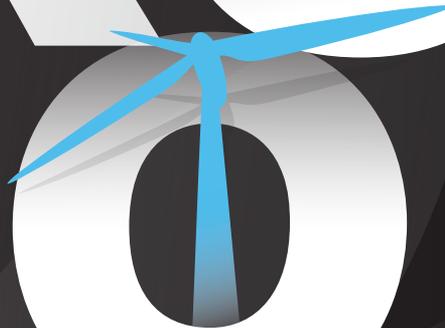


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**A 20-YEAR JOURNEY
TO GREEN
THE WORLD'S ECONOMIES**

FROM RIO TO RIO

A 20-YEAR JOURNEY
TO GREEN THE WORLD'S ECONOMIES

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149, 190, 192

Associated Press: 49, 127,

182, 185, 189, 198, 205

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GEF: xviii, 2, 12, 18-19, 25, 36,

57 (bottom), 62, 65, 66, 68, 69,

70, 75, 79, 85, 97, 119, 120,

122, 125, 126, 155 (bottom

left), 165, 172, 174-175, 176,

180-181, 187, 195

Getty images: vi, xii, xxiv, 15,

29, 97 (top left), 98-99, 112,

129, 147, 157

Lawrence Hislop, www.grida.no/photolib/detail/township-nearby-the-himalayas_76ce.aspx: 4-5

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Minden Pictures: xxvi, 22

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50, 59, 89, 90, 158, 167

Reuters: 77

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xxiii, 27, 28, 60-61, 72, 80, 102,

105, 107, 109, 114-115, 118,

132, 150, 152, 177, 179, 197,

200-201, 202, 208-209, 214

Stock.XCHNG: 108

Art Wolfe: 110, 162

The World Bank: xvi, xx, 7,

8-9, 35, 38-39, 40, 42, 52, 57

(top), 82, 87, 92, 95, 97 (top

right), 117, 137, 155 (top &

bottom right), 159, 169, 199

Contents

PRESENTATION V

FOREWORD ix

INTRODUCTION xix

CHAPTER 1 **THE ROOTS OF THE GREEN ECONOMY 3**

CHAPTER 2 **CHANGING THE PARADIGM IN THE CONGO BASIN 13**

CHAPTER 3 **FORESTS FOR LIFE 23**

CHAPTER 4 **VILLAGE POWER 33**

CHAPTER 5 **ENERGY EFFICIENCY, RENEWABLE ENERGY, AND CLIMATE CHANGE 43**

CHAPTER 6 **AS EASY, ALMOST, AS CHANGING A LIGHT BULB 53**

CHAPTER 7 **REVIVING THE DANUBE 63**

CHAPTER 8 **DEFUSING A TICKING TIME BOMB IN MOLDOVA 73**

CHAPTER 9 **SMALL GRANTS, BIG RESULTS 83**

CHAPTER 10 **FLOWER VALLEY 93**

CHAPTER 11 **NATIONAL PARKS AND THE NEW ECONOMY 103**

CHAPTER 12 **PROTECTED AREAS AND MORE IN THE AMAZON 113**

CHAPTER 13 **CONSERVATION AND DEVELOPMENT IN THE CORAL TRIANGLE 123**

CHAPTER 14 **THE BENGUELA CURRENT 133**

CHAPTER 15 **IN THE LAND OF THE PATAGONES 143**

CHAPTER 16 **BUILDING RESILIENCE IN NIGER 153**

CHAPTER 17 **INTEGRATED ECOSYSTEM MANAGEMENT IN CHINA 163**

CHAPTER 18 **AVERTING A HIMALAYAN TSUNAMI 173**

CHAPTER 19 **FIGHTING CLIMATE CHANGE WITH NEW REFRIGERATORS 183**

CHAPTER 20 **FINDING ALTERNATIVES TO DDT 193**

CONCLUSION 203

ABOUT THE GLOBAL ENVIRONMENT FACILITY 210



Kalahari Desert, Namibia

PRESENTATION



Izabella Mônica Vieira Teixeira

Minister of the Environment, Brazil

The year 2012 marks the twentieth anniversary of the United Nations Conference on Environment and Development, which ushered in the cycle of major United Nations conferences that produced a lasting impact. This cycle of conferences left their mark on the last decade through the international agreements reached and the great legitimacy conferred on a series of principles, strategies, and programs related to issues of key importance to humanity, such as human rights, gender equality, combating racism and, most importantly, the promotion of sustainable development. The lasting impact mentioned above, which confers tremendous importance on the Earth Summit, was its ability to lay the legal and conceptual groundwork in Rio de Janeiro for a development model centered around three pillars of sustainability, which are enshrined in the Rio Declaration and three conventions. The United Nations Conference on Sustainable Development, also known as Rio+20, continues this important historic legacy by outlining the path agreed upon in the quest for solutions aimed at growth, inclusion, and protection.

The creation of the Global Environment Facility (GEF) was in line with the approach of joining forces in a bid to achieve a more sustainable environment, with emphasis on support for environmental projects. As a financing mechanism for the three conventions arising from Rio 92, the GEF has complemented the other mechanisms used by

developing countries to achieve the objectives set forth in the aforementioned conventions.

From the outset, a solid partnership was forged between the GEF and Brazil. The Brazilian portfolio includes initiatives related to biodiversity, climate change, land degradation, international waters, and persistent organic pollutants, among others. Under the umbrella of the current GEF System for the Transparent Allocation of Resources (STAR/GEF-5), Brazilian projects focused on biodiversity, climate change, and land degradation, with benefits accruing to government entities, non-governmental organizations, and Brazilian civil society. Total contributions to Brazil stand at US\$337,435,654, with an additional amount of nearly US\$1 billion provided in the form of co-financing.

While important partnerships have been forged with the GEF, the most sizeable GEF contributions to Brazil have been in the area of biodiversity. Brazil embraced the challenge of maintaining its legacy as the world's biggest repository and provider of biodiversity and, with the assistance of the GEF, sought new and additional financial resources to achieve the objectives of conserving its biological resources and adopting measures to ensure their sustainable use.

For megadiverse developing countries, which are the main providers of genetic resources, international cooperation,



Brazilian Amazon

including South-South cooperation, is of critical importance to efforts to move forward with biodiversity conservation activities by helping mobilize the necessary financial, human, and technical resources. In recent decades, the GEF has been providing assistance aimed at reducing the significant deficit in the implementation measures adopted by the international community to address the challenges identified, and has been striving to modify its structure to meet

the commitments assumed under Rio 92 and the conventions bearing the name of this Brazilian city.

In Brazil, the GEF has been a valuable partner in the execution of the Amazon Region Protected Areas (ARPA) Program, the biggest tropical forest conservation program in the world. And it includes objectives set forth in the three aforementioned conventions. Its activities cover 43 percent of the Amazon biome and play a decisive role in the conservation of forest areas, thereby contributing to biodiversity preservation and to reduced deforestation, and thus to lower levels of greenhouse gas emissions. Sixty-four federal and state conservation units (CUs) (32 million protected hectares) have been created or strengthened. Of this amount, the program supported the creation of 46 conservation units, with 14 being integral protection conservation units and 32, sustainable use conservation units. The program further assisted with the strengthening of 18 integral conservation units covering an area of 8.5 million hectares.

The ARPA program is being implemented in three phases. Phase I ended in 2003 and Phase II is currently underway. During Phase I of the program, total contributions amounted to close to US\$115 million, with roughly US\$79 million coming from direct and indirect investment by the Brazilian Government and donors, and nearly US\$36 million from the Protected Areas Fund [*Fundo de Áreas Protegidas* FAP]. The GEF contributed US\$30 million to Phase I, US\$14.5 million of which was allocated to the FAP and US\$15.5 million, to direct investment in the conservation units supported by the program. The GEF contribution to Phase II stands at US\$15.89 million.

The GEF is also providing assistance with such programs as the Sustainable Cerrado Initiative, which has had a very positive impact on biodiversity conservation at this location, the second largest biome in Brazil. It recently approved the Marine and Coastal Protected Areas Program and thus directly strengthened Brazil's program in the area of marine biodiversity, whose richness and importance parallel its land ecosystems, through a contribution of over US\$20 million, for which an additional US\$70 million has already been provided in the form of counterpart funding from the business sector. This project includes components aimed at expanding the system and designing income-generating

mechanisms for families that depend on the biodiversity conservation units.

Brazil is hoping to receive further assistance from the GEF, given the new projects already submitted such as the proposal to strengthen the National System of Conservation Units [SNUCs] and restore the Paraíba do Sul River basin. In addition, Brazil is developing new initiatives and proposals for submission to the GEF, in keeping with current allocation projections for the country, and is considering further rehabilitation efforts targeting land degradation, the implementation of benefit-sharing arrangements, and biosafety actions. These projects strengthen the impact of Brazilian initiatives to adopt and achieve the Aichi targets, thus guaranteeing equitable economic growth and effectively reducing the rates of biodiversity loss.

Twenty years after the Earth Summit, we are meeting in Rio de Janeiro once more to forge new international agreements aimed at ensuring the sustainability of our planet. We stand before a society that is more keenly aware of the challenges to be addressed in order to make the necessary transition to sustainable production and consumption

patterns. Although much progress has been made since 1992, we are now undoubtedly at a critical juncture and need to act with a sense of urgency to craft new economic development models that allow for a significant reduction in greenhouse gas emissions, the reversal of biodiversity loss, and measures to combat desertification processes.

I am confident that this quest to make our economies more sustainable will receive international support and assistance, and that this effort, so important for humanity as a whole, can be waged the world over, without exception and with a generosity of spirit driven by the vision of a shared future. We must be cognizant that the role of international cooperation in facilitating the implementation of global agreements remains critical and that the entities enabling such cooperation are key forces that collectively drive this transition process. Financing agencies and funds such as the GEF can and should support government actions aimed at harmonizing policies that seek to leave present and future generations with a more sustainable planet. In this regard, the GEF can play a leading role by helping countries foster the changes sought to create a more just, united, and environmentally sustainable world.

Born in Brasília, Brazil, Izabella Teixeira is a biologist and holds a Master's Degree in Energy Planning and a Doctorate in Environmental Planning at COPPE/UFRJ. She has also worked as a professor at MBA and at environmental courses in different universities — she is an expert in strategic environmental assessment. From 2007 to 2008, Izabella Teixeira was the Deputy-Secretary of the Environment at the State Government of Rio de Janeiro until she was nominated for the position of Deputy-Minister of the Environment in Brazil. In May 2010 she was appointed Minister of the Environment and in January 2011 she has been reappointed to that position by the new President of Brazil.



KwaZulu-Natal Province, South Africa

FOREWORD



Naoko Ishii

CEO and Chairperson, Global Environment Facility

I became CEO of the GEF in August of 2012, two months after the first edition of this book was published in conjunction with the Rio+20 conference marking the 20th anniversary of the Earth Summit. Both the book and the return to Rio celebrated significant accomplishments in advancing the agenda of sustainable development and ensuring a strong linkage between the environment and economic growth. All of us gathered in Rio were very clear about one thing: We were there to celebrate progress, not success. We looked back on what has been done to address environmental issues not by way of congratulating ourselves, but in order to better grasp what works, what doesn't, how to improve, and where best to focus our energies.

This is how I view the stories in *From Rio to Rio: A 20-Year Journey to Green the World's Economies*. In the work we did with 19 nations of the Danube River Basin that brought a huge portion of the western Black Sea back to life, in our efforts to introduce energy-efficient refrigerators in China, in the innovative campaign to protect the ocean ecosystems of the Coral Triangle off Malaysia, Indonesia, and the Philippines, and in our support for the significant effort to protect huge areas of the Amazon Basin, GEF has built up a major repository of experience. GEF projects and programs have increasingly demonstrated the effectiveness of integrated and multi-sectoral approaches to conserve and sustainably use resources while maximizing global environmental benefits.

This history of the GEF is written in story form rather than in the language of a technical institutional paper because one of our most urgent tasks is to build the broadest possible understanding of the severity of the threats to our planet, an understanding that reaches beyond environment ministries and international institutions to the private sector and communities—from remote villages to major cities. By highlighting some of the progress we have made in tackling seemingly intractable problems, we hope to generate support for significant continued investment to ensure the sustainable use of the earth's natural assets such as fresh water, clean air, forests, and fisheries. We relate our experience to help solidify a global consensus for bold action required to prevent irreversible degradation of the earth and achieve sustainable development. Viewed through this lens, the "costs" incurred through support for projects to address climate change, threats to biodiversity, desertification, chemical pollution, and the decline of ocean environments emerge as "investments" that we know will pay substantial returns.

The 183 member nations of the Global Environment Facility represent a powerful coalition in support of urgent action to reverse the environmental decline of our planet. As an international institution, we benefit from the sum total of our collective experience in addressing environmental issues, and we gain strength from our combined determination to build a better, more sustainable planet in which the links between

environmental health and socio-economic development guide our actions. To succeed in achieving a thriving, sustainable world we will need to build on our experience by applying the lessons learned over the first two decades of the GEF to environmental threats that grow no less daunting with time. That is why the stories in this volume are much more than a nostalgia trip. By carefully evaluating our past efforts we can better understand what works and what doesn't as we build strategies for delivering global environmental benefits over the next 20 years.

The knowledge gained in these and other projects, the ability to mobilize complex local, national, regional, and international coalitions, the understanding of the interrelationships between seemingly separate environmental threats—all these qualities I regard as a strong foundation on which to build over the next 20 years. The GEF has accumulated an invaluable body of experience and knowledge, a strong culture of promoting innovation, an expanding network of agencies, and a high degree of legitimacy earned by competently serving the world's major multilateral environmental conventions.

Our experience puts the GEF in a strong position going forward, and we will need all of that strength, for the environmental threats we face are as urgent as at any time in human history. In spite of the prodigious efforts of the international community to date, we are collectively failing to reverse the damage we are doing to the global commons—the air, land, and water on which our lives depend. In several key areas such as global fisheries, megafauna such as elephants and rhinos, and coral reefs which are the nursery of global fisheries, we are rapidly approaching the point where the damage may be irreversible. Our failure to check the rise of global temperatures threatens fundamental global environmental impacts.

We have already reached or exceeded the carrying capacity of several of the earth's ecosystems. And the pressure is not easing up. The next decade will likely see world population grow by 700 million. An estimated 50 percent growth in economic output will expand the ranks of middle-class consumers by as much as one billion. There is a curious coincidence with the number 700 million, for that is the same number of people who, according to research by the Stockholm Resilience Centre, could be displaced by climate-driven water scarcity in the coming decades. These kinds of tectonic shifts in our

environment have led biologist Eugene Stoermer to label the current epoch dating to the beginning of the Industrial Revolution the "Anthropocene," conveying the profound impact of human activity on planetary conditions.

This is why I am urging that the next chapter in the GEF's history focus on further leveraging our role as a partner of choice in the global environmental leadership. My vision for GEF is to be a champion of the global environment by creating partnerships and strategically investing in solutions that address the underlying drivers of global environmental degradation. We need to proactively address the root causes of environmental degradation. And we need to innovate and seek to achieve impacts at scale by stimulating policy, market, and behavioural transformations. We will use the convening power of the GEF, in concert with our partners, to ensure that all key actors—from local communities to national governments, the private sector, civil society organizations, and indigenous peoples—recognize the part they must play in finding and implementing solutions.

There can be no separation between development and environment. Healthy ecosystems are essential to secure human health, food, energy, water, and ultimately sustainable development. Surprisingly, this idea has yet to be fully embraced. Our job is to make sure we don't learn this lesson the hard way.

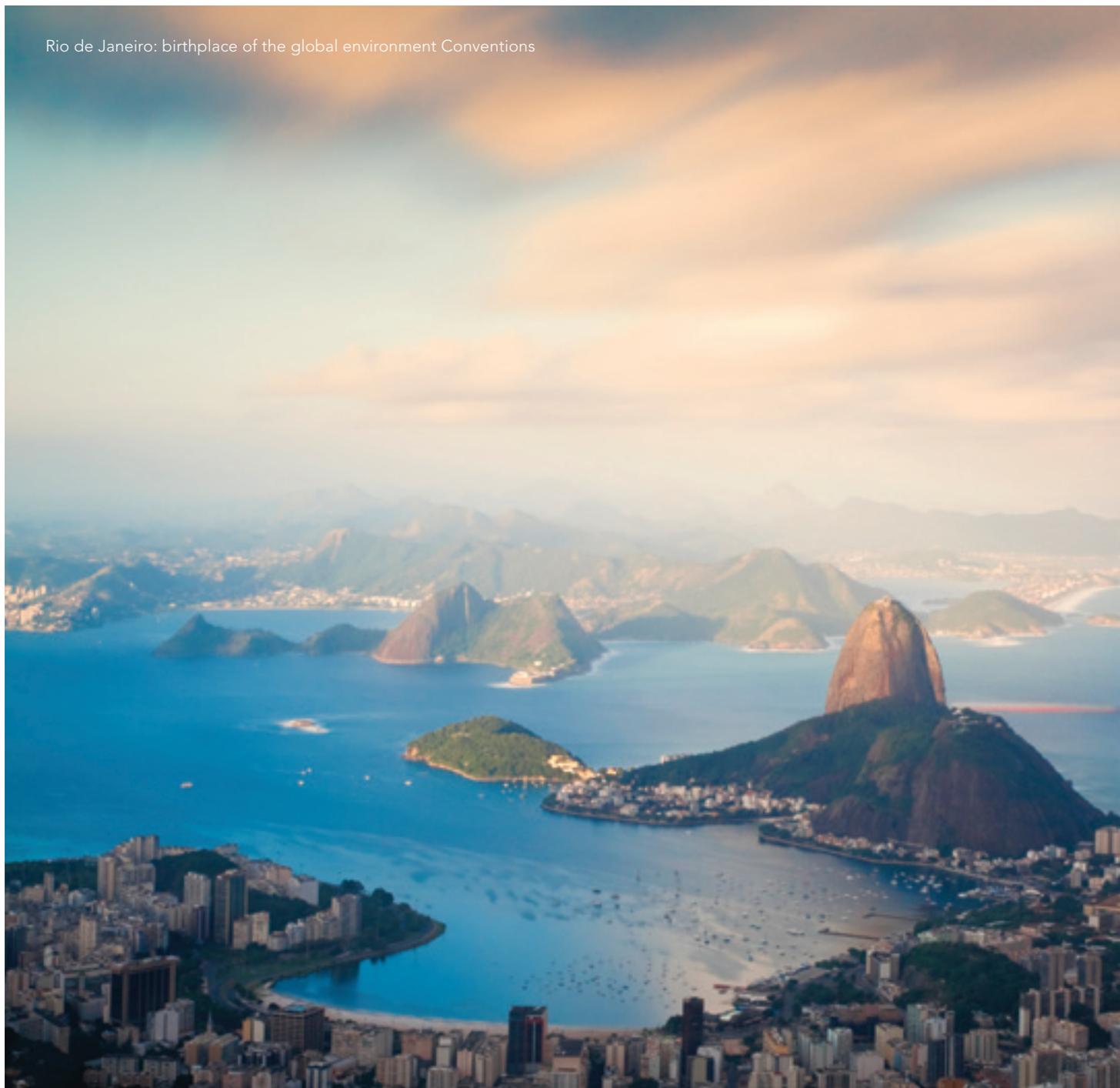
The first important steps toward these goals are being taken now as GEF embarks on its next four-year funding cycle, GEF-6. We need to skillfully manage our resources, carefully target our efforts, get the most out of every dollar invested, foster innovation for new approaches to stubborn problems, and bring together coalitions whose combined efforts add up to much more than the sum of their parts. Leverage, convening power, and innovation will be essential to creating the critical mass needed to achieve sustaining impacts at scale and turn around the worrisome trends in the global environment.

Following the highly successful conclusion of the GEF-6 replenishment, the entire GEF partnership is energized to begin implementation of the GEF-6 work program. In addition to our responsibilities today for supporting efforts to address climate change, biodiversity, forests, land degradation,



Guilin, China

Rio de Janeiro: birthplace of the global environment Conventions





desertification, chemical pollutants, and international waters, we will be financing projects under the new Minamata Convention on Mercury, opened for signature in Japan in the fall of 2013.

Among a number of innovations contained in GEF-6, we will be launching new “Integrated Approaches” aimed at some of the underlying drivers of environmental degradation globally and within priority regions. Implemented as pilot programs, the Integrated Approaches will complement GEF focal area strategies supporting the major environmental treaties. Underlying the Integrated Approaches is the recognition that taking on environmental issues one sector at a time will not reverse some of the most worrisome trends in the global environment before they become irreversible, or too costly to address. A cross-cutting approach is critical. Some examples are: Taking Deforestation out of Commodity Supply Chains; Sustainable Cities—Harnessing Local Action for Global Commons; and Fostering Sustainability and Resilience for Food Security in Sub-Saharan Africa. Ultimately, we aim to encourage early adoption and scale-up of projects and programs to break down the artificial silos that separate the focal areas and build on the linkages that help achieve sustainable development goals.

As head of a global environmental financing organization, I would be the last person to say that money is not an important part of addressing environmental threats and building a sustainable future. Certainly as the global economy emerges from a protracted downturn, economic growth, even as it imposes new environmental stresses, will also generate resources to strengthen combined efforts to make growth sustainable. But when I ask myself “What does the GEF really bring to the table in terms of addressing global environmental issues?” I think not only of dollars but also of experience—the kind of experience represented in the *Rio to Rio* story, and in the story we hope to write in the years ahead.



Ngala Private Game Reserve,
South Africa





Wind turbine farm, Tunisia

GEF

GEF has matured into a potentially powerful pathway towards sustainable development.”

GEF is an innovative experiment in leveraging the mandates, expertise and structures of three major multilateral institutions — the UN Development Programme, the UN Environment Programme and the World Bank — and now includes more members of the UN system and Regional Development Banks seeking to integrate environmental goals into their regular programmes. Drawing in a wider partnership of development actors, both public and private, has contributed to mainstreaming of global environmental goals. The Partnership has weathered institutional stresses during its growth phase, especially as it adapted to the Paris Declaration and other global decisions for improving development aid, but its impact on the ground remains strong and significant. The Multilateral Partnership is critical for the GEF’s ability to remain relevant, transparent, efficient and effective.

20 years after the start of that experiment, and through the successive visions of three eminent CEOs, the GEF has matured into a potentially powerful pathway towards sustainable development. As the only GEF Implementing Agency whose core business is the environment, UNEP has supported the GEF at the strategic level, and enhanced its scientific rigor by hosting its Scientific and Technical Advisory Panel, as well as assisted over 142 countries to access over \$1 billion grant financing that has leverage a further \$1.3 billion in co-financing.

Since 2008, UNEP has led a collaborative process involving numerous organizations and individuals on the greening of economies, in a manner that is people- and planet-centered, promoting inclusive growth, the creation of decent jobs, leading to greater equity in the distribution of benefits and enhancement of social protection, and sustaining environmental resources and services. As the first case study in this book shows, GEF co-financing of the Millennium Ecosystem Assessment has played a catalytic role in this process, laying the foundation for countries to achieve the transition to green economies.

In the coming decade, GEF and UNEP working together can contribute to achieving this vision. Jointly they can ensure a better alignment of global environmental policy-making with global environmental financing, and strengthen a global collaborative effort to secure sufficient, predictable and coherent funding for global environmental challenges.

Achim Steiner

UN Under Secretary General and UNEP Executive Director



Open air tannery, Bangladesh

From Rio to Rio: A 20-year Journey to Green the World's Economies

On April 30th, 1992, a Thursday, the morning headlines described a world in transition.

Heavy fighting raged in Bosnia, despite attempts to negotiate a cease-fire. Kabul descended into chaos following the fall of the Najibullah government, the last vestige of Soviet influence in Afghanistan. Riots broke out across Los Angeles after a jury acquitted four white police officers in the video-taped beating of an African-American man named Rodney King.

Largely lost amid the news of war and riots, the United Nations Population Division issued a warning. After revising upward its forecasts for world population growth, the U.N. called for an immediate and sustained program to curb the expansion. It said such action was needed to reduce poverty and hunger and to protect the earth's natural resources. In April, 1992, the world population stood at approximately 5.5 billion. In the 20 years since, the human population has grown by more than 25 percent and as of 2012 stood at just over 7 billion.

