, testing, certification, and labeling**. This is an area where sharing of international experience can be effective, and GEF projects can point to number of concrete achievements where client countries have adopted national standards, set up accredited testing laboratories, and instituted certification and labeling schemes. The introduction of voluntary mechanisms first (labels, voluntary standards) before moving to mandatory standards and labeling is generally accepted good practice. For example, new refrigerator standards adopted during the China efficient refrigerators project development phase contributed to future market development where even manufacturers not participating directly in the project have started to produce more efficient refrigerators to compete in the market. The lighting and boiler projects in China also contributed to developing standards. Lighting projects have also played active roles in supporting testing of compliance with minimum EE standards, certification and quality control. Quality testing is particularly important in the case of CFLs because their quality has varied and affected consumer's confidence in the products. In response to this issue, some countries, such as Thailand, established testing

procedures and provided testing capabilities and certification for CFLs and refrigerators. The PELP project also conducted random testing of CFLs in Poland to verify that they met the quality commitments made by the manufacturers. Similarly, the Efficient Lighting Initiative projects have developed quality specifications for lighting products and will randomly test these products in all seven participating countries and promote those that meet the requirements. In Mexico, quality standards for CFLs were created and enforced during the project. As a result, an increased number of CFLs are being sold and labeled according to the standards.

Finally, programs that support development of an energy efficiency industry also require a favorable policy framework *beyond* energy, such as fiscal policies and general regulations and practices for business development and the banking sector. It is not generally within the GEF mandate to work on such issues, yet project developers must take full account of fiscal and business limitations because they have notable effects on likelihood of success. For EE markets to develop, policy is necessary but not sufficient. It needs the necessary infrastructure of finance and of business.

Availability of Finance

A great deal of innovation in the development of new financing mechanisms and products is evident in GEF's EE portfolio. The assumptions underlying many of these projects are as follows. The availability of finance is identified as key barrier. A finance mechanism and product is designed. A finance barrier is removed. Finance is disbursed. EE investments are made. Energy savings are demonstrated. Capacity is built, and perceptions of risk are reduced. More finance is provided, and market transformation is initiated.

Many projects have underestimated the technical assistance needed to develop bankable projects and to develop appropriate financial products. Few countries have a track record of experience in financing EE investments. This sector raises particular challenges for project finance. EE projects—although potentially numerous—tend to be small. Transaction costs can be high. There are significant up-front investment costs, but with no new revenue streams. Often, there is no corresponding or distinguishable asset that can be used for collateral. Benefits can be small compared with overall operating expenses. And with little experience, these new technologies and practices are perceived as risky. Few banks understand financing possibilities in this sector.

In some countries with relatively undeveloped financial sectors, the availability of finance *is* the main constraint. However, in a surprising number of developing countries—especially emerging economies and the larger developing countries—it is not so much the lack of availability of finance that is the primary finance barrier, or even the lack of good projects. In many countries, the banking sector is fairly liquid and the potential for EE improvements is high. The barriers relate more to perceptions of risk, the lack of project developers, and the difficulties in linking technically feasible and apparently economic projects with bankers willing to make investments in this sector. Engineering, financial, accounting, and business enterprise skills, knowledge, and experience have to be melded into a common, coherent, and analytical decision making framework. And, as we shall argue below, it is that rare quality of "**entrepreneurial deal making**" that acts as the catalyst of success.

These "deal-making" skills may reside in ESCOs, but, equally, they may not. The presence of a competitive ESCO industry is often critical for the transformation of EE markets, but additional interventions are often necessary. The GEF EE projects that are the most successful are those that have project staff or have identified appropriate people in the sector who are passionately committed to this "deal-making role." They actively seek to bring the various stakeholders together and they forge a common language and understanding of the barriers that have to be removed and the kinds of financial instruments and products that will best distribute and manage risks.

Initial project development costs can also act as a barrier to EE market development. Energy audits, project design, and feasibility studies can be costly with uncertain outcomes. A number of interesting strategies have been tested by GEF projects, including the use of audit grants, contingent loans, ESCOs assuming the risk of paying for development costs for projects that do not make their way through to final investment, and the development of product lines where transaction costs are minimized by specializing in specific technologies or

market segments. Audit grants and contingent loans are appropriate strategies in the early stages of developing EE markets, while ESCOs and the development of product lines are appropriate in more mature markets.

Projects with the most chance of successful outcomes are those that seek to explicitly address the most critical and difficult barriers to deal flow. Projects must choose the most appropriate financial instruments and apply them dynamically to the circumstances prevalent in that country and the status of the banking market. Projects are also more successful if they clearly target the market sector they want to develop. This allows for the development of more specialized capacity and financial instruments. The GEF financial support mechanisms most often employed are partial loan guarantees, special purpose funds, investment grants and subsidies, as well as loan loss reserve funds and equity funds. These are elaborated in Box 4.2.

Box 4.2 Financing Instruments: Conditions and Use

- **Partial Loan Guarantees:** Most appropriate in well-developed banking sectors, where banks are liquid and willing to accept some risks, and when there is sufficient baseline market activity to justify and support the program. GEF funds are placed into a reserve account that is used to provide partial credit guarantees for EE loans, with a local financial institution. (China, Bulgaria, Hungary, IFC Commercializing Energy Efficiency Finance [CEEF] project).
- **Loan Loss Reserve Funds:** Well suited for developed and liquid banking sectors and a willingness by banks to take some risks, but better suited for a portfolio of small, standard loans. It should be accompanied by technical assistance to develop standardized loan applications and appraisal methods. GEF funds are placed into an account with local bank(s) to provide full or partial coverage for a portfolio of—not individual—EE loans (Hungary).
- **Special Purpose and Revolving Funds:** Can be used where there is insufficient liquidity in the banking sector or where there is major risk aversion among lenders, combined with a proactive fund manager. It removes the need for EE projects to compete with more conventional projects for commercial financing, although fund managers may be encouraged to leverage the GEF funds (Romania).
- **Equity Funds:** GEF funds as equity to ESCOs but such investments are uncommon and can raise concerns over equality, divestment protocol, and legal issues. (China, Romania Energy Efficiency Fund [REEF]).
- **Investment Grants:** Where the credit barrier is too high to support commercial financing, to target new and underdeveloped markets. Subsidies or investment grants can help facilitate investments on the end-user side by improving cash flow and reducing risks. (UNDP Romania, Bulgaria)

Source: Adapted from *World Bank GEF Energy Efficiency Portfolio Review and Practitioners Handbook 2004.*

The GEF EE portfolio has many examples of these different financing strategies. One of the most often quoted examples is the GEF/IFC HEECP, which provides **partial credit guarantees** to share in the credit risk of EE undertakings by domestic financial institutions in Hungary. The project has enabled smaller ESCOs to borrow at levels normally not feasible because of their relatively weak balance sheets. Six Hungarian financial institutions have utilized the project's "partial guarantees" (provided on a "first loss" basis). The promoters are mainly in the municipal sector, as well as in the industrial, institutional, and small residential sectors. A key feature is the emphasis of portfolio management and multiproject facilities, creating economies of scale and avoiding high preparation costs for individual deals. When the financial institution partner is ready to bankroll EE initiatives without the GEF project's support in one particular segment, the project has a role to find new market segments to support. The project is now being more widely replicated in the regional GEF/IFC CEEF project.

In countries, such as Romania and Bulgaria, GEF and the World Bank have created **revolving funds** to support EE investments. The ESCO market is relatively undeveloped in these countries, and the banking sector is not as liquid or competitive as in Hungary. The two loan funds rely on proactive fund managers to pursue new projects, recruit cofinanciers, and facilitate transactions. Projects should therefore seek to maximize competition for such assignments, including both quality and price aspects in the selection process, and properly incentivize fund managers to be proactive in identifying and developing new business. In most respects, the Bulgarian Energy Efficiency Fund is an application of the same concept as in Romania. However, the financial instruments include both a partial credit guarantee—sufficient to attract a commercial loan for a profitable EE investment by a well-collateralized industrial firm—and direct loans for municipal or residential EE investments.

In India, there are now numerous banking institutions operating; no regulatory restrictions on private businesses; and rates and term offerings are comparable to international norms. However, there are numerous barriers

present in the Indian market inhibiting the financing of EE. To stimulate credit, a GEF project will strengthen the energy efficiency capacity of IREDA, to catalyze and fund private ESCOs, and directly finance end-user EE investments. As a financial intermediary, IREDA on-lends the proceeds from a World Bank loan to private developers and, on an exception basis, to public corporations meeting IREDA's loan eligibility criteria. However, IREDA faces higher technological and financial risk when compared with more diversified institutions, and its cost of funds is high. Although industrial tariffs are among the highest in the world, providing increased incentive for EE, the project has so far not succeeded in directly leveraging capital from the private sector. By partially funding an ESCO, it has substituted, in at least one case, for funding that the company would have otherwise received fully from a commercial bank. Stronger involvement of financial institutions other than IREDA would help broaden the choice of investors in the long run and mainstream climate-friendly energy financing into the financial sector.

Finance might also be needed for manufacturers and suppliers of EE equipment and products, and for buyers. GEF support has often come in the form of **targeted subsidies**. For example, in Poland, manufacturers competed for the project subsidies by providing the largest guaranteed sales at the lowest project subsidy cost. Subsidies have also been available for market aggregation pilot bulk-buying schemes to be incorporated into utility DSM efforts in China—although it is difficult to conceive how these subsidies could be sustainable. There are also a number of examples of projects that employ various end-user finance schemes. Under the GEF/World Bank lighting project in Mexico, the national electric utility purchased CFLs and sold them directly to consumers through its offices. The utility purchased the CFLs in bulk under competitive procurement from manufacturers, receiving a significant discount over retail market prices and passed those savings along to consumers. Customers could pay for the lamps in full, or in installments through their power bills.

The World Bank GEF *Energy Efficiency Portfolio Review and Practitioners Handbook* identifies the following emerging good practices for financing programs: (1) conduct a full assessment of the EE market, from banks and project developers to equipment suppliers and end users in the project preparation phase; (2) identify critical barriers to the implementation of EE projects with the target markets and prioritize them; (3) select appropriate program interventions to address key barriers on a sustainable basis; (4) incorporate good practice principles in detailed project design that includes commercial orientation, program flexibility, sharing of risks and incentives, and transparency; (5) build the project pipeline early and intensively; (6) encourage competition for selection of program guarantor fund manager; and (7) continually monitor and market the program.

Building Business Infrastructure

GEF projects have employed a range of EE business support measures, including capacity building; strengthening the links between marketing, information dissemination, and business growth; alternative distribution channels to develop the market for EE products (for example, through utilities); and bulk procurement schemes to reduce costs for consumers.

Many GEF EE projects have also included components to develop ESCO markets in client countries (for example, China, Brazil, India, Vietnam, all by World Bank). ESCOs are an attractive business model for bridging the gap between end users and financing. ESCOs allow technical risks to be transferred away from end users and financiers. Costs can be reduced by bundling and packaging, and the ESCO model includes inherent business incentives to proactively develop projects.

Despite this potential, there has been debate within the energy community whether development of the ESCO business is the best way to reach energy efficiency goals. Creating viable and strong ESCO markets has proved challenging. Legal and taxation issues, poorly developed financial infrastructure, and limited equity markets can serve to inhibit the growth of ESCOs, which also often suffer from weak business, marketing, and management skills. The poor creditworthiness of many potential clients and unfamiliarity with energy performance contracting are further barriers. Project financing is a huge barrier (as discussed above), and emerging ESCOs are often unwilling or unable to take on and manage risks.

Where ESCOs exist or are emerging, the GEF may find a useful role in supporting market development. However, situations with a virtually nonexistent ESCO market present enormous challenges. A full-service ESCO market—involving full performance guarantees and off-balance sheet financing—may not be achievable in the short term in many countries. But other kinds of ESCO-like business models may be possible, including: ESCO's with third-party financing or variable term contracts, end-use outsourcing, equipment supplier credit, equipment leasing, and technical consultants with fixed or performance-based payments.

Some GEF projects have been criticized for spending an inordinate amount of time and resources on trying to develop ESCOs, but with little real deal flow. However, once established, ESCOs can specialize in specific market or technology areas and—in conjunction with financial institutions—can offer standardized products that lower transaction costs (as opposed to individual project deals) and that stimulate a stream of investments.

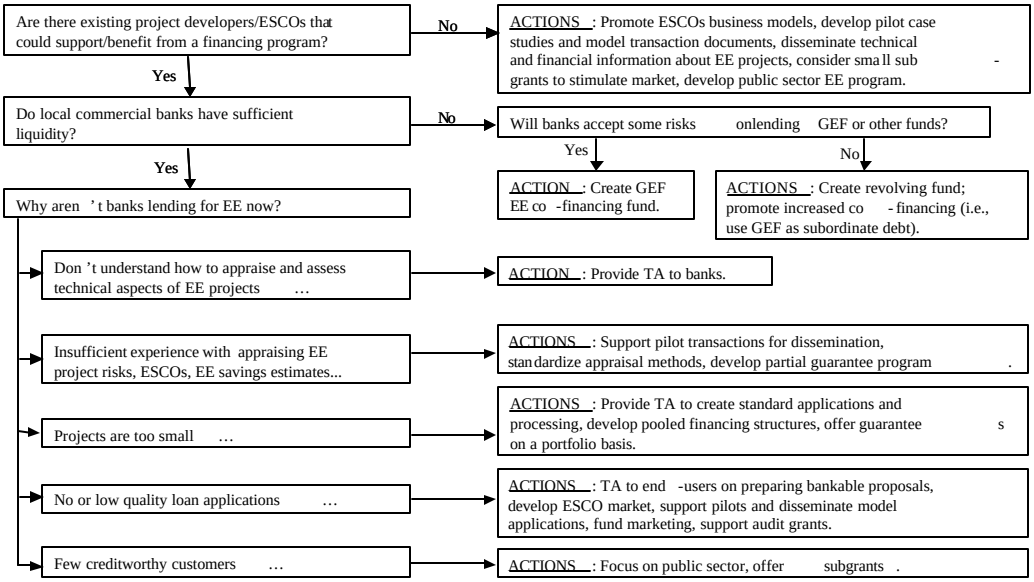
The WB GEF *Energy Efficiency Portfolio Review and Practitioners Handbook* concludes that (1) projects appear to have best success when a variety of ESCO business models are introduced and those most promising, and of interest to local stakeholders, are supported; (2) equity issues of new ESCOs need to be explicitly addressed if off-balance sheet financing is to be promoted; (3) utility-based ESCOs represent an attractive option when the private sector is unwilling to accept prevailing market risks; (4) parallel financing programs are critical to address the project finance barrier of ESCOs, but such facilities should support multiple transaction and financing models; and (5) complementary efforts to promote an enabling policy and business environment, such as fostering of business associations, can improve impacts and allow for constituency building.

Integrated Strategies for Energy Efficiency

There is some evidence that appropriate combinations of finance and business development strategies have contributed to transformation of markets for EE investments, particularly in some countries in Eastern Europe. Banks there now require less collateral and equity. In the initial investment decision, energy savings are counted as part of the debt servicing stream, and the transaction costs of banks have been lowered through the development of financial product lines applicable to generic EE investments.

More and more GEF EE projects incorporate a focus on financial instruments—particularly the use of partial risk guarantees—and try to emulate the success of projects such as the IFC's HEECP and CEEF. The *Energy Efficiency Portfolio Review and Practitioners Handbook* mentioned the risk of copying previous operational design that need to be adapted and refined with due regard to country conditions or the specific barriers that have to be overcome. A decision tree, developed by the World Bank GEF *EE Handbook*, provides a coherent guide to the choice of appropriate strategies to support EE projects (Figure 4.7).

Fig. 4.7. Sample Decision Tree for EE Financing Programs



A number of GEF **industrial energy** projects have been highly effective in market penetration and GHG reduction. The Climate Change Task Force has discussed the possibility that there may be little justification for GEF EE interventions in industry because many of these investments are financially viable and have short paybacks. There are at least two factors that can justify GEF interventions in this area. One is that industry accounts for 40 percent of global energy use; in China it accounts for nearly 70 percent of national energy use. The potential for major GHG reduction in this sector cannot be ignored. The second reason is that many industries in developing countries are simply not aware of the potential to reduce costs through EE improvements. These countries also face significant barriers in terms of the favorable policy frameworks, the availability of finance, undeveloped ESCO markets, and lack of capacity. A number of GEF projects have attempted to tackle a range of these barriers through multiple strategies (for example, Malaysia and Kenya, both by UNDP). However, these projects often progress no further than undertaking a number of energy audits, raising awareness, building capacity, and piloting a few projects. Sustainable market transformation seems much more likely if specific market segments are tackled in a systematic and sustained manner. The China Boiler project is an excellent example of what can be achieved.

One interesting group of GEF EE projects are those that seek to improve the efficiency of **heat and hot water** systems in Eastern Europe. The projects are similar in nature and provide a unique learning opportunity in developing programmatic and regional responses to specific markets with large GHG reduction potential (see Box 4.3 on the next page). The cluster also contains projects on biomass for heating, which is a good example of combining RE and EE approaches.

Box 4.3 Energy Efficiency in Heating and Hot Water

A portfolio of 19 UNDP/GEF projects in Eastern Europe provides a unique learning opportunity in the field of GHG reduction through providing heat and hot water efficiently. Thirteen of these projects are under implementation; only one is complete. Heating is of paramount importance in countries with long, cold winters, and reports to the UNFCCC from member countries in the region consistently identify this sector as a source of low-cost GHG reduction. The financial flows into poorly functioning, inefficient heating systems are enormous. The sector has become not only a burden to end users and to governments, but also a challenge to policies promoting privatization and market reforms. There is vast potential for replication, particularly in the large district heating systems. Much of the attention has been on EE measures. Fuel switching from coal to biomass has also featured, related to the region's forest resources. In all the Eastern European countries visited for this study, other EE projects also experienced a demand for support on biomass

In the early 1990s, GEF project designs revolved around technical demonstrations, capacity building in municipalities, and dissemination of project results. Technical problems, while omnipresent, were not, however, the primary cause of inefficiency and underperformance in the sector, and increasingly the focus has shifted to political, regulatory, social, and economic barriers that have held back potential market transformation. GEF has now shifted to project development that highlights market transformation.

Policy-related interventions in the portfolio originally pursued three aims: (1) local regulations that would make the operation of district heating systems economically viable, such as tariff policy; (2) local regulations that would overcome legislative barriers to certain types of equipment; and (3) national policy recommendations that would remove barriers for other municipalities in the same country. For example the project in Russia developed and lobbied for a series of regulations that would allow the implementation of a new billing system for heat and hot water. The project also developed legislation that allowed the installation of rooftop boilers in the city of Vladimir, dramatically improving the heat supply to buildings and reducing inefficiencies in the network. The national project director also provided input to national policies on heat by participating in an interagency working group. At the local level, the project in Bulgaria has enhanced institutional and human capacity in municipalities to plan, develop, and manage EE programs and projects. This project has also been highly effective in establishing networks of municipalities that have advocated changes in policy or programs to support energy efficiency. However, progress in these areas is often hampered by unfavorable laws on municipal financing, laws on privatization, ownership of property, pricing, taxation, and so forth. In practice, this means that countries on a faster reform track, especially the European Union accession countries, have a policy environment that facilitates further development of policies and regulatory frameworks conducive to efficiency improvements in the heat and hot water sectors.

Direct project financing interventions have included capitalization of loan funds or loan guarantee funds and capitalization of ESCOs. As financing has moved away from grants, the varieties of debt have expanded to reflect investment conditions in the host country. In the Slovak Republic, where there is some competition among commercial banks for municipal clients, the municipalities joined together to apply for a commercial loan from a Slovak bank. In Slovenia, the municipalities are taking loans from a designated line of credit for biomass projects created by the UNDP/GEF project within the Ecofund (a state environment fund). Options for equity investment have also expanded. For example, the Ukraine project is currently establishing an ESCO that will finance and carry out municipal heating upgrades. The GEF project in Bulgaria used outreach and training activities to change the markets for financing in the areas of efficient buildings and municipal efficiency projects. Projects undertaken by the World Bank and the IFC in the region have gone further in targeting market barriers to local financing of EE projects. The HEECP project in Hungary and the regional CEEF project have used partial risk guarantees to shift commercial banks into this market. Creative financial products have been developed for block-house heating projects. These projects have been more successful in countries with more competitive and liquid banking sectors.

GEF projects have also built business systems and infrastructure in this area through strengthening financial management in municipal energy departments and district heating companies and facilitating the creation of ESCOs. Most projects have also included awareness-raising activities, training and outreach, and M&E. Projects that have targeted municipalities rather than individuals have been more successful. Municipalities that often subsidize heat and hot water consumption, or face unsustainable losses, have much stronger incentives to reduce excess consumption than do individual residents who cannot easily be cut off from a district heating system for nonpayment.

One of the overall lessons in this portfolio is that market transformation strategies are most successful when they are tailored to specific country market conditions. Although there are many similarities in these projects, and they are all in the same region, the types of policy, financing, or business-related interventions differ markedly between the accession countries with open and competitive markets and those countries with less developed banking and ESCO markets and less enabling policy environments.

4.3.2 Renewable Energy (OP6)

This OP aims to remove barriers to the use of commercial or near-commercial renewable energy technologies and to reduce high implementation costs of RE technologies due to low volume or dispersed application. GEF projects in this OP include RE for productive uses and for rural electrification, grid-connected systems, and RE products. The focus of this study has been RE for rural electrification, although we have also provided evaluative comments on the other RE clusters, where information has been available.

The dramatic advances in electrification over the past decade—for example in China, Vietnam, and South Africa—have been achieved through grid connections, powered mostly by conventional energy sources. However, the costs of extending the power grid into remote areas with distributed populations are expensive. Off-grid and mini-grid systems, using RE, have the potential to provide a viable and effective alternative. Despite substantial off-grid and mini-grid programs in Africa and East and South Asia,[101] renewable energy technologies—especially PVs—still play a tiny role in supplying much needed energy services for households, institutions, and productive uses in rural areas. Costs are high, and significant market barriers have to be overcome.

GEF has become a primary funder of RE technologies in developing countries and emerging markets. Its role, which was initially technical in nature, has become more complex and less clear in terms of GEF comparative advantage. The GEF seeks to innovate and test new strategies to promote renewable energy in difficult market conditions and national contexts where poverty alleviation and development are paramount. Market transformation for increased renewable energy use is pursued through the development of enabling policies, standards, and certification; mechanisms to increase the availability of local finance; improved business infrastructure; information and awareness; capacity building; and through demonstration of innovation.

Enabling Policies

Most GEF renewable energy projects tackle financing-related barriers, or seek to explore effective business models, or build awareness and capacity. However, there is also a recognition in GEF that national policy issues are critical in creating the conditions for market transformation. Strategies include influencing overall energy policy, the development of specific RE policies or strategies, power sector reform and regulation, rural electrification policy, and RE technology standards, codes, testing, and certification.

A number of GEF projects have contributed directly to the development of **renewable energy policies** by drafting or revising national RE strategies and action plans, for example, in the Philippines, Indonesia, China, India, Sri Lanka, Sudan, Uganda, and Argentina. However, some projects ignore this area altogether, with negative consequences for project outcomes. Much depends on whether project staff are sensitive and responsive to the policy process. If project staff are well connected to policymakers they can be influential in shaping new policies through sharing relevant project experience and expertise. Many GEF projects take years to develop from concept to design to implementation, and the policy environment might change considerably. It is thus important to create project space for "policy entrepreneurship" that responds flexibly and quickly to new policy challenges and opportunities.

Two RE projects in China illustrate the contrasting policy approaches of GEF projects. The GEF/World Bank REDP offered a partial subsidy to PV suppliers, provided they offered certified products and audited levels of service. The partial subsidy provided an incentive for improvement in standards and quality, and there was the potential to transform a market for rural PV sales. However, bilateral donor programs provided much larger subsidies and a massive government village PV program offers systems for free! The lack of engagement at the policy level meant that the market transformation objectives of the project were unintentionally being undermined. The UNDP Rapid Commercialisation of Renewable Energy project in China, by contrast, has contributed directly to the development of a national biogas strategy and is responding strategically to the urgent need to develop a service model for the operation and maintenance of government-installed, PV-powered, mini-

grid systems for villages. The latter task was not strictly in the design of the project, but there was enough flexibility to respond strategically and to make a difference in the policy environment.

So far, few GEF projects explicitly focus on **power sector reform**. To promote the use of this strategy in the portfolio, one of the GEF Strategic Priorities, as of 2003, is the development of power sector policy frameworks that are supportive of RE and EE. Power sector reform in developing countries is mostly driven by factors other than environmental concerns and seldom by pressures to expand RE;– rather, the main drivers are the need to attract new investments in generation capacity or the need to deal with inefficiencies and insolvency by electricity distributors. However, power sector reform generally opens up space for independent power producers, including RE suppliers. The monopoly power of the incumbent is curtailed, and nondiscriminatory access to the grid is made possible. Retail choice also allows the introduction of "green power" sales. New power sector policies and legislation create opportunities for the development and implementation of explicit policies and regulatory instruments to promote renewable energy, for example through non-bypassable system benefit charges, competitively bid RE obligations, RE portfolio standards, feed-in tariffs, and green certificates.