Over those two decades, as the population grew, so did an understanding that the development path laid out in the middle of the 20th Century was no longer sustainable. By the first years of the 21st century, humanity's total ecological

footprint was estimated at 1.4 planet Earths. In other words, by one reckoning, humanity is consuming ecological services faster than Earth can renew them.

The message could not be clearer: We need to rebalance the goals of environment and development, and do so urgently. So the debate over what an alternative development path should look like, which began in earnest at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, continues to rage with undiminished passion and relevance. But it is a debate that is shifting in the direction of a greater understanding that environmental protection and economic growth are not opposing ambitions, they are, in fact, co-dependent.

The issues of sustainability, poverty eradication, food and energy security, climate change, and biodiversity conservation dominated the agenda at the first Rio conference. That they remain high on the agenda now testifies not to a lack of progress but to the depths of the challenges those issues represent. The past two decades have seen significant achievements in some areas, though not always fast enough or of sufficient scale to keep pace with global changes. Nevertheless, our understanding of the causes of environmental and economic ills, the links between them, and the shape of lasting solutions has become far more sophisticated.

In April, 1992, the terms routinely used today to describe and argue about the global environment were just being coined. While negotiators were drafting what would become the United Nations Framework Convention on Climate Change, ideas about CO₂ emissions and rising sea levels were only beginning to enter the common parlance. “Biodiversity” was still a new word to most people, even as the Convention on Biological Diversity was also nearing completion. Few people knew what “desertification” meant and fewer still understood it as a looming problem that required international action.

The U.N. warning about population growth was not the only global milestone to go largely unnoticed on April 30th, 1992. On that day, representatives of governments from the developed and developing worlds, meeting in Washington, D.C., agreed to restructure a pilot program begun within the World Bank the previous year called the Global Environment Facility, or the GEF. With international treaties on climate

change and biodiversity to be finalized in less than two months in Rio de Janeiro, the financial burden on developing nations would only grow. A new and robust financing mechanism was clearly needed.

The negotiators conferred that role upon the GEF, but only after vigorous debate. Donor nations — the developed country governments negotiating the biodiversity and climate change conventions — insisted that a modified GEF functionally independent of the World Bank was the only option for helping developing countries meet their obligations under the conventions. Unless the GEF was designated as the financing mechanism, they warned, there would be no global environmental conventions signed at Rio.

Thus the fully-fledged GEF was born — in an atmosphere of debate and controversy but also of determination and innovation. While the debates have continued since that spring of 1992, governments, businesses, and civil society



are converging towards a broad consensus regarding the need to create green jobs and build a green economy — one that improves human well-being while protecting the global commons by reducing environmental risks and ecological scarcities.

The defining feature of the GEF began to take shape in the earliest days following the agreement on the restructured organization. The central concern, then as now, was how to assist developing countries in fulfilling their commitments to the Rio Conventions to protect the global commons. This concern formed itself into a question: Where will the funding come from when a developing country bears the costs for environmental protection but the benefits accrue not just to the country but to the entire global community? From this question came the idea of incremental costs, a unique but often misunderstood feature of the GEF. A consensus arose that the GEF should fund the additional, or incremental costs associated with transforming a project with national benefits into one with global environmental benefits. As an example, choosing solar energy technology over coal or diesel fuel could meet the power generation needs of the host nation, but the use of clean technology would cost more. GEF grants would cover the difference or “increment” between a less costly, more polluting option and a costlier, more environmentally friendly option. No other funding mechanism has taken on this challenge, and it remains a vital part of global efforts for sustainable development.

The participants in the GEF agreed in 1992 that the Facility would fund incremental costs in four focal areas — climate change mitigation, biodiversity, international waters, and ozone depletion — and would function as the funding mechanism for global environmental conventions. The GEF was designed to be cost effective, consistent with national priorities, and accountable for its activities. Uniquely as well, donor countries participate in GEF’s governing body through their respective finance ministries rather than through their representatives coming from sectoral ministries such as agriculture or environment. This formula has helped ensure that the Facility is still running strong 20 years after its founding.

These principles, set out in the cautious, process-oriented language that complex international agreements demand,

can obscure more than they reveal. Had an interested but untrained observer obtained and read a copy of the April 1992 document creating the new GEF (such texts were hard to come by in those days before Google and instant access to information — no newspapers reported on it, there was no news conference or press release), they may have missed the most salient fact: The GEF was, and remains, an experiment, something brand new in the way the governments of the world manage our most vital shared resource, the Earth and its natural heritage.

As with any experiment, or series of experiments, the GEF has had successes and failures, and over the past twenty years, through aggressive real-time evaluation of its projects, it has sought to learn from both. Today the GEF is the world’s leading public financial fund dedicated to smart, environmentally sound choices that boost local economies and protect the planet. The GEF has invested almost US\$10.5 billion, almost entirely in the form of grants, augmented by about US\$51 billion in co-financing, for 2,700 projects in 165 developing countries and countries with economies in transition, spanning 5 continents.

Even such impressive figures tell less than the full story. The compelling narrative of the GEF lies not in its history but in its potential for the future. The chapters that follow explore 20 projects from the first 20 years of the GEF, not as a retrospective exercise but as an exploration of how the institution can continue to address global problems through tangible, local solutions and can help spread the seeds of a new economy.

To understand that potential one must understand and appreciate the ongoing evolution of the GEF and its approaches to biodiversity conservation, development, sustainability, climate change mitigation and adaptation, land degradation, pollution control, and the myriad other areas of concern. The purpose of this book is to document that evolution by exploring in detail some of the most salient experiences of the past two decades at the GEF.

The evolution of the GEF since its inception has not occurred in isolation, but rather as a result of its deep and extensive connections to the worlds of international conservation and development. The GEF is intertwined not only

with the two conventions that were signed at the first Rio conference, but the two that have followed since — the United Nations Convention on Combating Desertification (UNCCD) and the Stockholm Convention on Persistent Organic Pollutants — and the GEF is still the only financing facility to serve that role for multiple conventions. The GEF is connected as well to ten agencies, 182 national governments, hundreds of national ministries and departments, and hundreds more NGOs. These multiple responsibilities have created in the GEF a deep appreciation of the interrelationship of various environmental sectors, the ways in which, for example, programs on climate change mitigation and biodiversity, or on international waters and reduction in pollutants, complement one another.

The evolution of the GEF mirrors that of the community it serves, across conventions and across sectors. This is the story the following chapter will tell, not as chronology of events but as the growth and application of a set of ideas about conservation and sustainable development, the movement from general principles and global imperatives to specific and tangible projects with real impact on people's lives and livelihoods.

The story thus begins with the roots of our understanding of how profoundly human health and well being depend on healthy ecosystems, and of the limits to which we can exploit those systems before they collapse. That understanding has led to new ways of thinking about how to design and implement both broad programs and focused national efforts. The pattern can be seen across the GEF's work in biodiversity, sustainable forestry, climate change, international waters, and persistent organic pollutants: translating international consensus into fundable efforts. The examples here, drawn from varied geographies and focal areas, work at various scales and reflect a commitment to proven strategies like protected areas and a willingness to test new approaches to new challenges, such as land degradation, transboundary waters, and climate adaptation.

Throughout its history, the GEF has sought to address environmental threats while improving human well-being and social equity. The GEF was the prime financial driver behind the Millennium Ecosystem Assessment (Chapter 1), which for the first time brought wide attention and solid evidence

to the idea that nearly all human activity depends on the services such as flood protection and climate regulation that nature provides. The Millennium Ecosystem Assessment laid the foundation for the Green Economy, and helped shape the GEF's evolution as well, particularly the need to deal with ecosystems in an integrated way (see Chapter 2 on the Congo Basin Programme and Chapter 10 on the Agulhas Biodiversity Initiative), and the need to consider people in all environmental projects.

The projects described here illustrate how GEF's experience in the field has led to innovative approaches to working at multiple scales to provide multiple benefits to both people and nature. For example, GEF's program in Sustainable Forest Management (Chapter 3) works from local to global levels to promote improved forest management to maintain rich biodiversity, to protect carbon stocks by preventing deforestation, and to meet the pressing needs of forest-dependent communities. The sophistication of that program is the result of the growing international recognition of the importance of forests in the provision of various benefits (some 18 percent of all carbon emissions that contribute to global warming come from deforestation), as well as years of experiments in the field. Some of those experiments, such as those under the GEF Small Grants Programme, have been inexpensive and local, but they have made compelling contributions nonetheless (Chapter 9). The GEF's ability and mandate to work across scales gives it the potential to continue developing new methods that fit global imperatives as well as local realities.

The GEF has long been committed to helping communities and nations find their way to a low-carbon, resource efficient future, as seen in energy efficiency and renewable energy projects like those in Bangladesh (Chapter 4), China (Chapters 5 and 19), and Poland (Chapter 6). Perhaps the clearest sign of the GEF's evolution also relates to its climate work. While the need to mitigate the causes of climate change was apparent from the inception of the GEF, the urgency of adapting to its effects is far more recent. As the administrator of two climate adaptation funds, the Least Developed Country Fund and the Special Climate Change Fund, the GEF has taken a lead role in helping countries promote conservation and development in the context of a changing climate (see Chapters 16 and 18). The GEF also



Perito Moreno glacier, Patagonia, Argentina



Rio de Janeiro, Brazil

became the Secretariat of the newly created Adaptation Fund, resourced by proceeds generated by the Clean Development Mechanism of the Climate Change Convention — a market-driven offshoot of the climate negotiations.

Just as climate adaptation was not a concern for the GEF in 1992 but has become a significant focus of investment, so has land degradation grown in importance from being an operational objective in the GEF strategy to now representing a fully-fledged focal area. The Convention to Combat Desertification entered into force in 1996, and in 2002 the GEF's mandate expanded to include efforts to fight land degradation. As in other focal areas, the GEF responded to a call for action with efforts that would be meaningful to particular people in particular places, while demonstrating global benefits and offering important lessons that could be applied in many other contexts (see Chapters 15 and 17).

The GEF has responded to changing global priorities as well as local needs while adhering consistently to some important elements of its approach. Working with limited resources, the GEF must act as a catalyst by funding foundational activities, demonstration activities, and investment. The GEF's work in International Waters in particular uses all three of these approaches explicitly (see Chapters 7 and 14), but the need to catalyze and leverage public and private engagement in conservation and development is inherent in everything the GEF does.

The other constant in the GEF's work has been the recognition of the continued relevance and utility of the protected area as a tool for biodiversity conservation (see Chapters 11 and 12). Simply put, protected areas work. To every nation, protected areas represent the core of their national ecological infrastructure, and can even become local engines for sustainable development. As the GEF continues to evolve, the challenge will be to strengthen the ability of governments and communities to identify protected areas in the broad landscape and understand what must be protected, what can be used, and how both can be done sustainably.

Meeting that challenge will be possible only if the GEF and its partners continue to bring the best scientific thinking to the problem. This means more than gathering the most accurate data, though that is a component. It means grasping the implications and potential of the GEF's exploratory and experimental approach to addressing environmental challenges. The GEF has become increasingly sophisticated over its lifetime in assessing the results of its work, and it is now prepared to take the next key step and move from hypothesis to evidence. By gathering compelling evidence about the impact of its efforts and the complex interrelationships of conservation, development, land use, and climate change, the GEF is positioned to catalyze far-reaching changes in the actions of both individuals and governments. We hope the following chapters will illustrate how far the GEF has come over the past 20 years, and how far it still may go.



Green turtle, Atol das Rocas, Brazil



Through twenty years of experiment and innovation, the Global Environment Facility (GEF) has created working models of sustainable development that have shaped our attitudes toward environmental protection and economic growth. No longer are the goals of development and conservation viewed as mutually exclusive. In fact, through its willingness to try new approaches, to promote country-driven programming and market-based investment, to create partnerships among technical agencies, multilateral development banks, NGOs, and the private sector, the GEF has shown that the green economy can provide economic benefits comparable to or beyond those of conventional, unsustainable alternatives and standard philanthropic models. The twenty initiatives highlighted here are just a fraction of the 2,800 projects and 14,000 small grants awarded to 168 countries with emerging economies over twenty years. But they show the breadth of the GEF reach as an investment facility that has laid the ground work for sustainable development and forward-looking solutions to the challenges of food and energy security, climate change, sustainable land management, biodiversity conservation and the eradication of poverty. ”

Edward Norton

Actor / Filmmaker / UN Goodwill Ambassador for Biodiversity



The Roots of the Green Economy

A saying among rural and indigenous people in the Philippines goes like this: *Para sa amin, ang langit ay lupa*, meaning, “For us, paradise is our land.”

That neatly sums up how deeply interwoven the land, and by extension agriculture, is with the culture of the country. One third of Filipinos are employed in farming, fisheries and forestry, and these account for about 14 percent of the nation’s Gross Domestic Product (GDP). Agriculture is more than a mere economic consideration; in the Philippines, many people base their judgments about the legitimacy of the government on the scarcity or availability of rice.

Given the national importance of agriculture, the government of the Philippines convened scientists, farmers, entrepreneurs, government officials, and other stakeholders to develop a plan for the future of agriculture in the country. The result, called *Philippine Agriculture 2020*, envisions a sector that will have a major role in reducing poverty, achieving food security, global competitiveness, sustainability, justice, and peace. The aim is to do so in the broader context of healthy ecosystems that support biodiversity and provide many other important services, such as water

purification and flood control. The report looks forward to vibrant agriculture and natural resources that improve and sustain human well-being in the Philippines.

The willingness of the Philippines to develop a plan that sees agriculture in this context and not as an entirely separate sector of the economy stems from an idea that now seems obvious but less than a decade ago was rarely stated plainly: Human well-being depends on the services that nature provides, and those services are not free, or at the very least should not always be free. This fundamental concept of ecosystem services has now become part of the common language of conservation and development, and much of the foundation for the new thinking was laid in 2005 with the release of the groundbreaking *Millennium Ecosystem Assessment*.

A precursor to the conceptual framework that inspired the United Nations Environment Program (UNEP) to launch its Green Economy Initiative, the *Millennium Ecosystem Assessment* was a visionary and ambitious global effort to assess ecosystem change and analyze its effects on human well-being. With early and crucial support from the GEF and UNEP, more than 1,000 natural and social scientists from about 100 countries contributed to the project. *Philippine Agriculture 2020* is just one example of the national efforts built around the conceptual framework of the *Millennium*

Ecosystem Assessment — fundamentally the idea that ecosystems and human well being are inextricably linked.

The Millennium Ecosystem Assessment presented the most compelling and scientifically justified case for linking ecosystem services to human well-being. In so doing, the Assessment made a major contribution to linking biodiversity conservation with poverty mitigation. This corrected a notable gap in the Millennium Development Goals. Adopted by the United Nations in 2000, the Goals have become a driving force behind international development assistance, setting out a path to address poverty, hunger, disease, gender inequity, education and sustainability — but they said little about biodiversity and ecosystems. The Millennium Ecosystem Assessment's emphasis on exploring trade-offs has also been welcomed as a more realistic basis for analysis and policy than the prevailing focus on 'win-win' solutions for conservation and development.

The Millennium Ecosystem Assessment produced conclusions on which most of the scientific world could agree — a notable achievement in itself. It did this by synthesizing existing knowledge across scientific disciplines and providing the first comprehensive global assessment of the status and trends of all the world's major ecosystem services and the consequences of ecosystem change for human well being.

The main finding was shocking, and captured the attention of world leaders: Nearly two-thirds of the world's ecosystem services and their products are being degraded or used unsustainably, including clean water, sustainable fisheries, air quality, and the regulation of regional and local climate, natural hazards, and pests.

The other main findings of the assessment were equally sobering:

- In the past 50 years, humans have taxed ecosystems and their ability to provide food, water, timber, fiber and fuel faster than ever before. This has caused a reduction in the diversity of life on earth;
- Though these changes have contributed to gains in human well-being and economic development, the price has been degradation of many ecosystems and the exacerbation of poverty. Unless addressed, the problems will diminish benefits for future generations;



- The degradation of ecosystem services is a barrier to achieving Millennium Development Goals;
- And reversing the degradation can be achieved in some cases, but it will require significant changes in policy, institutions, and practices.

The significance of the Millennium Ecosystem Assessment's conceptual foundation and conclusions began to ripple through governments, UN agencies, NGOs, and private enterprises almost immediately. Within a year, findings from the Assessment were incorporated into decisions and recommendations from both the Convention on Biological Diversity and the Ramsar Convention on Wetlands. Ramsar's Wise Use Guidelines, for example, now emphasize the benefits and values of wetlands for sediment and erosion control; flood control; maintenance of water quality and abatement of pollution; maintenance of surface and underground water supply; support for fisheries,



Agricultural settlement in the Himalayas

grazing and agriculture; outdoor recreation and education for human society; and climatic stability.

The inclusion of concepts and findings from the Millennium Ecosystem Assessment in the Convention on Biological Diversity also translated into changes in the direction of the GEF, particularly the need to deal with ecosystems in an integrated way, and consider people in all environmental projects. The Biodiversity, International Waters, and Sustainable Land Management focal areas of the GEF rely heavily on findings from the Millennium Ecosystem Assessment, and UNEP, the World Bank, and the United Nations Development Program (UNDP) have internalized findings from the Assessment as well.

The Millennium Ecosystem Assessment began the long process of strengthening the links between environmental science and international policy. Many of the key figures in

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N early two-thirds of the world’s ecosystem services and their products are being degraded or used unsustainably, including clean water, sustainable fisheries, air quality, and the regulation of regional and local climate, natural hazards, and pests.”

the Assessment have been working in the years since its completion to create the new U.N.-led Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). The IPBES will be the first ongoing global mechanism recognized by both the scientific and policy communities that synthesizes information for decision making in the global environmental conventions, development policy dialogues, and elsewhere. IPBES will be the mechanism that addresses the gaps in the science policy interface on biodiversity and ecosystem services and will improve the links between emerging scientific knowledge and policy action at multiple scales.

The Millennium Ecosystem Assessment also reached beyond the traditional conservation and development communities by involving business in the assessment process to a greater degree than any comparable global effort, underscoring that

ecosystem service considerations are important to businesses as well. Business stakeholders had seats on the Board of the Assessment, and the Assessment was particularly influential at the investment bank Goldman Sachs. Formally the Goldman Sachs Group, Inc., the bank incorporated the concept of ecosystem services in its environmental policy, the first time that any firm in the financial sector explicitly recognized the threats to ecosystem services. In addition, the World Resources Institute and the World Business Council on Sustainable Development built on the Millennium Ecosystem Assessment to create a methodology that helps corporations manage business risks and opportunities arising from their company's dependence and impact on ecosystems. More than 200 companies worldwide have now undertaken the Corporate Ecosystem Services Review.

Despite the broad scope and sophisticated approach, the Millennium Ecosystem Assessment inevitably left some issues unaddressed. The Assessment's guidelines and framework do not themselves provide the tools that planners and policy-makers need at local, regional, and national scales. This is hardly surprising, given that no one has yet developed a full set of accounting tools that can measure the value of ecosystem services as accurately as those in use to measure the value of traditional economic goods and services.

The gaps in the Millennium Ecosystem Assessment may turn out to be as important as its concrete findings and recommendations. Inspired by what was missing as well as what was present in the Assessment, scientists soon began innovative efforts to take the next steps. One such effort is the Natural Capital Project, launched in 2006 as a joint venture of Stanford University, the University of Minnesota, World Wildlife Fund, and The Nature Conservancy. The National Capital Project is developing tools for quantifying the values of natural capital, particularly a family of software-based tools for Integrated Valuation of Ecosystem Services and Tradeoffs, or InVEST. InVEST enables decision-makers to quantify the importance of natural capital, to assess the tradeoffs associated with alternative choices, and to integrate conservation and human development.

Another effort building on the Millennium Ecosystem Assessment, The Economics and Ecosystems and Biodiversity (TEEB) study led by UNEP, also takes on the question of how

to value ecosystem services and biodiversity, but from the perspective of global policy makers. TEEB got its start in 2007, when environment ministers from the governments of the world's leading and emerging economies, meeting in Potsdam, Germany, agreed to initiate the process of analyzing the benefits and costs of biological diversity and biodiversity conservation.

TEEB relates biodiversity with ecosystems services and provides both a theoretical and an empirical framework for valuing them. The study also provides an economic analysis of factors affecting ecosystems and biodiversity, an important step given the new evidence about the degradation of ecosystems and biodiversity loss and the potential impact of these losses on human welfare. The TEEB analysis is a key component of UNEP's broader Green Economy Initiative.

The fundamental insights from TEEB have their roots in the Millennium Ecosystem Assessment, which was the first comprehensive effort to apply economic thinking to the use of biodiversity and ecosystem services. With that as a foundation, TEEB has helped to clarify two critical points: why prosperity and poverty reduction depend on maintaining the flow of benefits from ecosystems; and why successful environmental protection needs to be grounded in sound economics, including explicit recognition, efficient allocation, and fair distribution of the costs and benefits of conservation and sustainable use of natural resources.

The analysis of TEEB builds on the Millennium Ecosystem Assessment and presents an approach that can help decision makers recognize, demonstrate and where appropriate capture the values of ecosystems and biodiversity. Valuation is not an end in itself but simply a tool to rethink economic assumptions that led people to overlook — sometimes willfully, but more often out of necessity or ignorance — our dependence on services from nature.

The World Bank is also taking up the challenge of reversing the systemic under-valuation of ecosystem services first identified in the Millennium Ecosystem Assessment as one of the main causes of ecosystem degradation and biodiversity loss. The Bank's five-year global partnership on Wealth Accounting and the Valuation of Ecosystem Services (WAVES) is an effort to make wealth accounting a reality in a number of countries.



Santa Cruz Laguna, Philippines

While the Millennium Ecosystem Assessment, TEEB, and other efforts have made progress in the measurement and valuation of ecosystem services, and many agencies and organizations have undertaken case studies and demonstration projects, the challenge remains to engage Ministries of Finance and economic planning agencies in dialogue about implementing that progress in national accounting.

To meet this challenge, ecosystem valuation has increasingly focused on 'greening' national income accounts. National income accounts are crucial because they constitute the primary source of information about the economy, such as GDP, and are widely used for assessment of economic performance and policy analysis in all countries. Thus, integrating the economic value of ecosystems into national income accounts is key to communicate its importance to Ministries of Finance, planning agencies, and other key decision-makers.

All of these innovative efforts stand on the intellectual and scientific foundation laid by the Millennium Ecosystem Assessment. Few projects of its kind have been as effective in changing the way people from world leaders to on-the-ground field practitioners think about how to assess the value of nature and thus how to bring about lasting conservation and human development.

Reports such as the Millennium Ecosystem Assessment are often doomed to gather dust on countless office shelves, mute testaments to nothing so much as good intentions. Such has not been the fate of the Millennium Ecosystem Assessment. In the Philippines and many other places, including, as described in the next chapter, the Congo Basin, the power of the findings and ideas keeps the Millennium Ecosystem Assessment fresh and relevant, with lasting impact on the way governments and institutions understand the relationship between conservation and development.





Paddy field in Sri Lanka



Water reservoir, Rio de Janeiro, Brazil

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Dzanga-Ndoki National Park in the Central African Republic

Changing the Paradigm in the Congo Basin

The city of Libreville, capital of Gabon, may be known for oil, but water makes it work.

The wealth from some of the largest oil reserves in Central Africa pays for the city's skyscrapers, hotels, and lush neighborhoods. Water, on the other hand, keeps the lights on. Water, that is, spinning the turbines of two dams on the Mbé River, about 100 kilometers northeast of the city center. About 60 percent of the country's population, many of whom missed out on the oil boom, lives in Libreville. The rapid growth of the city has strained local infrastructure, and some poor residents who once had running water in their homes must now wait in the streets with buckets to get water from hydrants.

For now, the problem is not too little water but rather how to deliver it while keeping it affordable for even the poorest families. Solving that problem will require innovative and broad-scale thinking, and Gabon may provide an ideal place to test new approaches for conservation and development efforts in the Congo Basin, home to one of the world's largest and best preserved tropical rain forests.

The Mbé River watershed presents an ideal opportunity to test an intriguing and increasingly popular question, one

with roots in the Millennium Ecosystem Assessment: Will the beneficiaries of an ecosystem service like clean water be willing to pay those people who incur the opportunity costs of conserving such a service? In local terms, will the people of Libreville, who benefit from the power and water provided by the Mbé River, pay the land users upstream to adopt sustainable land management practices and thus preserve the city's lifeline?