A limited number of projects appear to have made an impact in this area. For example, the India Alternative Energy project carried out a study on independent power producers and helped influence a critical shift in the government's approach to RE development. The Sri Lanka ESD project enhanced the enabling environment for private investments in renewable energy, including mini-hydro and wind projects, through the application of a standardized small power purchase agreement. The Uganda Energy for Rural Transformation (ERT, by World Bank) project plans to develop detailed regulations under the Electricity Act. Regulations for RE rural electrification and small power producers are being developed by the project in Vietnam. One of the new GEF projects in this area is the World Bank China Renewable Energy Scale-up Program (CRESP), which includes the development of a mandated market share for RE. This topic is being given increasing attention in the international literature, and there is great potential for GEF projects to explore innovative interventions.

Power sector reform creates opportunities not only for grid-connected renewable energy, but can also create space for the development of mini-grid and off-grid systems using RE technologies though clear government support and legal frameworks for investments, ownership, operations and maintenance, tariffs, collection mechanisms, and service standards. A key issue is creating stable and long-term frameworks that provide a degree of certainty for the private sector in their financial planning. There are cases where private sector concessionaires have pulled out because the "rules of the game" have been unilaterally altered such that they are no longer able to get an adequate return on investment.

Rural electrification policy is critical for the success of RE projects in rural areas and is another important policy area that GEF projects could influence. Rural electrification will not expand significantly without a level of public investment or support. Public–private partnerships are increasingly being explored where the state—or an electrification fund supported by levies and grants—provides output-based subsidies, preferably on a competitive basis, to private firms or concessionaires with obligations to supply. Rural electrification policy can define the respective role of the state and private partners, concession areas, levels of subsidy support, the preferred business model (fee-for-service or equipment sales) and also technology choices and demarcation of grid versus off-grid or mini-grid areas.

Renewable energy projects have to find policy and market niches where they are viable. There are situations where GEF projects have engaged these policy issues. For example, a GEF project in Indonesia provided support to assist the government's Rural Electrification Steering Committee to develop a strategy and corresponding action plan. Similar activities were undertaken by the Uganda PV UNDP project in preparing a sustainable national program to provide sector-based PV electrification to areas that will not be served by the grid in the foreseeable future. In Sri Lanka, the completed ESD project indirectly influenced government planning and policy related to rural electrification. The project has encouraged the national electric utility and the government to more explicitly recognize and incorporate SHS into rural electrification planning and to recognize that unrealistic political promises and uncoordinated grid extension harm the market for SHS. However, there are also many projects that have not adequately engaged this area. As we note below, rural

electrification policies can determine the institutional and business framework for RE delivery—and the models that are chosen will have a profound impact on the delivery of energy services for the poor.

One successful, policy-related area of GEF project intervention is **standards, codes, testing, and certification**. Many projects have recognized that a key barrier to sustainable penetration of PV and other RE systems is poor-quality products, installation, and service. Important progress has been made in developing and adopting PV system and component standards, systems design, and installation codes of practice, as well as approved testing facilitating and certification systems. It has been important to work closely with the national standards authority. China has adopted a national standard and testing procedures for SHS developed by the GEF/World Bank project. The standard has undoubtedly played an important role in raising the quality and reliability of PV systems to the benefit of the market and ultimately consumers. Project standards for PV system components have also been approved by authorities in Uganda and Indonesia. Other projects that aim to develop standards include Argentina (World Bank), Bolivia, Peru, Chile, Fiji, and Sudan—all by UNDP. In Indonesia, the GEF/World Bank project helped develop a domestic testing and certification laboratory that has obtained international accreditation for PV component testing. The technical standards formulated for this project are being used, with adaptations, in a number of other countries including Sri Lanka, China, and Uganda.

The work on standards and certification has mainly focused on PV components and systems, but attention is now being given to hybrid systems involving PV, wind, hydro and/or diesel generators. For example, GEF/UNDP projects in Bolivia, Fiji, and Chile aim to establish standards and certification procedures for mini-grid systems. One of the challenges is how to incentivize suppliers to adopt standards and certification. One possibility is to link targeted, partial subsidies to approved products and systems. A remaining weak area is adequate codes and practices for service and maintenance, particularly where a sales-based, as opposed to fee-for-service, models are being used.

Building Appropriate Business Models and Infrastructure [102]

The promotion and adoption of renewable energy in rural areas has accelerated with the involvement of the private sector, often with a degree of support from government in the form of enabling policies, regulatory frameworks, and public–private partnerships. As illustrated in Figure 4.8, GEF projects have promoted private sector participation through two types of support: small-business development and the design of business delivery models (sales or fee-for-service). Examples of sales models are private firms operating in an open market and selling renewable energy products and systems (such as PVs) directly to consumers. In fee-for-service models the renewable energy equipment is typically owned by the service provider who installs and maintains the systems and then offers an energy service for which consumers are billed. Service providers could include incumbent utilities or competitively selected rural energy service companies (RESCOs) within regulated concessions that guarantee exclusivity on a geographic basis (or alternatively in terms of eligibility for subsidies). Concessionaires typically face obligations regarding supply, installation targets, and minimum service standards. A fee-for-service business model might also be offered by community-based organizations, local government, rural

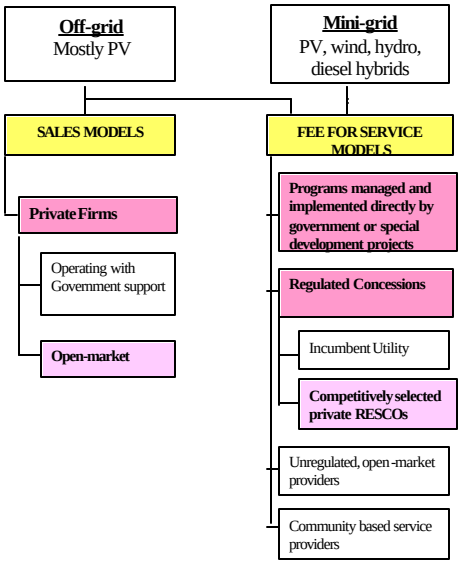


Figure 4.8 Rural Electrification / Renewable Energy Business Models

development projects, or unregulated, private firms.

GEF projects have offered business and enterprise support to RE manufacturers, suppliers, dealers, RESCOs, SMEs, and financial institutions. For example, the Uganda PV project provided support to the Uganda Renewable Energy Association, resulting in a significant increase in membership. In Zimbabwe the local solar industry was assisted through provision of procurement and storage facilities (UNDP). A series of market and technology assessments were conducted to encourage the entry of private sector equipment and service providers in Mexico by the World Bank project. The China REDP project incorporates direct support for business development, marketing, accounting, financial, and contract management in small PV suppliers. The difficulties and challenges of supporting and growing small businesses are often underestimated. Few GEF projects make adequate linkages to government-supported SME development programs.

First, many GEF projects have involved commercially-led PV **sales models** employing either cash sales or various forms of credit (dealer credit, end-user credit, or lease or hire-purchase schemes). Examples are the GEF projects in Indonesia, Philippines, China, India, Sri Lanka, Sudan, Uganda, Zimbabwe, and Bolivia.

In general, the advantages of sales-based models are that suppliers and dealers have strong incentives to market their products and develop their businesses. Smaller and modular systems are more common. Local infrastructure for installation, maintenance, and after-sales services can be built up as sales increase, thus implementation can be fast. The big potential disadvantage of sales-based models is that there is often no control on the quality of components and how systems are installed by end users themselves or by local technicians. Good maintenance and after-sales service are critical to the success of these models, as well as clear advice to end users on the limitations of the systems. Explicit government support may not essential, but it is advisable for the promotion of standards, codes of practice, testing, and certification, as well as consumer education.

Cash sales models are applicable where end users have disposable income, possibly on a seasonal basis, for instance in postharvest or livestock-sale periods, or may be made possible by returning migrant workers. These models involve the minimum number of stakeholders, have the lowest transaction costs, and minimum financing requirements. However, given the widespread levels of poverty in unelectrified areas in developing countries, the cash sales business model will inevitably only service niche markets. Wider market penetration requires various forms of consumer credit (discussed in the section below) to lower the barrier of high initial investment.

Second, a smaller number of GEF projects have explored concession, **fee-for-service** rural electrification models. Special fee-for-service development projects were established in Guatemala, Ghana (both UNDP), and Lao PDR (World Bank). Regulated concessions, using fee for service, were part of GEF projects in Peru, Argentina, Chile, Fiji, and Cape Verde. Many of these projects have been problematic, and the numbers of RE systems installed have been small. In the China REDP, a fee-for-service model was considered unworkable and was rejected early in project design, partly because no appropriate authority existed, in either the electric power or agricultural/rural sectors, to regulate concessions. The Sri Lanka ESD project demonstrated the initial failure of a fee-for-service model in that country. One dealer offered SHS on a service basis, but stopped on the grounds of the high expense of monthly collections in the fee-for-service scheme. The project in the Philippines was originally intended to demonstrate the viability of the RESCO approach as a delivery mechanism for RE systems. Considering the unfavorable results in using the RESCO approach in a similar project in a nearby province, it was decided to shift the business model to direct sales. Argentina is often quoted as an example of fee-for-service concessions, but few RE systems have been installed under the GEF/World Bank scheme there.

There appears to be a move away from fee-for-service by GEF-sponsored projects, although in theory this model has many potential advantages, such as the potential for bundling services, economies of scale, lower transaction costs, competitive bidding to minimize subsidies, obligations to supply, affordable service for the poor, incentives for customer education to manage and care for the systems, and more reliable after-sales service and maintenance. But establishment costs can be high, and a minimum scale must be achieved for cost-effective service and collections. Long pay-back periods expose the RESCOs to financial risk. There might also be high-levels of uncertainty in terms of the concession framework and the sustainability of subsidies. Consumers do not

own the systems and may not look after them well. PV systems thus need to be tamper- and theftproof. Ultimately, the challenge is to create a fair allocation of rights, obligations, and risks among the concessionaire, consumer, and government.

Fee-for-service models tend to be more complex than sales-based models. They require careful design and implementation of a concession and regulatory framework, capable bidders have to be found, and adequate management, billing, collection, service, and maintenance systems need to be developed and sustained. The move away from this model by RE suppliers may be understandable, but it is not necessarily desirable because the model may be most suitable for the poor and those in remote areas. We still do not have enough experience in fee-for-service models to point to unqualified successes, but it would seem important to allow sufficient time to identify approaches and for testing multiple models in a range of different contexts. An additional important element of fee-for-service approaches is their ability to support a broader range of services than just PV, including liquefied petroleum gas distribution for cooking, and in time other related services.

In the past, a majority of GEF interventions in this area focused primarily on **PV**, instead of being more open to broader energy service needs. This criticism was made at the UNDP/GEF Solar PV in Africa workshop in Johannesburg in 2003. GEF was urged to look for the most successful overall business model for a given context that meets customer and institutional needs. This may mean that PVs will be a smaller element of a larger package that includes nonrenewable energy, but in this case GEF should still consider support, because success of the model could see replication, with the PV (or other climate change–related technology) growing alongside the other elements of the project.

Third, a number of GEF projects explore the use of **mini-grids** powered by PVs, wind, mini-hydro, or hybrids of these technologies with diesel generators. It is interesting to note that, in projects that have included both off-grid and mini-grid components, there has been a clear trend during implementation for the mini-grid component to be abandoned or delayed. Mini-grid systems are clearly challenging. However, there would seem to be great potential for further exploration of mini-grids and hybrids combined with a fee-for-service approach. Increased funds for technology transfer may be available. Economies of scale combined with greater user densities allow for more competitive and larger power systems with greater potential for providing energy services for institutional and productive uses, as well as home use (examples are found in the Sri Lanka RE for Rural Economic Development, Uganda ERT, and India Alternate Energy projects). However, all the challenges of establishing a utility service remain, including the necessity of developing an appropriate regulatory framework. Technologies, such as small hydro, also pose specific challenges. Hydroelectric resources often require joint community management, participation, leadership, team work, and coordination. Under the Sri Lanka ESD project the mini-grid hydro installations were built, owned, and operated by the communities through electricity cooperative societies that were set up specifically for that purpose. In general, mini-grid systems are moving from pilot demonstration projects to being policy options for rural villages.

The most suitable business and implementation model for PV systems is determined by country conditions and the nature of its energy markets. In designing appropriate strategies, GEF has sought to understand the policy framework for electrification and nonelectrified areas, the energy service needs of end users, their economic circumstances, the potential for productive energy uses to strengthen repayments, competing energy sources, the presence of microfinance institutions interested in RE and rural electrification, familiarity and experience with credit schemes, the existence of PV dealer networks, and access to capital by PV companies or ESCOs. The advantages, disadvantages, and risks of the various business models, described above, then need to be assessed and weighed against country conditions.

Availability of Finance

The availability of affordable finance for the high up-front costs of RE systems remains the key barrier to their more widespread use, especially for poor people. GEF and its IAs have tested a range of financial mechanisms and instruments. These differ according to the status of the local finance sector, the finance barrier that has to be overcome, and the type of business model employed. Sales-based models may require a degree of financing for

suppliers and dealers, but the main need is microfinance for consumers. Fee-for-service models are likely to require substantial financing, because it may take 5 to 10 years before the initial investment of the ESCOs is recovered. Both models may require a level of subsidy. GEF projects seek to understand the nature of financial barriers and, hence, where GEF efforts should be targeted: financial intermediaries (banks, development finance institutions, microlenders), suppliers, dealers, service companies or end users.

GEF projects have explored a range of financial instruments, including (a) loan facilities for consumer credit (contingent loans, national RE funds, revolving funds, concessional debt, and so forth), (b) partial risk guarantees; (c) equity finance; and (d) targeted subsidies and grants.

Contingent loans have been used by GEF to cater for uncertainties in specific RE projects. Under these schemes, if the risk materializes, then the loan could be forgiven. A contingent loan was introduced in a China project to share specific risks associated with wind resource availability and turbine performance. Contingent loans have also been provided for up-front project development costs. This was a feature of the GEF/UNDP Caribbean Renewable Energy Technical Assistance Facility, which provides contingent loans for project preparation to create deal flow for the GEF-sponsored loan facility for the Caribbean Renewable Energy Fund. Repayment on the loans is linked to financial closure of funded projects. Specialized risk mitigation facilities have also been developed in GEF projects for technologies such as geothermal energy. Drilling risks incurred during the exploration of geothermal resources in Eastern Europe have been mitigated through funds that apply insurance and portfolio risk management principles.

One of the largest and boldest GEF projects in OP6 is the Photovoltaic Market Transformation Initiative (PVMTI), which is an IFC strategic intervention designed to accelerate the sustainable commercialization and financial viability of PV technology in developing countries, especially for off-grid applications. It seeks to achieve this goal by exploring and supporting a few, key PV business models by providing them with an appropriate combination of technical assistance and financing, demonstrating their viability, and encouraging other players in the target markets to replicate them. Financing mechanisms being explored include equity finance, concessional debt, and partial risk guarantees with leveraging from domestic financial institutions. The initiative focuses on India, Kenya, and Morocco, but investments in these markets are expected to provide sustainable, replicable models that can ultimately be financed on a commercial basis in other countries. However, progress has been slow, and only a fraction of the sales and installations will be achieved. Project evaluations have concluded that equity finance options have been used very sparingly, the loans may not have much concessionality in the end, and the guarantee facilities may also have a very limited call. Yet the private sector is needed for expanded RE investments. Little attention was given to consumer finance in this project. Other attempts at private equity finance (such as the GEF/IFC REEF for EE and RE) confirm the difficulties in attracting good-quality private sector participation.

The type of finance provided also depends on the available choice of financial intermediaries, including (a) microfinance institutions; (b) development finance institutions or banks; and (c) RE dealers. The financial mechanisms are generally revolving funds, national renewable energy loan funds, or dealer credit, often coupled with subsidies.

Consumer credit is a key challenge for projects using the sales delivery model. GEF projects provide consumer credit through microfinance institutions, development finance institutions, or dealers. GEF experience shows that consumer credit can be effectively provided through microfinance institutions. One advantage is that PV companies do not have to allocate working capital or budgets for credit schemes and can concentrate on sales and after-sales services. Good microfinance institutions are often much better equipped to manage credit schemes—they have a rural presence, know their clients, and know how to best collect debt. They can also be used for market promotions and consumer education.

An example is the Sri Lanka ESD project. SHS vendors had been reluctant to serve as consumer financing institutions because of the organization requirements, high costs, and risks associated with administering microloans to low-income isolated rural households. Consumers obtained loans from a national **microfinance**

institution with many local branches and strong ties to the communities in which it operated. Customers would sign a credit agreement with the microfinance institution, which would in turn pay the dealer. The microfinance institution remained responsible for repayment and collections. The project also offered output-based subsidies on an incentive basis to be disbursed only after confirmation of installation. The recently started Renewable Energy for Rural Economic Development GEF/World Bank project in Sri Lanka builds on the success of the ESD project and continues to make funds available to credit institutions for refinancing to microfinance institutions.

Another example of the microfinance model is the completed UNDP PV project in Uganda. Village banks were given a revolving fund that they use to lend to consumers at reduced rates with flexible repayment schedules. This mechanism was developed after dealer and consumer credit offered by development banks reached only the wealthiest households. For the Grameen Shakti Bank in Bangladesh, its PV solar program represents by far the largest business line for the company. The GEF/World Bank investment loan as dealer credit allowed this microcredit company to continue expanding its business and to lend to more PV consumers. A number of financing schemes are offered to consumers with different levels of downpayment and repayment periods. Grameen Shakti Bank is also exploring a microutility model in which PV systems are leased for income-generation activities.

A number of projects, for example Zimbabwe and Sudan (both UNDP), have facilitated consumer financing through **development finance institutions**, although the sustainability of these mechanisms is questionable once the project ends. National RE loan funds can be effective where domestic capital markets do not have sufficient liquidity and depth. Another example is the GEF/World Bank support to IREDA, which provides debt financing specifically for wind and PV projects. Although the IREDA credit line was never fully disbursed, and the cost of capital sank below the rates at which IREDA was able to offer loans, the IREDA financing initiative, coupled with increased promotional activities and financial incentives such as tax breaks, contributed to demonstrable market development, and commercial lines of credit have been created in the private banking sector to finance renewable energy.

Another financing option explored by GEF projects is **dealer credit**. This can be extended directly by dealers or through hire-purchase or lease schemes. In most cases one institution handles the collection of repayment installments as well as the maintenance, training, and other after-sales services. In some instances, informal credit arrangements are applied. However, interest rates are often high, and the payment facility absorbs working capital of the PV supplier. Payment schedules, ideally, should be designed to fit the income cycle of the end user. These schemes might exclude the poorest households owing to high downpayments and installments. PV companies are usually not experienced in or capable of administering a credit scheme; the risks of nonpayment are substantial, but the PV equipment can be used as collateral. The boundaries of ownership have to be clearly defined as well as the penalties for nonpayment.

In the GEF/World Bank project in Indonesia, sale of SHS was undertaken by private enterprises that extended credit to rural consumers through hire-purchase schemes. The PV dealers accessed credit, on normal commercial terms, from participating local commercial banks that refinanced their loans from the loan from the International Bank for Reconstruction and Development. The macroeconomic financial crisis of 1997–98 severely impacted the project: high inflation, high interest rates, falling incomes, and uncertainty about the future meant that it was virtually impossible for the private sector to expand the PV market.

Finally, **subsidies** linked to standards and certification have also been applied by GEF projects. The Sri Lanka ESD project worked to make solar systems affordable by targeting the interlocking barriers of high unit costs and prices and low sales volumes with an output-based subsidy that reduced the consumer's first cost and a refinance facility to ease credit to buyers. The project channeled subsidies to participating companies on the basis of their sales performance and not linked to costs or retail prices. The REDP in China offers output-based subsidies on an incentive basis to be disbursed only after confirmation of installation to participating PV vendors. The mechanism is broadly following ESD implementation arrangements, but on a declining basis per system. Based on the experience in Asia, the Uganda ERT project is providing grants for the installation of

systems in homes, public health, educational, and rural enterprises by private PV companies. Per-watt grants are channeled through the Private Sector Foundation to qualified companies for confirmed sales, leases, fee-for-service arrangements, hire purchase, and other commercial transactions. Systems that do not meet project standards are disqualified. The scheme gives companies a competitive incentive to develop the PV market and ensures that minimum standards on systems are maintained. Under the fee-for-service model, the Argentina project will accord a subsidy once the regulatory authority certifies that the concessionaire has installed the SHS in accordance with standards.

Many RE projects have adopted more than one approach to increasing access to finance, for example, the India Alternate Energy, Sri Lanka ESD, Uganda PV, and Zimbabwe PV. Often the financial mechanism is not clearly defined at the outset of the project, but is developed by the project following analysis of the renewable energy market and the financial sector. In some cases several schemes are tried before finding a successful formula. For example, in the Sri Lanka ESD project, dealer credit was tried but failed due to the high costs of monthly collections. A fee-for-service approach was also tried by one dealer without success, and eventually a microfinance consumer credit mechanism was developed. In some projects, multifinancing strategies may be effective because more than one barrier may need to be addressed. However, a trial-end-error approach must be combined with active learning, within the project and from other energy development actors, to shorten the time to generate results.

Most of the above finance mechanisms have been discussed in relation to electrification projects employing RE technologies. A number of additional financing mechanisms are relevant to grid-connected RE, including the use of system benefit charges on the power grid. Carbon trading and emission reduction credits provide a growing source of additional finance. GEF projects have not as yet explored these areas.

Over the past decade the GEF has demonstrated considerable innovation in financing mechanisms to increase the availability of affordable finance. The appropriate choice of financial instrument depends on the RE business model being employed and the financial barrier that has to be overcome. The GEF experience also demonstrates the importance of technical assistance and small amounts of seed finance to introduce local financial institutions to the possibilities of financing RE projects. The perceptions of the risks of these new markets can be shifted through carefully designed and targeted GEF interventions that demonstrate financial viability in niche market areas.

Integration of Renewable Energy Strategies and Future Trends

GEF experience with renewable energy projects for electricity production over the past decade has been rich and varied. We now have a comprehensive and coherent framework of strategies that are relevant for sustainable RE market transformation. An understanding has developed that a set of interlinked strategies are necessary that tackle policy, finance, business infrastructure, information, and capacity constraints and barriers. Project designers can work systematically through this framework of possible barriers and relevant strategies.

In terms of enabling policies, projects need to consider the possible importance of overall energy policy, specific renewable energy strategies, power sector reform, rural electrification policies and standards, codes, testing, and certification. In terms of possible business models for electrification, there is a great deal of experience with different types of sales models, but more experience is still needed with effective fee-for-service concessions. The full menu of financing options can be assessed, including national RE funds, support for financial intermediaries, partial risk guarantees, equity investments, concessional debt, contingent loans, revolving funds, support for microfinance institutions, dealer credit, grants, or subsidies. These strategies generally need to be supported by information and awareness and capacity building programs. The primary challenge, however, is accurate diagnosis of market barriers and specific country conditions, and then the correct choice and execution of strategies. The GEF portfolio is now large enough to demonstrate a number of successful approaches in particular market areas.

A number of overall strategic trends are apparent in the GEF cluster of projects focusing on renewable energy for electricity production. The enthusiasm for solar home systems appears to be waning, and few new large projects are being approved in this area. There is a growing consensus that PV costs are not falling to a level that is affordable by the vast majority of the poor who remain without access to electricity. Significant subsidies will continue to be required if the solar home market is to expand. It is also generally accepted that SHS have relatively modest development, miniscule GHG impacts—and fairly large program costs. While a number of interesting business models and financing schemes have been developed in this area, the contribution of PVs to electrification is small. Attention is accordingly shifting to institutional uses (for example, in clinics and schools) and exploring possible productive uses for PV systems that will assist with affordability and debt repayment for these systems. Attention is also shifting to mini-grid systems using a range of RE technologies including wind or microhydro or hybrid installations with these technologies and PV or diesel generators. The initial emphasis is on demonstration (as it was in the early days with SHS), but the potential is now for larger-scale applications that explore different institutional and business delivery models.

Thus, new GEF OP6 projects tend to include a range of RE technologies and fall under the caption of developing RE products or markets. This trend does not fully respond to the above concerns of seeking the most successful overall business model for a given context that meets customer and institutional needs. Another issue to consider is the fact that project success is difficult when trying to address multiple market barriers for a range of technologies.

Grid-connected RE systems have made the largest impact in OP6 in terms of GHG emissions and have the potential to do so in the future. **Biomass** (see Box 4.4) and wind projects hold much promise. Financing remains a challenge, but a key issue will be the extent to which GEF projects engage power sector reform to ensure that specific policy, regulatory, financial, and institutional mechanisms are introduced to increase the proportion of new power generation from renewable energy.

Another area that has significant potential in GHG reduction or avoidance is the use of **landfills and methane** gas. Strategies in this area are reviewed in Box 4.5.

Box 4.4 GEF Biomass Projects

Biomass projects are attractive for GEF because they represent energy sources with zero net carbon emissions. Projects include power production (combustion, gasification, cogeneration) from forestry and agricultural wastes including sugarcane bagasse, palm oil residues, wood chips, and sawmill waste. The STAP is currently studying the possible promotion of liquid biofuels. Many of these projects focus on technology demonstration, but also include activities that seek to tackle market barriers including enabling policies, availability of finance, business infrastructure, awareness, capacity development, and technology transfer. They are mostly OP6 projects with a couple of OP5 and also some OP7 projects. Four biomass projects have been completed, and few are currently active.

Many projects strive to promote biomass energy by improving the policies, legislation, and regulatory framework for RE. For example, the Malaysian GEF/UNDP project on Biomass-based Power generation from Palm Oil Residues seeks to: finalize a biomass policy document; formulate and recommend policies on RE electricity policy; propose regulatory policies on the pricing and sale of RE electricity; and develop a power generation market strategy for inclusion of biomass-based electricity power producers. The Thailand GEF/UNDP project on Removal of Barriers to Biomass Power Generation and Co-generation has contributed to the review of independent power producer power purchase agreements for RE.

Although the energy output (and avoided GHG) potential of biomass projects is generally higher than solar energy projects, they often tend to be more complex. Appropriate business models and contractual arrangements need to be developed, not just for the application of the technology and the heat or power off-take, but also for the fuel supply. Even though biomass is frequently an underutilized resource, its availability is often dependent on seasons, so that ensuring its all-year supply over the life of a project is often a very difficult task. (R)ESCO type models are also possible, but have not been explored extensively in the GEF portfolio.

GEF is able to leverage commercial finance for many of its biomass projects. The experience that develops through GEF demonstration projects assists in reducing risks and hence the cost of commercial finance. For example, the experience gained in the completed Mauritius GEF/World Bank project was instrumental in assisting the negotiation of a financing package for a subsequent bagasse/coal power plant at a sugar factory in the north of the country.

Proven biomass technologies differ by country. A technology could be considered proven in one country, but risky to finance in another. This is a challenge for accessing finance. For example, in India financial institutions treat sugar cogeneration and biomass sectors as high risk in view of precarious market and financial conditions for sugar mills, nonconducive policy frameworks in most of the states, and high fuel linkage risks. A GEF project in India aims to create a specific mechanism for contingent financing for model investment projects to overcome this barrier.

In Thailand, the financial scheme to subsidize the risk guarantee fee for the pilot plants has proved to be a useful tool to create confidence for banks and financial institutions to finance biomass-based power generation and cogeneration projects. However, the seasonal fuel supply risk is still a key concern.

Several GEF projects have now implemented pilots successfully demonstrating imported technology. Technology itself is frequently no longer the barrier and can be obtained on a commercial basis. Rather, the challenge is demonstration of the commercial and institutional framework in which the technologies can be profitably deployed and replicated.

Box 4.5 Landfills and Methane Gas

Methane (CH_4) is an GHG. Estimates of global methane emissions from solid waste disposal sites range from about 5 to 20 percent of total estimated anthropogenic sources globally. Landfill gas projects present a unique opportunity to obtain energy from improved waste management and processing, while at the same time providing global and local environmental benefits. Most of the GEF projects in this area were launched some time ago in China, India, and Jordan (by UNDP) and in Indonesia, Latvia, Mexico, and Uruguay by the World Bank. Most have similar objectives, that is, to reduce GHG emissions by recovering methane from landfill waste and to use the gas as RE in an engine or a boiler. They are mostly demonstration projects dealing with technical viability, regulatory frameworks, finance, and consumer awareness and acceptance. Few aim to remove barriers directly or transform markets for cogenerated energy at the national level. Rather, they aim to address a localized market for gas with possibilities of replication in other sites.

The most promising projects at this point are in China and Jordan. In Latvia, the gas production is operational but not yet financially viable. Most of the projects experienced significant delays stemming from the time needed to assess the landfill, obtaining financing, developing business arrangements, and procuring equipment. The Mexico project is the only one in which the physical implementation is ahead of schedule. The India Biomethanion and Uruguay projects have experienced major implementation hurdles.

All of the methane projects have faced problems in producing quality gas in sufficient quantities, which has consequences for the financial viability of the operations. The projects are dependent on off-take agreements (which may include gas purchase agreements; steam-purchase agreements; power purchase agreements) and fuel-supply agreements (including specifications of quality and frequency and volume of delivery).

Policy and legal frameworks. In addition to their direct demonstration effect for replication, GEF projects make a difference to policy or regulatory frameworks for waste management. For example, in China, the government's draft National Action Plan was launched in 2002 and will serve as the foundation for developing further national-level policy measures to provide incentives for the widespread adoption of landfill gas projects in China. The Jordan master plan, promoting biomass/biogas for the production of energy and fertilizer, is expected to be completed this year. The Mexico project is also strengthening the regulatory, policy, and social frameworks for the introduction of landfill gas capture and use. Meanwhile, unfavorable policy environments can impact negatively on projects. The profitability of the Latvia operation was threatened by governmental increases in disposal tariffs and refusal to purchase the electricity at average consumer prices.

Financing issues. The budgetary needs for plant development were underestimated for all the projects, and it has been difficult to obtain financing from communities, the private sector, or municipalities. In Uruguay, the municipality was unable to come up with the agreed counterpart funding owing to the economic crisis affecting the region. For the India biomethanation project, most of the beneficiary organizations were unable to meet their 50 percent cost commitment. Replication potential of the technologies is technically large, but financially unattractive, and would be more likely with strongly enforced local environmental law.

Business development. Collection and disposal of urban solid wastes is typically regulated and managed by local authorities. Municipalities are often inexperienced in working with private companies in this sector. GEF projects have played an important role in facilitated public–private partnerships. In Jordan, through a Danish-German partnership, landfill gas production has exceeded original estimates, although its liquid biogas production is not as successful.

Demonstration-type projects must demonstrate success, without which there is no incentive for replication. Where such achievements are late in coming, are complex or costly, and require considerable efforts, uptake by other actors is less likely. As the projects advance, more lessons are needed on financial viability and actual replication within the portfolio.

Graduation of methane initiatives to carbon finance schemes is also possible, because methane is one of the approved CDM methodologies. This has been demonstrated in Latin America and partly in Europe, where—after Mexico and Uruguay—other landfill gas methane projects are being considered under carbon finance because of attractive returns and available financiers. The view emerging within the GEF Climate Change Task Force is that the GEF should pass this technology to carbon finance and other sources, and move on to other areas of greater GEF comparative advantage.

Nevertheless, the methane field may remain an interesting area for the GEF, in specific cases where an enabling environment is necessary and the support could not be provided on a project-by-project level by the CDM.

4.3.3 Reducing the Long-Term Costs of Low-GHG-Emitting Energy Technologies (OP7)

OP7 consists of a limited number of projects, albeit with large financial allocations. Its objective is to reduce the cost of prospective technologies that have not yet become widespread market alternatives, through learning and economies of scale in the long term. A decade has passed, but the portfolio has not matured as expected. The number of projects supported to date has been small (16) and the achievements limited. Thus, in 2003, the OP7 goals were adjusted to reflect the strategic priority - Global Market Aggregation and National Innovation for Emerging Technologies (SP5).[103] This shift was supported by findings of a STAP[104] review of the OP7, which stressed the need for win-win situations of both global technologies and national priorities, and a stronger emphasis on private sector partnerships.

Within OP7, the solar thermal power portfolio consists of four projects (India, Mexico, Morocco, Egypt), implemented by the World Bank at a total investment of US$192 million.[105] All projects had to adapt their strategy from independent power projects to public sector power plants with variations of engineer-procure-construct contracts. This presented new challenges in securing public cofinancing, and also has consequences for the procurement process because there are a limited number of consulting firms and suppliers in the solar thermal technology industry. Key milestones have now been set for launching the four projects. The Morocco plant may be the most advanced (preparing for prequalification bid), whereas the Egypt project was just approved in May 2004 by the GEF Council. The India Mathania project was the first GEF solar thermal proposal, but appears to pose the largest challenges to cost reduction. Mexico will depend on obtaining turnkey finance through the plant contractor.

More advances have been made in large-scale biomass gasification.[106] The technology involves gasification of biomass—woodchips from plantations of rapidly growing trees in one project, sugar cane bagasse and field wastes in the other—and combustion of the resulting gases in a high-efficiency gas turbine to generate electric power. Three projects in Brazil, by the World Bank and UNDP, have resulted in resolving many technology and system integration issues and changing attitudes of key stakeholders. However, only with the 2001 Brazil power crisis did sufficient incentive appear to consider commercial demonstration. This experience confirms the interdependence between technology support activity and the political-institutional environment. Lessons are yet to be drawn on how to make an eventual commercialization in one country apply worldwide for cost buy-down.

In China, the first-ever coal-fired generation plant in a developing country using integrated gasification combined cycle technology is set to advance, with technical carbon sequestration. In a first phase, this GEF/UNDP project will demonstrate improved efficiency, and subsequently the technology's capacity to reduce carbon emissions, pollution, and solid waste emissions. The capital investment and energy production are still expected to be more expensive than other coal-based alternatives.

Emerging Issues

The "right" strategy for ensuring sustained global cost reduction remains elusive. The main difference between "regular" renewable energy projects and OP7 lies in technological risk barriers. Yet, other technologies that are more widely applied and for which there is demand (solar PV, grid-connected wind power) still struggle with cost competitiveness. The neglect of other, typical barriers within OP7 resulted in a focus of many projects on the financing aspects, rather than a balanced removal of all transactional, informational, and capacity-related barriers.[107]

The STAP 2004 review recommends that the list of OP7 technologies not be closed, and suggests smaller-scale technology applications, MSPs, EE technologies, or projects with a pure policy focus. Avoiding OP7 project "lumpiness" is attractive, but lessons from the Climate Change Program are clear—dispersed GEF projects (in terms of geographical presence, technology, strategy, and focus) face considerable limitations in effectively learning, overcoming cost barriers, and building a critical mass for results.

A key paradox has to do with the country drivenness in OP7. The series of OP7 projects in different countries have not so far brought local benefits or synergy with the development goals at the country level and, consequently, no global benefits. The technological nature of the OP7 portfolio has not allowed it to effectively integrate local policy and institutional aspects or with the poverty reduction agenda of the IAs. Furthermore, the parallel technology development in industrialized countries, which was assumed to happen as GEF supports emerging technologies and buffer the country projects, has been rare and disconnected. The STAP OP7 review recommended that the GEF should "be more active in stimulating local and international leadership and in promoting champions by establishing partnerships with private sector companies." However, evaluations have frequently pointed to the GEF's lack of comparative advantage in partnering directly with the private sector. Where such international partnerships exist, GEF may be able to seek a role, but where GEF has to motivate others to engage themselves it would still shoulder the main burden alone.

The recent efforts of the GEF to address the fundamental challenges of OP7 are commendable. The intended measures may remedy key weaknesses, but it is questionable whether they would fully address the lassitude of the program. The aspects that would justify a GEF OP to reduce the long-term costs of low-GHG-emitting energy technologies are becoming increasingly indistinguishable from other GEF focal areas. OP7 projects face the same market barriers and can be undertaken through RE, transport, or EE measures, and compete with other, more cost-effective ways to reduce poverty. The STAP findings also suggested "that OP7 should be integrated with OP5 and OP6 which are also connected with the removal of barriers."

4.3.4 Promoting Environmentally Sustainable Transport (OP11)

The last of the OPs, approved by the GEF Council only in 1999, recognizes that reduced long-term emissions from the transport sector will be essential for stabilizing GHG concentrations.[108] Transport consumes a quarter of the world's energy and accounts for some 25 percent of total CO_2 emissions, 80 percent of which can be attributed to road transport.[109]

The specific objective of this OP is to reduce GHG emissions from ground transport sources in recipient countries. From the outset, the Council recommended a selective and catalytic approach that was largely technology based. Following a STAP brainstorming session on transport in 2002, the OP11 goals were adjusted to reflect the Strategic Priority - Modal Shifts in Urban Transport and Clean Vehicle/Fuel Technologies (SP6). The focus of future projects would turn to public transit, nonmotorized transport, and nontechnology measures such as traffic demand management and economic incentives.

The transport projects are well targeted to include some of the world's largest urban agglomerations, in Brazil, China, India, the Philippines, Egypt, Peru, and Mexico. However, they do not explicitly engage in market barrier removal at the country level, as do the other OPs, although the projects apply the range of GEF strategies discussed in this chapter.

The largest group of transport projects is the GEF/UNDP FCB program, which supports commercial demonstrations of FCBs and refueling systems in some of the largest bus markets in the developing world. The program relies on technology "leapfrogging" in close partnership with international interest groups. Brazil and China, the most advanced projects, are expecting the first delivery of buses in September 2005. The Mexico project will evaluate the buses under the high altitude of Mexico City. The India and Egypt FCB projects are working on obtaining national cofinancing and reflecting the recent changes in the FCB market.[110] Success will depend on how the world FCB market evolves, led by the United States and Europe, to resolve the issues of cost, durability, and reliability.

The overall objective of the GEF/UNDP transport project in Egypt is to introduce viable electric and hybrid bus technologies that would have significant benefits to bus system emissions, the enhancement of Egypt's technological competitiveness, job creation, and protection of World Heritage sites, because the buses are to be used in the Giza archeological plateau. The project has demonstrated that the bus can be adapted to and function properly in Egyptian environments. However, the project also illustrates the difficulty of using such high-level

technologies without local capacities; the twin electric motors have to be sent to the United States to be repaired. Building capacity in operation and maintenance of electric buses is essential for smooth operation, and Egyptian technicians have since fixed some electronic circuits with guidance from the bus supplier. Given the progress, it is doubtful that the goal of 22 buses used in historic sites and protectorates before the end of 2005 will be reached.

The two projects explicitly dealing with promoting nonmotorized transport—Poland/UNDP and Philippines/World Bank—are undertaking construction of bikeways, helping the local government to address the policy and regulatory framework for cycling, and promoting strategies for awareness raising. Lessons have shown that more construction of bikeways does not ensure the increased use of bicycles; a promotional strategy to raise bicycle use is indispensable. Other types of projects also strive to address policy issues. In Peru, a document on a road-based public transport policy was requested as a precondition for some of GEF's disbursements. The first draft has been concentrated on diagnosis; policy recommendations are still vague due to political concerns regarding electric trains and bus rapid transit.

Reflecting the new Strategic Priority (SP6), four projects address modal shifts (Santiago, Lima, Hanoi, and Mexico City, all by the World Bank) that combine public transit, nonmotorized transport, and especially urban traffic management. GEF support is linked to larger urban development loans from the World Bank. For example, the Chile project intends to address most dimensions of transport: to reduce car use through road pricing, encourage replacement of old buses by cleaner buses with lower emissions levels, increase the use of emission-free modes such as bicycles, lay the groundwork for a more energy-efficient travel pattern through land-use changes, rationalize travel behavior, and enhance the analytical tools available. Ultimately, this depends on strengthening business capacities of municipal transport agencies to manage transport infrastructure by developing well-defined responsibilities, coordinating management and resource utilization, providing visionary leadership with a willingness to take risks, and offering long-term commitment.

Emerging Issues

A critical assumption of the June 2001 strategy for OP11 was that its measures would have security of funding and long-term commitment from GEF and other financiers. So far, this has not materialized. The growth in the portfolio has been slower than expected, but may likely increase as countries respond to the Strategic Priority.

Greater nuance is also required in the range of strategies and technologies employed, moving from technology options to integration with urban/transport planning and a more balanced mix of sustainable transport options. How can the GEF integrate effectively with mainstream transport planning? Is the GEF selecting key GHG-polluting transport modes, such as freight ground transport?

Ultimately, much of the challenge within transport is to change human behavior. The traditional approach of promoting low-emitting technologies will not suffice to promote modal shifts to public transport or nonmotorized transport. With GEF's traditional focus, it may not be realistic for the GEF to ensure modal shifts in developing countries, where increased motorization is driven by growth and seen as a sign of progress. Car users tend to be in the forefront of the growth wave. The key issue may be one of *preventing* a modal shift to less environment-friendly transport in developing economies. GEF's role will only be effective if it clearly defines its comparative advantage in public transport within larger investments and management systems.

4.4 GEF Strategic Response

This section assesses how GEF has positioned itself strategically to add value in response to global climate change concerns, national needs, and changes in national development contexts. It also assesses country drivenness and responsiveness, as well as synergies and alignment of GEF support with other initiatives and partners.

GEF programming within climate change over the past 13 years has been undertaken within a dynamic context. While the overall level of GHG emissions has worsened, awareness and acceptance of climate change has increased, and global efforts to meet the challenge are emerging.

What can the GEF—in funding incremental costs for mitigation in the developing world—realistically contribute? The Climate Change Program Study aims to identify what approaches or strategies have been the most effective in generating outcomes and how the GEF can become more strategic in addressing key national priorities, capacities, and needs within climate change. This implies an analysis of the cost-effectiveness of its use of resources, as well as a discussion on missed opportunities. Program performance can be illustrated by three questions discussed below:

a. How *strategic* has GEF been in addressing global climate change issues, within its mandate to support NAI countries?
b. How *responsive* has GEF been to country needs and priorities?
c. How *effective* has GEF been in selecting the right approaches for delivering results—at the program, cluster, or project level?

At the outset, it is recognized that GEF support was designed to provide incremental, new, and additional funding to long-term mitigation efforts, as well as to support countries in their obligations under the UNFCCC. As such, GEF functions within the strategic framework of the four OPs, and not under any formal programmatic framework at the country level.

4.4.1 Strategic Alignment and Focus

The strategic alignment and focus of the GEF may be analyzed at three levels: (a) the extent to which it has followed its UNFCCC mandate and COP guidance; (b) the degree to which it has focused its activities in countries where it is able to maximize impact; and (c) the degree of coherence and focus in the types of projects it undertakes within the defined OPs.

The GEF has been fully responsive to its mandate as defined by the UNFCCC and guidance from successive COPs. The COP-8 review of the UNFCCC financial mechanism found that GEF had performed its role effectively (2002). The COP has been closely involved in major strategic decisions regarding the GEF, including the choice of OPs and the recent call for adaptation pilots and capacity building support. Annex C contains an overview of key COP decisions relevant to the GEF.

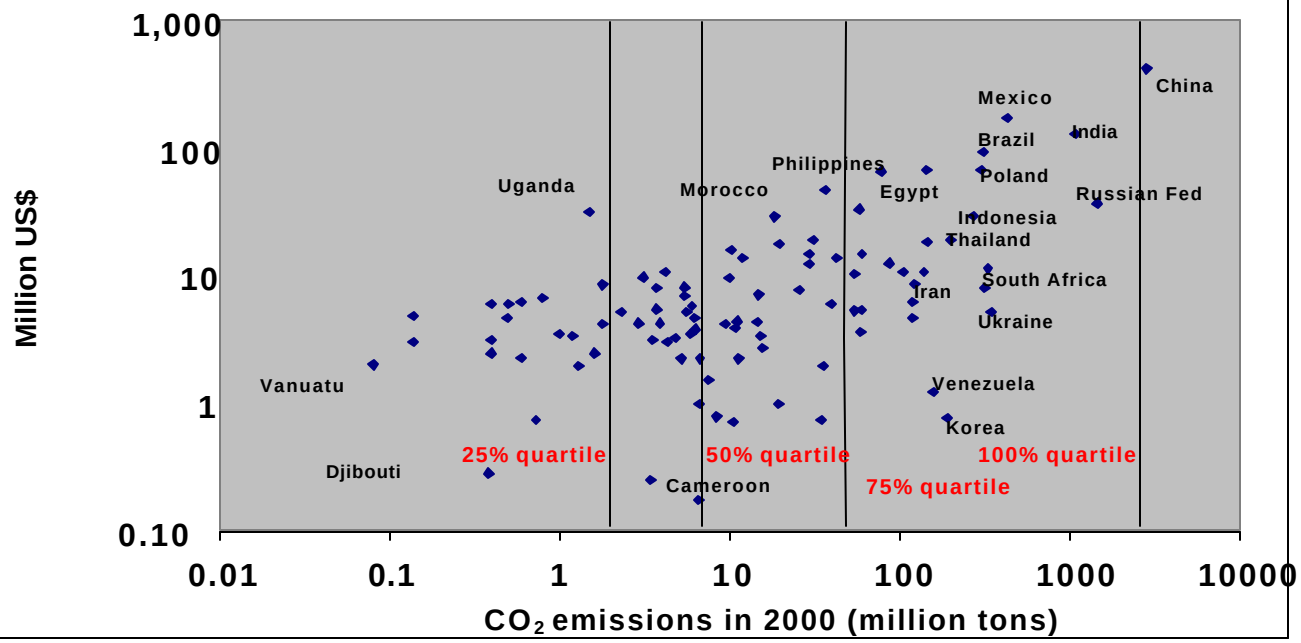
The question of whether the guidance has been helpful in defining a clear niche for the GEF is more open. A recent study commissioned by the UNFCCC on capacity building recommended that "Overall guidance, such as that provided by the UNFCCC framework, should be complemented by a more precise, country-specific definition of needs and priorities."[111]

There have been many changes in the policy framework; this does not favor stability in the portfolio to experiment, learn, and catalyze. In some cases, these changes have been evolutionary (adding SPs to the OPs); in other cases, the changes are more profound. For example, in the recent past the GEF did not officially focus on policy frameworks, adaptation, or stand-alone capacity building, whereas now these areas are emerging as specific priorities. Feedback from the program countries consistently indicates that it is difficult to discern GEF priorities and requirements at any given time, which causes slow uptake on GEF strategic shifts. And given the

lengthy formulation and approval process, this means that actively changing the course of the GEF portfolio as lessons emerge is difficult.

How strategic has GEF been in focusing projects in countries with large GHG emission challenges? The GEF distribution of mitigation projects can be presented in a log scale[112] (see Figure 4.9).

Figure 4.9 Distribution of GEF Project Funds per Country Vs GHG Mitigation Potential



Higher levels of GEF funding have, in general, been assigned to the developing countries with the *highest* overall potential for GHG mitigation, for example, China, India, Mexico, Brazil, and Poland. Within each region, the countries receiving most funds (with the exception of Africa) are those with the highest GHG emissions.

The GEF project-led allocation system has also generated some "outliers," such as Morocco and the Philippines. For example, Uganda has received disproportional allocations in terms of emissions reduction potential, mainly for RE rural electrification projects. Other countries, such as Venezuela, Republic of Korea, Ukraine, Islamic Republic of Iran, and South Africa have received relatively small amounts of funds despite being responsible for high emissions levels. Some such cases are explained by the combination of political and institutional factors at the country and agency levels that generate projects; other cases are more difficult to discern. Of course, investment in countries where emissions are currently low may be cost-efficient over the medium to longer term (that is, influencing energy system development now rather than switching technologies later). However, for some cases in the portfolio it is debatable if this switch is likely, even in the long term.

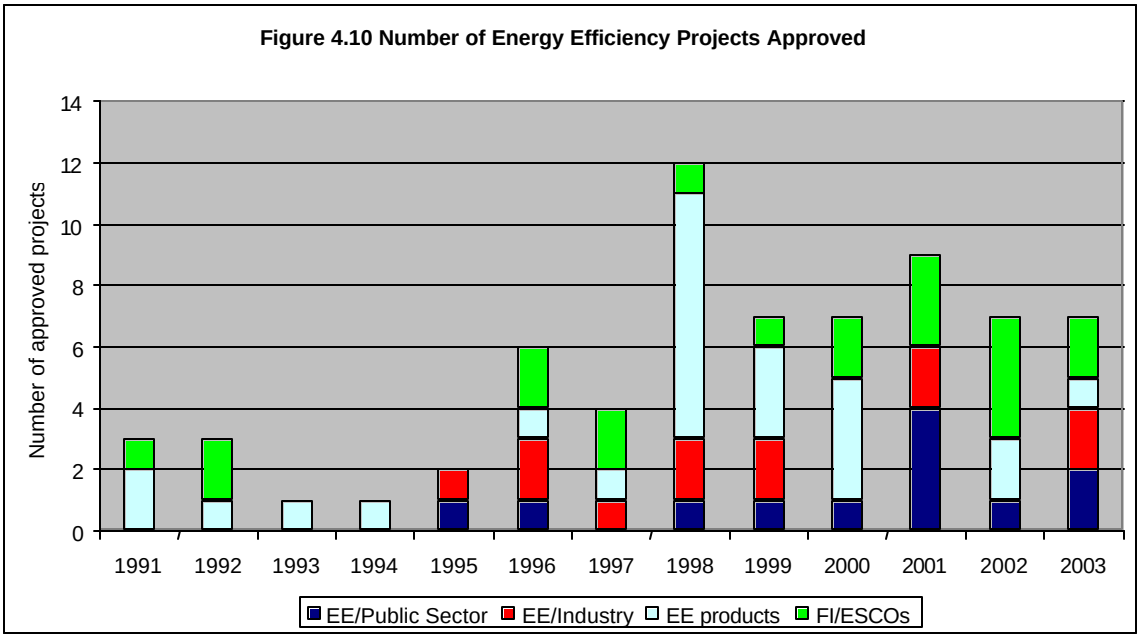
The most striking feature of GEF country allocations is the cluster of countries receiving similar funding levels but with widely differing emission levels. More than three-quarters of GEF projects are in countries with emissions less than 100 million tons per annum, and more than 50 percent of GEF countries have emissions less than 10 million tons per annum—yet many receive levels of GEF funding similar to countries with emissions in the hundreds of millions of tons. It is not obvious from the quantitative data how the GEF portfolio has been shaped. Apart from the concentration of funding in the largest and highest-emitting countries, the balance of the

GEF portfolio does not appear to have been directed by any strategic country choice that is related to maximizing potential GHG impact.