Such payments for watershed services may show the people of Gabon a new relationship between the economy and the environment. In an interview with Africa News, the former general director for the environment and nature protection at the Ministry of Environment, said "We have to shift from thinking about the environment in an economic context to thinking about the economy in an environmental context. We're changing the paradigm."

The Mbé River watershed, a key region both biologically and economically, begins in the mountains near Gabon's border with Equatorial Guinea and encompasses about 160,000 hectares. This globally important region is among the most biologically diverse in Africa, rich in species, many of which exist nowhere else on Earth. The diversity of the Mbé River watershed stems in part from its unusual topography: Huge, rocky outcrops called inselbergs loom

above the forest canopy, each one an island in a sea of trees that harbors its own distinct plants and animals. Further increasing diversity, the region receives up to 2,000 millimeters of rain per year, making it one of the wettest places on the continent.

The Mbé watershed straddles two biogeographic regions, with mountainous coastal forests to the west and lower-lying forests stretching eastward into the center of the Congo Basin. The combination of location, climate, and topography has isolated the landscape and ensured habitat stability throughout the last ice-age, when most forests of the region dried out and became savannahs. As a result of its long period of isolation and stability, the Mbé River watershed is one of the oldest forests in all of Africa, and it harbors a unique assemblage of species.

About a third of the Mbé River watershed falls within Monts de Cristal National Park. Outside the park, however, mining and forest concessions, along with villages and small scale farming could threaten the forests and ecosystem services. For now at least, the most important economic resource is the river itself. The Mbé feeds two dams, with a total output of nearly 130 megawatts, and a pipeline brings drinking water from the Mbé into Libreville.

Neither the dams nor the drinking water will last unless the entire watershed remains intact; loss of forest cover could lead to erosion and siltation that could eventually shut off both the power and the water. Despite fragile and erosion-prone soils, especially on steep slopes and near rivers, not one of the four logging concessions in the watershed abides by internationally-recognized sustainable forestry standards that could help prevent sedimentation and protect water quality. The companies cite notably high start-up costs as the reason for their unwillingness to adopt such practices.

Mining presents similar risks, though the mining industry is less developed than logging in the Mbé River watershed. The Mountains of Monts de Cristal contain rich mineral deposits — gold, diamonds, iron and platinum. Two exploratory mining permits for iron and platinum cover the entire watershed, and artisanal gold miners work in the region as well. Mining activity can threaten biodiversity and watershed ecosystem services; gold mining in particular can cause mercury pollution



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management
and protection of the natural
capital assets of the Congo Basin
will eventually benefit more
than 25 million people
whose livelihoods depend
on the forest ecosystems.



and increase sediment load in rivers, which harms both the hydroelectric dams and aquatic biodiversity.

Traveling along the main road that runs from Libreville to the city of Medouneu on the border the Equatorial Guinea reveals another potential threat to the Mbé. The road runs along the western edge of the watershed, and small towns and villages dot the roadway. The residents have made small clearings for their manioc, bananas, pineapple, peanuts, and yams. The road, however, provides the promise of access to urban markets, and with it the risk that the small-scale agriculture will become commercial, leading to deforestation. Deforestation rates in Gabon are among the lowest in Central Africa but could increase if the population or the demand for food rises.



Yaounde, Cameroon

The people and the business interests in the Mbé watershed thus have great incentive to exploit the resource of the area as fully as possible, while the residents of Libreville and the utility company that owns the dams and the pipeline, will suffer the consequences if such exploitation leads to long-term damage to the river. Payments for watershed ecosystem services may thus make perfect sense here.

The idea of such payments for watershed services has generated considerable interest, particularly in Latin America. The idea is still novel in the Congo Basin, even though the region holds enormous potential for hydroelectricity, perhaps as much as one-sixth of the global total. The GEF, the government of Gabon, UNDP, and the Wildlife Conservation Society are working on a pioneer project to test whether a payment scheme can be an effective way to secure environmental friendly behavior of upstream land users.

The Mbé River watershed is an excellent site for a pilot project of this sort, given that the hydroelectric power utility is an obvious buyer of the watershed ecosystem services. Unlike carbon or biodiversity, the watershed services of the Mbé are tangible and there is an equally obvious local beneficiary. With GEF support to the start up costs, the parties are designing a contractual payment scheme which ensures that the quantity and quality of water provided by the watershed is maintained. In exchange, Monts de Cristal National Park, management bodies, local communities, and other stakeholders will receive financial resources to invest in management activities that lead to further protection of this valuable resource.

This initiative is exciting, with all the potential ingredients for success. It is also daunting, due to the number of stakeholders with multiple interests, including ministries, the Monts de Cristal National Park, local authorities, mining and logging concessionaires, and local communities. The utility company needs to understand the link between deforestation and sedimentation. Similarly, local populations currently cause relatively little land degradation, making it difficult to determine what harmful activities they could be paid to stop doing. Finally, if the utility company, the main buyer of ecosystem services in this model, passes on some or all of the cost to its customers — electricity and water users in Libreville — then support for the idea could evaporate.

Recognizing the considerable challenges ahead to maintain the ecological integrity and resilience of its forest ecosystems, countries across the Congo Basin have jointly taken important steps to address the threats. In 1999, heads of state from Central Africa signed the Yaoundé Declaration, in which they announced their commitment to forest conservation in the region. In 2005, the countries ratified the Central African Forest Commission Treaty, and the commission is now the regional authority for orientation, decision making, and coordination of subregional actions and initiatives for the conservation and sustainable management of forest ecosystems. Ten countries of the Congo Basin — Burundi, Cameroon, Chad, Congo, Democratic Republic of Congo, Central African Republic, Equatorial Guinea, Gabon, Rwanda, and São Tomé and Príncipe — have developed a shared vision and a 10-year plan of action on forestry, called the Convergence Plan, backed by strong, high-level political will and commitment.

To support this commitment, the GEF launched the Strategic Program for Sustainable Forest management in the Congo basin in February, 2008. The Strategic Program seeks to reverse the current rate of deforestation and degradation of ecosystems, maintain ecosystem functioning, and conserve ecosystem values such as the biodiversity and carbon-based capital of the Basin.

The Strategic Program helps countries in the Basin meet their conservation and development targets and coordinates the many regional, national, and local initiatives already underway. The program also plays an important role in bridging the current gaps between political commitment and institutional weakness and the lack of stakeholder participation in on-the-ground implementation.

The Strategic Program has three main components:

- Maintaining ecosystem functions and values, especially biodiversity and carbon-based capital, in the regional network of protected areas
- Fostering sustainable management and use of forest and water resources in the larger productive landscape of the Congo Basin
- And strengthening the policy, regulatory, institutional, and sustainable financing framework for sustainable ecosystem management.



Southeast Cameroon, Africa

The Strategic Program has identified 13 projects, including the Mbé River watershed project, that reflect strong partnerships among Central African countries, their institutions, and other partners such as GEF agencies, cooperating agencies, NGOs, the private sector, and civil society. The sustainable management and protection of the natural capital assets of the Congo Basin will eventually benefit more than 25 million people whose livelihoods depend on the forest ecosystems.

A growing number of multilateral development organizations and international agencies are now using this kind of programmatic approach to support developing countries and countries with economies in transition. The GEF has long been committed to a programmatic approach, based on the principle that the institution's focus should be on programs rather than just simply individual projects. The GEF programmatic approach enables countries to achieve meaningful impacts by strengthening country ownership, promoting integration of global environmental concerns into decision making, and increasing opportunities for cofinancing from a variety of other sources.

This philosophy is based on the recognition that project-based activities provide recipient countries with little leverage to influence sector-wide transformations, while a programmatic approach is more likely to deliver synergistic results that benefit all. A broad range of activities are already underway in the Congo Basin, promising better conservation of forests and showing the potential to provide multiple benefits to the people of the region while protecting the ecosystem services on which they depend.





Congo River Basin



Cameroon, Africa

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Parc National des Volcans, Rwanda

Forests for Life

Ask just about anyone who has thought about global climate change to name where most greenhouse gases come from and like as not they will respond, correctly, with energy production and industry.

Together, those obvious culprits account for nearly half of the global total of greenhouse gases. Ask for the next biggest source, however, and most people will likely be stumped. The answer is deforestation. More than all the cars, trucks, buses, trains, and boats on Earth, more than all the industrial-scale agribusiness, more than all the construction, the loss of forests produces almost one-fifth of annual global greenhouse gas emissions.

Forests such as those in the Congo Basin and elsewhere contain an estimated 80 percent of the above-ground and 40 percent of below-ground terrestrial carbon, and currently hold more carbon than earth's atmosphere. The role of forests as important carbon reservoirs has gained remarkable attention in the global climate change discussion over the past several years. Today the consensus is that meeting emission reduction targets will be impossible without including forestry.

Yet, as the work in the Mbé River demonstrates, the importance of forests extends far beyond their role in sequestering carbon and regulating the global climate. Biodiversity, economic progress, and human well being also depend on healthy forests. Forests regulate water cycles and provide habitats for biodiversity while hosting a wide variety of genetic resources. More than two billion people use wood for cooking, heating, and food preservation. The UN Food and Agriculture Organization (FAO) estimated that the forest industry contributed approximately US\$468 billion to global GDP in 2006.

Forests also provide an essential source of cash, especially during poor harvests. In many countries, non-timber forest products — such as fruits, nuts, honey, mushrooms, bushmeat, plant products, medicine, aromatic products, and exudates such as lacquer — play important roles in local economies and livelihoods, and are important exports. According to the FAO, the value of these products extracted from forests worldwide amounted to at least US\$18.5 billion in 2005.

The challenge for the GEF and its partners is to find new ways to deliver multiple benefits — biodiversity, carbon sequestration, and human well-being — and to achieve broader and more meaningful impact on these vital ecosystems. Those benefits can overlap, but knowing where that happens and under what conditions requires taking a broad

view. As the financial mechanism for not only the global climate convention but the biodiversity and desertification conventions as well, the GEF is uniquely positioned to bring the often disjointed policies and funding sources together.

The need for innovative and broad-scale thinking is clear. Each year, rapidly growing human populations press deeper and deeper into forest frontiers in search of land for farming and grazing. The problem is particularly severe in the tropics, which account for approximately 90 percent of total greenhouse gas emissions from deforestation. The process feeds a downward spiral. As forests become fragmented, the smaller

and smaller parcels become degraded and ultimately disappear, converted into pasture or farmland.

One way to approach the problem is the concept of Sustainable Forest Management, or SFM. According to the United Nations Forum on Forests, SFM is a dynamic concept that seeks to maintain and enhance the economic, social, and environmental values of forests, for the benefit of both present and future generations. SFM is of particular interest in densely populated areas and places where many people heavily depend on forests for their income, because it allows the use of a wide range of forest products while addressing the pressure on forest resources.

Many developing countries lack the capacity to efficiently implement SFM on a larger scale in part because deforestation has, until recently, received little attention compared to the other causes of climate change. That began to change in 2005 when the parties to the UN Framework Convention on Climate Change acknowledged that reducing emissions from deforestation and forest degradation, or REDD, plays a vital role in a comprehensive strategy to reduce global greenhouse gas emissions. SFM, including forest conservation, is a relatively inexpensive and effective tool for mitigating climate change.

Since the idea of REDD was first introduced it has been broadened to include conservation, sustainable management of forests, and enhancement of forest carbon stocks, and is now called REDD Plus, most often spelled as REDD+. The possibility of using carbon markets to direct significant financial resources from developed countries to developing countries for forest conservation — a fundamental component of REDD+ — has generated widespread interest and dramatically raised the profile of the role of forests not only in regulating the global climate but also as an important part of the move towards a green economy.

In recognition of these varied services, in 2007 the GEF began to broaden its SFM efforts. The new approach was based in part on the understanding that SFM applies at a variety of scales, from local to regional to global, and that working across all these scales will be vital to integrating forests into economic decisions.



The challenge for the GEF and its partners is to find new ways to deliver multiple benefits — biodiversity, carbon sequestration, and human well-being — and to achieve broader and more meaningful impact on these vital ecosystems.



SGP project, Soche Mountains, Malawi

Add up all the goods and services that forests provide and their value alive vastly outweighs their value cut into logs, crushed into pulp, or burned into charcoal. Addressing the importance of metrics in environmental endeavors, economists can calculate with reasonable accuracy the value of some of the benefits from forests, particularly in regulating climate, sustaining freshwater and coastal fisheries, preventing erosion, and maintaining water supplies. Forests also have important intangible benefits — social, cultural, aesthetic, even religious — that have no price in the market but are hugely important locally and globally. What is clear is that forests deliver a range of services, and it is the package of ecosystem services, not just tons of carbon, that need to be considered.

Unfortunately, existing economic systems cannot adequately value forests. Markets fail because they usually do not account for what economists call externalities: the damage to watersheds that deforestation can cause, the diminished crop yields due to erosion, the decline in health because of the lack of clean water, and so on. The people who live near and depend on the forests bear those costs. Without a green economy that values ecosystem services, this burden will continue to grow and sustainable forest use will remain a challenge rather than an achievement.

A GEF-funded project in Malawi illustrates all of these trends, as well as some possible solutions. The project reveals at a fine scale how forests, forest conservation, and rural development can be part of a low-carbon future. The Soche Mountain Forest Reserve sits at the edge of the city of Blantyre, in southern Malawi. Due to the increasing demand from the city for forest products, the reserve has lately seen accelerated degradation. Biomass-based enterprises, such as fuel wood and timber extraction, beer brewing, and brick making, have proliferated in the area, leading to deforestation. People in search of agricultural land have cleared trees from the slopes of the Soche Mountain, but the communities cultivating the slopes lack both technical and material support to integrate sound conservation and agronomic practices into their farming systems.

The GEF Small Grants Programme in Malawi supports the Soche Mountain Land Care Extension Project, a multi-pronged community effort to restore the ecosystem of the

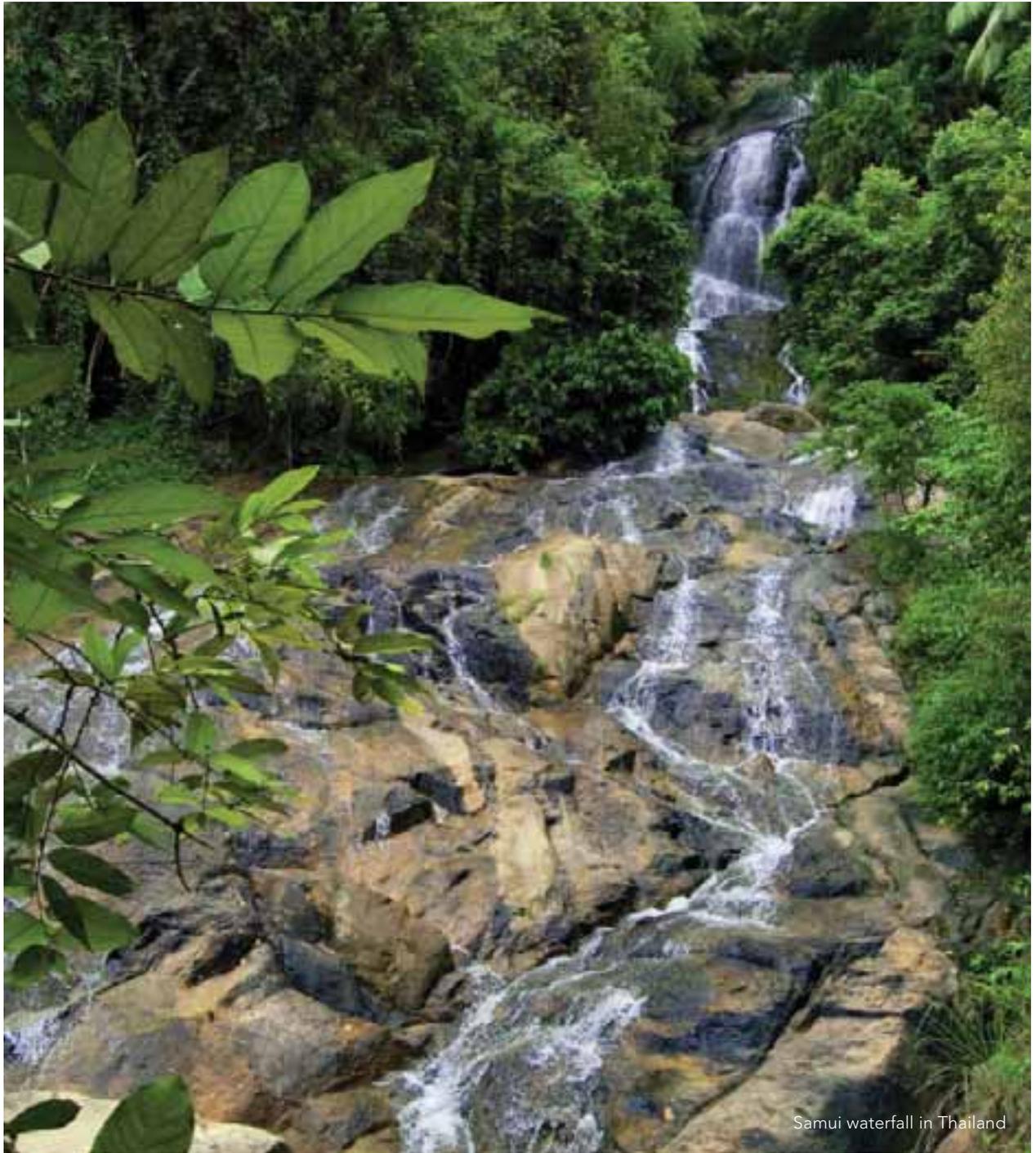
Soche Mountain Forest Reserve after years of degradation and neglect. The project helps people near the mountain develop community-based action plans. Activities include re-establishing forest cover on Soche Mountain, and applying good agricultural practices on farmland just below the mountain, such as tree planting, promoting natural regeneration of endemic vegetation, soil and water conservation practices, and capacity building.

Four communities joined together to form the Friends of Soche Mountain and planted a total of 46,000 trees. More than a third of the deforested area has been rehabilitated. Communities have established communal woodlots and now practice sustainable land management techniques in their own fields and homesteads. By working with community leaders the project persuaded farmers to stop cultivating the mountain slopes.

The project has also demonstrated that community conservation can bring additional benefits. One chapter of Friends of Soche Mountain supported an effort to provide potable water from a source on the mountain for use by communities. As a result, over 250 households now have access to safe drinking water, after chlorination and basic treatment for sedimentation.

As Maynard Nyirenda, Director of the NGO working on Soche Mountain, recalls, “We came to support community conservation efforts on Soche Mountain without plans to address the water problem. However, through a lengthy dialogue process, community leaders insisted that if we wanted to succeed we must provide a solution to the community’s greatest need — safe drinking water and that everything would then be under control — they were right!”

Building the capacity of both government authorities and local communities to participate in sustainable forest management and REDD+ projects is an important element in developing acceptable solutions. Another GEF-funded project aims to improve the African countries’ knowledge of and capacity for REDD+ issues, and to help them to articulate this new concept within the broader agenda of sustainable forest management. The project is building capacities for measurement and monitoring of carbon stocks through various types of technical assistance.





An important element of this project was a 10-day South-South exchange (direct collaboration between developing countries) on community forestry and REDD+ which took place in Brazil with participants from six African countries. The exchange helped countries to understand the role that community forestry can play in their national REDD+ strategies. The activity brought together participants from the Central African Republic, Cameroon, Democratic Republic of Congo, Gabon, Madagascar and the Republic of Congo to exchange experiences on community forestry and REDD+ with various Brazilian counterparts, including federal and state governments, the private sector, civil society, and indigenous people's organizations.

A key feature of this exchange is the training of African personnel on lower cost forest monitoring techniques perfected by Brazil's space institute, INPE. The idea is to provide a combination of open-source data, tools, and algorithms that can be adjusted to specific country needs for Geographical Information Systems (GIS), image processing, database management, and data access. At the UN Climate Conference in Durban, South Africa, in December 2011, the Democratic Republic of Congo (DRC) unveiled a new forest monitoring system developed through the exchanges with INPE.

Inspired by the Brazilian forest monitoring system called TerraAmazon, the new TerraCongo system will allow the DRC to monitor the performance of REDD+-plus demonstration activities and initiatives, deforestation in protected areas, and logging concessions, as well as national policies and measures in the forestry sector. The system is integrating the information coming from the National REDD+-plus Registry into a single visualization interface, thus promoting transparency and coordination between the various initiatives underway on the ground.

Efforts in Malawi, the DRC, and the Congo Basin more broadly are just a few examples of GEF innovation in financing projects and programs that seek to generate multiple benefits from forests. This experience will help ensure that strategies such as REDD+-plus address ecosystem services, biodiversity, and local people as well as the carbon that forests contain. The increasing awareness of forests and their potential to mitigate climate change provides a historic opportunity to counteract environmental degradation while directly promoting sustainable development. The potential to address both climate change and rural development in a variety of contexts has been central to the GEF's efforts over the past two decades and will be increasingly important for the next two as well.





Border of the Tai National Park, Ivory Coast

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Natore District, Rajshahi, Bangladesh

Village Power

Rural Bangladesh has as little modern infrastructure as any place on Earth — few roads, bridges, or power lines, and hardly any industry.

What Bangladesh has in abundance are small villages and sunlight. Putting those two things together brought about a breakthrough for both rural development and the fight against climate change.

The idea is simple enough in theory: Since no national power grid will provide rural electrification in Bangladesh for the foreseeable future — about 70 percent of the population in Bangladesh does not have access to electricity today — why not take advantage of the abundant sunlight and countless small but densely populated villages and use small-scale solar systems to power households across the country? That attractive hypothesis quickly runs up against the hard fact that few people in rural villages can afford a solar panel. With a US\$400 price tag, a 50-Watt system large enough to power a few lights and a small appliance or two would consume nearly a third of the average rural family's yearly income.

For years, many economists viewed that cost barrier as insurmountable, and argued that renewable energy was too expensive for the developing world. Enter the Grameen Bank. Created in 1971 by economist Muhammed Yunus, Grameen Bank began as an effort to demonstrate that offering small, low-interest loans to poor and landless people, mostly women, in rural Bangladesh could help lift people out of poverty. Not only did the bank offer the strongest case yet for that approach, creating the field of microfinance in the process, it expanded into a global enterprise and earned Yunus the Nobel Peace Prize in 2006.

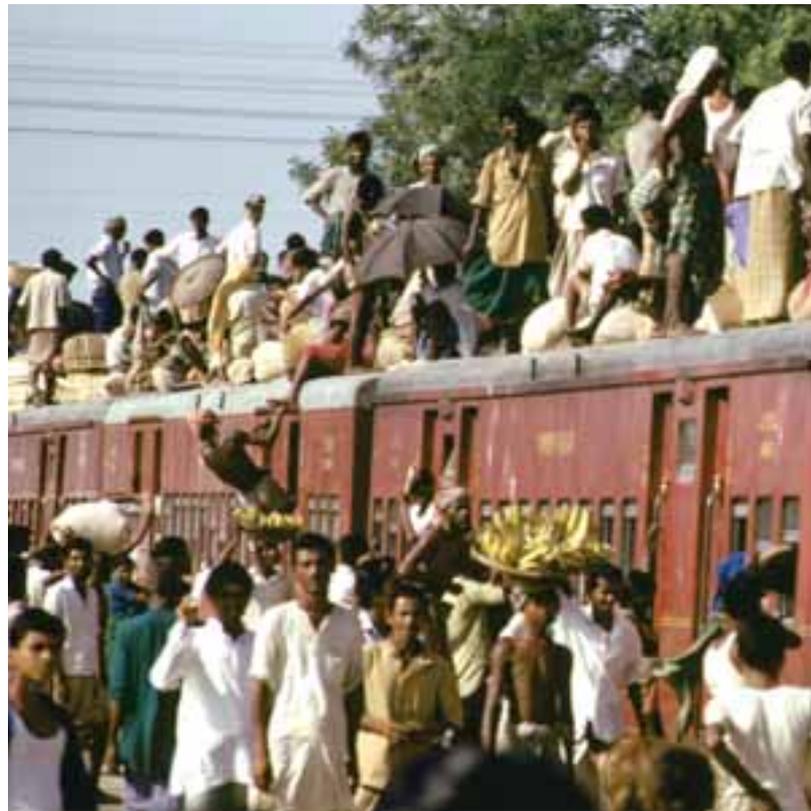
In 1996, Grameen Bank created a subsidiary, called Grameen Shakti (roughly translated from Bengali it means “village power”) to provide financing for solar energy in Bangladesh. Two years later, the GEF-funded Small- and Medium-Scale Enterprise Program, operated by the International Finance Corporation (IFC), the private arm of the World Bank, approved Grameen Shakti for financing. The firm used a US\$750,000 grant to buy its initial supply of solar panels. With the equipment in hand, and with the benefit of Grameen Bank's long experience with rural economies, Grameen Shakti was able to overcome the two main barriers to sales of solar home systems in Bangladesh, namely, high upfront cost and lack of consumer credit.