The degree of GEF strategic focus and alignment can also be assessed by looking at the composition of the GEF project portfolio. GEF programming for full- and medium-sized projects has taken place within the framework of the OPs. The climate change focal area is perhaps the most diverse in nature among GEF work; the range in clusters, objectives, and needs is vast. The evolution of project types within each OP has been irregular. The lengthy period from project conception and design through to implementation implies that a time lag in learning is inevitable. At any given time a number of projects are still ongoing that GEF stakeholders have already realized are less promising. Project approvals in "waves" of clusters may have the advantage of building a periodic critical mass, but only provided that implementation is managed in such a way that lessons learned can be integrated into the next project wave.

For example, the EE cluster fluctuations are apparent in the Figure 4.10, which shows the ratio of yearly project approvals by cluster. It is difficult to observe clear growth or evolution patterns among clusters. A similar picture is discernible for programming within OP6 on renewable energy. RE rural electrification (by PV, wind, hydro) saw a steady rise until 2000, then declined sharply.

Figure 4.10 Number of Energy Efficiency Projects Approved



In spite of the limitations in overall portfolio coherence, a project itself may have positive effects at the country level provided that the support responds to local priorities. GEF responsiveness is also measured in what kind of projects it undertakes in what situations.

4.4.2 Responsiveness

Both OPS2 and the Third Replenishment negotiations stressed the need for improved responsiveness of the GEF to country clients; the importance of mainstreaming of global environmental issues into the regular programs of the IAs; country ownership and strengthened outreach; and the absorptive capacity of recipient countries as well as the increased capacity of the GEF partners to deliver quality project assistance. The degree of government ownership and support for project results is also a central issue in ensuring the sustainability of project benefits.[113] The blend of country drivenness, GEF responsiveness, and local implementation capacities is acknowledged as a key factor in portfolio performance.

GEF climate change allocations are distributed across nearly all eligible countries, and those countries with the highest GHG emissions receive the most funding. In this broad sense, the GEF climate change portfolio is responsive to country needs. However, the pattern does conceal considerable disparities in allocations and focus—both in terms of low potential for maximizing replication effects and missed mitigation opportunities.

The GEF is involved in climate change activities in 143 developing countries; the only 10 developing countries currently not supported face special circumstances of instability or war, such as Somalia, Afghanistan, and Iraq.[114] Within this near global coverage, the nature, scope, and scale of GEF assistance vary considerably.

Figure 4.11 Portfolio Characteristics at Country Level

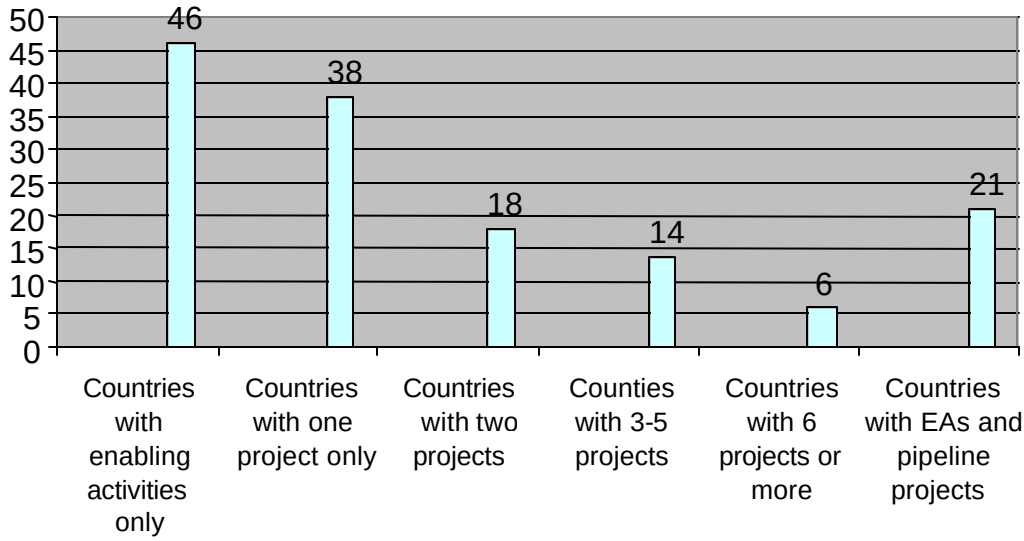


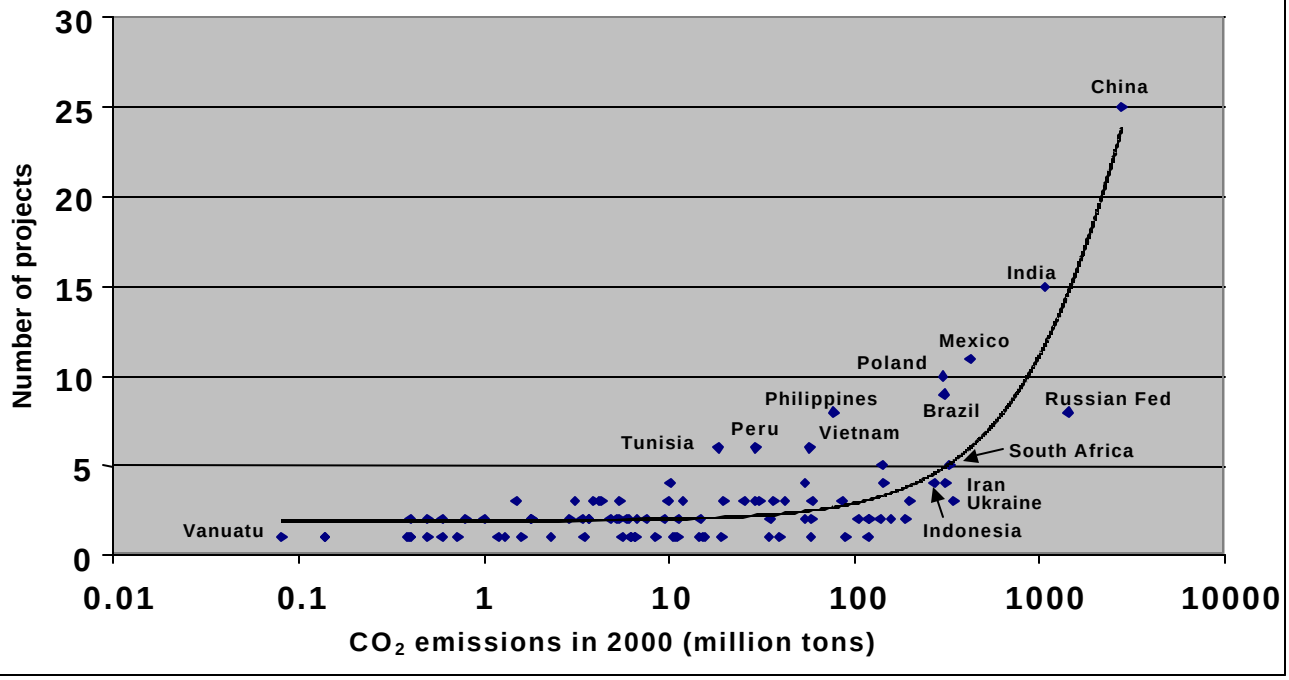
Figure 4.11 illustrates the level of support for full- and medium-sized projects for countries (excluding regional and global projects).

A third of the 143 countries receive assistance only for EAs. The majority of these are in low-income countries with low levels of GHG emissions (less than 2 tons per capita yearly) or in tiny medium-income countries, many in the Caribbean.[115] The targeting of GEF assistance in EAs is generally responsive to national needs of capacity building and adaptation, and is based, in part, on absorptive capacities.[116]

According to the project climate change pipeline, the GEF intends to expand its support to regular full- and medium-sized projects in 21 of these countries that have so far benefited only from EAs. The majority of these represent countries with middle incomes and medium to high CO_2 yearly emissions (2–7 and above 7 million tons per capita, respectively) such as Venezuela, Colombia and Uzbekistan. A move to mitigation projects in these countries would appear to be a logical step. For the rest, the pattern is not clear.

Among countries with mitigation projects, only six countries can be considered to have a substantial "country portfolio," with seven or more approved projects: China, India, Mexico, Brazil, the Philippines, Poland, and the Russian Federation. These are, generally, the countries with the highest mitigation needs in their respective regions. See Figure 4.12.

Figure 4.12 Number of GEF Mitigation Projects per Country



While there is a clear trend of the very highest emitting countries receiving the most projects, there is no obvious evidence of strategic choice in the remainder of the portfolio. Countries with similar levels of GEF support—one or two projects—have GHG challenges and emission levels that vary by a factor as much as 1,000. There are some nuances; countries with three to five approved projects, are mainly middle-income countries. Fifty percent of countries with only one project are low-income countries with low GHG emissions.

The likely reasons for the apparent absence of strategic choice in the bulk of the GEF portfolio are many. Primarily, the project-by-project approval policy does not favor decisions on strategic response and coverage. Second, the GEF portfolio is country driven. Third, project priorities must also coincide with the priorities of the IAs at the country level. Fourth, early and past experience with GEF may have boosted the capacity to generate project proposals in some countries. Individual motivations also play a role. A World Bank evaluation on private sector involvement in power sector reform pointed out that "The relatively few projects that materialized were mainly at the behest of the championing task managers, often buoyed by the availability of Global Environment Facility (GEF) funds."

Dynamic responsiveness on the part of the GEF implies the capacity to gauge what the country needs and priorities are and to assess suitability of project proposals within a national framework. National communications to the UNFCCC, undertaken within the obligations of the Convention, contain climate change emissions inventories and describe national measures to address climate change issues. Apart from their use for reporting to the Convention, the national communications do not seem to have been valuable in guiding programming. To some extent national priorities are expressed in other plans and documents, which makes formulating a targeted response difficult.

A review of a sample of national communications[117] revealed a mixed picture. In some countries, such as Morocco and the Philippines, the GEF portfolio mirrors the GHG challenges, and national mitigation measures as expressed in the national communications. In other cases, the GEF emphasis has been on minor elements of the national communication priorities. In Indonesia—where manufacturing is growing at a rate of 24 percent a year and the national communications focus is on energy reform, transport, and forestry—the GEF has mainly

promoted SHS. In Uganda, the national communications stress on RE lies in Nile basin hydro development, and PV—the focus of three GEF projects—does not figure prominently. Some of the largest GEF recipient countries do not yet have national communications upon which to base programming.[118]

Another vehicle for determining country priorities are the IA country programs,[119] which have been agreed upon with the recipient governments. Both the World Bank and now UNDP have requirements that projects must fit within these overarching frameworks. A sample review found that GEF activities are generally referred to in these programming frameworks, albeit often at such a generic level that actual priorities do not emerge. The synergies with country IA strategies vary; in some cases the GEF support constitutes the only environment-related effort. It appears that it is not easy to manage coherent and strategic country programming that spans agency priorities and mandates, GEF strategic priorities and operational programs, country climate change challenges, and national and local benefits. Yet, integrated programming is essential. As a recent World Bank evaluation on environment performance expressed, the "benefits of stand-alone environmental projects can be more than offset by the negative environmental impacts of lending in other sectors that ignores environmental benefits."[120]

The GEF has tested a number of programmatic approaches in the climate change focal area over the year. One approach has been technology based, supporting the dissemination of low-GHG-emitting technologies across countries and regions (for example, fuel cells, concentrating solar power, biogasification/cogeneration). Another country-based approach targets the development of national markets or long-term development effort, for example in the form of rural or decentralized energy supply programs (examples in Mali and Sri Lanka). In practice, this has taken the form of follow-up phases of initial projects with expanding scope as "replications."[121] A phased project approach is certainly recommendable to invest in market transformation. A next step would be a forward-looking and transparent priority framework with common goals and intended results that facilitates country programming.

4.4.3 Overall Effectiveness

How effective has GEF been in selecting the right approaches and delivering results within individual countries? GEF projects are, of course, submitted for approval at the country level, but GEF priorities are also made clear at the global level. The current project approval practice is thus an interdependent circle, with implicit incentives for countries and IAs to propose projects they perceive GEF will favor, and for the GEF to approve proposed projects it believes are country priorities. Once the project reaches the GEF Council there is strong pressure to approve it. With the current complex and long approval system, innovation is more risky than copying projects previously cleared.

Although GEF projects can sometimes be in line with national priorities, the current system has led to cases of inconsistent focus *within* countries where the GEF is not consistently addressing major climate change needs related to either GHG emissions sources or expressed national goals. For example, in India, the top sources of direct GHG emissions are power generation, transport, and iron and steel production. Top sources of indirect emissions are construction, food crops, and textiles. Although the traditional use in India of biofuel—for cooking, fuel, timber, methane from paddy fields and livestock—contributes to GHG emissions, these are relatively limited in scope. So far, only 11 percent of GEF allocations in India have been for energy efficiency. The somewhat erratic evolution of the portfolio is shown in Figure 4.13. An attempt to develop a GEF country program early in this decade did not materialize in a strategy.

The pattern is the same for Mexico, whose energy consumption ratios compare favorably with OECD averages. By the 1990s Mexico was the 13th largest energy consumer and the 12th largest energy-related CO_2 emitter worldwide (1.9 percent of global emissions). Less than 10 percent of the GEF portfolio funds are for EE.

Other examples, such as China, counter these trends and show pertinent focus. The World Bank and UNDP worked together through the Energy Sector Management Assistance Program on energy development, which

allowed for early interaction on the GEF climate change portfolio as a whole within China. Subsequently, both good and bad examples of interagency cooperation can be observed.

However, it is still somewhat disconcerting that the GEF project portfolio in many countries misses out on opportunities for strategic impact by not addressing the *major* energy issues. Interviews among stakeholders indicated many reasons why such project choices are made. First, complex national issues are seen to be beyond the reach of the GEF, such as influencing overall energy policy. Second, there may have been concerns that issues are not within GEF's role or mandate, such as working on power sector reform. Third, some issues are perceived to represent a comparative advantage for *other* agents than GEF, such as working with private sector industries. Whatever the reason, a need to work on policy frameworks and overarching power sector issues is finally now emerging.

For countries with significant GEF portfolios (six or more projects), a simple but integrated GEF country program with objectives and strategies would be useful, within which appropriate and linked projects could be approved. Smaller portfolios may not require a full program, but still need explicit priorities.

Moreover, the study findings show that the issue of project timing is important for effectiveness in countries with few projects. Of the 18 countries with 2 approved projects, 12 had staggered projects, but not necessarily in the same area. For any concerted effect on markets, a certain magnitude of support is required.

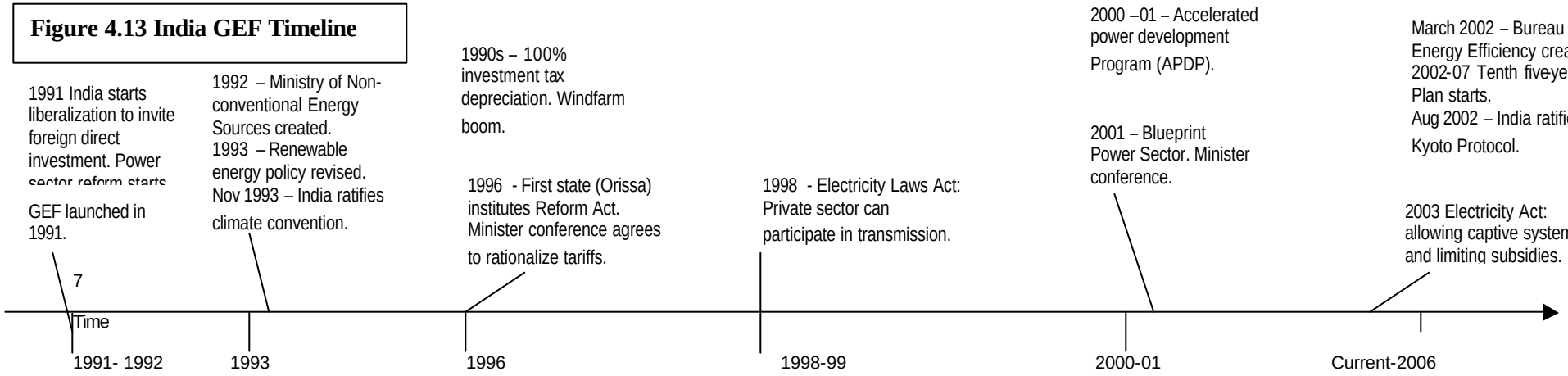
Countries with simultaneous and complementary GEF projects need coordination and cooperation to be effective. Such synergies are far from satisfactory. At the portfolio or focal area level, knowledge sharing is not systematic, focused, or systemwide. This diminishes both efficiency and effectiveness of the portfolio.

Most developing countries supported by the GEF require support in the area of climate change, but they may require different types of support. The introduction of GEF stand-alone projects for capacity building and adaptation may allow the GEF to respond strategically to the range of needs encompassed in low- to medium-emission countries, while continuing to funnel funds for mitigation projects in high-emission countries. However, the introduction of new areas of work may tend to disperse efforts and put additional strain on institutional capacities. The new pilot funding window on adaptation will present new strategic challenges and choices for GEF in both countries with and without GEF mitigation projects.

GEF projects may also gain in effectiveness and leverage results if appropriate partnerships are built. Such partnering in the GEF and Climate Change Program has often been focused on obtaining financial resources. The target of a 4:1 cofinancing ratio sometimes has been difficult for projects to achieve and does not seem to have stimulated effectiveness in the portfolio. Very important is the ability of the GEF project to generate new finance in the market. Climate change projects are thus dependent on effective public–private sector partnership and private sector cooperation—not habitual strengths of development agencies. The 2003 Project Performance Report process interestingly pointed out problems of predictability in working with partners in climate change and the immediate consequences for success or failure. Due attention to the importance of both financial and substantive alliances, and to networking for replication, tend to be underestimated.

Nevertheless, the GEF is not alone in facing challenges of strategic development and effectiveness of its portfolio. A significant gap between rhetoric and reality is a major theme in all evaluation reports on environment priorities, and "the more recent ones indicate a falling-off in performance in the late 1990s. Effective priorities seem to have shifted away from the environment."[122] The overarching attention to the environment among stakeholders influences the momentum and effectiveness of GEF. The GEF faces a constant challenge of keeping the environmental issues at the forefront of the development agenda.

Figure 4.13 India GEF Timeline



IREDA 1991 Hilly Hydel 1991 ALGAS – regional EA 1991 Biomethanion 1992 EA: Selection GHG Options (sectoral studies) 1993	PVMTI, global project 1996 Solar thermal power 1996	Coal bed methane 1998 Energy efficiency (IREDA II) 1998 Biomass energy for rural India 1999 EA: Preparation of first communication to UNFCCC 1999	Fuel cell buses 2001 Cleaner production/environmental management system (regional) 2001 Barriers to biomass 2002 Energy efficiency in steel re-rolling 2003	
Pilot phase strategies: • Institutional capacity building • Renewable energy awareness • Technological testing	**Focus on renewable energy:** • Technology testing and transfer • Convention	**Current strategies:** • Market aggregation (fuel cell buses, solar thermal plant) • Energy efficiency • Power sector reform?		

5. KEY FINDINGS AND RECOMMENDATIONS

The analysis presented in the previous chapters of this study reveals a number of key findings on the strategic coherence and focus of the GEF climate change program, overall GHG impacts, market transformation outcomes, performance and emerging issues in OP5, OP6, OP7 and OP11, knowledge management, document management, and M&E systems.

In the light of these findings, specific recommendations are made, highlighted in bold below. These mainly relate to overall GEF climate change programming and management. These recommendations are supplemented by a host of lessons that derive from the global portfolio of GEF projects. A broad understanding is emerging on the strategies that work and those that work less well, and the areas where further project innovation and learning is still necessary.

5.1 Strategic Issues

5.1.1 Strategic Coherence

With time GEF has met with increasing expectations with regard to its role and mandate in climate change. The evolution of GEF's climate change OPs, strategic priorities, performance dimensions, and indicators at best seem incremental, at worst inconsistent. The linkages between GEF's overall mission or goals, its strategic priorities, OPs, project clusters, and performance measurement indicators are no longer conceptually clear, nor are they entirely consistent. The inclusion of "new" areas not within the traditional GEF body of climate change work, such as adaptation and stand-alone capacity building, presents additional challenges and workload to the GEF system.

This absence of conceptual elegance and coherence is best illustrated by the way in which GEF has defined market transformation and the way in which it has formulated its strategic priorities. The discourse within GEF on strategies to achieve market transformation is either narrowly constructed or consists of poorly grouped and often unconnected sets of market barriers or project activities. The first GEF Strategic Priority (SP1) in climate change is defined as "transformation of markets for high volume products and processes."[123] Market transformation projects are understood to "consist of capacity building, marketing and awareness raising, standards and labeling programs, dealer incentives, and manufacturer technology transfer and product design."[124] No mention is made here of a number of important strategies that are key to market transformation and barrier removal, including enabling policies, availability of finance, and adequate business infrastructure.

The GEF Strategic Priorities, as currently formulated, obscure potential linkages or overlaps between proposed strategies. For example, the second, third, and fifth strategic priorities give the impression that finance, sector reform, and market aggregation activities are separate and unrelated to the market transformation objective captured in SP1 when, clearly, they contribute directly to this overall goal. The strategic priorities are also a rather curious mix of these market transformation activities and a selective focus on specific sectors (for example, RE for productive uses and modal shifts in transport).

The practical implications of the OP barrier removal goals and strategic priorities for the project clusters are unclear. Undoubtedly, there is a broad understanding that certain kinds of projects are no longer favored and that others are now strategic priorities. However, as our analysis in previous chapters has shown, this is not always evident in the portfolio, and a direct correlation with the strategic priorities cannot be made—not even with those projects that have been approved or have entered the pipeline more recently.

The match with performance indicators and M&E is incomplete and inconsistent. The 2000 GEF report on measuring results from climate change programs sees market transformation as the "level of market penetration of sustainable technologies and practices in given country markets," yet indicators on market penetration and barrier removal are unclear and proxy indicators inconsistently applied in project formulation. The strategic

priority indicators present considerable challenges at the project level. Thus, aggregation and reporting for the GEF portfolio on intended results will remain ad hoc.

Furthermore, to maintain a strategic and innovative GEF role, the Climate Change Program must also keep abreast with the developments and trends in the climate change field—without implying that GEF should precipitously launch activities in new areas. Although emerging issues are discussed within the GEF family, they often do not materialize in support of a GEF position on the subject—including carbon trade; serious exploration of other high-impact areas and technologies, involvement in near zero emission clean coal technologies, and so forth. Strategic policy positions, such as the weight between types of projects (for example, discontinuing STRMs), are not easily available to stakeholders in the IAs and in the field. The past approach—relying on informal networks on GEF policies—is no longer effective.

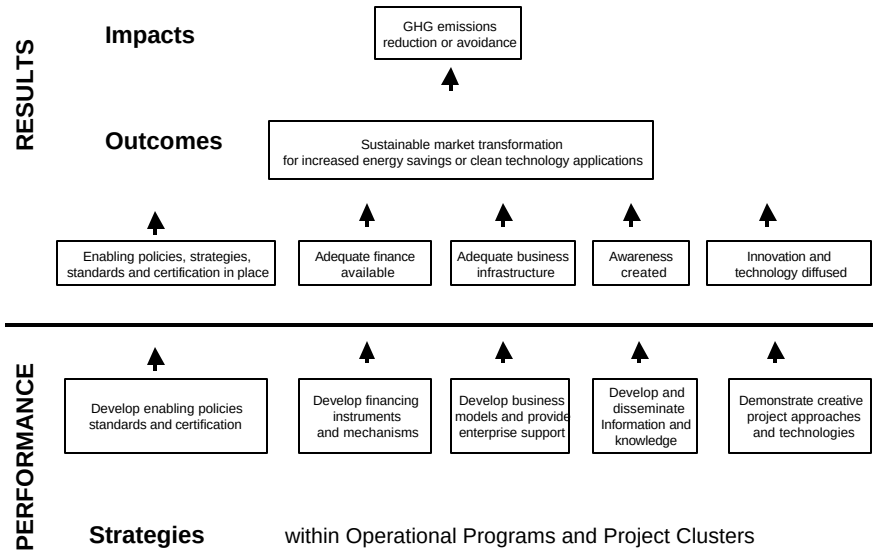
In particular, it would be useful to further clarify GEF involvement in carbon finance programs and cofinancing and where one program should start and the other end. Assuming carbon finance grows consistent with modest forecasts, the greater the opportunities for GEF to address barrier removal activities (and less on actual finance) as part of a continuum, and the need for the GEF to address the largest markets and lowest hanging fruit should accordingly decline. Whereas the GEF does not have an obvious role in facilitating emissions trade, it needs to seize the leveraging opportunity of funding that carbon trade represents.