The project has improved lives and provided cleaner energy to more than a million Bangladeshis. A typical household in rural Bangladesh uses candles or kerosene for light, posing a fire hazard, and in the case of kerosene a health hazard from the fumes as well. On top of that there is the soot that must be cleaned, a task that always falls on women. The savings on the cost of kerosene alone, about US\$7 per month, in many cases covers the loan payment for the solar system. Kerosene costs have risen dramatically in recent years, driven up by world oil prices and higher transport costs, and they will rise still further as the Government of Bangladesh reduces its kerosene subsidy.

A typical solar home system in Bangladesh consists of a small 30 to 100Watt photovoltaic panel — 50Watt is the most common — connected to a battery for storage. By 2011, Grameen Shakti had installed 550,000 such systems in more than 60,000 villages, benefiting some 2.5 million people. The installation rate is growing exponentially, with plans to reach one million installations serving 10 million people by 2015. A million solar home systems, once in operation, will reduce approximately 50,000 tons of CO₂ emissions per year by replacing kerosene and diesel generators, according to a World Bank report.

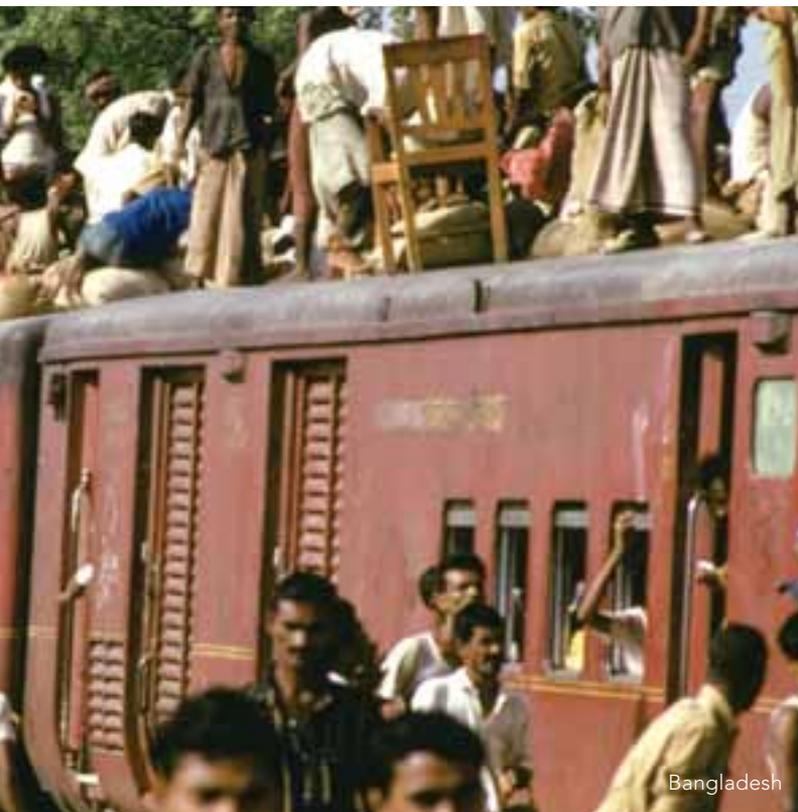
Grameen Shakti also helps fund other renewable energy technologies, including wind, biogas, and solar thermal projects. The biogas program is linked to the emerging poultry and livestock industry in Bangladesh by focusing on marketing slurry (what remains after producing biogas from manure) as a replacement for chemical fertilizer. By 2007, Grameen Shakti had built up a network of 390 offices in all of Bangladesh's 64 districts, reaching out to the rural areas where 70 percent of the country's 135 million people live.

Solar home systems bring significant social as well environmental benefits. The electricity means schools can remain open later, children can study at home at night, health clinics have reliable power, and businesses can stay open longer. Perhaps as important as all of those benefits, solar power enables people to charge cell phones. With Grameen Shakti also establishing Internet connections, rural villages can be linked to the rest of the country and the world.



Cell phones can mean more than just a link to the world outside the village. In the Tangail district of central Bangladesh, for example, one shop owner saw an even bigger opportunity. Capitalizing on the growing demand for cell phone service in his village, the shop owner purchased a solar system from Grameen Shakti, added rental cell phones to his shelves, and started keeping his shop open four extra hours a day. In only four months, income from the phone operations reached US\$30 per month — easily covering his payment installments of US\$6 a month to the bank.

This example just hints at the potential income that can be generated by solar home systems. In the neighboring Ghazipur District, pharmacist Shahid Sarkar also keeps his shop open longer and uses his cell phone to order medicines more efficiently. Tailors, restaurants, and groceries can also bring in more money by extending their hours thanks



“Solar home systems bring significant social as well environmental benefits. The electricity means schools can remain open later, children can study at home at night, health clinics have reliable power, and businesses can stay open longer.”

to solar systems. Solar home systems have led to increased production in areas such as fishing, rice processing, poultry farming, and handicrafts. Grameen Shakti hopes to create 100,000 jobs in renewable energy and related businesses.

Women gain particular benefits from owning a solar home system. They feel more secure after dusk and can be more mobile. Since they usually spend more time in the home, they benefit most from the elimination of kerosene smoke. Many women have used the increased working time provided by the solar home system to start small-scale businesses such as poultry and handicrafts, and Grameen Shakti is training female technicians to install and maintain the solar systems.

Other opportunities for entrepreneurship promise even more fundamental changes. Here the people in rural Bangladesh have an advantage over energy consumers

elsewhere, including from developed economies. In many countries, people generally assume that their electric meter spins in just one direction; they buy power from the utility company and pay the bill each month — period. The idea that they could generate their own electricity and sell it back to the utility or to their neighbors — causing their meter to spin the other way — is too radical for most to imagine. In Bangladesh, however, with no long history to overcome, setting up households as their own micro-utilities, ready to generate and sell electrical power, is already taking hold.

Grameen Shakti pioneered this micro-utility model to make electricity available even to those who might not qualify for a loan on their own. Instead of installing a solar home system and paying US\$6 per month to the bank, a family might rent a single lamp from their neighbor for US\$2 per



month. One system can provide this sort of service to five or six homes or businesses, easily covering the owner's loan payment and making electricity more widely available. The micro-utility model has become extremely popular among Bangladeshi shopkeepers, and thousands of solar home systems and tens of thousands of lights have been installed under this scheme.

The efforts in Bangladesh demonstrate how a relatively small investment from the GEF early on can leverage vastly greater investments in renewable energy technologies. Such investments are more crucial than ever, as climate change, increasing dependence on oil and other fossil fuels, growing imports, and rising energy costs are making the developing world increasingly vulnerable to both economic and environmental shocks.

Solar energy projects like Grameen Shakti, and the renewable energy sector in general, offer an opportunity to reduce greenhouse gas emissions and pollution and to exploit local

and decentralized energy sources— wind, solar, hydro-electric, tidal, geothermal, and biomass. These renewable sources are immune to the volatility of the fossil fuel markets and bring the added benefits of stimulating employment, technological development, and economic growth.

Renewable energies constitute a key element of a sustainable future and they have been fundamental to GEF since its inception. Over the course of its 20 years history, the GEF has invested over US\$1.1 billion in renewable energy initiatives in almost 100 developing countries and economies in transition. These investments have been augmented by an additional US\$8.3 billion in cofinancing. GEF support has been instrumental in putting renewable energy on the agenda of all major developing countries and emerging economies.

The GEF remains committed to promoting renewable energy in developing countries and economies in transition as an essential component of sustainable development



that can face the climate change challenge. As the experience of Grameen Shakti illustrates, however, enormous challenges remain. Perhaps the greatest challenge now is that while governments and donors race to forestall the worst by reducing greenhouse gas emissions, the climate is already far more variable than ever, and no country is more vulnerable to that variability than Bangladesh. In 1998, for example, the worst flood in over a century devastated two-thirds of the country. Floods inundated 90 percent of the Grameen Shakti operating area, cutting into the proceeds for new sales of solar home systems and repayments of loans on old ones. Subsequent severe floods hit Bangladesh in 2004, and again in 2011.

Grameen Shakti literally weathered those storms because its repayment plans were resilient enough to adapt to the changing circumstances. The same principle applies to all of the GEF's climate projects: they invest in climate resilience, putting in place technologies and methods that reduce pollutants and can adapt to new climate realities.

Grameen Shakti is the most successful solar photovoltaic project in the Small- and Medium-Size Enterprise Program, far exceeding expectations in terms of the number of solar home systems installed. Other photovoltaic projects, particularly those attempting to operate in less densely populated areas than Bangladesh, failed to live up to original expectations. Economies of scale are vital to the success of solar companies, since they reduce the costs of collecting payments or providing services, and such economies of scale are harder to come by in sparsely populated and remote rural areas. Bangladeshi villages provide Grameen Shakti with a large pool of potential clients without which a private solar company simply cannot sustain the cost of a service technician or collection agent.

Grameen Shakti's ties to Grameen Bank and, through it, countless local communities, proved to be invaluable and a major driver of success. The credibility, trust, and community standing of the Grameen brand enabled Grameen Shakti to overcome the challenges that have defeated many solar

home system companies elsewhere in the world. In fact, strengthening trust and communities may be the most important outcome of micro-credit schemes, even more so than expanding economic opportunities or empowering women.

While Bangladesh is ideally suited to solar power because of its higher than average solar radiation, demand for solar energy was minimal at the time of Grameen Shakti's founding. The Grameen Bank thus placed considerable focus on providing increased value to its clients, while making a dedicated effort to reduce costs and thus lower prices. They even offered a warranty, including free maintenance for the first three years, training seminars, monthly inspections, and, most remarkably of all, a 20-year money-back guarantee.

That Grameen Shakti would feel compelled to offer such a guarantee speaks volumes about the continuing reluctance to adopt unproven technologies, even when the benefits are readily apparent. The willingness and ability of Grameen Shakti to experiment with new approaches, and its success in spreading solar power to so many villages suggest that it may yet overcome this reluctance, and in so doing make a significant contribution to rural development, energy security, and climate change mitigation in Bangladesh and beyond. With GEF support, even banks that serve larger, more traditional borrowers than does Grameen Shakti, such as banks in China, are beginning to see the return on investments in energy efficiency. This recognition raises the prospect of even greater global impact.





Sri Lanka



Residential solar power

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Great Wall of China

Energy Efficiency, Renewable Energy, and Climate Change

Residents of crowded, bustling, dirty Beijing who crave a taste of nature can drive about 80 kilometers to the northwest, passing the Great Wall on the way, to the Songshan National Nature Reserve.

While there they might catch a glimpse of an imperial eagle, golden leopard, or a black stork, hike through the ancient pines and cypresses, or admire the view from Flying Dragon Cliff. At 4,700 hectares Songshan conserves biodiversity and helps provide clean water and air for Beijing, but if the visitors want a glimpse of the future they would do well to stop at the very edge of the reserve, at a farm with 3 million chickens.

Beijing Deqingyuan Chicken Farm, or DQY, is the largest in China and borders Songshan to the south. It also runs entirely on biogas made from the hundreds of tons of chicken manure the farm produces each day. The farm produces enough energy to run not only its own operations but to sell the surplus electricity to the local utility company and thus power the nearby town as well. Farmers then use the rich organic sludge left over after producing biogas to fertilize

their fields and orchards. This kind of radical energy efficiency saves millions of tons of carbon from entering the atmosphere, saves millions of dollars, and, by reducing pollution of many sorts, saves not just carbon but lives as well.

The funding for DQY's biogas plant came from a five-year loan provided by the GEF and the International Finance Corporation (IFC) under a program called China Utility-Based Energy Efficiency, or CHUEE. Within three years of its launch in 2006, the program spawned 98 energy efficiency and renewable energy projects. The program's US\$512 million in loans reduced China's CO₂ emissions by 14 million tons per year. As with the solar power project in Bangladesh in partnership with Grameen Shakti, CHUEE has demonstrated novel and effective approaches to rural development, energy security, and climate change mitigation.

The reduction in carbon emissions that CHUEE achieved is significant, equivalent to removing all CO₂ emissions from a country the size of Bolivia. Another measure, however, highlights the enormous challenges ahead: A single coal-burning power plant in China, the Zouxian plant in Shandong province, about 400 kilometers due south of Beijing, emits 33 million tons of CO₂ per year¹, more than twice the amount

1. www.carma.org

saved by all the energy efficiency investments under the CHUEE project.

Such figures make the case not for abandoning energy efficiency and renewables, but rather understanding the complexities and the variety of factors — technology, policy, financial capacity and willingness, to name a few — that make up the bottom line number of tons of CO₂ reduced. And while that bottom line provides a useful shorthand, it actually sheds little light on perhaps the most important aspect of energy efficiency investments: they continue to pay dividends year after year, decade after decade. Those dividends are reflected not just in the energy savings

and resulting climate benefits, but also in lasting energy security, helping reduce the amount of energy countries need to import, and protecting the local environment by reducing the pollution that comes with fossil fuel based energy production.

Investing in efficiency and renewable sources thus offers broad economic and environmental benefits in addition to saving energy. Finding and replicating projects that offer such multiple benefits has been a key goal of the GEF since its inception. Today the GEF is one of the public sector's largest funders for energy efficiency and renewables in the world, with direct investments of US\$850 million in more than 90 developing countries and countries with economies in transition countries, and an additional US\$5.9 billion in cofinancing. These investments are expected to reduce CO₂ emissions by 1.4 billion tons by 2020.

The GEF has invested a substantial share of its resources in projects that remove market and other barriers to energy efficiency and renewables. Through its support, developing countries have introduced a combination of policies and regulatory frameworks, standards and labels for appliances, lighting, buildings, and industrial equipment. They have established market-based approaches and financial instruments. Finally, the GEF has fostered technology transfer through the demonstration of energy-efficient and renewable energy technologies that directly affect current and future generations.

The DQY chicken farm in particular and the CHUEE project generally offer important lessons for the GEF and any institution working on climate change projects. On its 50 hectares, the DQY farm has taken the goal of agricultural self-sufficiency nearly as far as it can go. Founded in 2000, DQY now employs 600 people and is the only chicken farm in China which conforms to both European and US standards for animal welfare. The official egg supplier for the 2008 Beijing Olympics, DQY, producing about 1.5 million eggs every day, takes up 70 percent of the city's branded egg market.

Despite its size, DQY produces no emissions. The 220 tons of droppings and 170 of waste water produced daily are blended together and fed to an anaerobic tank for fermentation. The resulting methane gas is then further treated



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Shanxi, China

to remove water and harmful chemicals, then burned in two large generators to produce electricity. What is left over after fermentation gets applied as fertilizer, while the exhaust gases from the biogas combustion are fed to a boiler to heat the water used to clean the chicken sheds, thus making the system an almost entirely closed loop.

This is an elegant solution to an utterly inelegant problem. It reduces CO₂ emissions by eliminating the need for electricity generated by burning coal. Moreover, by burning methane, it removes an even more potent greenhouse gas — methane, which is more than 20 times more effective at trapping heat in the atmosphere than CO₂. The system also removes sulphur, nitrogen oxides and dust, thus improving the local air and water quality, controlling odor, and improving the environment for the workers and the production and living conditions of the farmers.

All 300 households in the village near the plant have been using the biogas for cooking and heating free of charge since 2007. Not only is it free, it saves time as well, according to Liu Mingliang, the head of the village. “The flame is much bigger than natural gas and can save almost five minutes in boiling a kettle of water,” he told the China Daily in 2009.

The DQY biogas plant obviously produces benefits for the company, the local community, and the country, and many people are interested in learning from it — the farm hosts dozens of delegations from interested businesses every week. Just the fact that the project was even considered for funding under the GEF/IFC China Utility-Based Energy Efficiency project tells a story about how such ambitious projects play out on the ground, and about the need for projects to be nimble enough to respond to changing conditions.

At the outset, the fundamental idea behind the project, as the name suggests, was to place utilities at the center and make them “one-stop shops” for companies looking to become more efficient and for banks looking for good loan prospects. The project also began as an attempt to improve the efficiency of natural gas, a clean but relatively expensive fuel, thereby making it price-competitive with cheaper but far dirtier coal. A gas utility and several banks were lined up as key initial participants.

In practice, this was not the way things worked out. The utility served small businesses such as hotels, shopping malls, and restaurants, and when a bank that specialized in such clients bowed out of the project, those banks that remained saw small businesses as too risky and expensive because of high transaction costs. Furthermore, there was little pressure from the government and the public on gas utilities to improve energy efficiency or promote renewable energy sources, as the government’s focus was on large industrial and energy companies.

At the same time, however, demand for investment in energy efficiency and renewables in China was booming. So the CHUEE project shifted from focusing on utilities and on a transition to gas to a focus on the banks themselves, since few banks in the country were familiar with the kinds of energy projects that companies were interested in developing. Typically in China, a bank makes a loan to a private business which puts up all its corporate assets as collateral for working capital and pays the loan off in one to two years. Banks tend to be wary of new technology, of loans for purposes other than, say, expanding a factory or upgrading a production process, and of longer term loans. All of these elements figure prominently in financing renewable energy and efficiency projects, so CHUEE included technical assistance to help bankers understand the needs of the companies that were coming in increasing numbers to ask for loans.

More importantly, however, CHUEE provided the banks with guarantees against losses on loans for energy projects. The guarantee would give the banks incentives to lend companies money for new equipment, like the storage tanks, generators, and specialized equipment that DQY needed to turn chicken manure into clean energy. The goal was to provide incentives for participating banks to experiment with new financing approaches for energy projects, as well as to build their capacity to undertake this kind of business as a standard business line.

The original design of the program was intended to target small to medium sized companies, like DQY, that faced particular challenges in accessing suitable financing for energy projects. Once the focus shifted from utilities to banks, however, that became more difficult, as the banks tended to focus on larger companies that needed larger



Zhejiang Province, China

loans and that also had more collateral, like steel, chemical, and cement companies. The original expectation was that 60 percent of the guaranteed loans would be small (about US\$0.2 million). In reality, the average loan size was US\$5.7 million, and loans of US\$0.2 million or less constituted less than 10 percent of the actual portfolio.

Moving down market to smaller companies remains a key challenge, as these companies are the ones with limited access to finance for energy projects. The size of their projects tends to be smaller than average for the program as a whole, and their impact on greenhouse gas reduction is correspondingly more modest. Moving down market therefore needs to be accompanied by scaling up for maximum impact on CO₂ reduction.

The goals of the CHUEE project and those of the Chinese government are complementary. The government recognizes that inefficient and non-renewable energy use poses a risk to the country's sustained economic growth, and it has committed to greater efficiency as a means to burn

less coal and thus to reduce greenhouse gas emissions. The government took a series of steps that caused lending to energy efficiency projects by public sector banks to soar in 2007. These steps included direct loans from state-owned banks to large state-owned enterprises for energy efficiency investments, and a ban on loans to steel and cement industries unless the loans were for energy efficiency or pollution reduction.

While CHUEE remains a niche player in the context of China's energy efficiency and emission reduction efforts, it clearly has played a role in the country's energy market. The program has provided many unique contributions to that market. Building banks' institutional capacities, promoting new lending practices, and improving access to financing for some underserved yet important groups all are important contributions to increased energy efficiency and expanded use of renewable energy in China. Together, these advances will lead ultimately to China burning less coal, thus placing CHUEE and projects like it at the center of the effort to build low-carbon, resource-efficient economies.



Windmills in Beijing, China



Biogas project generating energy for a rural community, China

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Energy efficient light bulb, Sri Lanka

As Easy, Almost, as Changing a Light Bulb

Say the word “coal” and most people think glossy black, slow-burning rocks, the hard stuff that generations of miners dug out of the Appalachian Mountains in the eastern United States, Shaanxi Province in central China, or Jharkhand in eastern India.

Lignite, while technically a kind of coal, does not fit that image. First of all, it is brown, and crumbly. Lignite burns so fast it just seems to disintegrate. Geologists classify lignite as coal but really it is just peat that never quite hardened. It seems unfinished, like half-fired clay.

Bituminous and anthracite coal, the more familiar kinds, ship well and indeed trade all over the world. Lignite, being soft, does not. When burned, lignite also produces less heat, more carbon dioxide, and four times as much sulphur as its harder cousins. Where deposits of lignite occur, however, the fuel is abundant, close to the surface, and therefore cheap.

Among the largest deposits of lignite in the world occur in Central Europe, particularly Germany, the Czech Republic,

and Poland. During the Soviet Era, governments in the region pursued rapid industrialization based on lignite-burning power plants. Dozens of such plants fed cheap power to the refineries and chemical factories. As workers moved in, still more plants were needed to provide heat and power to the growing towns and cities. The result was an environmental catastrophe, an unmatched level of industrial pollution. Pollution so devastated the region where Germany, the Czech Republic and Poland meet that it earned a grim nickname: the Black Triangle.

After decades of blight, by the 1980s the Black Triangle was practically unfit for human habitation. Sulfur dioxide concentrations were double the maximum safe level. Even worse, soot and dust spewing from the power plants turned the sky a dreary gray, forcing children to wear surgical masks on their way to school. Life expectancy fell and infant mortality rose as the pollution got so thick that even stepping outside became dangerous.

Then, in the fall of 1989, the Berlin Wall came down, while at nearly the same moment the Solidarity Movement in Poland and the Velvet Revolution in what was then Czechoslovakia brought down Communists governments. The resulting democratic regimes set about almost immediately to bring the Black Triangle back to life. The task entailed a complex effort

involving international agreements, new laws and regulations, clean, modern power plants and sophisticated technologies to scrub emissions from old ones. In Poland, however, one of the most important steps was as easy — almost — as changing a light bulb.

By the early 1990s, once Poland's economy had recovered from the shock of leaving central planning behind, the government and international donors saw an opportunity. While the country was becoming more efficient in its energy use, it was the twelfth largest emitter of CO₂ in the world, despite a population of just 38 million people, well below much larger emitters. Much of the demand for electricity was coming from household lighting, as most everyone in the country used old-fashioned incandescent bulbs. While more efficient, longer lasting compact fluorescent light bulbs (CFLs) were becoming common elsewhere in the world, they were practically unheard of in Poland, and the few that were available cost far too much for most consumers. The industrial giant Phillips opened a plant to manufacture CFLs in Poland, but exported nearly all of them.

If Poland wanted to provide cheaper energy services, reduce pollution, and defer the need for new energy generation, transmission, and distribution capacity, then getting those domestically-produced CFLs into light fixtures across the country was the place to start. A compact fluorescent bulb lasts six to ten times longer than an ordinary incandescent bulb and consumes only a quarter of the electricity. Replacing one 60-watt ordinary bulb with a 15-watt CFL avoids burning around 160-180 kilograms of coal or a barrel of oil at a power plant. This translates to around 300 kilograms of greenhouse gas emissions reductions.

In 1994, the GEF and International Finance Corporation (IFC) began funding efforts to stimulate the Polish market for CFLs. Beyond simply selling a certain number of more efficient light bulbs, the goal was to transform the entire market for them. Only by making sure that consumers would continue to buy CFLs after the project ended would it have a lasting effect.

The idea of using targeted projects to transform markets has become an important tool for the GEF and its implementing agencies. The lessons these organizations have



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At the heart of the GEF/IFC program, called the Poland Efficient Lighting Program, or PELP, were subsidies to reduce the retail prices of CFLs from any manufacturer that was able to meet minimum technical requirements. GEF provided over US\$2.6 million in subsidies to five Polish lighting manufacturing companies that competitively bid voluntary wholesale price reductions equal to at least the full value of the subsidies. As a result, CFL prices decreased by 34 percent in real terms from 1995 to 1998, and they have remained low since the project ended. The retail price of a single CFL fell by about US\$6, about three times the average subsidy for each one, and consumers bought 1.2 million CFLs through the project.