In sum, there is a clear need to revisit the conceptual and strategic coherence of the Climate Change Program, and to place the OPs within a more consistent framework that will facilitate project design, implementation, and monitoring. This is not as radical an undertaking as might first seem likely. The four climate change OPs are basically robust and allow the incorporation of the main GHG avoiding or reducing technologies and strategies: EE, RE, and transport energy—with the remainder of emerging GHG-friendly technologies able to be accommodated within OP7 (if the interpretation of its objectives is broadened).

A more coherent way of formulating GEF's strategic framework would be to make explicit GEF's overarching goal as the removal of market barriers and sustainable market transformation for energy savings or clean technology applications that achieve reduced or avoided GHG emissions. Market transformation outcomes that contribute to this goal are enabling policies, available finance, adequate business infrastructure, information and awareness, appropriate technology, and adequate capacity. And GEF strategic priorities could be those strategies that contribute to these market transformation outcomes and associated GHG impacts.

The elements incorporated in the current strategic priorities could be maintained, but could be reformulated in a more coherent manner that recognizes the various dimensions of market transformation more explicitly and rearranges sector specific priorities more systematically and at different levels. A hierarchy of strategic objectives and priorities could be formulated. At the first level it would focus on overall market transformation to achieve sustainable GHG impacts. At the second level it would incorporate the five broad strategies that contribute to this primary strategic objective. And at the third level, sector and cluster priorities in the various OPs could be made more explicit and systematic. Performance indicators and M&E reporting systems could then be reformulated to match the above framework. This is illustrated in Figure 5.1 below.

Figure 5.1 Possible GEF CC Strategic Framework



It should also be underlined that any strategic framework, while focused, must contain sufficient flexibility to incorporate important country-specific circumstances. The aim is to support countries in project development by providing them with a clearly comprehensible and easily applicable framework that helps the stakeholders to better manage expectations and measure performance. This is all the more important given the extremely ambitious task assigned to the GEF—to lay the foundation for a GHG-stabilized world in developing countries—with limited resources. Much will also depend on improved communication from the GEF on its goals and approaches.

(1) The GEF Secretariat should take the lead in improving overall strategic coherence by clarifying the overarching goal of market transformation outcomes that contribute to GHG emissions reduction or avoidance, and the manner in which existing Operational Programs and associated strategies contribute to this overall goal.

The GEF should retain its four OPs as the basic programming pillars of its Climate Change Program. Within this framework, issues that require greater clarification include: (a) what is understood by barrier removal and market transformation; (b) broad overall desired outcomes and associated market transformation strategies for each OP; (c) identification of priority project clusters and strategic priorities within each OP; and (d) how to monitor and assess strategies (performance) and outcomes/impacts (results) in a conceptually clear and logically consistent framework. The strategic framework needs to be kept current by judiciously debating GEF support options and emerging trends, adjusting strategic priorities in a transparent manner, and communicating the evolving GEF agenda to stakeholders.

As mentioned in the previous chapter, the GEF has been fully responsive to its mandate as defined by the UNFCCC and guidance from successive COPs. The COP-8 review of the UNFCCC financial mechanism found that GEF had performed its role effectively (2002). GEF also has to be responsive to country needs. However, there is room for GEF to play a more creative role in interpreting and developing its mandate more judiciously and systematically.

5.1.2 Strategic Choice

The current project development system does not always favor strategic choice. GEF projects are, of course, submitted for approval from the country level, but GEF priorities are also made clear at the global level. The current project approval practice is thus an interdependent circle, with implicit incentives for countries and IAs to propose projects they perceive GEF will favor, and for the GEF to approve projects once proposed. The current complex and long approval system, combined with lack of clarity of GEF objectives and priorities, may provide a disincentive to innovation because it becomes less risky to forward projects similar to ones previously cleared. Three broad trends may be observed.

First, the GEF has performed a credible job in responding to country needs in climate change in the eligible countries, through a complex array of approaches and strategies. GEF is involved in nearly all eligible countries. Higher levels of GEF funding have also, in general, been assigned to the developing countries with the highest overall potential for GHG mitigation. The study supports this trend.

However, it is noticeable that a large number of countries receiving similar GEF allocations have widely differing GHG emission levels. The bulk of GEF's portfolio does not appear to be directed toward achieving maximum impact. There are also clear anomalies: some countries with low levels of GHG emissions have received considerable attention, while some countries with high emissions have not received adequate support. In some cases, the success in obtaining GEF support has been justified by good results, in other cases not.

Second, the current demand-driven and project-led approval system has led to cases of inconsistent focus *within* countries where the GEF is not always addressing major climate change needs. National communications from eligible countries have, in general, not been valuable in guiding GEF programming. The GEF should urgently address the need for more coherent substantive programming that allows national climate change priorities, GEF strategic priorities, and IA country priorities to coalesce.

Third, although the strategic focus of GEF has shifted over time, this is not adequately reflected in the GEF project portfolio. There has been a shift from technology demonstration projects in the early phases of GEF to more market and business filtered approaches in recent years. IAs no longer favor projects with an exclusive focus on PV SHS. Renewable energy for productive purposes and other RE sources such as wind and biomass are being given more attention. More EE projects incorporate financing mechanisms and ESCO development. There is more caution about supporting large capital-intensive emerging technologies such as solar thermal electric pilot projects in OP7. However, these strategic shifts are not always obvious from GEF portfolio data, which reveals an irregular evolution of project clusters within each OP, resulting, in part, in dispersed portfolio innovation. The lengthy period from project conception and design through to implementation implies that a time lag in learning is inevitable. At any given time a number of projects are still ongoing that GEF stakeholders have already realized are less promising.

The current system has led to a relatively scattered portfolio and cases of missed opportunities in terms of potential impact. However, the climate change portfolio has by now reached a scope that is, for the most part, sufficient to identify successful project strategies and conditions, based on experience. This should allow strategic choice of areas, geographically and operationally, that hold the most promise for market transformation, barrier removal, replication, and GHG impact. Such strategic choices must be based on the substantive programming framework referred to above.

However, the past allocation system has served the GEF well in terms of flexibility; this should be retained as a principle to reflect that local conditions are not always favorable to impact. The study finds that the notion of "performance" can be applied to a country climate change portfolio only with considerable difficulty.

The marginal cost of carbon abatement varies from situation to situation and cannot be used as a parameter for GEF allocations. However, with limited resources, GEF is obliged to exercise fully its mandate to target markets for barrier removal where replication may have the greatest uptake. In situations with limited markets for EE or

RE, and relatively low GHGs, the effects of a GEF project on barriers, replication, market, and climate are also likely to remain limited.

(2) The GEF should improve strategic choice and resource allocation within its Climate Change Program, in order to ensure that the bulk of the portfolio is directed toward mitigation efforts in countries with relatively higher levels of GHG emissions and market transformation potential. For countries with significant GEF portfolios, integrated GEF country strategies need to be developed; smaller portfolios require, at least, explicit priorities.

The GEF Climate Change Program is not so extensive as to require an administratively complex financial entitlement system; it is important that GEF retains flexibility in order to respond to opportunities where they arise.

5.2 Results and Performance

5.2.1 Overall Impact on Greenhouse Gas Emissions

The incremental and catalytic nature of GEF support does not make impact analysis useful for organizational benchmarking, but may provide interesting insights into which program strategies and target areas have the potential to yield greater impact within the portfolio. With this in mind, the performance of the GEF portfolio overall in avoiding GHG emissions is satisfactory. It has brought about considerable GHG reductions, at relatively total low incremental costs. For closed projects with data, estimated avoided direct and indirect emissions amount to 224 million tons CO_2 at an incremental cost of US$194 million. The quality of GHG reporting and estimated targets have improved with time; 104 active full- and medium-size projects are collectively intended to enable roughly 1,7 billion tons of CO_2 avoidance over 10–30 years, backed by US$605 million in GEF funding.

Nonetheless, there is an obvious tradeoff between immediate GHG impacts and long-term catalytic market transformation and barrier removal. The analysis shows that some parts of the portfolio, such as energy efficiency and STRMs, are better at producing GHG impacts. However, individual projects, such as large-scale investments or geothermal exploration, may be responsible for high achievements in GHG avoidance but have little potential for replication or sustained barrier removal.

The key issue is that the portfolio has suffered from mixed and unclear expectations on how to address GHG, where implicitly projects are expected to deliver on both short-term GHG and long-term barrier removal and market transformation. In many cases, projects cannot fail to disappoint on one score or the other. The Climate Change Program is in need of overall GEF strategic guidance on the relative importance of maximizing immediate GHG impacts versus longer-term cumulative results that might derive from sustainable market transformation for clean GHG-avoiding technologies and systems.

Finally, the current quality and availability of GHG targets, estimates, calculations, monitoring, and reporting are unacceptable. As the UNDP study on municipal heating and hot water pointed out, “This area of project intervention is probably the least understood at present.” Although the data quality has improved in recent years, the portfolio still suffers from lack of targets; unrealistic estimates, especially for replication; unavailable data; and inconsistencies in estimates among and within clusters. While recognizing the complexity, GEF has to do better in developing and disseminating consistent and clear guidelines and methodologies, an effort which has now started.

This GHG methodology should be based on a substantive programming framework and should reflect a vision of how long-term market barrier removal can be linked to climate change mitigation. Some types of projects, such as capacity building or research, are not expected to lead to immediate GHG reduction, in which case this should be made explicit. Corresponding indicators for substantive results should also be developed.

(3) The GEF Secretariat should provide explicit guidance regarding the realistic calculation of GHG avoidance or reduction in project design and implementation and the manner in which impacts should be monitored and reported.

This should include clear and comprehensive guidelines and methodologies for calculating and estimating GHG impacts for various technologies and various assumptions and serve to establish realistic expectations and goals for the portfolio. The GEF Secretariat should be provided with additional resources to implement and maintain improved M&E and data management systems in this area.

5.2.2 Market Transformation

Market transformation is a long-term challenge and a dynamic process. Sustainable market transformation is possible and is starting to emerge in specific sectors and countries, but it takes longer than anticipated. There are situations where a combination of favorable external circumstances, appropriate choice of project strategies, good implementation, and adequate GEF resources has helped a move toward changing markets.

The greatest progress has been made within the **energy efficiency** portfolio, where achievements can be observed in specific countries and sectors, such as financing markets in Hungary, energy-efficient appliances and products in Mexico and Poland, and industrial boiler conversion in China. GEF support has certainly helped strengthen energy service industries where they are emerging, but is rarely sufficient to launch such an industry "from scratch." However, for many markets that are evolving, GEF can be seen to help drive changes forward. This is especially challenging for large markets, such as introducing energy performance contracting in China.

The experience of the **renewable energy** cluster is more mixed. Sustainable market transformation is not realistic where RE remains, in general, more expensive and less accessible than traditional high-emitting energy sources, despite sustained efforts at volume increases and market aggregation. Nevertheless, increased use of RE is emerging in countries with more developed RE and finance capacities supported by sustained GEF and other donor resources. GEF has contributed to emerging market changes in specific energy sectors in specific countries, such as for mini-hydro energy in Sri Lanka and the wind market in India. Although PV systems are not yet affordable by major target groups, particularly the rural poor in Africa, some PV-oriented projects have been successful in niche market areas such as clinics, schools, high-value applications such as communications, and also where households have adequate levels of disposable income. The potential still has to be demonstrated for mini-grid applications using hybrids and productive uses of RE. Grid-connected RE systems might be viable where adequate policy and regulatory support is available. *Global* market aggregation of specific renewable technologies, as envisaged in OP7 and OP11, lies far in the future.

GEF projects have made an important contribution to the development of standards, codes, testing, certification, and labeling both for EE and RE. These efforts are an important element in market transformation: product and system quality can be enhanced such that maintenance costs are minimized and a breakthrough in consumer acceptability is achieved. There is a potential to replicate these successes in a wider range of medium- to larger-sized developing countries, although it is more difficult in smaller countries where the economies of scale for testing facilities are less evident. Within the GEF Strategic Priorities, this strategy was envisaged to be one of the main drivers behind market aggregation of high-volume products. This study finds, however, that a favorable policy framework, access to finance, the level of business development, and user demand are also key drivers in market development.

The current dispersion of the GEF portfolio does not favor extensive replication and market transformation. GEF work to remove market barriers could be made more effective with clear targeting of sectors and users, correctly balancing and prioritizing barriers, and systematic coordination between projects.

The need for a GEF vision of a conceptual framework on how market transformation happens is already part of Recommendation 1 above. Market transformation reflects replication and greater impact for all climate change

project clusters, as well as the win-win situations of global environmental benefits and local benefits. A good market development strategy would include the need to develop frameworks for main sectors and users that would reflect the varying levels of ambition in, for example, EE clusters versus influencing emerging markets in renewable energy.

5.2.3 Emerging Issues: Energy Efficiency (OP5)

This is probably the most effective and clearly defined of GEF's OPs, with relatively clear delineation between different clusters. The greatest impact has been where projects have targeted specific EE products or technologies and those sectors with the largest savings and replication potential. Such projects are better able to understand and target specific market barriers and work in a sustained manner to transform specific markets. The cluster shows achievements in market transformation in specific countries and sectors, including difficult areas such as transforming financing markets.

Many EE projects are now incorporating financing components that require careful analysis of the specific context and set of market barriers and provision of adaptive management in the project design phase. The partial guarantee mechanism has been successfully applied in financial markets with sufficient liquidity and competition. However, the GEF operates in difficult markets where the required set of interventions are different in nature and where the need for technical assistance to support businesses in EE project development is as high—or higher—than the need to provide cash inflow.

ESCO development is still a challenge, but nevertheless important. ESCOs facilitate the development of project pipelines. They allow technical risks to be transferred away from end users and financiers, and costs can be reduced through bundling and packaging. The full-service ESCO model is not necessarily the most appropriate in all circumstances, and indeed might not be feasible in underdeveloped markets. A range of complementary business models are possible. There is also need for better integration of GEF projects with country SME and enterprise support programs.

GEF projects have made a worthwhile contribution to the development of EE standards, testing, certification, and labeling. There is much potential to replicate and spread this experience and knowledge in a wider range of countries.

EE projects with multiple strategies (policy, standards, institutional development, capacity building, financial instruments, ESCO development, information and awareness) are probably the most effective. At the same time, GEF projects must be flexible enough to react to changes in the broader financial sector in the country, through alternative strategies.

In fact, structural change in the manufacturing and industrial sectors of developing countries has probably been the most influential factor in changes in energy use. We have provided examples of significant improvements in energy efficiency in countries such as China or Hungary that have occurred independent of GEF projects. It has been argued that it is not realistic to expect a GEF project to influence relevant national industrial and economic polices that could impact energy efficiency. However, GEF projects do need to be cognizant of the effects of external factors such as energy prices, power sector policies, and so forth. GEF projects are often not well equipped to seize such opportunities, often because they were designed many years previously when external circumstances were different, and sometimes because inflexible budget lines and work programs constrain the ability of projects to respond strategically and quickly to new policy opportunities.

There are many examples of effective interventions within the GEF EE portfolio and rich opportunities for learning. These lessons need to be captured and disseminated effectively in order to shape future project design and GEF strategic choices in this area. The recent GEF World Bank *Energy Efficiency Portfolio Review and Practitioners Handbook* captures well EE financing and ESCO development and should be disseminated widely through the IAs and in eligible countries. To maximize GEF effectiveness within EE, the GEF Climate Change Task Force should work with projects to extract portfolio-wide experiences, conduct thorough analyses, and

present synthesized findings that would assist with replication in handbooks or other guidance. This would be appropriate for the key EE clusters (EE products, EE in industry, and EE in the public sector) and also for successful areas such as standards, testing, certification, and labeling.

In sum, the potential for energy savings and GHG reductions is immense, particularly in emerging economies and rapidly developing countries. As mentioned above, GEF has tended to target countries where emissions are highest and savings potential greatest. However, there are some important energy-intensive countries which could still be targeted. Within EE, the study cautions against the notion of phasing out, globally, GEF support to specific clusters and areas. The GEF may put its catalytic and innovative role to good use by disseminating and replicating what is "already achieved" in one country in other circumstances.

5.2.4 Emerging Issues: Renewable Energy (OP6)

It is probably true to say that the GEF Renewable Energy (RE) portfolio has been less effective than its EE projects. Examples are fewer of successful applications that indicate possibilities of sustained market transformation. The portfolio is not as clearly delineated, and there is substantial overlap between the different clusters of RE for rural electrification, RE grid-connected generation, RE productive uses, and RE products and markets. The sets of market barriers and challenges to RE are determined not only by RE applications but also by the type of technology employed. The sets of issues for PV systems are often quite different from wind or biomass, for example.

GEF, in the past, perhaps concentrated too much on photovoltaics (PV). PV has low GHG impact and restricted potential for making a significant difference in rural electrification or poverty reduction. Increased market volumes have still not brought costs down to affordable levels for the poor. However, there are important niche applications for middle-income homes, institutions, high-value uses such as communications, and productive uses (including irrigation). GEF and the IAs have already begun to review their involvement in this area. There have been a number of recent reviews, but none sharp enough to provide definitive guidance on whether GEF should continue to fund pure PV projects. While a number of reviews have highlighted different institutional models, financing arrangements, and business models for PV solar home systems, and more generally for RE for rural electrification, none have provided the quality of analysis or systematic guidance that is evident in the GEF World Bank *EE Handbook* mentioned above. There are important lessons regarding future GEF allocations to PV projects in terms of exploring more appropriate applications and sectors—and being more strategic in selecting countries with higher potential impacts.

PV also has applications in mini-grid and hybrid systems, combined with wind, hydro, and diesel generators. These systems have the potential to provide higher levels of service more suitable for productive uses. The GEF portfolio still has insufficient experience in either mini-grids or in RE for productive purposes to extract effective lessons.

There may be potential for a greater proportion of the GEF RE portfolio to incorporate varied types of RE including emerging technologies such as stationary fuel cells, microturbines, and modern biomass. A number of GEF projects have included wind, microhydro and biomass, but programmatic learning from these projects is not yet evident in the portfolio. Recent RE projects envisage a broader range of technologies and a greater focus on market development. Given the trend to underplay the range of technologies once implementation starts, careful monitoring of such projects to generate learning would be useful.

The overall policy environment, and power sector reform and regulatory frameworks in particular, are crucial for more widespread and sustainable applications of renewable energy. Power sector reform creates a window of opportunity for new regulatory frameworks, financial instruments, and institutional mechanisms to be put in place that support renewable energy. Although this area is captured in one of GEF's strategic priorities and the IAs have long experience in this area, there are insufficient examples where GEF has achieved success.

One area where GEF has been successful is the development of standards, testing, and certification of RE technologies and systems. This is a vitally important area because effective standards and testing can significantly improve quality, reliability, and consumer acceptance.

The GEF RE portfolio has explored two primary business models (with a range of submodels) suitable for rural electrification. There appears to be a movement away fee-for-service to sales models. More still needs to be known about the degree to which sales models provide effective after-sales maintenance and service. Fee-for-service models have a number of potential advantages, especially for poorer households, and it is hoped that the GEF will continue to explore this model.

The GEF projects have also explored a range of finance models. Micro-finance for consumers (in the sales-based model) has been effective. Perhaps there could be greater exploration of a range of dealer credit mechanisms? Subsidies are still common on many renewable energy rural electrification projects. Increasingly the emphasis is on output-based subsidy allocation to increase their effectiveness.

Within the strategic framework in Recommendation 1 above, the GEF should develop a clear vision of its role and objectives in promoting renewable energy, that reflects a more intuitive and useful cluster categorization of RE projects. This vision should more purposefully explore the potential within power sector reform to develop RE supportive policy, regulatory, financing, and institutional mechanisms, and deepen the experience in fee-for-service and concession models to understand and improve how they work. There is scope to explore more fully different niches—both potential and natural—for the IAs to promote GEF concerns. For example, the World Bank has significant action in energy and financial sector reform measures, and UNDP works actively in sustainable development policy frameworks.

Finally, the RE portfolio is in particular need of more systematic and programmatic learning, through in-depth portfolio reviews and practitioners' handbooks on (a) a clearer set of GEF conclusions on PV that will shape future strategic choices for this technology, based on the PV review work of UNDP; (b) new areas such as RE for productive purposes, mini-grids, and for specific RE technologies; and (c) the successes in the area of RE standards, codes testing, and certification.

5.2.5 Emerging Issues: Long-Term Costs of Low-GHG-Emitting Technologies (OP7)

OP7 was refocused in 2003 into SP5 - Global Market Aggregation and National Innovation for Emerging Technologies. At the time, the option of discontinuing this OP was also debated in the GEF family. OP7 projects are mainly at an early demonstration stage; those that have started have a far way to go in the product lifecycle toward introduction, growth, and maturity. The recent efforts to address the fundamental challenges of the OP7 program are commendable, but as yet are not likely to fully address the fundamental obstacles of this program. The optimal strategy for ensuring sustained global cost reduction for climate-friendly technologies remains elusive.

STAP proposals recognize the need for greater flexibility and creativity in OP7 development. A specific strategy for operationalizing the recent STAP recommendations has not been developed, because the focus is still on financing and project implementation issues. However, with the proposals of smaller projects, more countries, inclusion of other barriers, policy-type interventions, broadening technology focus, and so on, the nature of the GEF OP7 is becoming increasingly indistinguishable from other GEF focal areas.

Three of the study findings call for further caution: (a) market transformation is highly complex in local circumstances; (b) a dispersed portfolio in terms of countries, projects, and technologies does not provide for critical mass for learning or cost buy-down; and (c) technologies that are now widely applied and for which there is demand (solar PV) still struggle with cost-competitiveness. It can be questioned whether GEF can, or should, attempt serious market transformation at a global level.

In the meantime, OP7 provides the GEF with a window of opportunity to fund new technologies that are not currently cost-effective, particularly as the technology focus has been minimized in the other OPs. A project-by-project approach to new technologies has not been effective in either galvanizing national innovation or in promoting global market aggregation. In addition to market and policy factors stressed in the Strategic Priority, the GEF involvement in OP7 is more likely to be effective if it is built on a vision and strategy for the specific technology promoted and implemented through a set of interconnected and managed projects.

Overall, initial conclusions from the portfolio suggest that more attention has to be given to active market aggregation across countries and across technology applications, and that GEF needs to exercise its facilitating and catalyzing role in building market development alliances more vigorously. More attention to transform markets and respond to policy and political issues, institutional circumstances, and the need to match global benefits, local benefits, and project opportunity cost of the client country, rather than technology issues, will be the strategic direction for OP7 under this priority.

The GEF should, of course, continue to keep a vigilant eye on the effort and costs of the combined GEF family in this area compared with the potential gains in reducing technology costs and aggregate global markets.

5.2.6 Emerging Issues: Environmentally Sustainable Transport (OP11)

The potential for global benefits—and local benefits—in transport, is enormous. This OP was introduced in response to country demand and projected growth in GHG emissions in developing countries. In practice, the GEF's limited resources and unclear comparative advantage has made it difficult to play a major role in transport, which is largely dependent on political concerns.

The portfolio within transport is still young, and mixed in nature. There has been a push to promote greater nuance in the range of strategies and technologies employed, moving from technology options to integration with urban/transport planning and a more balanced mix of sustainable transport options. Ultimately, much of the challenge within transport is to change human behavior. The traditional approach of promoting low-emitting technologies will not suffice to promote modal shifts to public transport or nonmotorized transport.

With the GEF traditional focus, it appears quite ambitious for the GEF to ensure modal shifts in developing countries, where increased motorization is driven by growth and seen as a sign of progress. The future pipeline may bring more coherence to the portfolio in line with the strategic priority, provided the GEF responds to questions such as: How can the GEF integrate effectively with mainstream transport planning? Is the GEF selecting key GHG-polluting transport modes, such as freight ground transport? Continued attention is needed in refining the GEF role to be effective, with a clear delineation of its comparative advantage in public transport within larger investments and management systems. One possibility is a GEF role in smaller cities; by its Strategic Priority, the GEF intended to prioritize projects initiated or supported by local municipalities.

5.3 Management and Implementation

5.3.1 Knowledge Management and Documentation Systems

Because of the diversity in project clusters within climate change, the challenges to effective learning are great. At the same time, the traditional climate change approaches of piloting new technologies, promoting market aggregation, raising awareness, replication, and innovation are strongly dependent on effective knowledge generation and sharing at the project, country, and global level. In short, the ability to learn is a particular success factor for the climate change portfolio.