Warsaw, Poland

The percentage of Polish households using CFLs tripled, from 10 percent to 30 percent. New manufacturers entered the Polish market, increasing competition, and the total number of CFLs in use increased to about 1.6 million units in 1996, up from 0.6 million in 1994.

The public education component of the project promoted the CFL subsidy program by providing general consumer information on the benefits of energy-efficient lighting from a trusted, non-industry source. The public came to know the project's "green leaf" logo as a consumer brand connoting energy-efficiency and high quality.

Counting just the efficient bulbs purchased as a direct result of the two-year subsidy, the project produced electricity savings of at least 435 gigawatt-hours and reduced CO₂ emission by at least 529,000 tons. But the impact was far larger when its indirect contributions are taken into account, including greater awareness of CFLs, encouragement of new manufacturers, and a lasting reduction in price. Counting all that, the program impact amounted to total electricity savings of at least 2,320 gigawatt-hours and CO₂ reductions of 3.62 million tons. All told, CO₂ emissions per capita in Poland have fallen by 25 percent since 1989.

The project accelerated the maturation of the Polish CFL market toward saturation within about three years. A higher percentage of households in Poland now use CFLs than do so in the United Kingdom or the United States, and sales increased at more than twice the rate in the rest of Central and Eastern Europe. Polish consumers can now find more different types and wattages of CFLs in more places, including supermarkets, hypermarkets. This is what a transformed market looks like.

Consumers were not the only focus of the project. A pilot component was aimed at demonstrating to Polish electric utilities that they would be better off helping customers use less electricity than watching demand grow and then investing in expensive new power plants and transmission lines. This approach, called demand-side management, was not widely accepted in Poland in the mid-1990s. The pilot project worked in three cities where the electric power grid capacity was inadequate to meet existing electric loads or soon would be. Engineers carried out detailed analyses of

the impact that widespread use of CFLs would have on the power grid and demonstrated to the Polish electric utility industry, in real field conditions, the potential benefits of a demand-side program.

The results were clear: in the neighborhoods participating in the pilot, demand for electricity dropped by 15 percent. In some households, peak power usage dropped by 40 percent. Such significant reductions would mean enormous savings for the power companies, and important reductions in greenhouse gas emissions if the companies implemented demand-side management across the country.

Opening the market for CFLs is proving to be largely beneficial in Poland, but intervening in anything so complex can bring unintended consequences. Now that the project has ended, the new CFL market has evolved and cheaper, imported bulbs are flooding into the country. The overall quality of CFLs has declined, posing the risk that consumers will become disenchanted and go back to the old incandescents. At the same time, however, new European regulations are encouraging the sustainable growth and use of CFLs, and more efficient incandescent bulbs as well.

Improving energy efficiency involves more than just lighting. Broader efforts are needed, and here Poland faces other obstacles. Poland for now can generate more electricity than it needs, so the government has less incentive to enforce efficiency measures. The coal industry is also enormously influential in Poland, given that coal provides more than 80 percent of electricity generation in the country and provides many jobs. As a result, government policy has focused less on energy efficiency initiatives, which encourage using less energy and therefore less coal electricity generation, than on creating new jobs in renewable energy industries such as biomass.

Despite such challenges, the GEF/IFC experience in Poland suggests that the purely private-sector approach had a significant impact on the market at a reasonable cost. That important lesson has already reached other countries, and inspired the GEF and the IFC to create the Efficient Lighting Initiative (ELI), a three-year, US\$15 million investment to promote efficient lighting in Argentina, the Czech Republic, Hungary, Latvia, Peru, the Philippines, and South Africa.



Morocco



Sri Lanka



India

ELI achieved impressive results over its three-year life:

- In Peru, annual sales of compact fluorescent bulbs (CFLs) increased twentyfold, from 250,000 to over 5 million;
- In Argentina, the price of CFLs dropped eightfold due to ELI-inspired promotion and competition between lighting manufacturers;
- In the Philippines, manufacturers improved the quality of their efficient lighting products to meet ELI specifications;
- Electric utilities in Argentina, Peru, the Philippines, and South Africa began selling and financing efficient lamps to their customers;
- Municipal authorities in the Czech Republic, Latvia, Peru, and South Africa began energy-efficient street lighting upgrades;
- Thousands of newly trained lighting professionals in seven countries are able to specify efficient lighting for their clients.

Across seven countries, ELI reduced energy consumption by 2,590 gigawatt-hours, and CO₂ emissions by more than 2 million ton between 2000 and 2003. These initial

estimates indicate that ELI catalyzed immediate uptake of efficient lighting, even as the program strategy focused on underpinning long term, sustained market growth.

GEF efforts to promote CFLs in Poland and around the world have brought significant economic and environmental benefits by bringing down costs and reducing the need for new energy-generating capacity. While the focus in many of these efforts begins with the economic benefits, by way of getting governments and communities to buy in, the impact on the global environment is real and will be increasingly important as the GEF and its partner agencies explore, new ways to foster green economies from regional and national efforts all the way down to projects involving just a few towns or villages. That ability to work across scales and across all levels of government and civil society, a hallmark of the GEF since its inception, can help transform the green economy from a compelling idea to a tangible reality for millions of people. That approach had one of its truest tests and greatest successes in the campaign to revive one of Europe's lifelines, the Danube River.



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Danube Delta, Romania

Reviving the Danube

September, 1991, could hardly have been a less auspicious moment for bold environmental initiatives in Central and Eastern Europe.

In just a few months would come the final dissolution of the Soviet Union, the overwhelming political force in the region for half a century. The violent breakup of Yugoslavia was already underway and would not be fully resolved for another eight tragic years. Cooperative efforts on water and the environment, troublesome in the best of circumstances, would seem downright foolhardy when many of the potential participants are bombing each other. Even so, at that fraught moment, governments, the GEF, UNDP, and NGOs meeting in Sofia, Bulgaria, took the first, halting steps toward cooperation on conserving and restoring one of the most important resources they all share, the Danube River.

By the mid-1980s, the need for urgent action in the Danube Basin was plain. Over the previous 150 years, growing human populations and booming industries had wreaked serious environmental havoc. Some 80 percent of the Danube's wetlands and floodplains had disappeared since the end of the 19th century, threatening key species such as pelicans

in the Danube Delta and beavers in the Upper Danube, and leading to worsening floods across the basin. Pollution, especially from organic substances and nutrients, posed a major long-term threat to the environment. In the 1970s and 1980s, nutrient pollution threw off the ecological balance in the western Black Sea and led to a dead zone — produced when oxygen levels are too low for most organisms to survive — and that covered tens of thousands of square kilometers.

The problems were clear, and in theory at least so were the solutions. A map of the Danube shows why: The river stretches 2,780 kilometers from Germany's Black Forest to the Danube Delta on the western shore of the Black Sea. The Danube River Basin covers 10 percent of Europe, a total area of over 800,000 square kilometers. The basin today includes the territories of 19 countries, making it the world's most international river basin. It is also home to 81 million people with a variety of languages and histories. With these preconditions, any effort to restore the Danube would need broad, and in fact, unprecedented international cooperation. Far less clear was how this could happen in practice.

Such was the setting for the GEF's first foray into international waters. While GEF's work in the Danube Basin has evolved into a multi-faceted program lasting 15 years, it began with a single goal: build the willingness and the capacity

for a diverse group of nations with a history of war and mistrust to work together. The first task was to demonstrate the benefits that only such cooperation could achieve. The working hypothesis of the GEF's International Waters intervention was simple: Get countries to examine the basket of benefits they receive from shared water resources like the Danube they will quickly realize that the basket would be much bigger if they cooperated with their neighbors. Everyone on the Danube Basin needed to understand how such transboundary resources are used, abused, or transformed. A better understanding would give decision-makers confidence that longer term joint interventions could tackle problems more effectively.

Here, political transformation helped catalyze environmental transformation. In the vacuum created by the collapse of the Soviet Union, the European Union was now the region's dominant economic engine. The promise of accession to the EU and the subsequent need to meet its stringent environmental directives provided the driving force for environmental change in the Danube Basin. The GEF and UNDP provided countries with significant assistance in helping to build their capacity to meet the EU's accession and legislative challenges. In 1994, meeting once again in Sofia, 11 Danube countries and the European Commission signed the Danube River Protection Convention. This agreement provided the overall legal framework for protecting and sustainably using water and other shared ecological resources in the Danube Basin.

The Convention came into force just four years later, on October 22, 1998, a remarkably fast accession for a complex treaty covering such sensitive and often contested resources. That this was achieved so quickly testifies both to the urgency of the problem and to the foundation that the GEF had helped create for basin-wide cooperation. Days later came another milestone, the creation of the International Commission for the Protection of the Danube River (ICPDR) and its Permanent Secretariat, the main implementing body of the Danube Convention.

Since its creation, the Commission has grown into one of the largest and most active international bodies of experts on integrated water resource management in the world, promoting policy agreements and setting joint priorities

and strategies to improve the basin. This permanent, financially sustainable body is now vital to maintaining continuity, momentum, and country commitment to managing the Danube effectively and sustainably.

After 2000, on the basis of a voluntary political commitment by all Danube countries, the main priority for the Commission became the implementation of the EU Water Framework Directive, which obliges EU member states and accession countries to use a river basin approach for managing their water resources. Now that even countries outside the EU have agreed to abide by the Water Framework Directive, effectively all Danube countries are guided by a single overarching legal framework governing the region's waters.

One of the first projects of the Commission was the GEF/UNDP-led Danube River Basin Pollution Reduction Programme. That effort led to the preparation of the first GEF "Transboundary Diagnostic Analysis" for the Danube Basin with a focus on nutrient pollution. This analysis would become an important building block for subsequent Danube analyses and for an action program that included measures to reduce water pollution, promote conservation, and restore ecosystems. Joint action by countries was seen as essential to reduce the flow of pollutants from agricultural, domestic and industrial sources into the Danube and Black Sea.

A GEF/World Bank Investment also provided a focused regional framework for country-level investments aimed at a common goal of reducing nutrient pollution in the Black Sea and helping to jump-start and further accelerate key investments in sectors such as municipal wastewater, agricultural run-off, and industrial pollution, as well as policy and legal reforms and capacity building for enhanced monitoring and enforcement.

The process established a scientific and technical fact-finding analysis feeding into a negotiated plan that establishes clear priorities for action. This initiative in the Danube basin has become a model for other transboundary water problems. The joint fact-finding and analysis encompasses two fundamental components of multinational efforts like the Danube project, building trust and fostering a shared understanding of the problems all the parties face.

Danube River in Serbia



“The support by the GEF and UNDP not only turned the Danube into a model of integrated river basin management, it also backed up the political stability of the whole Danube region.”

In addition to cross-border cooperation, the EU Water Framework Directive obliges Member States to engage the public into river basin management planning process, through which it also encourages the involvement of NGOs and local citizens in water issues. In order to facilitate this process, the GEF, through its Small Grants Programme, helped create the Danube Environmental Forum, the umbrella organization for the largest network of NGOs and local communities in the basin. It consists of 174 member organizations from 13 Danube countries. The Danube Small Grants Programme marked the first time the GEF had worked with NGOs in this way.

The Danube Environmental Forum was particularly successful in fostering public involvement, particularly in countries like Serbia, Bulgaria, and Romania, where NGO activities and the notion of public access to information have short histories. NGOs, working on door-to-door campaigns and hosting

numerous meetings at the community level provided the means by which the project could reach many of the stakeholders, especially farmers. Many projects supported by small grants were geared to solving nutrient reduction, and about half of the small grants went to NGOs supporting activities to promote best agricultural practices.

Public awareness of the issues facing the Danube is now at an all-time high. In 2004, the International Commission for the Protection of the Danube River launched international Danube Day to celebrate the 10th anniversary of the signing of the Convention. Danube Day is now an annual event paying tribute to the Danube and its tributaries. The diverse activities on and near the river draw millions of people from a cross-section of society and help create stronger connections between people, the basin and its biodiversity, mobilizing Danube Basin residents to take action.



Danube River in Romania

The GEF's experience in the Danube illustrates the necessity of working at various spatial, temporal, and political scales. The GEF's involvement began with a regional focus, supporting steps toward a binding, international convention. Once that framework was in place the focus turned to efforts at finer and finer scales, from basin-wide to binational to national to local, all the way to working with individual farmers to improve their practices. Working at all of these scales can have significant impacts as long as the broader commitments and institutions are in place. That lesson is being applied to other transboundary waters, such as the Benguela Current off the southern African coast, Lake Victoria, and the Guarani Aquifer beneath Argentina, Brazil, Paraguay and Uruguay.

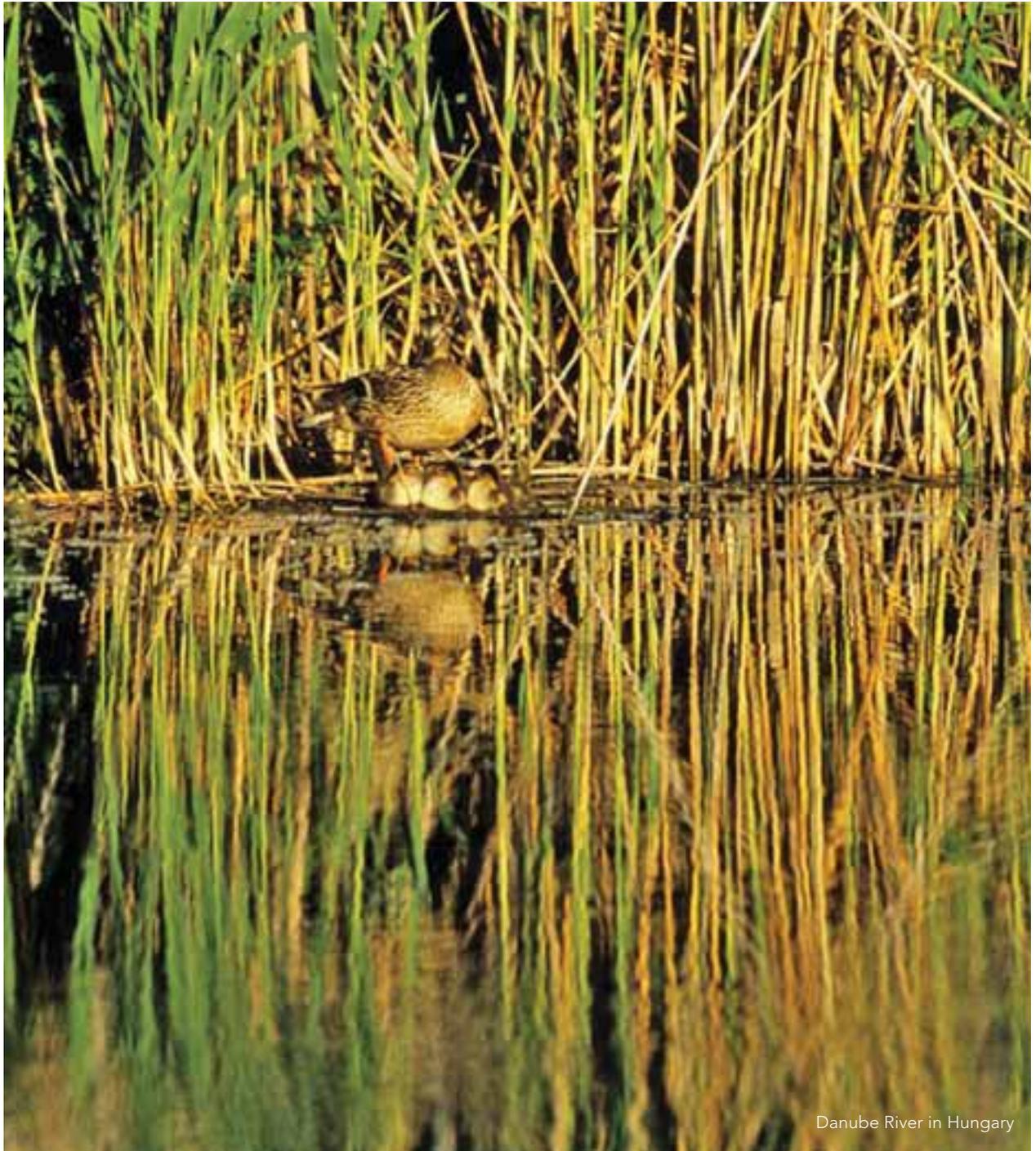
The support by the GEF and UNDP not only turned the Danube into a model of integrated river basin management, it also backed up the political stability of the whole Danube region. The Commission was able to begin implementation of the Water Framework Directive so that it is now the benchmark for European transboundary water bodies. With GEF's support, the Commission also took a holistic look at the pressures facing the river, such as the significant eutrophication problems caused by agricultural inputs, the important flood buffering attributes of riverine wetlands, and the critical need to improve tariff and charge schemes for water and sanitation systems. Ultimately, GEF and UNDP efforts in the Danube–Black Sea area could become a model for expanding public awareness of the need to embrace integrated water resource management as a way to ensure that economies can grow without environmental destruction.

The environment of the Danube Basin and of the Black Sea is now showing clear signs of recovery, overcoming a legacy of pollution that has left scars across the region. In the northwest shelf of the Black Sea, the turnaround has been nothing short of extraordinary. Twenty years ago, the entire shelf was hypoxic, a huge dead zone marked by periodic blooms of algae but few fish, shellfish, or other species. Now, with reduced nitrogen and phosphorous pollution, oxygen depletion in the lower levels of the sea observed in the 1970s and 1980s has been virtually eliminated, with oxygen levels now at or near saturation in most areas. Measures of biodiversity are up: The number of benthic species observed in the early 2000s was nearly double that of the late 1980s, though still significantly lower than conditions in the 1960s. More broadly, across the Danube Basin, nitrogen emissions have decreased by 20 percent and phosphorus almost by 50 percent over the last 15 years.

The Danube offers a telling illustration of the GEF's catalytic role. The GEF has three categories of catalytic activities, all of them evident in the Danube: foundational, demonstration, and investment. In the Danube project, the GEF used these three categories in a phased approach: the foundational phase of bringing countries together; a demonstration phase with efforts like the pollution reduction programme; and an investment phase in which countries and other donors join to provide the funds necessary to scale up activities. Acting as a catalyst has always been fundamental to the GEF, and will continue to shape the way it works in all its focal areas and in all regions.



Danube River in Bulgaria



Danube River in Hungary



Danube delta in Romania

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Defusing a Ticking Time Bomb in Moldova

The tiny village of Ratus sits at a crossroads in central Moldova, about 60 kilometers from the capital, Chisinau.

Surrounded by fields, with other small villages nearby, the few streets in Ratus cover less than a square kilometer, a village in most ways typical of rural parts of Eastern Europe. But until recently Ratus held a dangerous secret. For years, the entire district of Telenesti, some 850 square kilometers in size, sent tons of obsolete and prohibited pesticides to Ratus. These hazardous chemicals accumulated in rotting containers until 400 tons sat in an old warehouse, essentially a toxic ticking time bomb for the people and the environment in Ratus, across Moldova, and beyond.

In the Soviet era, particularly the 1970s and 1980s, Moldova imported huge amounts of pesticides to spur agricultural production. Between the 1950s and 1990s, farmers used 560,000 tons of pesticides, including 22,000 tons of the organochlorinated variety. Soil samples taken between 1976 and 1990 showed pesticide contamination levels 50 times the maximum allowable concentration. High concentrations of the pesticide dichlorodiphenyltrichloroethane (DDT) turned up in 60 percent of soil samples despite the prohibition of DDT in 1970.

As Ratus became a dumping ground for pesticides, so Moldova at large became a hot spot for deadly PCBs. Industrial expansion during the Soviet era meant rising demand for electricity and electrical equipment and a related need for cooling and insulating fluids that would not catch fire, as did the mineral oil previously used for those purposes. The solution came in the form of a relatively inert class of man-made chemicals called polychlorinated biphenyls, or PCBs. Throughout the latter half of the 20th Century, tons of PCBs accumulated in electric capacitors and transformers even though scientists had determined that they were potent environmental and health hazards in the 1930s. In Moldova, a major energy generating and transit hub for the Soviet Union, most equipment containing PCBs was out of use but still in place by the late 1980s, leading to oil spills and leaks from corroded capacitors. Approximately 20,000 PCB-containing capacitors containing about 380 tons of PCBs were situated in 20 electrical substations throughout the country, but especially at the Vulcanesti Power station.

After Moldova declared independence from the Soviet Union in 1991, owners of the chemicals and warehouses abandoned their stockpiles and the containers began to decay, leaving wind and rain to spread the poison across the region. “We didn’t believe that we would ever be free of

this danger threatening the public health and the environment,” the mayor of Ratus village, Raisa Pavlov, said in 2007.²

Many people who came into contact with the pesticides did not know anything about the risks and did not comply with any of the minimum protection requirements. Excessive exposure to the chemicals in rural areas led to an increase of ailments, including chronic hepatitis and cirrhosis. By the late 1990s, increasing numbers of mothers were being hospitalized, and the number of children born with malformations was growing. Most people who worked with chemicals got seriously ill, and some died of cancer. The threat to the environment and health of thousands of people was real and growing.

“As Ratus became a dumping ground for pesticides, so Moldova at large became a hot spot for deadly PCBs. “We didn’t believe that we would ever be free of this danger threatening the public health and the environment,” the mayor of Ratus village, Raisa Pavlov, said in 2007.”

The problem is hardly Moldova’s alone. Pesticides, industrial chemicals, and unwanted by-products of industrial processes known collectively as Persistent Organic Pollutants, or POPs, are a global scourge, particularly so in Eastern Europe and Central Asia. There they form part of the grim environmental legacy of collective agriculture and heavy industrialization that led to the near death of the Black Sea and the Danube River, and left pollution hotspots scattered throughout the region.

POPs can cause diseases in humans even in unimaginably small concentration — parts per trillion or even less. They can remain toxic for decades because they resist degradation in air, water, and sediments, and they accumulate in the fatty tissues of most living organisms, leading to concentrations higher than those in the surrounding environment. They also can travel great distances from the source of release through air, water, and migratory animals, often contaminating areas thousands of kilometers away from any known source. Thus, POPs can cause significant adverse human health and environmental effects both near and far.

Women, infants, and children are especially vulnerable to certain effects of POPs. These synthetic chemicals can move easily through the human body, even through a woman’s placental barrier and into the womb, exposing unborn children to health hazards during the most vulnerable stages of development. Evidence links human exposure to specific POPs or classes of POPs with adverse health effects, including cancers, diabetes, immune system changes, learning disorders, and reproductive deficits and sex-linked disorders. The source of the harm caused, however, is not always easily identified.

Recognizing the dangers of POPs, many countries began limiting or banning their production, use, and release, in some cases as early as the 1970s. These efforts culminated in the Stockholm Convention on Persistent Organic Pollutants, that was adopted in May of 2001, and that entered into force in 2004. The more than 160 countries that are Parties to the Convention agreed to eliminate or reduce the release of POPs into the environment.

The Stockholm Convention began with a focus on 12 POPs of immediate concern, often referred to as “the dirty

2. quoted in World Bank 2007



dozen." These are the pesticides aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB, also used as an industrial chemical), mirex, and toxaphene; PCBs; and dioxin and furans, which are unintentional byproducts of combustion and industrial processes (as are PCBs and HCB). Unintentional chemical byproducts are among the most potent cancer-causing chemicals known. In 2009, the parties to the Convention added nine new chemicals to the list.

The GEF is the lead institution providing technical and financial assistance to support the efforts of developing countries and countries with economies in transition to implement the Stockholm Convention. The GEF is helping countries create national inventories of POPs and working with these nations to reduce or eliminate the use and release of these chemicals into the environment. The GEF also helps facilitate safe disposal and supports the development of environmentally sound alternative products, practices, and techniques.

Since adoption of the Stockholm Convention the GEF has committed US\$496 million to projects in the POPs focal area and leveraged some US\$1.5 billion in co-financing, bringing the total value of the GEF POPs portfolio to approximately US\$1.6 billion. Just seven years after the Stockholm Convention went into force, the GEF is helping more than 138 countries to inventory their POPs and develop priority interventions to reduce or eliminate releases of these chemicals to the environment and risks to human health. These efforts have also raised awareness and built the capacity of institutions to consider and plan for eliminating not only POPs but other harmful chemicals as well. Through these activities, intra-governmental coordination, stakeholder engagement, and open information have been advanced, particularly towards industry and the private sector.