The Climate Change Program has benefited from some very good knowledge sharing initiatives. The UNDP-GEF unit has proposed knowledge management approaches in most of its climate change clusters, of which the learning around PV projects in Africa and municipal heating and hot water in Eastern Europe has been most

dynamic. The World Bank has generated several learning products, including an incisive analysis of its EE portfolio, and should also be commended for launching ex-post project impact studies. The GEF Secretariat has historically contributed with series of publications highlighting lessons learned. The annual Project Performance Review monitoring exercise and the Climate Change Task Force are opportunities for bringing together portfolio experiences. In sum, there are examples of good learning efforts *within* IAs, and at headquarters level within the Climate Change Task Force. Study visits between projects, especially within a region or within specific clusters, are relatively common (for example, within clusters on methane and FCB, and within EE in the Arab states and Europe). The Local Benefits Study visits have also provided valuable information.

Effective knowledge management normally has three phases: (a) knowledge creation and acquisition, (b) knowledge storage and repository, and (c) knowledge dissemination and application. Despite the above-mentioned studies, learning within the GEF family has been neither systematic nor systemwide, nor has it had strong outreach to outside expertise. This has diminished both efficiency and effectiveness of the GEF Climate Change Program. Better learning and knowledge sharing would be particularly needed in the following areas:

- Horizontal exchange, between projects within the same clusters, within and between countries. A project manager interviewed only discovered the extent of similar projects in the region during a visit to the agency headquarters. Projects implemented by different agencies in the same country generally have good relations, but not necessarily close cooperation. The GEF Secretariat reviews require coordination plans from each project in a country where another project in a similar area is already active, but the effect of this is uncertain. A project visited by the study planned to develop a guide on bank terms for EE loans, when the study team pointed out that the other GEF project in the country (by another IA) had worked with these banks for the past six years and already had this information. This horizontal exchange is particularly needed at the implementation stage. Furthermore, project and field stakeholders consistently point to difficulties in discerning GEF priorities at any given time (for example, on what types of new activities GEF would fund), which hampers effective field uptake of strategic shifts.

- The GEF system is weighted toward a centralized approach. The vertical communication chain is long and indirect, from GEF Council policy decisions, through the Climate Change Task Force to GEF IA coordination units, to regional departments, to the country offices, to projects on the ground and vice versa. This creates communication problems, referred to in the section on strategic coherence, and also applies to active learning. Country stakeholders interviewed consistently expressed frustration with difficulties in obtaining information and data on GEF concerns. This need is especially acute at the formulation stage, in which countries are dependent on clear messages on priorities and information on lessons learned.

- Whereas the IAs have their own systems for knowledge management, there is a risk that GEF issues "fall between the cracks." In reviewing the IA knowledge networks, it was found that GEF may miss out on opportunities to facilitate internalization and assimilation of what is learned through GEF projects. The key questions are to what extent GEF climate change concerns are mainstreamed within IAs, and how to promote learning between the IAs in common areas of interest. The GEF Secretariat and the GEFME may play a facilitating role, but they also have limited capacities to provide extensive support. The climate change focal area would be a potentially good candidate for any knowledge management pilot that the GEF may undertake.

The GEF knowledge storage systems are part of the problem. The OPS2 recommended a shift from an approval cuture to result- and quality-orientation; this will remain elusive as long as it is so difficult for any stakeholder to gain a full overview of what is going on in the portfolio at any given time. The portfolio information, project data, and documentation management are, in part, incomplete, dated, or restricted, and hamper dynamic portfolio management and effective monitoring.

Whereas the IAs have means to monitor their project implementation, the mechanisms for overall knowledge sharing and document management are lacking, as are the means to share between agencies. Basic project documentation should be available and accessible. It is, for example, difficult to ascertain when a project

actually starts, its duration, and actual projected end; which makes planning of mid-term reviews to guide implementation difficult. The respective roles and responsibilities of the various agencies could also be revisited; only the GEF Secretariat and GEFME can monitor the overall portfolio across agencies, but they need the tools to do so. The GEF database is not an analytical tool accessible to parties outside the GEF Secretariat, updating is irregular, it has limitations in data on results, and data inconsistencies between GEF and IA databases are frequent. This function is seriously underresourced in the GEF Secretariat. To date, the GEF website has not been actively used as a channel to reach IAs, country stakeholders, and project management in the focal area. The recent initiative to revamp the GEF Secretariat website provides a welcome opportunity for broadening the GEF outreach. Documentation management is particularly needed for sharing lessons and monitoring results from evaluations.

(4) The GEF Secretariat, together with the IAs and assisted by GEFME and STAP, should develop a strategic and pragmatic approach to capturing and sharing information and knowledge within the climate change area, both among projects and between headquarters and the field and supported by electronic knowledge systems.

5.3.2 Monitoring and Evaluation Systems

The monitoring systems at the project level—and certainly at the IA coordination level—appear to have improved over the past years. Following the findings on strategic coherence above, there is room to systematically review monitoring systems to ensure that they reflect GEF systematically and coherently reflect GEF priorities. The GEF also may not have been able to capitalize on the IA results-based management systems; monitoring tends to concentrate on implementation and procurement issues. The lack of analysis on what generates results does not support project learning.

As stated in Recommendation 3 above, there are specific limitations in the estimates, measurement, monitoring, and reporting on GHG and CO_2 emissions. In addition, the GEF performance in the climate change area needs to be assessed in terms of qualitative results such as market transformation, replication, and barrier removal. This study observed weaknesses and inconsistencies in the application of GEF performance dimensions, in regular monitoring mechanisms, and the use of results-oriented or proxy indicators. And the guidance on these issues available to field and project staff, as well as aggregate program indictors, are not easily usable or coherent. The current project monitoring system is not likely to yield reporting on the GEF Strategic Priorities in a satisfactory manner. It is also weak on assessment of impact; although the recent GEF post-project evaluations by the World Bank must be commended.

(5) The GEFME should provide support to the suggested task of improving the strategic coherence of the Climate Change Program by providing guidance, tools, and indicators for assessing GHG impacts, market transformation outcomes, and the effectiveness of associated strategies in specific OPs and priority areas.

5.3.4 Implementation Issues

In assessing the GEF Climate Change Program, the study did not aim to review project implementation activities, which are covered in other monitoring reports to the GEF Council. However, two aspects, already discussed on numerous other occasions, regularly affect program results in a negative manner. Most seriously, the long and cumbersome project approval process causes habitual delays in GEF project implementation. Such delays have particularly severe effects for climate change projects because they address rapidly changing markets. As time passes from conception to start, the problem addressed may not just deteriorate further, as for other focal area or clusters, but changes completely. The project may find itself irrelevant when it starts and is immediately faced with a need to reshape its strategy. There were many examples of this, especially within EE. As a building block in addressing this issue, the GEFME is currently undertaking a review of the factors that affect the length of time required to prepare, process, and begin implementation of GEF projects.

The current efforts toward project cycle simplification are commendable. However, the current system has become so complex that an incremental approach to improvement is not likely to yield quick effects. The growing design requirements—on incrementality, GEF criteria, the high demands of cofinancing, the number of steps, and levels of departments involved—are all subject to complaint from the country level. A project-by-project approval system at the GEF Council level was likely appropriate in earlier times, but cannot be sustained with the current volume of projects. Theoretically, a sound formulation process generating quality design has a positive effect on results. However, the long process appears to yield diminishing returns in terms of quality projects. In spite of solid project documents, projects are likely to run into problems. Restructuring of projects after implementation starts is not uncommon.

Many projects also experience further delays and implementation and procurement problems—in spite of rigorous approval processes. The reasons are many and varied. Key factors include the capacity of local implementation agents, the procedural burden of IA implementation processes, the absence of adaptive and dynamic project management, erroneous assumptions of external factors mixed with a lack of preparatory activities, and nonavailability or application of lessons learned. UNDP found that all its heating projects under implementation for more than four years required extensions of at least two years, a trend that is also evident in World Bank GEF EE projects. The 2003 Project Performance Report raised project complexity as a key performance factor. Climate change projects, with their technological issues and barrier removal goals, tend to be complex.

The annual project implementation review process has had insufficient influence on future decision making. The IAs actively monitor their portfolio, although the level of detail varies from project to project. The World Bank has instituted an annual follow-up for GEF portfolio improvement. Nevertheless, the project clusters and country portfolios go beyond each IA. The study finds that there are currently no effective mechanisms for managing the progress of the climate change portfolio as a whole, either at the pipeline or at the implementation stage.

The perception of the GEF—at the field level, among projects and government partners, and within agencies—is one of excessive bureaucracy and project micromanagement. This is not an image to be proud of. The GEF Council should continue to pursue further simplification on issues that are within the purview of the GEF, while the IAs also need to reflect on how GEF projects can best fit into their own systems and where these systems may require more flexibility to accommodate GEF interventions.

(6) The GEF should move toward a greater decentralization in project-by-project approvals, based on clear design principles for climate change project cluster types and a focus on *results*.

Such principles need not be prescriptive or narrow so as to limit innovation, but should rather reflect lessons learned from the portfolio and elsewhere and help to facilitate analysis during the project design process. This should be coupled with a more active management of the portfolio as a whole, through the Climate Change Task Force, led by the GEF Climate Change Team. The purpose is to support the progress of the Climate Change Program by sharing knowledge, facilitating a timely decision making process, and communicating transparently with stakeholders.

5.4. Concluding Remarks

The GEF has an important role to play in the worldwide efforts to combat climate change. As the financial mechanism for the UNFCCC, GEF has made a significant contribution to both mitigation efforts and capacity building in the developing world. Based on its partnership with experienced IAs in the field, the GEF has extended its support to most eligible countries.

To maximize its impact and reach its potential as a strategic partner for developing countries and a more effective agent at the global level, the GEF faces three key overall challenges:

First, how to ensure programmatic and strategic coherence that reflects a clear GEF comparative advantage and makes the most of limited resources. Given the symbiotic and consensual nature of GEF work, it is more difficult to ensure strategic leadership than it is for a simple organizational structure. Yet, more integrated decision making is needed, with strategic, organizational, and managerial implications. The GEF partnership is currently facing some fundamental decisions on performance-based allocation systems. These study findings do not support a notion that better results are generated through an allocation system—by itself—to potentially important areas. For future success of the Climate Change Program, any allocation cannot be made without a substantive framework—overall and at the country level.

Second, how to solve the conundrum of renewable energy. Renewable energy remains the largest part of the GEF portfolio, but with slow and limited impacts and tradeoffs between carbon effects and local needs. Joint assumptions on cost reductions have often proved to be flawed, and the affordability issue perpetually plagues the portfolio. Furthermore, the degree of activity in this area, worldwide, is enormous. The GEF role, which initially was technical in nature, has become more complex and less clear. Is GEF's expertise in finance? In policy? In private sector development? In community development? All of the above? To restore a strategic focus in the RE portfolio, stakeholders must come to terms with realistic expectations. Ultimately, it is a policy decision as to what types of impacts GEF should pursue.

Third, how to maximize the generation and use of ideas and knowledge. The GEF financial contribution, although not negligible, cannot by itself generate the changes the stakeholders desire within climate change. The GEF mandate is based on the premise that experience, innovation, and risk taking can be determining factors in promoting behavioral change. Within existing or expanded capacities, the GEF needs to seek optimal ways of making that experience count and communicate lessons learned and policy directions in an effective manner.

ANNEX A: METHODOLOGY ISSUES

This annex contains excerpts of the study Terms of Reference (the CCPS2 Evaluation Framework) and more detailed information on the methodology used.

Scope

The study draws lessons from past and current activities that are particularly relevant to future programming, within the themes of (a) energy efficiency (OP5) and (b) RE for rural electrification (within OP6), with particular attention to the challenges of market transformation and financing. Portfolio analysis and recommendations were driven by the following key questions determined in the initiating framework:

1. What have been the *results* of the GEF interventions (in terms of impact on GHG emissions and in terms of sustainable market transformation outcomes with respect to enabling policies, available financing, and requisite business infrastructure)? What are the global and regional trends that may influence the achievement of impact? That is, *what* results has the GEF achieved?
2. What has been the *performance* of the GEF in achieving these results? (that is, *how* did the GEF achieve those results?)
3. What *approaches or strategies* have been the most effective in reaching the above outcomes? How can the GEF become more strategic in addressing key national priorities, capacities, and needs within climate change?

In practical terms, it was determined that the study will focus on full-size and mid-size projects at the country level as the main vehicles for reaching the GEF climate change objectives, with less attention to EAs, which were covered by a separate review in 2000.

Methodology

The GEF climate change portfolio was analyzed from the perspective of the conceptual framework in Figure 1.1 in this report, with a focus on impact, outcomes, and strategies (enabling policies, availability of finance, requisite business infrastructure, and so on). For each cluster review, separate methodology notes guided the analysis. The analysis focused on aspects that were relevant at the program level and could be aggregated from projects. Although exact attribution of results cannot meaningfully be aggregated, the achievements mentioned show a credible link between GEF support and outcomes.

Consultations were held in a continuous manner throughout the process, both formally and informally. Key formal benchmarks included the presentation of initial guidance to the Climate Change Task Force in September 2003, a workshop on the methodology in November 2004, and a brainstorming workshop on preliminary findings in June 2004.

To seek information on the key questions, the methodology for the study included a series of desk reviews, project cluster/thematic reviews, country portfolio analysis ,and field visits. The documentation review included (a) general documentation on climate change to identify current trends and issues and to contextualize performance analysis; (b) past GEF reports, studies, and evaluations (the first climate change program study, OPS2, specially managed project reviews, etc.), to identify emerging issues and issues for follow-up; (c) internal GEF documents and documentation of the implementing agencies, including country programming documents; and (d) sample reviews of national communications. This study built on existing terminal, mid-term, and thematic evaluation reports.

The comprehensive portfolio review was based on existing data in the GEF and IA databases and in the 2003 project implementation reviews (PIRs), complemented by other implementation status reports and Council documents. The data sets were circulated among the IAs for verification. The analysis in this report reflects data as of April 30, 2004.

For the purposes of the study, projects were primarily clustered according to their *main* purpose and secondly in terms of technology (where appropriate). Ideally, a future cluster classification of GEF climate change projects should be multidimensional and systematic, as some projects could fall into several categories. The CCPS2 operates with the following different clusters:

- EE products and markets: Projects that aim to help produce and sell energy-efficient products (light bulbs, stoves, CFC-free fridges) and a number of projects that aim to transform markets in general, through for example, labeling, codes, or DSM.
- EE in the public sector: Projects that aim to work with the public sector, at municipal and central level, to promote EE. This includes municipal heating and hot water, energy-efficient buildings, and public street lighting programs.
- EE in industry: Projects that aim to make industrial processes more energy efficient (such as steel, cement, kilns, bottles, boilers) and projects that aim to promote EE in general industry or promote cogeneration of electricity for industrial manufacturing.
- Financial institutions/ESCOs: Projects that have as their main or only component to ensure access to EE finance (through guarantees and credit lines, for example) and to support ESCO development.
- Rural electrification through RE, the largest cluster overall, with projects that explicitly aim at providing electricity to rural areas with solar, wind, hydro, or biomass energy. It can again be divided into grid, off-grid, and mini-grid.
- RE for productive uses (OP6): Projects with an explicit purpose of developing RE for productive use and some projects that mainly aim at electricity generation of such volume that use for production, beyond households, is likely, such as subclusters of methane, solar thermal projects, and biomass use.
- RE products and markets: Projects aiming at market transformation for RE, through for example power sector reform, capacity building, national wind programs, and production and marketing of RE products such as solar cookers.
- Geothermal exploration: Technical demonstration and development of geothermal power plants.
- Carbon reduction/sequestration: Projects encouraging fuel switching to low-carbon fuels and energy production/recovery from fugitive emissions, including some STRMs.

The in-depth cluster reviews (electricity production with RE and EE programs) used as point of departure the thematic cluster reviews from the 2001 program study and OPS2, complemented by project documents and monitoring reports; the 2003 PIR process; other recent documentation; and field visits. Other clusters within these two OPs and the other OPs were also covered, with a briefer analysis; including EE products and markets and EE in industry; biomass, methane, and landfills.

Although no specific papers by the IAs were explicitly commissioned for this study, the review used and expanded on recent studies undertaken by the IAs, including the GEF World Bank *Energy Efficiency Portfolio Review and Practitioners Handbook;* the UNDP *Solar Photovoltaics in Africa: Experiences with Financing and Delivery Models;* and a World Bank review on productive uses of renewable energy. Members of the study team took part in a UNDP regional workshop on municipal heat and hot water in Eastern Europe (February 2004). UNDP subsequently developed a desk review of the heating projects, based on written project documentation; discussions with project managers, UNDP Country Office staff, and UNDP-GEF staff; and external sources of information on non-UNDP-GEF projects.

The field visits were important for gaining a clear comparative understanding of strategies and outcomes; reviewing if and how GEF projects have been effective in market transformation for the adoption of renewable/energy-efficient technologies; and filling information gaps. The CCPS2 also fully used project or country visits from other exercises (local benefits study and SMPRs) that took place during the study period, by complementing their reviews with additional questions related to the conceptual framework (if not already covered). The study developed a GHG typology of countries to facilitate sampling and analysis of projects. A limited number of existing GEF country mission reports were good sources on country focus and results, to which the Study Team added review of GEF portfolios in a limited sample of countries with similar and different conditions. This provided context to the performance analysis.

The use of applicable indicators for measuring results of the clusters was derived from "Measuring Results from Climate Change Programs" (2000) and the GEF strategic priority indicators for the period of FY03–06 (GEF/C.21/Inf.11, 2003). Aggregate targets were not available for past periods covered by the study. Information is available from a limited number of project impact inventories in the 2003 PIR Indicator Sheets and field visits. Whereas indicators may be applied to specific project examples, their inclusion in project design and reporting is not consistent enough to "roll up" in terms of aggregated results.

Approach to the GHG Impact Analysis

For 43 closed projects and 124 active projects, CO_2 reductions were calculated using a slightly simplified version of the evolving methodology initiated in November 2003 and currently under refinement by the GEF Climate Change Task Force in consultation with GEFME and the IAs. This approach applies the following equation: **Total lifetime reduction = direct lifetime reductions + indirect lifetime reductions • causality factor* (*causality factor not used in this impact calculation because of time constraints and data gaps).** This relies on a few critical concepts:

- **Time frame, duration versus lifetime**: Project duration is simply the time the project is active. Lifetime refers to tangible effects from project activities and/or installed technologies that extend past the official project closing (that is, 20-year lifetime of a grid-connected wind farm installed as part of a project with a 7-year duration). Assumptions about investment lifetime, often dependent on local circumstances, will dramatically affect any CO_2 impact estimate.
- **Direct reduction**: Tangible CO_2 reductions directly attributable to project efforts, during project duration and technology/investment lifetime. In the wind farm example above, the observed and anticipated CO_2 reductions over the 20 years of the installation's life are considered direct reductions.
- **Indirect reduction**: Replication effects catalyzed by the GEF intervention. Building on the example above, additional private sector investments in the wake of GEF involvement could be indirectly attributable to GEF. In this calculation, not all projects are judged to be able to be replicated, by either intent or results. Indirect reductions can also be claimed in principle by capacity building measures and other so-called intangibles, although quantifying this effect is problematic.
- **Indirect proxy**: When data are insufficient to form an indirect reduction estimate, a proxy can be used based on assumptions common to project type and other variables. The proxy used in this calculation is normally a multiplier in the range of 1.5 to 3 depending on technology and project categories.
- **Causality factor:** Estimates the portion of indirect reductions attributable to GEF intervention, but is not used in the current impact calculation. Extending the wind farm example, a causality factor could be applied to the indirect reductions attributing half the savings to GEF intervention.

Projects were evaluated for their projected CO_2 reductions using data reported in the project documents, mid-term reviews, and final evaluations, where available. Because of great variation in data availability and inconsistent assumptions found in existing project documentation, as well as the absence of an agreed methodology for measuring CO_2 reductions, a number of data gaps were filled with conservative assumptions applied during this impact analysis, or were excluded from the calculation where a best guess could not be exercised with reasonable accuracy. Table A.1 shows the likelihood, as per the final project evaluations, of reaching explicit or implicit GHG avoidance targets established at project inception.

Table A.1 GHG Targeting Profile*

Projects w/ targets			Projects w/o	
Compliance			Appropriateness	
Likely miss?	Likely meet?	Lacking data	Targets needed	Targets not needed
14	9	3	7	9

* Of 43, one project unaccounted for due to weak documentation

Three iterations were conducted of each set of projects, active and closed. For the second and third iterations, only projects that initially claimed very large CO_2 reductions were examined with greater resolution; these were frequently revised downward by applying more conservative assumptions than argued for in project documentation.

Although later projects generally had fewer data gaps and slightly more consistent CO_2 estimations, a wide band of uncertainty remains throughout the portfolio that can only be clarified through detailed ex-post and/or mid-term evaluations. This would also allow assessment of direct ex-post project reductions, that is, where GEF funds are used beyond the project duration (for revolving funds, continued credit guarantees, or reinvestments).

All methane and carbon figures are converted to CO_2 equivalents here using IPCC guidance (that is, 1tC = 3.667t CO_2 e and 1tCH4 = 21t CO_2 e). Time frames were not held constant due to highly diverse project components, including technology lifecycle, financing modalities, and intervention strategies. In some early project documentation, total investment lifetime is not included; in many of these cases, a lifetime of 20 years is assumed where no other indication is given.

Issues on Comparability and Data in GHG Calculations

It is difficult to fairly and accurately compare GHG impact across projects not only because of inconsistent data, reporting, and assumptions in project documents, but also because of the nature of the projects themselves. Many of the projects, especially those in countries where GEF made its initial climate change investments, have no GHG targets, estimates, or GHG results—simply because they aim to remove market and policy barriers, build capacity, and raise awareness. These and other important results resist quantification. Global benefits arising from these projects will be seen decades down the road, which makes it impossible for GEF to reliably claim a quantifiable portion of future carbon abatement.

The GHG data quality, the state of document and information management and GHG calculations in the GEF are inadequate. In assessing avoided GHG emissions, the study team spent an inordinate time in addressing methodology and data gaps. Key issues on methodology application and data quality and availability include:

- Inconsistent and absent reporting guidance and requirements for GHG, although recent progress by the Climate Change Task Force is noted.
- The concept of causality factor was not used in the study calculation, because it was found to be inherently subjective; difficult to apply consistently; and the notion of quantifying attribution conceptually flawed. The analysis is as illustrative when direct and indirect emissions are juxtaposed.
- The methodology component on direct ex-post project reductions was not used. Closed projects did not provide useful information on this component, and it was largely impossible to extract the data. Instead, this component was conflated with the total direct figure.
- In terms of GHG reporting, project status reviews and PIRs are usually out of step with later findings from final evaluations. In general, the targets and estimates have been revised downward both by final evaluations that reported GHG results and by this study.
- Underlying assumptions were often missing/lacking in project documents, and no breakdown was given on (in)direct or direct emissions. At times, indirect and/or direct contribution was therefore extracted from a given total CO_2 reduction estimate if an educated guess could be made as to appropriateness.
- Source of additional replication variance: An indirect multiplier was applied in this study only if it could be determined from project documentation what the direct reductions were. If only a total CO_2 savings was included (which may or may not include replication), then a multiplier was not applied to estimate replication.
- On multipliers in general: The indirect proxies tend toward the conservative side. Actual impacts for some projects could well be higher. Many projects estimated indirect impact based on the total market potential in a country and worked down from there; not surprisingly, these estimates tended toward the high side (and were revised downward typically using the proxy multiplier).
- On closed projects: With roughly a third of the closed portfolio excluded from the impact calculation, actual results may be expected to be different, and could only be estimated through a comprehensive ex-post evaluation study. Estimates were generally of low quality for the closed projects. Assumptions underlying technologies, time frames, and replication were inconsistent, which may skew results.

Calculations that should explain how the estimate or target was arrived at were missing. Basic conversion factors were missing.

- For both closed and active projects, documents are often internally inconsistent: (a) targets, when available, are listed in various places; (b) incremental costs analyses incomplete or not standardized; (c) contradictions (that is, *x* tons here, *y* tons there).
- For both closed and active projects, GHG targets and estimates are vague (for example, "reduce GHG emissions"); time frame sometimes unclear ("during project life"); assumptions often unclear or missing; and calculations often missing.
- Project documentation is missing in hard copy or electronically. The GEFSec project database lacks desperately needed improvements and regular updates. Documentation is often unlinked and must be searched for manually on the GEF/IA electronic network, where it even exists. Project documentation for closed projects is often missing, in particular final evaluations conducted by the IAs. Requests for basic documents or data often have a long response time.