The first step for signatories to the Stockholm Convention is the preparation of a National Implementation Plan (NIP) to guide the overall effort. By the end of 2008, the GEF had funded or was funding initial planning in 138 countries. More than one hundred countries are now at the stage where their Plan has been endorsed and submitted, or is in the final review and endorsement stage, and 108 of these countries have already submitted their plans to the Convention.

Moldova ratified the Stockholm Convention in 2004 and immediately began preparing its National Implementation Plan. The focus of the plan was identifying the main sources of POPs in the country: the warehouses full of pesticides like the one in Ratus, and power stations that have stored huge amounts of used capacitors and oil contaminated with PCBs. In 2005, the GEF provided US\$6.35 million in funding for Moldova in the first NIP implementation project in the GEF portfolio. The project took an integrated approach to deal with the top priority Stockholm Convention issues facing Moldova, addressing PCBs, obsolete pesticides, and strengthening of institutions and regulations for long-term sustainability.

The goals of the GEF project, carried out by the World Bank, were to help Moldova manage and dispose of contaminated stockpiles and to strengthen the regulatory and institutional arrangements for long term control of POPs and other toxic substances. This would be done in line with the requirements of the Stockholm Convention and other related conventions and protocols ratified by Moldova. There would be beneficiaries at the local, regional, and global levels: some 150,000 people live or work in the vicinity of contaminated sites, and managing POPs provides regional and global environmental benefits by reducing pollution of water supplies, preventing pesticides and PCBs entering regional and global food chain through soil contamination, and reducing impacts on land, biodiversity, and waters.

This sort of ambitious undertaking is complex and there are bound to be surprises. In late 2006, for example, as work began on the removal and destruction of POP stockpiles at the Vulcanesti power station in Moldova, engineers had an unwelcome surprise. The plan was to incinerate 50 tons of contaminated soil from the station. But it turned out that the site had more than 3,000 tons of contaminated soil. The contaminated soil was buried in enormous cofferdams constructed at the site. Because of the intervention, things went more smoothly after that. Over the next ten months, another dozen power stations were dismantled and about 19,000 capacitors, with a total weight of 950 tons, were destroyed.

The evacuation of obsolete and prohibited pesticides began in early 2007 at the central store house in Ratus. Nationwide, the project enabled the environmentally sound destruction



of nearly 1,300 tons of obsolete pesticides, and over 950 tons of PCB containing equipment (approximately 19,000 capacitors) — about 80 percent of the PCB contaminated electrical equipment in the country. The project identified hotspots including more than 1,500 old and abandoned warehouses and pesticide mixing or preparation sites and 16 PCB contaminated sites. The effort also strengthened the country's legislative and regulatory framework, which sets the stage for a modern chemical management system, and increased public awareness about health and environmental hazards from POPs.

These actions resulted in substantial local and global environmental and human health benefits. The risk of exposure to dangerous chemicals has been significantly reduced or eliminated. Improvements to transboundary and global water quality is also ensured through the elimination and better management of these substances. Prior to the project, what little legislation existed on chemicals and hazardous waste was woefully inadequate. Since then, a total of 15 draft laws and regulations have been completed under the Project.

Once enacted, these laws and regulations will form the legal foundation for a modern regulatory system for the management and control of POPs and other toxic chemicals and wastes in Moldova.

The involvement of various levels of government, local communities and civil society in the project helped to generate strong support for regulatory reform and capacity building for POPs management in the country. For example, Moldova's Deputy Minister of Agriculture, Anatolie Spivacenco, stated that the project had led to adoption in Parliament of legislation regulating import, storage, and use of pesticides. The head of the Environmental Movement of Moldova, Alecu Renitsa, noted that the project had allowed thousands of tons of poisons stockpiled during the Soviet era to be destroyed, and had benefitted the communities, the country, and the environment as a whole. Projects operating in one country, or even in one city or one village, like Ratus, but which have far broader impact, are a hallmark of the GEF and one of its defining principles: Limited scale does not necessarily mean limited significance.





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Ganges River, India

Small Grants, Big Results

The Bagmati River, sacred to both Hindus and Buddhists, flows down Nepal's Kathmandu Valley, through terraced rice fields and past ancient temples.

As the river nears the teeming cities of Kathmandu and Lalitpur, it becomes as much a garbage dump as a source of spiritual cleansing. Untreated sewage flows into the river, and generations of residents have used the waterway to dump their household trash as well.

Local people, government agencies, international organizations, and foreign tourists have complained about the growing garbage problem in Kathmandu and Lalitpur, cities with a combined population of nearly 1 million. Complaints abound; workable solutions have been scarce — that is until two women, Bishnu Thakali and Sharada Vaidya, together with their neighbors, stepped forward with a plan of action.

In 1992, Thakali, Vaidya, and about a dozen other women fed up with the growing mountains of trash in their Kupondole neighborhood, just south of the Bagmati, took matters into their own hands. Starting with 50 nearby houses, they went door to door making the case for people to reduce,

reuse, and recycle their garbage. At first the results were mixed: They encountered some resistance but also received some expressions of support. Encouraged, they decided to expand the effort and formed an organization called the Women's Environmental Protection Committee, or WEPCO. "We used to blame the government, the municipality—everyone but ourselves," recalls Vaidya.

By 2004, WEPCO had expanded waste collection to over 1000 households, charging each a small fee, and managing about seven tons of waste daily. Since most of the household waste is biodegradable, it makes for an ideal source of biogas. WEPCO has built several small demonstration biogas plants producing gas usable for cooking. The organization also sells fertilizer made from organic compost.

The women of WEPCO have found other ways to turn trash into opportunity. The group collects paper from banks, hotels and other businesses and recycles it, training local women and selling recycled paper products, including stationery that often goes back to the same businesses that provided the waste paper in the first place. "There is good money in waste, from recycling paper and plastics to making cooking gas from kitchen waste. Everybody in Kathmandu can save money and keep their environment

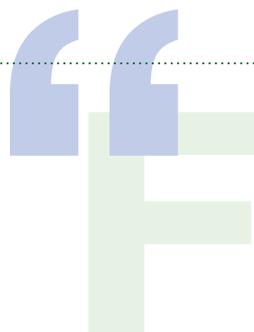
cleaner. But it takes education,” says Thakali, who is now the President of WEPCO.

WEPCO is just one example of the projects that GEF supports through its ground-breaking Small Grants Programme (SGP). For almost two decades, the SGP has been one of the crown jewels of the GEF, working with communities around the world to combat the most critical environmental problems. Through thousands of small grants, the program has demonstrated that supporting communities in their efforts to achieve more sustainable livelihoods is not only possible but vital in bringing about change and improving the global environment.

Launched in 1992, the same year that Thakali and Vaidya began their war on trash, SGP channels financial and technical support directly to community-based organizations, non-governmental organizations (NGOs), and indigenous peoples' organizations in 122 developing countries. Through nearly 14,000 grants, SGP has supported activities that conserve and restore the environment while enhancing people's well-being and livelihoods, striking a balance between human and environmental needs. The United Nations Development Programme (UNDP), acting on behalf of the other GEF implementing agencies, carries out SGP projects through strategic partnerships. SGP has been able to match program funding from the GEF (approximately US\$400 million) with cash and in-kind contributions for a total financial impact of over US\$800 million since the program's inception.

SGP projects focus on testing innovative solutions to environmental problems at the community level, with the hope and expectation that successful approaches will be replicated at broader scales. The grants, which average about US\$35,000 with a maximum of US\$50,000, go directly to local groups and indigenous peoples in recognition of the key role they play as a resource and constituency for environment and development concerns. The decentralized structure of SGP encourages maximum country- and community-level ownership and initiative.

Program grants ensure that communities and other key stakeholders understand and can carry out conservation and sustainable development strategies and projects that protect the global environment, help develop community-level



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strategies, and implement technologies to reduce threats to the global environment if they are replicated over time. SGP also gathers lessons from community-level experience and initiates the sharing of successful community-level strategies and innovations among local organizations, host governments, development aid agencies, and others working on a regional or global scale.

SGP is more than simply a fund that provides small grants. By raising public awareness, building partnerships, and promoting policy dialogue, SGP seeks to promote an enabling environment within countries for achieving sustainable development and addressing global environmental issues. SGP has helped organizations and governments support local, community-based initiatives while at the same time meeting national obligations and global commitments.



Citarum River, Indonesia

That approach bore fruit in Nepal, and helped empower the women of WEPCO. It is also working in the Caribbean nation of Belize on the Yucatan Peninsula. Responding to a range of threats facing the Belize Barrier Reef System, an SGP-funded initiative called the Community Management of Protected Areas Conservation Programme (COMPACT) has been working for more than a decade to preserve the integrity and character of the reef. The program, an initiative of SGP, UNESCO, and the United Nations Foundation, seeks to develop World Heritage Sites, Biosphere Reserves and other socio-ecological production landscapes into learning laboratories for sustainable development. COMPACT works at eight current or proposed World Heritage Sites around the world, and in Belize is developing and supporting a range of conservation and sustainable livelihood activities through transparent and democratic partnerships with coastal communities and other stakeholders.

The Belize Barrier Reef System, the second largest in the world behind Australia's Great Barrier Reef, and a World Heritage site since 1996, encompasses seven marine protected areas (MPAs) with a total area of 116,148 hectares. One of the most diverse ecosystems in the world, the reef is Belize's top tourist destination, attracting almost half of the country's 260,000 annual visitors, and is vital to its fishing and tourism industries. Twenty-two coastal communities several inland communities are adjacent to the World Heritage Site and local livelihoods depend on the health of the reef system for activities such as fishing and tourism.

COMPACT's establishment in Belize grew out of a year-long participatory process which brought together key stakeholders in a national forum to discuss the conservation and sustainable use of the Belize Barrier Reef System. A baseline assessment resulted as part of this process; it revealed the degree of alienation felt by the fishing community toward the MPAs, which they viewed as having been aimed at restricting traditional fishing in favor of tourism development.

In response, COMPACT's site strategy prioritized helping fishers benefit from the MPAs through co-management arrangements and alternative livelihood initiatives. Thus the emphasis was on the need to help local users understand the global value of the reef and their roles as its stewards. The result has been a shift in the attitude of fishermen and others in

the coastal communities that depend on the health of the reef system. Fishermen who were once opposed to the MPAs have now become among their greatest advocates. Many are leading efforts to expand the boundaries of MPAs within the Belize Barrier Reef System and to improve fisheries management policies within the reef.

The fishing village of Sarteneja, Belize, provides a telling illustration of the impact the SGP can have. Since the community has historically depended largely on harvest of lobster, conch, and finfish, COMPACT supported a project to provide alternative livelihoods to reduce pressure on the declining fisheries resource. The project has focused on increasing local awareness of the value and unique attributes of the Bacalar Chico National Park and Marine Reserve, while training local tour guides and helping to market the eco-tourism and educational tourism potential of the area.

COMPACT projects, like those in Belize, provide tangible demonstrations of the highly touted but often largely abstract notion of linking local livelihoods and biodiversity conservation. Demonstrating constructive ways of involving local stakeholders in the conservation and sustainable use of biodiversity in and around protected areas remains one of the most important challenges and priorities for nature conservation.

Another SGP project illustrates how a relatively small amount of funding can engage local stakeholders in this way to tackle multiple problems including biodiversity conservation, land degradation, and gender issues. Communities in remote, rural areas traditionally lack access to conventional power sources. These communities have to rely on kerosene or firewood for basic energy needs, leading to local deforestation and contributing to climate change. Solar energy provides an alternative energy solution while simultaneously spurring progress in human development including poverty reduction, gender equality, education and health. There remains a need, however, to enhance the capacities of local communities to build, install, maintain and repair solar technologies and local women could play a significant role in addressing these issues.

In 2008 the SGP began a partnership with Barefoot College in Tilonia, India. A pioneer in demystifying complex technological processes for illiterate students, this institution has



Fishing in Mexico

been working since 1972 to provide basic services and solutions to problems in rural communities, with the objective of making them self-sufficient and sustainable. Barefoot College and SGP are working together to support “Women Solar Engineer” pilot projects across Africa’s and Asia’s poorest countries. In this collaborative effort, the GEF SGP provides communities with technical support and funding for the solar panel kits. The Barefoot College, offers a six-month training program to the women beneficiaries of the GEF SGP.

The partnership between SGP and Barefoot College is rooted in the belief that it is fundamental to empower communities to develop their own sustainable energy solutions. Under the Solar Engineers project, each community forms a village solar committee that supervises the community’s solar energy project and selects candidates for the training in India. After learning how to install, maintain and repair solar energy kits, the engineers return to electrify households in their villages. In return for their installation, maintenance, and repair services, the women engineers receive a monthly salary from the village solar committee.

Through these projects the women have managed to provide electricity to over approximately 2,245 households, bringing light to nearly 15,000 beneficiaries in 32 villages in 12 countries: Benin, Bhutan, Burkina Faso, Cameroon, Chad, Ethiopia, Ghana, Kenya, Mozambique, Niger, Rwanda, and Uganda. In addition, communities have seized the opportunity to provide electricity to numerous public facilities, including

schools, hospitals, food processing plants, local administration offices, religious buildings and community centers. Most fundamentally, the projects have managed to reduce CO₂ emissions, ease pressure on deforestation, and decrease air pollution from burning firewood and kerosene.

However, the most profound impact of solar electrification has been on community-wide economic activity. Solar lighting has enabled the extension and improvement on the continuity of economic activities after dark. All participating communities noted the powerful effect of the GEF SGP-Barefoot College partnership on the social status of the illiterate women trainees. The program empowered women trainees to acquire complex technical skills, enabling them to return as qualified solar engineers to serve their communities. Most of the Women Solar Engineers managed to translate their new livelihood activity into better living standards.

The Small Grants Programme embodies a central theme of the work of the GEF and its partners: What matters most is the tangible, measurable difference their efforts make for the environment and for people often struggling to survive. That impact can be seen in finest detail at the local level in small projects, where innovation can be found as well. As seen in Nepal, Belize, and in the dozen countries served so far through the partnership with Barefoot College, the Small Grants Programme offers real-world experience in the sometimes fraught process of linking sustainable local livelihoods and biodiversity conservation.



Rajasthan, India



Rajasthan, India



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Flower Valley, South Africa

Flower Valley

The annual Chelsea Flower Show in London draws thousands of flower lovers from around the world who stroll through showy displays and arbors reveling in the orderly exuberance of the English country garden.

This century-old tradition would seem an unlikely stage for the innovative conservation and use of South African biodiversity. Yet this is precisely what attendees of the show walking the grounds of the Royal Hospital, Chelsea, encountered in the spring of 2011.

In May, 2011, the judges at the flower show awarded a gold medal to a South African exhibit of stunning plants picked from the Agulhas Plain and other areas in the Cape Floral Kingdom. This global center of plant diversity overlooks the junction of the Atlantic and Indian Oceans at the southernmost tip of Africa. The flowers and plants in the exhibit—which included the colossal King Protea, with blossoms nearly a foot in diameter, and other species representative of the unique South African ecosystem known as fynbos—were picked according to a new set of standards designed to ensure a sustainable harvest of these natural treasures.

The gold medal highlights the increasing emphasis that global consumers are placing on sustainability. In an effort to translate that interest into tangible progress for biodiversity conservation and rural development, the GEF and the United Nations Development Programme (UNDP), supported the South African government in the creation of the Agulhas Biodiversity Initiative (ABI). This project brought together private landowners, rural communities, government agencies, and both national and international organizations to tap into new markets sustainably-grown flowers in order to protect landscapes in an economically viable way. The objective of ABI was to convince landowners, private businesses, and local communities that biodiversity—if managed and used sustainably—will provide economic benefits in the long-run comparable to that of the conventional and unsustainable alternatives, such as cattle and sheep ranching, or wheat farming.

The Agulhas Biodiversity Initiative, a broad effort to improve conservation and sustainable use in the Agulhas Plain, is one of three complementary GEF initiatives in support of the Cape Action for People and the Environment (CAPE) partnership program, jointly supported through the World Bank and UNDP, and coordinated by the South African National Biodiversity Institute. GEF financing in the Cape Region is aimed at strengthening the ability of individuals, institutions,

and government to test and carry out new types of conservation and development in a variety of ecological and socio-economic conditions.

The CAPE Programme seeks to conserve the biodiversity of the Cape Floral Kingdom while creating significant social and economic benefits. This region is the smallest and richest of the six floral kingdoms in the world, and the only one to be found entirely within one country. In an area of just nine million hectares the Cape Floral Kingdom contains over 9,000 species of plants, nearly 70 percent of which are found nowhere else on earth. More than 1,400 species in the Cape Floral Kingdom are listed as being critically rare,

endangered, or vulnerable, and at least 29 species have already become extinct.

The rich biodiversity of the Cape Region provides for a multitude of essential ecological services and livelihood opportunities. However, over 80 percent of the 275,000 hectares of the Agulhas Plain is privately owned, so any strategy for the conservation of this rich biodiversity needs to include local communities and especially the landowners and land users.

With national partners, including South African National Parks (SANParks), the GEF and UNDP launched ABI to explore innovative ideas and to secure the Agulhas National Park, which was created in 1996 and is the largest protected area in the vicinity. The Park, like much of the region, had been invaded by exotic plants which were choking out the native fynbos and leading to catastrophic wildfires. Under ABI, land managers tested new methods of clearing and containing these invasive and highly combustible alien species. Most importantly, ABI gave its partner organizations the chance to work with private landowners and disenfranchised local communities to find economic benefits in the sustainable use of the biodiversity of the Agulhas Plain.

An important step came in 1999, when a 530 hectare farm in the Plain called Flower Valley was on the verge of being sold and potentially converted to vineyards, which would have wiped out another parcel of native fynbos. Instead, Flora & Fauna International intervened to buy the land, and donated it to the newly created Flower Valley Conservation Trust. Flower Valley Farm became a testing ground for new methods for meeting the challenges of ecologically, economically, and socially sustainable use of the fynbos biome.³

ABI and its partners, including the Trust, recognized the need to strengthen the scientific basis for sustainable harvesting, to promote social responsibility and compliant production systems, and to develop markets to manage sustainable fynbos flower products such as bouquets. Ultimately, through this work and the resulting economic incentive, the harvesting of fynbos has become an important conservation mechanism in the region. The Code of Best Practice for sustainable wild harvesting is now complete, along with a vulnerability

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D evolved, collective
landholder conservation

is a powerful idea. It provides enormous advantages, including the management of landscapes over much larger areas, economies of scale, the control of unsustainable activities through peer pressure rather than prohibitively expensive and unwanted top-down regulation, and greater efficacy of service delivery.”

3. A biome is a large geographical area with distinct plant and animal groups adapted to that particular climate; examples include tundra, taiga, grasslands, savanna and desert.



Protea of the Floral Kingdom, South Africa

index for 71 harvested species and 79 species with harvest potential (only 150 of some 2,000 species are commercially harvested). Seven suppliers have been trained and certified to sell flowers, and a formal national certification system is now in the making.

In its early years, the Trust, as a non-profit organization, struggled with complex commercial challenges such as linking flower pickers and property owners. In response, in 2003 the Trust and private investors created an independent for-profit company called Fynsa to handle the commercial matters and to find markets for sustainably harvested wild fynbos purchased from certified suppliers.

Aligning the goals of a start-up, for-profit business with developing new ethical and ecological sustainable approaches posed some serious challenges. Nevertheless, Fynsa struck a deal with the European retailer Marks & Spencer and supplied the luxury retailer with over 330,000 bouquets in 2006. More recently, Fynsa completed a similar agreement with Pick 'n Pay, a large supermarket chain in South Africa, and is now in the process of expanding to include other South African retailers and another major retailer in the UK. The deal with Marks & Spencer has provided Fynsa with a steady, reliable demand for its fynbos bouquets, increasing employment and providing a year-round income. Fynsa now buys flowers from harvesters working on private lands covering over 30,000 hectares, and the income and steady market provides an incentive for the private land owners to conserve biodiversity.

Through stewardship agreements with landowners and the expansion of the Agulhas National Park, ABI helped to secure the protection of 102,000 hectares, or 37 percent of the Agulhas Plain. At least 40 percent of this surface area is on privately owned productive landscapes, reinforcing the important role of the agricultural sector to conservation. By the end of the project, the area of properties harvested by certified suppliers was expected to double to 120,000 hectares.

The Flower Valley Programme demonstrates that biodiversity can be an economic resource, but it did not work exactly as planned. The Programme began with the assumption that green certification would show consumers that a particular product has been produced in a sustainable way

and thus would justify a premium price on the flowers of Flower Valley. Consumers, however, have not shown a willingness to pay more for certified flowers, so retail chains are not willing to pay suppliers more, either. For wild harvested fynbos, at least, the value of certification appears to lie not in price premiums but in preferential market access and year-round demand. While the project has been unable to secure premium prices for sustainably harvested fynbos flowers, it has secured a direct market with major retailers, reducing payments to middlemen and increasing returns to farmers. These direct markets would not have materialized without the sustainable production and verification systems developed under the project.

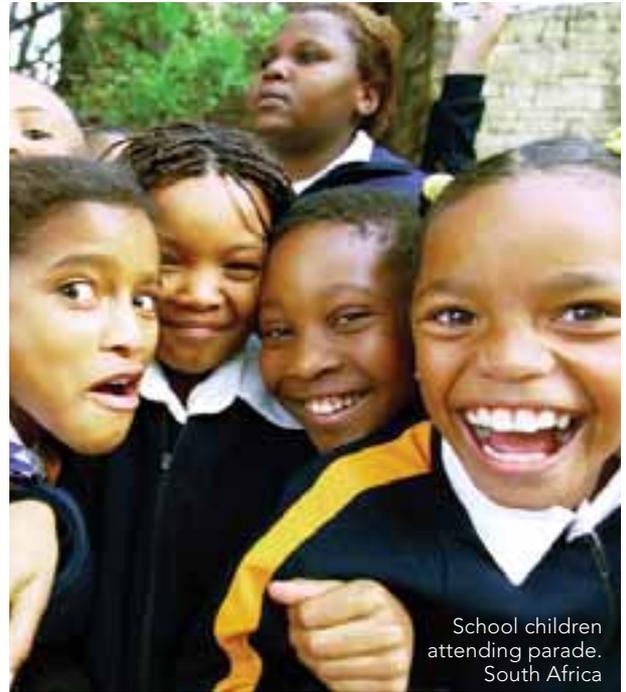
In another unexpected turn, despite progress made in the development of a system for certifying fynbos harvesters and securing certified markets, the Flower Valley Programme has not demonstrated that wildflower harvesting is viable as the sole land use for landowners in this area. Rather, it has shown that there is value for the landowner in holding on to virgin fynbos land for harvesting as a complementary land-use option in a mixed farming enterprise.

The partners of ABI continue to work on ways to address the troubling question of how to make biodiversity part of the economic foundation for the Cape and indeed all of South Africa. The project made great strides towards a biodiversity economy through the Nuwejaars Wetland Special Management Area, northeast of Agulhas National Park, with financing secured from the Government of Germany's International Climate Initiative. There, 25 private landowners and the community of Elim made binding commitments to conservation management of their land. They are finding new ways to protect the ecologically important Nuwejaars Wetland while retaining their farms and ranches. The community has undertaken collective action to remove invasive alien species, restore natural fire regimes, rehabilitate wetlands, and reintroduce wildlife—including buffalo, a species not seen in the region in two centuries, and hippo, missing from the area for 150 years.

This development of stakeholder-driven collective action is a new form of conservation in South Africa. Devolved, collective landholder conservation is a powerful idea. It provides enormous advantages, including the management



Cape Town, South Africa



School children
attending parade.
South Africa



Dyer Island, South Africa

of landscapes over much larger areas, economies of scale, the control of unsustainable activities through peer pressure rather than prohibitively expensive and unwanted top-down regulation, and greater efficacy of service delivery. This model is ideally aligned to South Africa's need to expand conservation onto private and communal land. The project's work in Nuwejaars is demonstrating how collective landholder action can transform land use practices, creating approaches that are more dependent on sustaining biodiversity, eco-tourism and carbon- and energy-neutral production.