ANNEX B: LIST OF CLIMATE CHANGE PROJECTS

(as of April 30, 2004)

Closed or completed projects

Country	Project name	Agency	Type	OP	Total GEF financing (US$ million)	Fiscal eear approval	GEF ID
Argentina	Efficient Street Lighting Program	World Bank	MSP	5	0.74	1999	569
Benin	Village-Based Management of Woody Savanna and the Establishment of Woodlots for Carbon Sequestration	UNDP	FP	STRM	2.50	1993	389
Brazil	Biomass Integrated Gasification/Gas Turbine Project	UNDP	FP	7	8.12	1993	381
China	Energy Conservation and Pollution Control in Township and Village Enterprise Industries	UNDP	FP	5	1.00	1995	263
China	Issues and Options in Greenhouse Gas Emissions Control	UNDP	FP	7	2.00	1992	379
China	Development of Coalbed Methane Resources in China	UNDP	FP	STRM	10.00	1991	380
China	Wind Power Development Project	UNDP/ADB	FP	6	12.00	2001	881
China	Sichuan Gas Transmission and Distribution Rehabilitation	WB/UNDP	FP	STRM	11.40	1992	75
Costa Rica	Tejona Wind Power	World Bank/IDB	FP	6	3.30	1993	60
Côte d'Ivoire	Energy Efficiency Market Development	World Bank	MSP	5	0.73	1999	570
Cuba	Producing Energy Efficient Home Refrigerators Without Making Use of Ozone Depleting Substances	UNDP	MSP	5	0.75	2000	804
Czech Republic	Kyjov Waste Heat Utilization	World Bank	FP	STRM	5.80	1997	127
Ghana	Renewable Energy-Based Electricity for Rural, Social and Economic Development in Ghana	UNDP	FP	6	2.53	1997	333
Global	Research Programme on Methane Emissions from Rice Fields	UNDP	FP	STRM	5.00	1991	382
Global	Redirecting Commercial Investment Decisions to Cleaner Technologies – A Technology Transfer Clearinghouse	UNEP	MSP	5, 6	0.75	1999	611
Global	Fuel Cell Bus and Distributed Power Generation Market Prospects and Intervention Strategy Options	UNEP	MSP	7, 11	0.69	2000	819
Global	Monitoring of Greenhouse Gases Including Ozone	UNDP	FP	STRM	4.80	1991	384
Global	Alternatives to Slash and Burn	UNDP	FP	STRM	3.00	1992	390
Global	Global Alternatives to Slash and Burn Agriculture Phase II	UNDP	FP	STRM	3.00	1995	277
Guatemala	Renewable Energy-Based Small Enterprise Development in the Quiche Region	UNDP	MSP	6	0.41	2000	28
Hungary	Energy Efficiency Co-Financing Program	WB/IFC	FP	5	5.00	1996	111
India	Alternate Energy	World Bank	FP	6	26.00	1992	76
Indonesia	Solar Home Systems (SHS)	World Bank	FP	6	24.30	1996	119
Iran, Islamic Rep. of	Teheran Transport Emissions Reduction	World Bank	FP	5	2.00	1992	572
Jamaica	Demand Side Management Demonstration	World Bank	FP	5	3.93	1993	64
Lithuania	Klaipeda Geothermal Demonstration	World Bank	FP	6	6.90	1995	106
Mali	Household Energy	World Bank	FP	6	2.50	1993	52
Mauritania	Decentralized Wind Electric Power for Social and Economic Development (Alizes Electriques)	UNDP	FP	6	2.00	1993	371
Mauritius	Sugar Bio-Energy Technology	World Bank	FP	6	3.30	1991	577
Mexico	High Efficiency Lighting Pilot	World Bank	FP	5	10.00	1992	575
Peru	Technical Assistance to the Centre for Energy Conservation	UNDP	FP	5	0.90	1992	315
Philippines	Leyte-Luzon Geothermal	World Bank	FP	6	30.00	1991	80
Poland	Efficient Lighting Project (PELP)	WB/IFC	FP	5	5.00	1995	96
Regional	Creation and Strengthening of the Capacity for Sustainable Renewable Energy Development in Central America	UNDP	MSP	6	0.75	2000	27
Regional	Control of Greenhouse Gas Emissions through Energy Efficient Building Technology in West Africa	UNDP	FP	5	3.50	1993	376
Russian Federation	Greenhouse Gas Reduction	World Bank	FP	STRM	3.20	1993	70

Country	Project name	Agency	Type	OP	Total GEF financing (US$ million)	Fiscal eear approval	GEF ID
South Africa	Concentrating Solar Power for Africa (CSP-Africa)	World Bank	MSP	7	0.23	2000	19
Sri Lanka	Renewable Energy and Capacity Building	UNDP	FP	6	1.53	1996	425
Sri Lanka	Energy Services Delivery	World Bank	FP	5, 6	5.90	1996	104
Sudan	Community Based Rangeland Rehabilitation for Carbon Sequestration	UNDP	FP	STRM	1.50	1993	377
Thailand	Promotion of Electricity Energy Efficiency	WB/UNDP	FP	5	10.10	1992	81
Uganda	Uganda Photovoltaic Pilot Project for Rural Electrification	UNDP	FP	6	1.80	1996	295
Zimbabwe	Photovoltaics for Household and Community Use	UNDP	FP	6	7.00	1991	374

Active or ongoing projects

Country	Project name	Agency	Type	OP	Total GEF financing (US$ million)	Fiscal year approval	GEF ID
Argentina	Renewable Energy in Rural Markets Project	World Bank	FP	6	10.12	1998	124
Armenia	Improving the Energy Efficiency of the Urban Heating and Hot Water Supply	UNDP	FP	5	3.16	2003	1116
Bangladesh	Rural Electrification and Renewable Energy Development	World Bank	FP	6	8.54	2002	1209
Belarus	Biomass Energy for Heating and Hot Water Supply	UNDP	FP	6	3.37	2003	1198
Bolivia	A Program for Rural Electrification with Renewable Energy Using the Popular Participation Law	UNDP	FP	6	4.45	1997	314
Brazil	Hydrogen Fuel Cell Buses for Urban Transport	UNDP	FP	11	12.62	2000	6
Brazil	Biomass Power Generation: Sugar Cane Bagasse and Trash	UNDP	FP	7	3.75	1996	338
Brazil	Energy Efficiency Project	World Bank	FP	5	15.00	1998	128
Bulgaria	Energy Efficiency Strategy to Mitigate Greenhouse Gas Emissions	UNDP	FP	5	2.60	1997	302
Cameroon	Private Sector/GEF Co-financing of Global Warming Mitigation in Cameroon through Biomass Conservation, Restoration	UNDP	FP	6	0.18	1994	1839
Cape Verde	Energy and Water Sector Reform and Development	World Bank	FP	6	4.93	1998	444
Chile	Reduction of Greenhouse Gases	UNDP	FP	5	1.70	1993	372
Chile	Removal of Barriers to Rural Electrification with Renewable Energy	UNDP	FP	6	6.07	2001	843
China	Capacity Building for the Rapid Commercialization of Renewable Energy	UNDP	FP	6	8.85	1997	261
China	Promoting Methane Recovery and Utilization from Mixed Municipal Waste	UNDP	FP	6	5.31	1996	304
China	Barrier Removal for the Widespread Commercialization of Energy-Efficient CFC-Free Refrigerators in China	UNDP	FP	5	9.86	1998	445
China	Energy Conservation and GHG Emission Reduction in Chinese Township and Village Enterprises (TVE), Phase II	UNDP	FP	5	8.00	1999	622
China	Barrier Removal for Efficient Lighting Products and Systems	UNDP	FP	5	8.14	2001	841
China	Targeted Research Related to Climate Change	UNDP	FP	5, 6, 7, 11	1.72	2001	880
China	Demonstration of Fuel Cell Bus Commercialization in China (Phase II-Part I)	UNDP	FP	11	5.82	2001	941
China	Second Beijing Environment Project	World Bank	FP	5	25.00	2000	7
China	Efficient Industrial Boilers	World Bank	FP	5	33.56	1996	97
China	Energy Conservation	World Bank	FP	5	22.35	1997	98
China	Renewable Energy Development	World Bank	FP	6	35.73	1998	446
China	Energy Conservation Project, Phase II	World Bank	FP	5	26.00	2002	1237
China	Passive Solar Heating for Rural Health Clinics	World Bank	MSP	5	0.78	2001	1280
Croatia	Energy Efficiency Project	World Bank	FP	5	7.08	2001	944
Cuba	Co-generation of Electricity and Steam Using Sugarcane Bagasse and Trash	UNDP	FP	6	12.52	2000	782
Czech Republic	Low-Cost/Low-Energy Buildings	UNDP	MSP	5	0.45	1999	571

Country	Project name	Agency	Type	OP	Total GEF financing (US$ million)	Fiscal year approval	GEF ID
Ecuador	Renewable Energy for Electricity Generation—Renewable Electrification of the Galapagos Islands	UNDP	FP	6	4.08	2002	1135
Ecuador	Power and Communications Sectors Modernization and Rural Services Project (PROMEC)	World Bank	FP	5, 6	3.19	2001	938
Egypt, Arab Rep.	Introduction of Viable Electric and Hybrid-Electric Bus Technology	UNDP	MSP	11	0.75	2000	31
Egypt, Arab Rep.	Fuel Cell Bus Demonstration Project in Cairo, Phase I	UNDP	FP	11	6.51	2001	926
Fiji	Renewable Energy Hybrid Power Systems	UNDP	MSP	6	0.75	1999	632
Global	Technology Transfer Networks (TTN) Phase II: Prototype Verification and Expansion at the Country Level	UNEP	FP	5, 6, 13, 3, 14	2.01	2003	2043
Global	Solar Development Group (SDG) (a.k.a. Solar Development Corporation SDC)	WB/IFC	FP	6	10.00	1999	595
Global	Renewable Energy and Energy Efficiency Fund (IFC)	WB/IFC	FP	5, 6	30.00	1996	667
Global	Efficient Lighting Initiative (Tranche I)	WB/IFC	FP	5	9.58	1999	519
Global	Solar and Wind Energy Resource Assessment	UNEP	FP	6	6.81	2001	1281
Global	Promoting Industrial Energy Efficiency through a Cleaner Production/Environmental Management System Framework	UNEP	MSP	5	0.95	2002	1340
Global	Global Promotion of Youth-Led Enterprises in Off-Grid Renewable Energy with Applications	World Bank	MSP	6	0.80	2002	1315
Global	Efficient Lighting Initiative (Tranche II)	WB/IFC	FP	5	5.65	1999	1439
Global	Photovoltaic Market Transformation Initiative (IFC)	WB/IFC	FP	6	30.05	1997	112
Guinea	Rural Energy	World Bank	FP	6	2.00	2000	8
Hungary	Public Sector Energy Efficiency Programme	UNDP	FP	5	4.20	2001	835
Hungary	Rehabilitation and Expansion of Small Hydro-Plants on the River Raba in Hungary	World Bank	MSP	STRM	0.41	2003	1702
Hungary	Energy Efficiency Co-Financing Program 2 (HEECP2)	WB/IFC	MSP	5	0.70	2002	1316
India	Biomass Energy for Rural India	UNDP	FP	6	4.21	2000	10
India	Coal Bed Methane Capture and Commercial Utilization	UNDP	FP	STRM	9.19	1998	325
India	Development of High Rate BioMethanation Processes as Means of Reducing Greenhouse Gas Emissions	UNDP	FP	6	5.50	1992	370
India	Optimizing Development of Small Hydel Resources in Hilly Areas	UNDP	FP	6	7.50	1992	386
India	Removal of Barriers to Biomass Power Generation, Part I	UNDP	FP	6	5.65	2003	1199
India	Removal of Barriers to Energy Efficiency Improvement in the Steel Rerolling Mill Sector	UNDP	FP	5	7.03	2003	1240
India	Energy Efficiency	World Bank	FP	5	5.00	1998	404
Indonesia	West Java/Jakarta Environmental Management Project	World Bank	FP	STRM	3.11	2000	765
Iran, Islamic Rep. of	Carbon Sequestration in the Desertified Rangelands of Hossien Abad, South Khorasan, through Community-based Management	UNDP	MSP	STRM	0.75	2001	673
Jordan	Reduction of Methane Emissions and Utilization of Municipal Waste for Energy in Amman	UNDP	FP	6	2.74	1996	280
Kenya	Removal of Barriers to Energy Conservation and Energy Efficiency in Small and Medium Scale Enterprises	UNDP	FP	5	3.19	1999	573
Kenya	Joint Geophysical Imaging (JGI) Methodology for Geothermal Reservoir Assessment	UNEP	MSP	6	0.98	2003	1780
Lao PDR	Off-grid Electrification Pilot Demonstration, A Component of the Laos Southern Provinces Rural Electrification	World Bank	MSP	6	0.74	1998	424
Latvia	Economic and Cost-effective Use of Wood Waste for Municipal Heating Systems	UNDP	MSP	6	0.75	2001	914
Latvia	Solid Waste Management and Landfill Gas Recovery	World Bank	FP	STRM	5.12	1997	123
Lebanon	Barrier Removal for Cross Sectoral Energy Efficiency	UNDP	FP	5	3.40	1999	636
Lithuania	Elimination of Green House Gases in the Manufacturing of Domestic Refrigerators and Freezers at Snaige	UNDP	MSP	STRM	1.00	2002	1381
Lithuania	Heat Demand Management (formerly Vilnius Heat Demand Management Project)	World Bank	FP	5	6.05	2001	948
Macedonia	Mini-Hydropower Project	World Bank	MSP	STRM	0.75	2000	32
Macedonia	Development of Mini-Hydropower Plants	World Bank	FP	STRM	1.50	1999	637

Country	Project name	Agency	Type	OP	Total GEF financing (US$ million)	Fiscal year approval	GEF ID
Malawi	Barrier Removal to Malawi Renewable Energy Programme	UNDP	FP	6	3.42	1999	641
Malaysia	Industrial Energy Efficiency Improvement Project	UNDP	FP	5	7.30	1998	448
Malaysia	Biomass-based Power Generation and Co-generation in the Malaysian Palm Oil Industry, Phase I	UNDP	FP	6	4.03	2001	940
Mexico	Demonstration Project of Hydrogen Fuel Cell Buses and an Associated System for Hydrogen Supply in Mexico City, Phase I	UNDP	FP	11	5.42	2001	931
Mexico	Action Plan for Removing Barriers to the Full-scale Implementation of Wind Power	UNDP	FP	6	4.74	2003	1284
Mexico	Renewable Energy for Agriculture	World Bank	FP	6	8.90	1999	643
Mexico	Methane Capture and Use (Landfill Demonstration Project	World Bank	FP	6	6.57	2000	784
Mexico	Introduction of Climate Friendly Measures in Transport	World Bank	FP	11	6.10	2002	1155
Mongolia	Commercialization of Super Insulated Building Technology	UNDP	MSP	5	0.75	2000	22
Mongolia	Improved Household Stoves in Mongolian Urban Centers	World Bank	MSP	5	0.78	2001	862
Morocco	Market Development for Solar Water Heaters	UNDP	FP	6	2.97	1999	646
Mozambique	Energy Reform and Access Project	World Bank	FP	6	3.37	2002	1158
Namibia	Barrier Removal to Namibian Renewable Energy Programme, Phase I	UNDP	FP	6	2.70	2001	935
Nicaragua	Off-grid Rural Electrification for Development (PERZA)	WB/UNDP	FP	6	4.37	2003	1079
Pakistan	Fuel Efficiency in the Road Transport Sector	UNDP	FP	5	7.00	1992	391
Peru	Photovoltaic-Based Rural Electrification in Peru	UNDP	FP	6	3.96	1998	449
Peru	Renewable Energy Systems in the Peruvian Amazon Region (RESPAR)	UNDP	MSP	6	0.75	2001	857
Peru	Obtaining Biofuels and Non-wood Cellulose Fiber from Agricultural Residues/Waste	UNDP	MSP	6	0.99	2002	1558
Philippines	Palawan New and Renewable Energy and Livelihood Support Project	UNDP	MSP	6	0.75	2000	29
Philippines	Metro Manila Urban Transport Integration Project - Marikina Bikeways Project Component	World Bank	FP	11	1.48	2000	785
Philippines	CEPALCO Distributed Generation PV Power Plant	WB/IFC	FP	7	4.03	1999	652
Poland	Integrated Approach to Wood Waste Combustion for Heat Production	UNDP	MSP	6	0.98	2001	982
Poland	Gdansk Cycling Infrastructure Project	UNDP	MSP	11	1.00	2001	1279
Poland	Coal-to-Gas Project	World Bank	FP	STRM	25.33	1992	67
Poland	Zakopane/Podhale Geothermal District Heating and Environment Project	World Bank	FP	STRM	5.40	1999	654
Regional	Caribbean Renewable Energy Development Programme	UNDP	FP	6	4.78	2001	840
Regional	Pacific Islands Renewable Energy Programme (PIREP)	UNDP	MSP	6	0.70	2002	1058
Regional	Commercializing Energy Efficiency Finance (CEEF) - Tranche I	WB/IFC	FP	5	11.25	2002	1541
Regional	Energy Efficiency Improvements and Greenhouse Gas Reductions	UNDP	FP	5	6.36	1997	267
Regional	Capacity Building for the Adoption and Application of Energy Codes for Buildings	UNDP	MSP	5	0.99	2000	5
Romania	Capacity Building for GHG Emission Reduction through Energy Efficiency	UNDP	FP	5	2.29	1996	284
Romania	Energy Efficiency Project	World Bank	FP	5	10.35	2001	883
Russian Federation	Capacity Building to Reduce Key Barriers to Energy Efficiency in Russian Residential Buildings and Heat Supply	UNDP	FP	5	3.38	1997	292
Russian Federation	Removing Barriers to Coal Mine Methane Recovery and Utilization	UNDP	FP	STRM	3.30	2003	1162
Russian Federation	Cost Effective Energy Efficiency Measures in the Russian Educational Sector	UNDP	MSP	5	1.00	2002	1646
Russian Federation	Developing the Legal and Regulatory Framework for Wind Power in Russia	WB/IFC	MSP	6	0.73	2004	2194
Senegal	Sustainable and Participatory Energy Management	World Bank	FP	STRM	4.77	1996	118
Slovak Republic	Reducing Greenhouse Gas Emissions through the Use of Biomass Energy in Northwest Slovakia	UNDP	MSP	6	1.00	2002	1318
Slovenia	Removing Barriers to the Increased Use of Biomass as an Energy Source	UNDP	FP	6	4.40	1999	658
South Africa	Pilot Production and Commercial Dissemination of Solar Cookers	UNDP	MSP	6	0.80	2002	1311
Sri Lanka	Renewable Energy for Rural Economic Development	World Bank	FP	5, 6	8.00	2002	1545

Country	Project name	Agency	Type	OP	Total GEF financing (US$ million)	Fiscal year approval	GEF ID
Sudan	Barrier Removal to Secure PV Market Penetration in Semi-Urban Sudan	UNDP	MSP	6	0.75	1999	660
Syrian Arab Rep.	Supply-Side Efficiency and Energy Conservation and Planning	UNDP	FP	5	4.61	1997	264
Syrian Arab Rep.	Increasing the Efficiency of the Hydrocarbon Sector by Using Waste Gas	World Bank	MSP	5	0.75	1999	662
Tanzania	Transformation of the Rural Photovoltaics (PV) Market	UNDP	FP	6	2.57	2003	1196
Thailand	Removal of Barriers to Biomass Power Generation and Co-generation	UNDP	FP	6	6.83	2000	13
Thailand	Building Chiller Replacement Program	World Bank	FP	5	2.50	1999	540
Tunisia	Experimental Validation of Building Codes and Removal of Barriers to Their Adoption	UNDP	FP	5	4.36	1999	520
Tunisia	Barrier Removal to Encourage and Secure Market Transformation and Labeling of Refrigerators	UNDP	MSP	5	0.71	1998	576
Tunisia	Solar Water heating	World Bank	FP	6	4.00	1993	86
Turkmenistan	Improving the Energy Efficiency of the Heat and Hot Water Supply	UNDP	MSP	5	0.75	2001	983
Uganda	Rural Energy for Development	World Bank	FP	6	17.90	2000	787
Uganda	Energy for Rural Transformation Project (APL)	World Bank	FP	6	12.45	2000	1831
Ukraine	Climate Change Mitigation in Ukraine Through Energy Efficiency in Municipal District Heating (Pilot Project in Rivne) Stage 1	UNDP	FP	5	2.03	2001	934
Uruguay	Landfill Methane Recovery Demonstration Project	World Bank	MSP	STRM	1.00	2000	766
Vietnam	Systems Efficiency Improvement, Equitization and Renewables (SEER) Project - Renewables Components	World Bank	FP	6	4.85	2002	965
Vietnam	Demand-Side Management and Energy Efficiency Program	World Bank	FP	5	5.72	2003	1083

Future projects (approved but not yet started)

Country	Project name	Agency	Type	OP	Total GEF financing (US$ million)	Fiscal year approval	GEF ID
Brazil	Biomass Power Commercial Demonstration	World Bank	FP	7	40.48	1997	63
Burkina Faso	Energy Sector Reform Project	WB/UNDP	FP	5, 6	3.29	2002	1062
Cambodia	Rural Electrification and Transmission (a.k.a Renewable Energy Promotion)	World Bank	FP	6	6.08	2001	946
Chile	Sustainable Transport and Air Quality for Santiago	World Bank	FP	11	7.33	2003	1349
China	End Use Energy Efficiency Project	UNDP	FP	5	17.38	2003	966
China	Renewable Energy Scale Up Program (CRESP), Phase 1	World Bank	FP	6	41.57	2001	943
China	Efficient Utilization of Agricultural Wastes	WB/ADB	FP	6	6.40	2002	1105
Costa Rica	National Off-grid Electrification Programme Based on Renewable Energy Sources, Phase I	UNDP	FP	6	1.15	2003	1132
Croatia	Removing Barriers to Improving Energy Efficiency of the Residential and Service Sectors	UNDP	FP	5	4.59	2001	882
Croatia	Renewable Energy Resources Project	World Bank	FP	6	6.35	2002	1291
Cuba	Generation and Delivery of Renewable Energy Based Modern Energy Services in Cuba; the case of Isla de la Juventud	UNEP	FP	6	5.66	2004	1361
Eritrea	Wind Energy Applications	UNDP	FP	6	2.27	2004	1136
Ethiopia	Renewable Energy Project	World Bank	FP	6	5.21	2003	1686
Georgia	Promoting the Use of Renewable Energy Resources for Local Energy Supply	UNDP	FP	6	4.71	2003	1137
Global	Fuel Cells Financing Initiative for Distributed Generation Applications	WB/IFC	FP	7	9.85	2004	1685
Global	Development of a Strategic Market Intervention Approach for Grid-Connected Solar Energy Technologies (EMPower)	UNEP	MSP	7	1.00	2004	1599
India	Fuel Cell Bus Development in India (Phase II - Part 1)	UNDP	FP	11	6.28	2001	929
India	Solar Thermal Power	World Bank	FP	7	49.75	1996	578
Kazakhstan	Wind Power Market Development Initiative	UNDP	FP	6	2.90	2000	783

Country	Project name	Agency	Type	OP	Total GEF financing (US$ million)	Fiscal year approval	GEF ID
Maldives	Renewable Energy Technology Development and Application Project (RETDAP)	UNDP	MSP	6	0.75	2004	1029
Mali	Household Energy and Universal Rural Access Project	World Bank	FP	6	3.76	2003	1274
Mexico	Hybrid Solar Thermal Power Plant	World Bank	FP	7	49.70	2000	12
Mexico	Large Scale Renewable Energy Development Project	World Bank	FP	6	25.35	2003	1900
Morocco	Solar Based Thermal Power Plant	World Bank	FP	7	43.90	1999	647
Morocco	Energy and Environment Upgrading of the Industrial Park of Sidi Bernoussi Zenata, Casablanca	World Bank	MSP	5	0.75	2003	1838
Peru	Lima Urban Transport	World Bank	FP	11	8.28	2003	1081
Philippines	Capacity Building to Remove Barriers to Renewable Energy Development	UNDP	FP	6	5.45	2002	1264
Philippines	Electric Cooperative System Loss Reduction Project	World Bank	FP	5	12.35	2003	1532
Philippines	Rural Power	WB/UNDP	FP	6	9.35	2002	1071
Poland	Polish Energy Efficiency Motors Programme	UNDP	FP	5	4.50	2002	1265
Poland	Krakow Energy Efficiency Project	World Bank	FP	5	11.18	2000	786
Poland	Demand-side Energy Efficiency in Public Buildings, Lodz Municipal Energy Services Company	WB/EBRD	MSP	5	1.00	2004	1445
Regional	Development of Geothermal Energy in Europe and Central Asia and World Bank-GEF Geothermal Development Fund, Tranche 1	World Bank	FP	6	25.70	2003	1615
Regional	Energy Management and Performance Related Energy Savings Scheme (EMPRESS)	UNEP	FP	5	2.36	2003	1096
Regional	Commercializing Energy Finance (CEEF) - Tranche II	WB/IFC	FP	5	6.75	2002	2174
Senegal	Energy Sector Investment Project	World Bank	FP	6	5.00	2001	921
South Africa	Solar Water Heaters (SWHs) for Low-income Housing in Peri-Urban Areas	UNDP	MSP	6	0.73	2000	805
Tunisia	Development of On-Grid Wind Electricity in Tunisia for the 10th Plan	UNDP	FP	6	10.53	2004	967
Tunisia	Development of an Energy Efficiency Program for the Industrial Sector for Tunisia	World Bank	FP	5	8.50	2004	1905
Uruguay	Energy Efficiency Project	World Bank	FP	5, 6	7.22	2003	1179

ANNEX C: COP DECISIONS AND GEF

COP Session	COP decisions (guidance)	Other COP decisions	GEF report to COP and other documents
COP-1	- Decision 11/CP.1, Initial guidance on policies, program priorities and eligibility criteria to the operating entity or entities of the financial mechanism; - Decision 12/CP.1, Report of the Global Environment Facility to the Conference of the Parties on the development of an operational strategy and on initial activities in the area of climate change	- Decision 9/CP.1, Maintenance of the interim arrangements referred to in Article 21.1; - Decision 10/CP.1, Arrangements between the COP and the operating entity of the financial mechanism	GEF Report to INC/FCCC on the Restructured Global Environment Facility (A/AC.237/89, December 14, 1994) - GEF Report on the Development of an Operational Strategy and on Initial Activities in the Field of Climate Change (FCCC/CP/1995/4, March 10, 1995)
COP-2	- Decision 10/CP.2, Communications from the Parties not included in Annex I to the Convention: guidelines, facilitation and process for consideration (Guidelines for the preparation of initial national communications.); - Decision 11/CP.2, Guidance to the Global Environment Facility (Enabling activities that facilitate endogenous capacity-building, including data collection; transparency, and pragmatic application of the incremental costs concept on a case-by-case basis; and, disbursement of financial resources to meet the agreed full costs incurred by the developing country Parties in compliance with Article 12.2.)	- Decision 12.CP.2, Memorandum of Understanding between the COP and the Council of the GEF; - Decision 13/CP.2 MOU between COP and the Council of the GEF: annex on determination of funding necessary & available for implementation of Convention	GEF Report, (FCCC/CP/1996/8, June 27, 1996) - Instrument Establishing the GEF, adopted March 1994 -GEF Operational Strategy, October.1995 -Operational Criteria for Enabling Activities, GEC/C.7/inf.10, 1996
COP-3	None	- Decision 11/CP.3, Review of the financial mechanism; - Decision 12/CP.3, Annex to MOU between COP and Council of GEF on the determination of funding necessary & available for the implementation of the Convention	GEF Report (FCCC/CP/1997/3, October 31, 1997) First Overall Performance Study of GEF, - Revised Operational Guidelines for Expedited Financing of Initial NC of NAIPs, (Part I) February 1997
COP-4	- Decision 2/CP.4, Additional guidance to the operating entity of the financial mechanism (Provide funding to developing country Parties in accordance to Articles 4.3, 4.5, and 11.1: implement adaptation response measures under Article 4.1; assist with their prioritized technology needs, studies for preparation of national programs, and public awareness activities; and, support capacity building. Streamline and simplify GEF's project preparation cycle.)	- Decision 3/CP.4, Review of the financial mechanism; - Decision 12/CP.4, Initial national communications from NAIPs	GEF Report (FCCC/CP/1998/12, September 29, 1998) New Delhi Statement of First GEF Assembly, April 1998
COP-5	- Decision 10/CP.5, Capacity-building in developing countries (non-Annex I Parties) (Provide financial and technical support; assess ongoing efforts and elaborate special needs of developing countries; and, strengthening national focal points.)	- Decision 8/CP. 5, Other matters related to communications from NAIPs	GEF FCCC/CP/1999/3Report (Operational September 29, 1999) Guidelines for Expedited Financing of Climate Change Enabling Activities-Part II: Expedited Financing for (Interim) Measures for Capacity Building in Priority Areas, October 1999
COP-6	- Decision 5/CP.6, Bonn Agreement on the Implementation of BAPA (Establishment of: a special climate change fund, a least developed countries fund, and an Expert Group on Technology Transfer. GEF and others to support adverse effects of climate change activities and response measures.)		GEF FCCC/CP/2000/3Report (& GEF Review Add.1, October 11, 2000) GEF Review of Climate Change Enabling Activities, October 2000,
COP-7	- Decision 6/CP.7, Additional guidance to an operating entity of the financial mechanism (Provide funding to developing country Parties in accordance to Articles 4.3, 4.5, and 11.1: strengthen adaptation activities, support "country-team" approach, improve climate change related data collection, undertake more in-depth public awareness activities, strengthen establish early warning systems for extreme weather, assists with national communications.);		GEF FCCC/CP/20001/8Report (GEF Climate October 16, 2001) Change Program Study (Executive Summary)

COP Session	COP decisions (guidance)	Other COP decisions	GEF report to COP and other documents
	- Decision 7/CP.7, Funding under the Convention; (Establishment of special climate change least developed countries funds; Parties in a position to do so to provide funding for developing country Parties.); - Decision 10/CP.7, Funding under the Protocol (Establishment of an adaptation fund for developing country Parties.); - Decision 27/CP.7, Guidance to an entity entrusted with the operation of the financial mechanism of the Convention, for the operation of the least developed countries fund; - Decision 28/CP.7**,** Guidelines for preparation of national adaptation programs of action		

[1] The GEF Climate Change Program is defined for the purpose of the study as the GEF Climate Change Portfolio (closed, ongoing, and future projects), the four Climate Change OPs and Strategies, and corresponding performance and M&E frameworks.

[2] All numbers are from the GEF Secretariat project database, Project Management Information System, as per April 30, 2004.

[3] "Report by the GEF to the First Conference of the Parties," approved by COP-1.

[44] UNFCCC (United Nations Framework Convention on Climate Change). FCCC/CP/1995/7/Add.1; decision 12/CP.1, June 6, 1995. This decision appears in appendix 3.B.

[5] First Study of GEF Overall Performance, 1998.

[6] GEF Business Plan fiscal year (FY)04–06 (GEF/C.21/9), April 9, 2003.

[7] This is based on the results chain developed within results-based management in development assistance (applied by the Organisation for Economic Co-operation and Development-Development Assistance Committee [OECD-DAC], World Bank, and United Nations Development Programme [UNDP]).

[8] Outcome is defined as the likely or achieved short-term and medium-term effects of an intervention's outputs (OECD-DAC glossary).

[9] GEF Operational Strategy, 1997, chapter 3

[10] GEF project strategies emanate from the GEF Instrument, Council decisions on Operational Programs and Strategic Priorities, UNFCCC/COP guidance on modalities, the Business Plans, and guidance on GEF review criteria, among others.

[11] IPCC (Intergovernmental Panel on Climate Change). 2001d. "Climate Change 2001: The Scientific Basis." Contribution of Working Group I to the Third Assessment Report. Cambridge, United Kingdom: Cambridge University Press for IPCC.

[12] IPCC (Intergovernmental Panel on Climate Change). 2001a. "Climate Change 2001: Synthesis Report." Geneva.

[13] The IPCC reports these projected changes in degree Centigrade, rounded to the nearest 0.05ºC per unit time. In degree Fahrenheit, the changes would be time 9/5, that is, 1.1 ºF ± 0.4ºF.

[14] IPCC (Intergovernmental Panel on Climate Change). 2000a. "Special Report on Emissions Scenarios." A special report of Working Group III of the IPCC. Cambridge, United Kingdom: Cambridge University Press.

[15] Similarly, IPCC reports sea-level rise in centimeters. The conversion rate is 1 centimeter = 2.54 inches, so the projected range of increase is 6–37 inches.

[16] IPCC (Intergovernmental Panel on Climate Change). 2001b. "Climate Change 2001: Impacts, Adaptation and Vulnerability." Contribution of Working Group II to the Third Assessment Report. Cambridge, United Kingdom: Cambridge University Press for IPCC.

[17] IPCC (Intergovernmental Panel on Climate Change). 2000b. "Special Report on Regional Impacts of Climate Change: An Assessment of Vulnerability." Geneva.

[18] IPCC (Intergovernmental Panel on Climate Change). 2001c. "Climate Change 2001: Mitigation." Contribution of Working Group III to the Third Assessment Report of the IPCC. Cambridge, United Kingdom: Cambridge University Press for IPCC.

[19] Grubb, M. 2003. "On Carbon Prices and Volumes in the Evolving Carbon Market." In *Greenhouse Gas Emissions Trading and Project-Based Mechanisms*. Paris: Organisation for Economic Co-operation and Development.

[20] GGI (Global Governance Initiative). 2004. "Assessment of the World's Efforts on Climate Change." Chapter 2. World Economic Forum, Washington, D.C..

[21] This is a term used by the UNFCCC.

[22] Industrialized countries are listed in Annex B to the Protocol, but with few exceptions this is the same as the Convention's Annex I. However, Article 3 of the Protocol specifies that Annex I Parties shall ensure that their CO_2-equivalent does not exceed their assigned amount, which is listed in Annex B of the Protocol.

[23] WRI (World Resources Institute). 2003. Climate indicators analysis tool (CAIT). Washington DC. www.wri.org.

[24] IPCC (Intergovernmental Panel on Climate Change). 2000a. "Special Report on Emissions Scenarios." A special report of Working Group III of the IPCC. Cambridge, United Kingdom: Cambridge University Press.

[25] Agarwal, A., and S. Narain. 1991. *Global Warming in an Unequal World: A Case of Environmental Colonialism*. New Delhi: Center for Science and Environment.

[26] IPCC (Intergovernmental Panel on Climate Change). 2001c. "Climate Change 2001: Mitigation." Contribution of Working Group III to the Third Assessment Report of the IPCC. Cambridge, United Kingdom: Cambridge University Press for IPCC.

[27] IPCC (Intergovernmental Panel on Climate Change). 1995. "Second Assessment Synthesis of Scientific-Technical Information Relevant to Interpreting Article 2 of the UN Framework Convention on Climate Change." Rome.

[28] IEA (International Energy Agency). 2002. *Beyond Kyoto: Energy Dynamics and Climate Stabilisation*. Paris: IEA/Organisation for Economic Co-operation and Development; Aldy, J E, J. Ashton, R. Baron, D. Bodansky, S. Charnovitz, E. Diringer, T.C. Heller, J. Pershing, P. R. Shukla, L. Tubiana, F. Tudela, andX. Wang. 2003. *Beyond Kyoto: Advancing the International Effort against Climate Change*. Arlington: Pew Center on Global Climate Change.

[29] Economies in transition (EITs) that are part of Annex I, such as Russia, cannot receive funding through the financial mechanism, which is for "developing countries." However, EITs can still receive funding from GEF, but outside its role as the financial mechanism (Yamin & Depledge 2003a).

[30] Yamin, F. and J. Depledge. 2003a. "The International Climate Change Regime: A Guide to Rules, Institutions and Procedures". Draft chapter on Finance, Technology and Capacity Building. Institute of Development Studies, Brighton.

[31] Decision 12/CP.1, based on GEF report FCCC/CP/1995/4.

[32] Climate Change Secretariat. 2002. *A Guide to the Climate Change Convention and its Kyoto Protocol*. Bonn.

[33] IPCC (Intergovernmental Panel on Climate Change). 1996. "Technologies, Policies and Measures for Mitigating Climate Change." IPCC Technical Paper No. 1. Geneva; Johannson, T. B., R. H. Williams, H. Ishitani, and J. Edmonds. 1996. "Options for Reducing CO_2 Emissions from the Energy Supply Sector." *Energy Policy* 24(10/11):985–1003.

[34] IPCC (Intergovernmental Panel on Climate Change). 2001c. "Climate Change 2001: Mitigation." Contribution of Working Group III to the Third Assessment Report of the IPCC. Cambridge, United Kingdom: Cambridge University Press for IPCC. p. 26.

[35] Goldemberg, J., and W. Reid, eds. 1999. *Promoting Development while Limiting Greenhouse Gas Emissions: Trends & Baselines*. New York: United Nations Development Programme and World Resources Institute.

[36] IPCC (Intergovernmental Panel on Climate Change). 2001c. "Climate Change 2001: Mitigation." Contribution of Working Group III to the Third Assessment Report of the IPCC. Cambridge, United Kingdom: Cambridge University Press for IPCC. p. 142.

[37] Gupta and Bhandari 1999; Yamin 1999; Rosa Pinguelli and Kahn Ribeiro 2001; Byrne and Glover 2002; IEA 2002; Winkler and others 2002b; Baumert and Figueres 2003; CAN 2003; Global Environmental Subcommittee 2003; Höhne and others 2003; Willems and Baumert 2003; Ott and others 2004; Sugiyama and Deshun 2004.

[38] "Sink" means any process, activity, or mechanism that removes a greenhouse gas, an aerosol, or a precursor of a greenhouse gas from the atmosphere (UNFCCC 1992, Article 1 Definitions).

[39] GEF (Global Environment Facility. 2004b. "GEF Assistance to Address Adaptation." Paper for the GEF Council, May 19–21. GEF/C.23/Inf.8. Washington, D.C.

[40] See http://unfccc.int/issues/aij.html

[41] Note that Article 6 JI is more restricted in scope than the Activities Implemented Jointly pilot program, because the CDM effectively combined the Brazilian proposal for a Clean Development Fund with the concept of project-based JI. Developing countries cannot participate in JI under Article 6.

[42] See http://carbonfinance.org/cdcf/home.cfm and http://carbonfinance.org/biocarbon/home.cfm.

[43] Another major development in carbon trading, although less relevant to developing countries, is the European Union's Emission Trading Scheme (ETS), which is critical to its plan for achieving its Kyoto targets.

[44] Ellis, J., H. Winkler, and J. Corfee-Morlot. 2004. "CDM: Stock Taking and Looking Forward." Draft for review. Organisation for Economic Co-operation and Development/International Energy Agency, Paris.

[45] Sinha, C. S. 2004. "State and Trends of the Carbon Market 2003." Presentation at South Asia Forum on Clean Development Mechanism. February 2.

[46] "Summary of Negotiations on the Third Replenishment of the GEF Trust Fund," November 2002, para.19

[47] The GEF Business Plans FY04–06, presented to the GEF Council in document GEF/C.21/9.

[48] GEF/C.21/Inf.10, "A Proposed GEF Approach to Adaptation to Climate Change."

[49] GEF/C.21/Inf.11, "Strategic Business Planning; Directions and Targets," Annex 2: Climate Change.

[50] Paragraph 13 in the Summary of negotiations. The GEF-3 targets are based on projected levels of financing of US$529 million, and reflect the cumulative impact of all projects approved during the FY03–06 period, including in most cases replication of the project without GEF input after project completion. An intermediate target was also established: approval of projects to avoid 200 million tons of CO_2 by the end of 2004. Consequently, these targets do not apply to the existing portfolio reviewed by this study.

[51] GEF/C.20/4, "Summary of the Negotiations on the Third Replenishment of the GEF Trust Fund," November 2002.

[52] Beijing Declaration, paragraph 10, and GEF/C.22/11, "Performance-Based Framework for Allocation of GEF Resources," November 2003.

[53] "Joint Summary of the Chairs," GEF Council meeting, May 19–21, 2004.

[54] GEF/C.22/7 of October 2003, Action plan to respond to recommendations for improving GEF's performance.

[55] STAP (Scientific and Technical Advisory Panel. 2004. "Opportunities for Global Gain: Exploiting the Inter-Linkages between the Focal Areas of the GEF." Draft.
[56] GEF/C.22/Inf.9, "The GEF Project Cycle: An Update."
[57] OPS2 recommendation, GEF/C.22/7, Action plan to respond to recommendations for improving GEF's performance.
[58] GEF/C.17/Inf.11, "The GEF Programmatic Approach: Current Understandings."
[59] GEF/C.19/8, Clarifying the roles and responsibilities of the GEF entities.
[60] Speech by the UNDP Administrator, 2003.
[61] World Bank. 2000. "Fuel for Thought."
[62] DP/2004/16, "Annual Report of the Administrator 2003," paragraph 110.
[63] World Bank. 2002. "Promoting Environmental Sustainability in Development: An Evaluation of the World Bank's Performance." Operations Evaluation Department, Washington, D.C.
[64] UNDP Multi-Year Funding Framework/Results-Oriented Annual Report Strategic Goal 3 on Energy and Environment for Sustainable Development; World Bank. 2000. "Fuel for Thought."
[65] World Bank. 2000. "Fuel for Thought."
[66] UNDP Energy policy paper.
[67] Mentioned in World Bank power sector evaluation, environment sector evaluation, the UNDP 2003 Annual Report of the Administrator, and the review of the GEF's private sector engagement (GEF/C.22/Inf.6).
[68] GEF/C.23/11, "Principles for Engaging the Private Sector, May 2004.
[69] The term "project" in this report includes full-size projects (FPs), medium-sized projects (MSPs), and short-term response measures (STRMs). It excludes enabling activities (EAs) and project development facilities (PDFs).
[70] PPR 2003, elapsed time for FY2003: World Bank 795 days, UNDP 370 days, UNEP 391 days.
[71] EAs each have a ceiling of US$450,000. They are here treated as a project type, that is, a time-bound intervention with specific objectives and inputs.
[72] The level of allocated resources is the most appropriate indicator of GEF engagement and prioritization. However, the number of approved projects shows similar trends.
[73] Instrument for the Establishment of the Restructured GEF, May 2004 booklet, Preamble, paragraph 9.
[74] GEF Instrument, paragraphs 9 and 27.
[75] Guiding principle 3 in the GEF Operational Strategy, 1996.
[76] GEF Operational Strategy, 1996, Chapter 1.
[77] GEF/C.22/11, Performance-based framework for allocation of GEF resources, October 2003.
[78] Within each region, the largest contributors to CO_2 emissions are shown separately from their regional totals to illustrate where interventions and replication have the potential to yield greater effect on global environmental benefits.
[79] GEF Instrument, Annex D.
[80] The two types of EAs—for national communications and add-on funds for capacity building—are recorded in the Project Management Information System as separate initiatives and therefore are presented as such in this report. The IAs, in practice, manage these as interconnected activities in the same country.
[81] The four regional development banks (ADB, African Development Bank, EBRD, IADB), Food and Agriculture Organization, United Nations Industrial Development Corporation, International Fund for Agricultural Development.
[82] These agencies can now directly access funds for PDF-A grants for the development of eligible concepts. Two (ADB, IADB) also have direct access to MSP and FP funds. (GEF/C.22/12, Review of experience with executing agencies under expanded opportunities, October 2003).
[83] The amounts for future projects not yet approved, including those with PDFs and pipeline projects, may differ once they are approved. The table shows amounts tentatively earmarked in the GEF Project Management Information System as of the end of April 2004.
[84] Excludes EAs.
[85] Financial ceilings for PDFs range from US$25,000 for PDF-A, US$350,000 for PDF-B in single countries for projects having entered the GEF pipeline, and up to US$1 million for PDF-C for technical design and feasibility work for large projects.
[86] Analysis of GEF Council approval of PDF-A (56) and PDF-B/C (83) since 1995 to November 2003. The assessment is a low estimate, because PDF titles and actual project titles at times differ, and some PDFs were not matched to a project.
[87] The World Bank GEF Coordination Unit has recently commissioned the first ex-post evaluations of four GEF/World Bank EE projects. This is a commendable initiative that will yield more lessons learned on impacts and sustainability.
[88] One project with an improbable estimated reduction was eliminated from the impact calculation, leaving a group of 27 projects that together form the basis of the CO_2 calculations for closed projects. Alternative transport occupies a small space in the portfolio with only two projects, but neither had CO_2 data, which effectively removed the cluster from the impact calculation.
[89] A brief description of project clusters is included in annex A.

[90] "Impact Assessment: Poland Efficient Lighting project (PELP): Final Report" September 2004.

[91] These figures look less attractive when total co-financing is included in the calculation. For example, co-financing by IAs in the 24 closed projects amounted to 10 times the GEF grants. On this basis, average direct project abatement costs for these projects work out at US$81 per metric ton carbon or US$32 per metric ton carbon including replication effects. However, great caution should be attached to the interpretation of these figures because the types of IA financing differ greatly between projects and not all co-financing is directed to abatement.

[92] Developed using the World Bank Institute Knowledge Assessment Methodology (KAM), which is designed to help client countries understand their strengths and weaknesses in making the transition to the knowledge economy. The methodology consists of a set of 76 structural and qualitative variables that serve as proxies for four pillars that are critical to the development of a knowledge economy. The comparison is undertaken for a group of 121 countries, which includes most of the developed OECD economies and about 90 developing countries.

[93] The GEF EE products portfolio, June 2002.

[94] The World Bank has taken the initiative to commission ex-post impact studies for a sample of four closed EE projects in this cluster. Findings will be ready by the end of November 2004.

[95] UNDP (United Nations Development Programme. 2004. "Solar Photovoltaics in Africa: Experiences with Financing and Delivery Models," p. 34.

[96] Survey by Zimbabwe Department of Energy/Energy Sector Management Assistance Program.

[97] GEF Operational Strategy, chapter 3, 1996.

[98] GEF Business Plan FY04–06 (GEF/C.21/9), April 9, 2003.

[99] Ibid.

[100] This review relies, in part, on the superb World Bank GEF *Energy Efficiency Portfolio Review and Practitioners Handbook* prepared by Jas Singh in January 2004.

[101] More than US$200 million in GEF funds have been allocated to PV projects, half of which are in Africa.

[102] Recent studies/reports have provided valuable overviews categorizations of the range of PV business models and financing schemes that have been employed internationally. "The GEF Solar PV Portfolio: Emerging Experience and Lessons," GEF Monitoring and Evaluation Working Paper 2, August 2000. "Summary of Models for the Implementation of Photovoltaic Solar Home Systems in Developing Countries," Report IEA-PVPS T9-02:2003. "Financing Mechanisms for Solar Home Systems in Developing Counties," Report IEA-PVPS T9-01:2002. "Solar Photovoltaics in Africa: Experience with Financing and Delivery models," UNDP Monitoring and Evaluation Report Series – Issue 2, 2004.

[103] GEF/C.21/Inf.11, April 2003, GEF Strategic Planning and Targets.

[104] GEF/C.23/Inf.16, May 2004, Reducing the long term costs of low greenhouse gas-emitting energy technologies.

[105] GEF/C.23/Inf.9, April 22, 2004," Solar Thermal Portfolio: A Status Report (by the World Bank).

[106] Case Study, OPS2.

[107] GEF/C.23/Inf.9, April 22, 2004, "Solar Thermal Portfolio: A Status Report" (by the World Bank), and STAP review.

[108] OP11, GEF Council, June 21, 2001.

[109] UNEP data, 2004.

[110] GEF/UNDP Fuel-Cell Bus Programme: Update, GEF Council, May 2004.

[111] Technical paper on the range and effectiveness of capacity building in developing countries relating to decision 2/CP.7, UNFCCC/Groupe-Conseil Baastel Ltée, April 2004.

[112] A log scale gives a "compressed" picture of useful values between xmin and xmax suitable for use as tick mark positions on a logarithmic scale. An actual size scale would show more dispersion. Figure 4.9 includes all long-term mitigation and STRM projects, closed, active, and future, but excludes funds for EAs. A quartile is one of the four divisions of observations that have been grouped into four equal-sized sets based on their statistical rank. The quartile including the top statistical ranked members is called the first quartile.

[113] GEF Replenishment negotiation, November 2002, paragraphs 17–18, and the 2003 Project Performance Report.

[114] This includes countries with current or future projects. The countries without GEF country-specific projects are: Angola, Liberia, Somalia, Afghanistan, Myanmar, Estonia, Turkey, Iraq, United Arab Emirates, and West Bank and Gaza.

[115] The study uses the standard grouping of low income (US$735 or less GNI per capita), middle income (US$736–US$9,075), and high income (US$9,076 or more).

[116] Analysis of the effectiveness of GEF enabling activities in developing national communications and building capacity requires a different framework than mitigation projects, and was not a key scope of this study. A separate, in-depth review of EAs, particularly on qualitative aspects and use of national communications, may be useful in the future, to complement the most recent review of climate change EAs that focused on process issues.

[117] The CCPS2 conducted a review of the content of national communications for sample countries that have received considerable GEF funds or rank high on GHG emissions: Indonesia, the Philippines, Sri Lanka, Morocco, Egypt, Poland, Mexico, Uganda, and Russia.

[118] Countries with EAs but for which national communications are not yet completed include China, India, Brazil, Bahrain, Libya, Saudi Arabia, Bosnia and Herzegovina (pending), Serbia, United Arab Emirates, Zambia, Venezuela, Cameroon, Gabon, Guinea Bissau, São Tomé and Principe, Nepal, Rwanda, Sierra Leone, Malta, Mozambique, Oman, Suriname, and Tonga.
[119] World Bank Country Assistance Strategy, UNDP Country Program Outline, or Country Cooperation Framework.
[120] World Bank. 2002. "Promoting Environmental Sustainability in Development: An Evaluation of the World Bank's Performance." Operations Evaluation Department, Washington, D.C.
[121] GEF Secretariat. 2004. "Programmatic Approaches in the Climate Change Focal Area." Internal paper.
[122] WB 2002 evaluation and four donors environmental aid program evaluations: Norway, 1995; Denmark, 1996; Finland, 1999; and the United Kingdom, 1999.
[123] GEF Business Plan FY04–06 (GEF/C.21/9), April 9, 2003.
[124] GEF/C.21/Inf.11.