The challenges for efforts like ABI and, more broadly, the CAPE Programme are clear. South Africa's national and provincial parks are threatened by landscape processes that extend far beyond their boundaries. The future of the parks thus depends on an equally broad approach to conservation, one that emphasizes connectivity across the landscape, particularly in the face of climate change and economic globalization. Protected areas must be both ecologically and economically viable, and that will require far deeper understanding of conservation economics and governance.

In light of these challenges and to address the growing isolation of parks, ABI partner SANParks developed a draft buffer zone policy. According to Tertius Carinus, Project Coordinator of the SANParks Cape Region Buffer Zone Project, "ABI provided a solution on how the management [of protected and productive areas] can be linked. We, as the ABI related staff, have now been taken up in SANParks as part of the "new" Buffer Zone approach in SANParks. This new approach gives SANParks a policy mandate to work off-reserve," which will reduce the threats to the ecosystems in both the protected reserves and the productive areas.

An economy based on the economic management of public goods and environmental services like water, aesthetic values, and carbon does not yet exist in South Africa, or just about anywhere else. Yet ABI and the CAPE Programme are important tests of new models of conservation beyond protected areas and of linkages between state and private conservation. Such efforts are vital demonstrations that biodiversity protection, income generation, and job creation can be complementary aims.



Cape Town region, South Africa



Lambert's Bay, South Africa



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Cheetah, Namibia

National Parks and the New Economy

Thousands of years ago, the Nama people of what is now southern Namibia described the enormous desert that stretches for 1,500 kilometers along the Atlantic coast with a stark but telling word; they called it simply Namib, or “vast place.”

For the GEF and its partners, the Namib and the Cape Floral Kingdom to the south represent examples of a vast challenge — to find ways to conserve huge landscapes while also crafting a unifying vision of a country’s protected areas as both priceless biological assets and as engines of a new economy. Addressing this issue head-on, the Government of Namibia, the GEF, and UNDP joined forces to craft a project called Strengthening the Protected Area Network (SPAN).

The Namib has been dry for some 56 million years, longer than any other desert on Earth. The arid millennia have weathered the soils of the Namib, creating spectacular seas of sand dunes that can tower 300 meters over the desert floor. With just a few millimeters of rain each year, the barren landscape appears devoid of life. Yet a startling array of species have evolved to survive here, many by finding ways to capture moisture from the dense fog that frequently moves inland

from the cold Benguela current in the south Atlantic. Some of these creatures are small, like the so-called fog beetles that spread their hardened outer wings into the damp breeze and drink the tiny drops of water that condense on the bumpy surface and roll down into their mouths. Other animals in the Namib are quite large, including oryxes, springboks, ostriches, even desert elephants and lions. All have evolved unique and often extraordinary techniques to survive in the harsh Namib environment.

While creatures of the Namib can subsist on fog and endure scorching temperatures, species living in northeastern Namibia face the opposite challenge, as the climate there produces nearly 600 millimeters of rain per year. This diversity of climate, topography, and plant and animal species makes Namibia a priority for biodiversity conservation. Scientists recognize 28 different vegetation types in Namibia, many that occur only here or in adjacent areas. Approximately 75 percent of the mammal species richness of southern Africa exists in Namibia, with 14 endemic species. Namibia has also been an evolutionary hub for certain groups of organisms including melons, succulent plants, solifuges (also called false spiders), geckos, and tortoises.

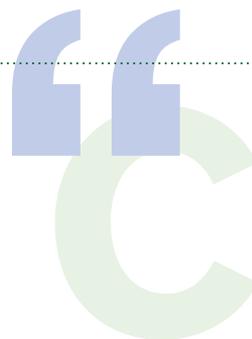
Long ago, well before the colonial era, Namibia recognized the importance of this rich natural heritage and began

efforts to protect it. In 1907, during German colonial rule, Etosha became the country's first National Park and was at the time the largest game reserve in the world. Those efforts accelerated following independence in 1990. The Government went so far as to address habitat conservation and protection of natural resources explicitly in the new constitution. As a result, the Government's conservation efforts have made the country a stronghold for populations of large animals such as the black rhinoceros, with almost a third of the world's population, and the cheetah.

The system of state-managed protected areas forms the cornerstone of Namibia's conservation program. The protected area network encompasses 20 sites, including Namib-Naukluft National Park, which is larger than Switzerland and protects most of the desert and the adjoining Naukluft Mountains. All told, Namibia's protected areas cover 17 percent of the country's land area — by comparison neighboring South Africa protects about 7 percent; the United States, which invented the concept of the national park, has set aside about 12 percent.

Until the SPAN project began in 2006, the protected area system, despite its large size, was not wholly representative of the country's diverse ecosystems and habitats. For instance, the succulent karoo, the northern savannas and the miombo woodlands remained largely outside the protected area system. The system also lacked internal cohesiveness and connectivity, with too many small and isolated protected areas. This can lead to the fragmentation of wildlife populations, excess damage from tourism activity, costly management and enforcement of poaching laws, higher vulnerability to alien species invasion, more bush fires, and over use of water and biological resources.

The sites within the protected area network faced the further challenge of insufficient financial resources. The shortfall limited the management effectiveness of the parks, thereby threatening the ecosystem services and biodiversity that they seek to protect. Before SPAN began, the annual budget of the Ministry of Environment and Tourism for park management was approximately US\$7 million, a fraction of the funds necessary to adequately manage the system. The Government in fact did not know the actual cost of managing parks, making effective planning impossible.



Conservation is in our hands, the animals are in our hands. We must try to protect them, as this will eradicate poverty in communities, and we should protect animals so that future generations will also be able to see species such as rhino.

The SPAN project helped the Government to address these threats and fill gaps in the system. The project assisted the Government's formal launch of activities in three new protected areas. The largest is the two million hectare Sperrgebiet National Park, which extends southward from Namib-Naukluft and covers more than 1.5 million hectares of the succulent karoo biome. That single addition to the protected area system increased the representation of succulent karoo from just over 10 percent to more than 90 percent. In north-eastern Namibia, the project also helped to formalize the creation of Bwabwata National Park in 2007. With support from the project, the Government addressed the problem of the small protected areas by consolidating two small reserves, Mahango and Caprivi Game Parks, and adding a strip of biodiversity-rich land on the Kwado River, a major wildlife corridor between Botswana and Angola.



White rhinoceros, South Africa

Beyond establishing protected areas, Namibia has taken a further important step, one that may yet prove to be a model for the rest of the world for land and resource protection. Namibia is showing how protected areas contribute to a nation's broader economy. In part, this approach is a child of necessity. Although the human population density of Namibia is amongst the lowest in Africa, the lack of water makes agriculture — the mainstay of most African economies — difficult, if not impossible, in much of the country. Under these circumstances, natural resource-based activities, including wildlife production and management made possible by the areas under protection, represent sound economic as well as ecological use of land.

The old habit of placing little or no value on the economic benefits of protected areas dies hard. Prior to the SPAN project, even a government as conservation-conscious as Namibia did not fully realize the economic importance of its protected areas, and thus tended to rate investing in those areas a low priority. To change that outlook, Namibia's Ministry of Environment and Tourism used the SPAN project as a catalyst, and undertook a comprehensive economic analysis of the protected area system in 2004 (when SPAN was in its development phase). The results were striking: looking only at park-based tourism and leaving aside other ecosystem services provided by the system, the study determined that the protected area system contributed up to six percent of Namibia's GDP. The study also found that the economic rate of return on the government investment over 20 years was as much as 23 percent, and that further investment in protected areas could lead those areas to contribute up to 15 percent of GDP over the next two decades.

Although not typically considered a "sector" of the economy on the list of national accounts, purchases of services by foreign tourists make up nearly a quarter of the total value of Namibia's exports of goods and services. Tourism is thus one of Namibia's most important industries, and it largely depends on wildlife, as nearly 70 percent of the tourism dollars are spent on nature-based tourism, according to the study. The total economic impact of protected area tourism increased from approximately US\$240 million in 2003 to some US\$317 million in 2008. An important corollary of this analysis was that if protected areas can deliver solid economic returns without a deliberate national policy

to do so, a concerted national effort could yield even more impressive results.

The Ministry used these study results to negotiate an increase in the state budget for park management and development by 300 percent over the last four years. The government also earmarked 25 percent of park entrance revenue for reinvestment in the protected area system through a trust fund, providing up to US\$2 million additional financing per year.

The economic analysis of the protected area system also led to successful negotiation of a large amount of additional donor funding for those areas, including US\$15 million from Germany and a US\$67 million grant from the U.S. Government's Millennium Challenge Account (MCA) to build protected area infrastructure and strengthen community-based nature tourism. This investment is expected to create 6,000 new jobs. A large part of the MCA grant — US\$40.5 million — was a direct investment in the management infrastructure of Etosha National Park, marking the first time that an MCA poverty alleviation grant was awarded to a biodiversity-based tourism project as an investment in parks. Clearly the US Government has recognized, as Namibia Government did before it, that a well-managed protected area network can, and must play, a significant role in poverty alleviation.

The importance of demonstrating the value of protected areas to local communities has long been clear in Namibia. The country has a strong community-based natural resource management conservancy program that gives user rights to the communities that live in the conservancies. Wildlife conservancies, which particularly benefit the rural population, have become one of the fastest growing areas of economic development in the country. Most conservancies and private reserves cater simultaneously to conservation and productive uses of land, such as livestock husbandry and farming. They act as buffers to the protected area system, providing a transition zone from more intensive to less intensive land uses.

The conservancies and protected areas on private and communal lands form crucial parts of the conservation effort in Namibia, as 80 percent of country's population of large game animals occur outside of the state protected areas.



Opuwo, Namibia



The populations of game animals on private and communal lands have increased dramatically since the creation of new property rights systems.

People like Johnson Tjirikombanda Vejorerako have seen the changes. One of the longest serving park rangers in Etosha National Park, Vejorerako grew up on the park's western edge, helping his family graze cattle alongside wild-life. He believes the Government's conservancy program has improved conservation efforts.

"Now the animals are like people's cattle and they have a reason to look after them as they receive benefits from them," Vejorerako says. "Conservation is in our hands, the

animals are in our hands. We must try to protect them, as this will eradicate poverty in communities, and we should protect animals so that future generations will also be able to see species such as rhino."

The GEF-funded and UNDP-supported SPAN project has helped pay the salaries of dedicated field staff like Vejorerako, people who form the foundation of lasting conservation and who understand the role that local communities must play. The project has fostered innovative thinking and built trust about the role of protected areas in Namibia and beyond. The project has helped demonstrate the role that protected areas can play in both conservation and economic development, and what steps are required to turn that potential into reality.



African lion, Namibia

National Parks and the New Economy



Namibian Desert



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Protected Areas and More in the Amazon

In 1998, the President of Brazil, Fernando Henrique Cardoso, surprised his country and the world with a bold announcement: Brazil would set aside 10 percent of its forests in protected areas, a commitment of 25 million hectares, about half the size of France, most of it tropical rainforest in the Amazon.

That pledge set the stage for the Amazon Region Protected Areas Program, or ARPA, the most ambitious tropical forest conservation programs ever attempted. Over the past decade, ARPA has become a touchstone for the GEF and has demonstrated the interconnections between biodiversity protection, climate change mitigation, provision of ecosystem services, and economic security for the people of the Amazon region.

The vast size of the Amazon beggars all description, even after decades of land fever has cleared forest for ranches, farms, and settlements in an arc of deforestation that stretches across Brazil from southwest to northeast. Travelers on commercial flights over the Amazon basin can still see a

nearly unbroken blanket of green unrolling beneath them, hour after hour. In Brazil alone, the Legal Amazon Region — an area covering the northern states of Amazonas, Pará, Acre, Amapá, Tocantins, Roraima, and Rondônia, plus part of the states of Mato Grosso and Maranhão — occupies over four million square kilometers of land, an area that would make it the seventh largest country in the world. This vast expanse contains approximately 30 percent of the planet's remaining tropical rain forest, and is estimated to contain carbon stores of 120 billion tons.

Near Brazil's border with Suriname and French Guiana, the landscape changes. Here the endless swaths of green are punctuated by dramatic granite outcroppings that rise thousands of feet above the forest canopy. This is the Guiana Shield, one of the most biologically diverse ecoregions on Earth, and one of the most remote. In 2002, this area became a landmark for conservation with the creation of Tumucumaque National Park, the world's largest tropical forest national park.

At over 40,000 square kilometers, Tumucumaque is larger than Belgium, and while scattered illegal mines can be found, it has no roads and almost no human inhabitants. With its vast size and relatively pristine condition, Tumucumaque offers a rare opportunity to conserve an intact tropical forest

community of remarkable diversity. This single reserve supports at least 800 plant species, 366 birds, 207 fishes, and over 100 mammals (including 48 species of bats). Among these are such rare and endangered creatures as giant river otters, giant armadillos, tapirs, bush dogs, red-handed tamarins, and a rare, threatened tree known as the serpentwood.

The creation of Tumucumaque was one of the most public successes of ARPA, launched in 2002 with a US\$30 million grant by the GEF and implemented by the World Bank, with the equivalent of over US\$50 million in co-financing provided by the German bilateral funding agency Kreditanstalt für Wiederaufbau (KfW), the World Wildlife Fund, the Government of Brazil, and other donors. ARPA set out to help Brazil ensure comprehensive protection of its majority portion of the Amazon by increasing the number of strictly conserved areas, improving their management, and also creating new areas dedicated to the sustainable use of forest resources.

By the time ARPA began, efforts to coordinate and implement environmental policies in the Brazilian Amazon had been lagging for years. In the 1990's, annual deforestation rates in Brazil were around 17,000 square kilometers and corresponded to average annual emissions of 200 million tons of carbon. Annual deforestation peaked in 2004 at approximately 27,000 square kilometers. The extent of the Amazon basin, lack of managerial capacity and resources, powerful forestry and mining interests, and poverty in the region have historically stymied regional and national reforms. Even a decade ago, the Brazilian government spent less than US\$3.5 million per year to manage 30 protected areas in the Amazon.

ARPA set out to significantly change that situation, and do so completely and in relatively short order. While protected areas are not always the right tool for conservation in every context, in the Amazon, protecting large, contiguous areas of forest has proven to be effective in both conserving biodiversity and in maintaining crucial ecosystem services, particularly reducing carbon emissions from deforestation, preventing floods and soil erosion, and regulating regional and perhaps even global rainfall and temperature. ARPA thus set out a goal at once simple to state and profoundly difficult to achieve: Create the most ambitious tropical forest national protected area system in the world.



Brazilian Amazon

For a sense of the scale of the challenge, consider that a comparable protected area network, the National Park System in the United States, has been in development for 130 years yet is less than half the size of the ARPA reserves and has been vastly more costly to create. Few protected area systems face the daunting issues ARPA has had to overcome, including enforcement of environmental laws in remote areas, effectively addressing the needs and aspirations of rural people for improved livelihoods, and valuing and funding conservation activities against the wider backdrop of ongoing resource exploitation.

Despite the obstacles, ARPA has made nearly unequalled progress. ARPA initially set an ambitious goal of protecting 12 million hectares of forest; by 2008 it had reached twice that, with 24 million hectares in 44 new protected areas. Of that total, approximately 13.2 million hectares are under strict



preservation protection while 10.8 million hectares are in sustainable use reserves. All told, the project supports 62 protected areas, nearly a third of all protected areas in the Brazilian Amazon, and helps fund efforts to improve park management for more than eight million hectares of strict preservation areas.

What do all the newly protected areas mean for biodiversity in the Amazon? In broad terms, ARPA protects 16 out of 19 forest ecosystems in the Brazilian Amazon, five out of six floodplain ecosystems, and all four savanna types. An analysis of 39 of the protected areas supported by ARPA found over 11,400 species of plants and animals. One estimate of the total species diversity in the Amazon puts the figure at just over 45,000 species, suggesting that ARPA alone may protect fully one-fourth of the region's diversity of life. Even if, as seems likely, the earlier estimate severely

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understates the species in the Amazon, ARPA has still protected a significant representative sample of the region's biodiversity. ARPA protected areas contain at least 56 species that are threatened with extinction, and since 2001, scientists have discovered 35 species new to science in ARPA supported areas, including a striking, orange-sideburned monkey called Prince Bernhard's titi (*Callicebus bernhardi*); the cryptic forest falcon (*Micrastur mintoni*); and the Pará thin-toed frog (*Leptodactylus paraensis*).

ARPA draws on a diverse set of institutional partners, from the Brazilian non-profit organization FUNBIO to the Ministry of the Environment and state government agencies to international donors and organizations, civil society, scientific advisors, and international and domestic experts. This partnership across the grassroots, national, and international levels reflects a new, participatory approach to protected

area management and conservation that is proving to be a global model. For example, ARPA has helped create local protected area committees, as required under Brazilian law, to bring communities into the process of creating and managing reserves, and has helped strengthen the ability of five state governments (Mato Grosso, Acre, Tocantins, Rondônia and Amazonas) to conserve their own state protected areas. ARPA's efforts to institutionalize the political will for conservation and increase support for conservation goals as part of the mandate for state governance is an important contribution to state capacity in the Amazon.

But the creation of strictly protected areas alone is not enough. About half of ARPA protected areas are extractive reserves and sustainable development reserves that directly benefit local human communities. The project has been instrumental in promoting the sustainable use of natural resources associated with the protection of culturally and socially important livelihoods—thus helping prevent even more damaging economic activities from taking root. The economic gains, in turn, are helping to deliver global environmental services, including climate change mitigation.

As the world looks to protect the Amazon as a globally essential carbon sink, ARPA has been an important showcase for the types of mechanisms needed for successful action. The 62 protected areas supported by ARPA are preserving a forest carbon stock of about 4.6 billion tons of carbon (18 percent of the total stock protected in the Amazon), almost twice that required for emissions reduction under the first phase of the Kyoto Protocol. Models based on a small part of ARPA (13 protected areas created between 2003 and 2007) showed that around 1.1 billion tons of carbon could be saved from emissions until 2050. Similar studies showed that the total of Brazilian Amazon protected areas could be responsible for saving some eight billion tons of carbon.

Protected areas are also the most cost-effective means of reducing carbon emissions from deforestation and are thus a sound investment. The cost of decreasing emissions from deforestation in the Brazilian Amazon is estimated as US\$1 to \$2 per ton of CO₂ equivalent. This includes paying for programs benefiting local communities within forests and other ecosystems, opportunity costs, plus law enforcement and further financial support for protected areas. By the conservative estimate of the Brazilian Government, Amazonian rainforest contains 100 tons of carbon per hectare, so the cost would be US\$100-\$200 per hectare. ARPA, however, demonstrated that protected areas can achieve the same result for just US\$10 dollars per hectare.

Investment in protected areas brings multiple benefits. It decreases emissions at less cost than other options while generating revenue. The economic profits from creating and strengthening protected areas is estimated to reach tens of billions of dollars by 2050, once the other benefits of leaving the forests standing—such as preventing flooding and soil erosion, regulating temperature and rainfall, ecotourism, cultural values, scientific research, and so on—are taken into account.

During the second of three planned phases of ARPA, to last from 2010 until 2014, the overall target for the project have been expanded to cover those ecosystem services as well. The spatial extent will also increase, to a total of 60 million hectares of the Brazilian Amazon.

ARPA represents not only the world's largest conservation program in protected areas but a crucial component of a sustainable future for the Amazon. The project has demonstrated the economic value of biodiversity and protected areas. It has shown that dramatic expansion of biodiversity conservation is not only possible in the tropics, but that such expansion can be part of broader efforts to bring biodiversity and ecosystem services into local and national economies.



Vicinity of Manaus, Brazil



Hyacinth macaw, Brazilian Amazon



ARPA ranger house, Brazilian Amazon



ARPA floating station, Brazilian Amazon

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SGP program — Wisata coral farm in Indonesia

Conservation and Development in the Coral Triangle

Legend has it that centuries ago a flood washed away a princess from Johor, Malaysia.

In his grief, her father ordered his subjects to sea, to return only when they had found his daughter. So goes the creation myth of the Bajau, a Malay people who are among the world's last sea nomads.

A few Bajau still live in the traditions of their ancestors, working ancient trade routes among the scattered islands of the Philippines, Malaysia, and Indonesia. This is part of the Coral Triangle, a region spanning six countries and nearly six million square kilometers encompassing the oldest and richest coral system on Earth

Some Bajau are born at sea in narrow, high-prowed vessels called lepa-lepa, coming ashore only occasionally to trade pearls, fish, or sea cucumber for rice, water, or other necessities. Government programs have resettled many of the Bajau to villages built on stilts — these communities, some of them as much as a kilometer from shore — dot the islands.

Whether nomadic or sedentary, the Bajau depend entirely on the sea as do many people in this region. The Coral

Triangle is home to more than 150 million people, half of whom rely on marine resources as their primary source of protein. This area supports the largest tuna fisheries in the world, which generate billions of dollars in global income every year. The spectacular reefs and blue waters draw tourists from around the world. In the Philippines alone, annual tourism revenues top US\$4.5 billion, at least US\$1 billion of which is tied to coastal and marine venues. All told, the value of fisheries, tourism, and shoreline protection from coral reefs, mangroves, and associated habitats is estimated to be US\$2.3 billion annually.

The Bajau offer a window into how such statistics about the value of ecosystems translate into the real lives of people directly dependent on nature. Far from the tuna, or shrimp, boats or tourist enclaves; Bajau fishers, who are skilled free divers, hunt with homemade goggles and spear guns at depths of 30 meters or more. They have also adopted more modern and more destructive fishing methods, including dynamite and potassium cyanide. The poison stuns grouper and other reef fish in high demand for the restaurant trade, then the cyanide settles onto the coral and kills it.

The widespread use of such techniques, hardly limited to the Bajau, has led to the destruction of reefs across the Coral Triangle: Eastern Indonesia, parts of Malaysia, the

Philippines, Papua New Guinea, Timor Leste and Solomon Islands, specifically the Sulu Sea and inland waters of the Philippines, Celebes/Sulawesi Sea, Java Sea, Flores Sea, Banda Sea and parts of the Pacific Ocean extending to the border between Indonesia and Papua New Guinea. Through the millennia, genetic diversity from two oceans has been mixing in this region characterized by extremely complex bathymetric and oceanographic features, including deep troughs, upwellings, strong currents, and shallow shelves.

The Coral Triangle, also known as the “nurseries of the seas,” is the global center of marine biodiversity, holding more than 75 percent of the known coral species, six of seven species of marine turtle, and about 3,000 species of reef fish — more

than twice the number found on reefs elsewhere. Healthy reef systems also help buffer coastal communities from surf and tidal extremes caused by severe storms and tsunamis.

Just as ARPA illustrates how the Amazon forests are crucial components of a sustainable future, so too the protection of reefs and mangroves in the Coral Triangle will be vital to help people in the region adapt to climate change and secure their future. In late 2007, the six governments of the Coral Triangle — Indonesia, Malaysia, Papua New Guinea, the Philippines, Solomon Islands, and Timor Leste — agreed to establish a new international partnership to conserve coral reefs and the multitude of species and fisheries they support. In May of 2009, the six nations gathered at the Coral Triangle Initiative Summit in Manado, Indonesia, where the Heads of states signed a historic declaration adopting a 10-year plan of action to avert the growing threats to the region’s coral reefs, fish, mangroves, vulnerable species, and other vital marine and coastal living resources.

The Coral Triangle Initiative derives from high-level political commitments and proactive implementation by governments of the Coral Triangle area, supported by multilateral and bilateral agencies, non-governmental organizations (NGOs), and private sector partners. The six countries have chosen to address in partnership the management, conservation and adaptation to climate change of the tuna fisheries and coral ecosystems in that region.

So far, the GEF is the largest contributor of funds to the Coral Triangle Initiative (CTI). Planning of the GEF program for the Coral Triangle was led by the participating countries and it was assisted by the Asian Development Bank (ADB), the coordinating agency, and four other GEF agencies: FAO, UNDP, UNEP and the World Bank, in addition to the World Wildlife Fund (WWF). To support the Initiative, in 2008 the GEF began a program of US\$63 million that covers biodiversity, international waters, and adaptation to climate change activities. The program has also been able to catalyze more than US\$300 million of co-financing for the Initiative to conserve tuna and coral ecosystems while alleviating poverty.

The GEF/ADB program in the Coral Triangle provides a framework for action on conservation of the Southeast Asia portion of the Coral Triangle and support the region’s



The effort in the Coral Triangle aligns with international efforts to improve trawl fisheries and may offer important lessons on what measures work best in managing bycatch, reducing waste, and thus improving fisheries resources.



Flat worm, SGP coral farm project, Indonesia



Clown fish, SGP coral farm project, Indonesia



Terumbu Disekitar, SGP coral farm project, Indonesia

sustainable development. The effort includes establishing national and sub-regional governance frameworks and regional mechanisms to address threats to marine resource systems, and strengthening capacity of key institutions responsible for coastal and marine resources management, especially at the national and local levels.

The program helps countries in the Coral Triangle expand national Marine Protected Areas (MPA) and Marine Managed Areas (MMA) networks. But as in the case of Namibia's protected areas, the size of the area protected is not the only issue. The program also helps develop adaptive management strategies in response to climate change impacts. It supports these strategies by creating mechanisms for coordinated and sustainable financing of these efforts, including inputs from governments, multilateral and bilateral development

partners, non-governmental organizations (NGOs) and the private sector. The initiative brings together for the first time all the partners needed to mobilize action in the countries of Southeast Asia and the Pacific. The sustainable management of these resources is crucial to ensure that an adequate supply of food exists to directly sustain 120 million people living along the coastlines.

The GEF program supports more than 10 projects in the six participating countries. Among them is a US\$3.88 million grant to restore productive capacity of critical watersheds, enhance biodiversity conservation and protected area networks and reduce poverty of dependent communities in selected watersheds in the Philippines. It is being implemented by the ADB and includes cofinancing of US\$103 million.



Sangihe Beach, North Sulawesi, Indonesia

This recently launched project envisions integrated natural resources management of watershed resources in the upper river basins. The goal is to optimize economic and ecological benefits for national development, social equity, and enhanced quality of life, especially for the poor local communities. These efforts will slow the degradation and overexploitation of target watersheds, and eventually lead to their rehabilitation, enabling them to produce water and other environmental goods and services on a sustainable basis. Improved watershed management will also help reduce poverty in local and dependent communities. The project will help conserve globally significant biodiversity, reduce land-based pollution of coastal waters, protect carbon stocks, and reduce overall greenhouse gas emissions.

The GEF-funded program also aims to improve the management of fisheries in the Coral Triangle. The countries in the region are among the largest fish producers in the world, and the industry is an important source of employment and economic growth. A significant portion of the catch comes from bottom-trawling, which supplies low-value fish to be used as feed in aquaculture operations. Poorly managed bottom-trawling poses significant threats to both the environment and the economy. The nets damage coral when dragged across the seabed, and they snare bycatch — fish and other marine organisms that lack value because they are too small or are considered inedible.

Wasteful and destructive bycatch is an increasingly important problem. Some large-scale operations, for example the shrimp fleets in Indonesia's Arafura Sea, simply discard what they consider low-value fish. The fish killed in this process may include juveniles of ecologically important and economically valuable finfish, threatening the viability of an important fishery and the livelihoods it supports. Trawlers may also catch sea turtles unless the boats are equipped with

special turtle extruder devices designed to keep the creatures out of the nets. Smaller-scale trawl operators make use of nearly all their catch, selling the low-value fish for aquaculture or local markets. Faced with declining catches of larger and more valuable species, pinched by rising fuel prices and weak access to markets, and hampered by poor post-harvest methods, more and more fishers in the Coral Triangle depend on bycatch as a source of income.

The problems of waste, capture of juveniles and sea turtles, and damage to reefs need to be addressed not only in an environmental context but in the context of poverty and food security. The GEF program is working to improve the management and monitoring of bycatch in close collaboration with current resource users. Some of the key initiatives include: establishing bycatch management plans; promoting the use of more selective fishing gear; developing sustainable policies and practices such as zoning fishing areas; and promoting awareness of and knowledge on trawl fisheries bycatch management. The program has also helped to generate better data on the overall fishing effort and capacity, bycatch trends, and mapping of fishing grounds.

The problem of bycatch is global. The effort in the Coral Triangle aligns with international efforts to improve trawl fisheries and may offer important lessons on what measures work best in managing bycatch, reducing waste, and thus improving fisheries resources. Improved management and sustainable use of resources is the goal of the GEF's efforts in International Waters and Large Marine Ecosystems. The beneficiaries are not just the fish. In the Coral Triangle, regional, national, and local stakeholders — in particular the fishermen, fish workers, and communities that depend on healthy and sustainable fisheries for their livelihoods and food security — all stand to gain.



Raja Ampat, Indonesia



Raja Ampat, Indonesia

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Humpback whale, South Africa

The Benguela Current

Hout Bay, South Africa, lies in the shadow of Table Mountain, one of the continent's most distinctive geological features and a symbol of the city of Cape Town.

The town of Hout Bay is in part a well-to-do suburb of that bustling city of some 3 million people and a tourist destination in itself. The body of water that is the town's namesake is also among the busiest in the Western Cape, with an active, established fishing industry.

A microcosm of South Africa, Hout Bay is a complex community, home to many ethnic groups and social classes. While the commercial fishery gets most of the attention from the local and national government, a good many people of Hout Bay and from communities all along the coast of Southern Africa also depend of the sea for their lives and livelihoods.

These subsistence fishers work from small boats in pursuit of lobster, snoek (a perch-like staple of the Cape), hottentot (a kind of sea bream endemic to southern Africa), as well as line fish. They must contend not only with commercial fleets and their huge trawl nets but also with changes in the Benguela Current, the rich ocean upwelling that flows northward for

some 3,000 kilometers along the coast from the Cape of Good Hope nearly to the Congo. The Benguela is the life-blood of the southern Atlantic and a vital economic resource for South Africa, Namibia, and Angola. Fisheries being roughly six times more productive than that of the North Sea, the Benguela Current supports an important global reservoir of biodiversity and biomass of zooplankton, fish, sea birds, and marine mammals, while nearshore and offshore sediments hold rich deposits of precious minerals (particularly diamonds), as well as oil and gas reserves.

The Benguela Current is one of 64 Large Marine Ecosystems (LMEs) around the world (the Sulu-Sulawesi Sea in the Coral Triangle is another). These are natural regions encompassing coastal waters from river basins and estuaries to the seaward boundary of continental shelves and the outer margins of coastal currents. They are relatively large regions of 200,000 square kilometers or greater, defined by their undersea topography, or bathymetry, the depth and composition of the seabed, or hydrography, the productivity of their fisheries and the make-up of their natural food chain. Across the globe, 80 percent of the global marine fisheries catch comes from these ecosystems.

Since the mid-1990s, however, annual fish catches in LMEs have declined by more than 10 percent overall, representing

millions of metric tons. Fishing down food webs, meaning targeting and depleting the populations of successively lower levels of marine predators, together with destructive fishing gear, pollution, and habitat loss from destructive trawling and coastal aquaculture, have all been shown to contribute to the decline of marine ecosystems across the globe. Existing populations in many cases are today only a fraction of historical levels. The depletion of ocean fisheries and the destruction of coastal habitats constitute globally significant environmental problems: As much as 90 percent of the large fish have been removed from the oceans, and three quarters of fish stocks are fished at their maximum yield level, overfished, or depleted.

All of these trends threaten the food security of hundreds of millions of poor people globally, people like South Africans Ivor Mars and Andre Prins.⁴ Ivor Mars has been fishing in and around Hout Bay since he was 12 years old and has seen the changes first hand. “The way we were catching fish at that time and the way they catch fish now is a big difference,” Mars says. “I don’t think there are a lot of fish left in the ocean now. In a couple of years from now there will be nothing in the water left, not even a seal will be left, because they are catching everything.”

Others in the region feel the same way. “It is very disturbing to think what our future is going to be like if the people carrying on the destructive fishing keep polluting our area,” says Andre Prins, who fishes out of Saldhana Bay, about 120 kilometers north of Hout Bay. The commercial fleets, he believes, “must change their way of fishing, change the trawl nests, change the equipment they are using to harvest the fish from the sea, because it is destructive, it is messing with our future, our community’s future, and just a matter of time before this bomb is going to burst out. Our children’s generation is not so stupid. They are not illiterate. They see things.”

The challenge, for the GEF and everyone concerned with addressing the problems these and other fishermen face, both economically and in terms of the underlying environmental trends, is that the depletion of fisheries resources in coastal oceans is but one symptom of mismanagement. Taking on these problems requires a comprehensive approach, addressing such issues as wasteful land practices, the pollution of freshwater systems, and inefficient energy use. Not

“**A**ngola, Namibia, and South Africa created the new, ecosystem-based, Benguela Current Commission, the first Large Marine Ecosystem commission in the world. With more than 200 million people around the world directly dependent on fisheries for food security, cooperative efforts like those supporting sustainable use of the Benguela Current will be essential to securing the oceans and their resources and reducing poverty.”

only are coastal and marine ecosystems at risk, but so too are the human communities that depend on them for economic security and social stability.

Sector-by-sector approaches to economic development created this crisis, which is precisely why a similar focus on single marine sectors (e.g. fisheries, pollution, habitat, biodiversity) will fail to solve it. Marine ecosystems are by their very nature interconnected — no firm boundaries prevent fish and other sea creatures from migrating, often over great distances, and currents readily carry pollution far from its source. Recognizing the need for an ecosystem-based approach to coastal and marine systems, the GEF over the past 15 years has worked to create a movement in support of intergovernmental instruments to reverse the downward spiral of coastal and marine resources.

4. Mars and Prins quoted in *Current Voices*: http://www.youtube.com/watch?v=-V9kqnPbn2A&feature=player_embedded



Fishing trawler, South Africa

Only collective action can cope with these transboundary coastal and marine concerns, shifts in climate, the impacts of globalization, and the financial pressures they put on declining coastal ecosystems. The scale of economic loss facing coastal countries is at the level of trillions of dollars of ecosystem goods and services, and they are at risk through failures in governance.

In the mid 1990s, the governments of South Africa, Namibia and Angola saw the need for collective action to conserve the resources of the Benguela Current. Habitat loss, pollution, the unsustainable exploitation of marine and coastal natural resources, and increasing problems of human and ecosystem health caused by introduced species were among the issues these three nations sought to address. The government requested GEF assistance with the sustainable management and utilization of the Benguela Current. Of primary concern was the protection of the area's marine life. The nations sought to accomplish this through the development of methods to better predict environmental and ecosystem changes, the protection of biological diversity, and strengthened capacity to adapt to fluctuating climatic conditions that threaten fisheries. Also on the to-do list was the reduction of coastal and off-shore mining impacts and better management of land-based pollution.

South Africa, Namibia, and Angola have a tangled history that makes cooperative management of their shared marine resources challenging indeed. Colonial powers with different languages, cultures, and laws fought for influence in the region and created boundaries without regard to indigenous inhabitants and natural habitats. The colonial governments paid little attention to managing marine resources, a sorry legacy inherited by the independent states. Even today, the various agencies responsible for pieces of the complex puzzle that make up the offshore environment rarely cooperate. Mining concessions, oil and gas exploration, fishing rights and coastal development have taken place with little or no proper integration or regard for other users.

During the 1960s and 1970s, a profusion of foreign fleets fishing off Angola, Namibia and South Africa severely depleted the fisheries. At the same time, all three countries were engaged in liberation struggles and associated civil wars. Consequences of these wars have been the population

migration to the coast and localized pressure on marine and coastal resources (e.g. destruction of coastal forests and mangroves) and severe pollution of some embayments.

The first step in building trust among the three countries was a transboundary diagnostic analysis of the situation in the Benguela LME. This analysis identified and investigated the causes of negatives impacts on the region, and built a common framework for finding solutions. The national dialogues began the process of aligning different ministries related to land and water activities to work in an integrated, ecosystem-based fashion.

As a result, in 2002, Angola, Namibia, and South Africa agreed on specific reforms and investments in an action program that needed to be carried out to improve planning and management of resources in the region. Since then, they have surveyed shared fisheries, reduced the by-catch of seabirds, sharks, and turtles caught by longliners, and proposed new marine protected areas.

Most important of all, Angola, Namibia, and South Africa created the new, ecosystem-based, Benguela Current Commission, the first Large Marine Ecosystem commission in the world. The Commission, launched in 2007, demonstrates how the political commitment of three countries can combine to address ecosystem sustainability. In response, the GEF funded a second and final project to operationalize the Commission and support negotiations for a legal agreement, the Benguela Current Convention, among the three countries to sustain its work.

The Convention, signed in late 2011, will be ratified in 2012. As with the Danube Convention (see Chapter 7), this binding agreement will provide the foundation for long-term cooperative management of the Benguela Current LME. The Convention will enable the Benguela Current Commission to fulfill its role of marrying science with management to improve decision-making in fisheries, coastal management, mining, and energy.

Marine ecosystem projects supported by the GEF use science-based tools to provide forecasting and recommendations so that stakeholders at all levels can adapt to highly variable climate and long-term climate change. The



Walvis Bay, Namibia

Benguela environment is highly variable, prone to large-scale episodic warming events called Benguela Niños, intrusions of warm water from the east or cold water from the south, and changes in winds and salinity. All of these compound the effects of fishing and complicate the task of sustainable resource management. In addition, the Benguela Current is believed to play a significant role in global ocean and climate processes and may be an important site for the early detection of global climate change.

The GEF-supported, ecosystem-based approach in the Benguela region and elsewhere is building political and stakeholder commitment to action, setting the stage for the world community to invest in capacity building and technology. The participatory process relies on sound science to generate political solutions and commitments to reverse marine degradation and resource depletion. With more than 200 million people around the world directly dependant on fisheries for food security, cooperative efforts like those supporting sustainable use of the Benguela Current will be essential to securing the oceans and their resources and reducing poverty. Sustainable fisheries management, pollution control, the maintenance of essential habitats, and the creation of marine reserves will prove good investments in the productivity and value of the goods and services that the oceans provides to humanity.



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Cape Cross, Namibia

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Patagonia, Argentina

In the Land of the Patagones

When the Portuguese explorer Magellan landed in 1521 on the southern coast of what is now Argentina, the people living there were Tehuelche Indians.

The Tehuelche tended to be tall, at least compared to Europeans of the time, and Magellan took them to be a race of giants. He called them “Patagones,” after the frightening, dog-headed character Patagon in a chivalric novel of the day. The legend that giants bestrode the land henceforth called Patagonia would persist in Europe for centuries.

The actual Tehuelche had far more prosaic lives than myth would have it. They survived the cold and arid conditions in Patagonia as nomads, traveling hundreds of kilometers hunting guanaco that thrived on the shrubs and tuft grasses. Vast and inhospitable, Patagonia stretches across more than 1,500 kilometers, most of it cold, windswept, and dry. Within these generally harsh conditions, however, Patagonia hosts a mosaic of 11 different biozones, including arid scrub, grasslands, scrub forests, and humid zones called mallines. Both the forest and the Patagonian steppe represent unique biomes. This variety of terrain and climate has led to a diversity of species, many found only here. Patagonia has six endemic

plant genera, usually represented by only a few species. The birds and mammals are also diverse, including an endemic plover, a burrowing parrot, Darwin’s rhea, an endemic opossum, four endemic rodents called Tuco-tucos (similar to pocket gophers), and the curious Patagonian hare, a monogamous rodent of ancient South American origin.

Patagonia resisted permanent settlement until the late 19th century, when both Chile and Argentina encouraged immigration to the area. Since then, the region has offered hard lessons in the consequences of overgrazing, but, more recently has provided a lesson in how sustainable land management can provide a foundation for both rural livelihoods and environmental protection, with global implications.

The 19th century settlers in Patagonia brought their animals with them, and by 1910 the region had more than 20 million sheep, though still relatively few people. The settlers also brought with them from Europe and more humid parts of South America their assumptions about how to raise livestock. They added animals to their herds based on what they thought the land could support, but without a clear understanding of the limits and characteristics of the new environment.

For a time, the flocks of sheep and the smaller herds of cattle brought prosperity as the production of wool and meat

boomed. By the 1950s, however, the damage had begun to mount. As the flocks and herds grew, they exceeded the availability and capacity of the local ecosystems, degrading them to the point of permanent damage. Overgrazing led to the loss of native grasses and eventually to erosion, as Patagonia's relentless winds blew away the dry and sandy soil.

As more livestock concentrated into remaining areas of quality pasture, a downward spiral of land degradation ensued. With a reduction in ecosystem productivity, historical management strategies were no longer appropriate, threatening the remaining resource and making the breeders more vulnerable to fluctuations in the market. With lowered profitability and increased degradation, the majority of the small-scale, subsistence farms fell into conditions of extreme poverty.

Patagonian sheep herds have declined to 8 million head in the last decade with almost 12 to 18 percent of the breeders abandoning their ranches, causing up to a 47 percent reduction in rural employment in the Patagonian provinces with significant environmental and social effects. While sheep-rearing once provided significant inputs to regional incomes, it now represents only one percent of the region's GDP.

The loss of Patagonia's native grasslands also means the release of significant quantities of CO₂. Overgrazing causes a transition from steppe ecosystems to shrubland, with the loss of more than nine tons of carbon per hectare. Restoring the range conditions across Patagonia could avoid the emission of more than 50 million tons of carbon.

The comfortable assumption has long been that simply reducing the amount of livestock or abandoning ranches altogether would reduce pressure on the land and lead to the recovery of the ecosystem. In Patagonia, however, decades of rest have not resulted in recovery nor improved the physical and biological aspects of these fragile rangelands. Scientists now understand that most vegetation and soil transitions are irreversible. Almost 12 percent of Patagonian territory — 10 million hectares, roughly the size of Egypt — has passed the point of no return and will never recover.

The flip side of that grim statistic is that most of the degraded land in Patagonia — 85 percent by one estimate



— can still be saved through sensible and scientifically validated management. Studies on changes in plant composition associated with grazing in Patagonia show that the number of species can be maintained or even rise slightly with moderate or intermittent levels of interventions, but not when this disturbance or the grazing systems are intense or permanent. Thus, moderate grazing seems not to endanger species composition while intense grazing does.

The GEF and UNDP are working with the Government of Argentina to spread the adoption of range management technologies that will both sustain production and maintain the diversity and function of the local ecosystems. Under the mandate to improve the management of drylands through the United Nations Convention to Combat Desertification (UNCCD), GEF and UNDP focused on restoring the integrity, stability and functions of the rangeland ecosystems of



Cachi, Argentina

Patagonia. The goal is to keep Patagonia's unique species and habitats, spectacular grasslands, and human communities resilient and sustainable.

The range management technologies being applied in Patagonia fall under the broad heading of sustainable land management, or SLM. SLM innovations include measures to increase the productivity of agricultural and forestry lands (e.g. soil quality, vegetative cover), maintain ecosystem services (e.g. carbon sequestration, water availability, erosion and flood control, drought mitigation), and protect genetic resources (e.g. crops, livestock, wildlife).

By harnessing synergies and linkages between components within production landscapes, SLM can generate multiple global environmental and livelihood benefits. On the one hand, it addresses the often conflicting objectives

“ Properly managed rangelands with continuous or seasonal grazing are very different from the overstocked and under-managed systems characteristic of the baseline circumstances. ”

of intensified economic and social development, while maintaining and enhancing ecological and global life-support functions of land resources. On the other, it reconciles environmental issues with economic and social development by improving the policy, planning, and management of lands. As the foundation of sustainable agriculture and land use, SLM clearly plays an important role in poverty alleviation.

Combating desertification in Patagonia highlights how investing in sustainable land management generates not just local benefits but global ones as well, including reducing the risk of carbon emission from loss of vegetation and erosion, protecting important biodiversity, and demonstrating the links between ecosystem rehabilitation and economic development. When the project began in 2003, the GEF had relatively little investment in land degradation, but since then that focal area has grown into an important part of the GEF portfolio.

Ranching remains important to both the economy and culture of Argentina, so the GEF and UNDP developed this project in the spirit of demonstrating how sustainable land management can work for livestock producers. Two key aspects were engaging ranchers in making decisions about the project and creating incentives so they would see the value of investing in land management.

Today, several thousand herders in Patagonia still maintain a nomadic existence, much like the Tehuelche of centuries ago. They move their small herds from summer pastures in the Andean highlands to lowland grazing in the winter. But much of their traditional pastoral knowledge is outdated due to historic demographic and economic changes. The number of herders has grown, but the ownership of more and more land has been concentrated in a few wealthy and powerful owners. While most of the sheep farmers in Patagonia have small flocks, most of the land is under the control of medium- and large-scale producers, those with flocks of over 2,000 head. These producers control more than 80 percent of Patagonia's land. The largest producers, just three percent of the total, control more than half the land. The largest ranches, located in the southernmost states of Tierra del Fuego and Santa Cruz, can have 20,000 head of sheep and cattle. Many of the owners of these modern facilities, with full border fences, paddocks, windmills and comfortable houses, actually live in Buenos Aires.

Over centuries, small herders lost their access to the rangeland they once used, to the point where their traditional livestock management was no longer feasible in a greatly reduced area. Most sheep farmers in the region thus maintain small herds of cattle and sheep, operating on private property or on legally consigned lands, mostly without subdivisions and often without fencing that would enable them to better divide their management time and energy, protect sensitive areas, or protect their ewes during lambing.

They maintain one-room clay houses for their families, often without floors or access to electricity and gas. The typical family will have about six or seven members whose access to health care is limited due to a lack of hospitals in the rural zones. The rural road infrastructure is an earth road impassable in winter. Horseback is the main mode of transportation, with public transportation being used

only periodically. They generally exist outside of the cash economy, bartering for goods and services, and selling their labor in their spare time to generate cash. Illiteracy is estimated at 70 percent. They are frequently of native origin and rely heavily on family labor for tending flocks. This group uses mostly local breeds with little application of range management techniques.

Given these conditions among both the poor and wealthy producers, it is not surprising that only three percent of breeders, covering about two million hectares of land, had adopted SLM practices when the GEF/UNDP project began. A number of factors explain this low percentage: the strong traditional component of sheep production; the weaknesses of the extension services; the disperse nature of the small-scale producers; the negative impact of incentives without sustainable management requirements; the lack of a common vision on SLM between institutions, programs and projects; and the negative economic results that prevented farmers from seeking technical advice.

The GEF/UNDP project focuses on activities that will lead to broader-scale adoption of improved land management practices. The modified approach will improve the quality and quantity of production, increase financial returns, enhance the economic sustainability of the farms, and reduce poverty. Other causes of land degradation and desertification such as oil, mining, introduced species and firewood collection, have less widespread impacts and will be addressed in other sustainable management programs but using the network, information exchange opportunities, and consciousness raising aspects of this program as a platform for development.

All grazing systems in Patagonia are extensive; sheep and other livestock range over large areas in search of fodder, in contrast to intensive systems that concentrate the animals in smaller areas with better grazing. While many countries promote intensive grazing over 100-500 hectares or even less, in Patagonia few producers operate on anything less than 2,000 hectares.

Even over such large areas, relatively inexpensive infrastructure such as electric fencing of meadows and lambing shelters allow for forage deferment for a better nutrition of ewes at lambing and better protection from climatic conditions



Mara nursing young, Patagonia

and from predators. That helps more lambs to survive, which increases profitability and generates a surplus for sale. Range management is improved because meadows are rested and animals better distributed over the land. Using SLM, breeders reduce the uncertainty of production and obtain 18 to 33 percent higher net income compared to those using traditional management.

Recognizing that Patagonian ecosystems are easily damaged by overgrazing, these practices conform to the extensive nature of the production systems in Patagonia and to the needs of the ecosystem by providing management guidelines that are adaptable to the situation of the individual producer and to the characteristics of the local ecosystem. These practices involve objective range forage evaluation, stocking adjustments based on range and weather conditions, better protection of ewes and lambs at critical times, and other good production practices that have enabled breeders increase their net income by 18-22 percent in comparison with traditional management. .

Increase in production stems from reduced mortality and improved individual animal performance. That, in turn, increases the number and quality of animals and the wool available for sale. These breeders were able to produce enough financial and non-financial returns to meet the expectations of quality and way of life of their families. Properly managed rangelands with continuous or seasonal grazing are very different from the overstocked and under-managed systems characteristic of the baseline circumstances.

Sustainable land management is not a panacea. Even with optimal forage allocation, some farms do not achieve enough financial return to be economically sustainable. In these cases, SLM needs to be combined with other productive alternatives such as agro-tourism, a well-developed activity in Patagonia with nearly 100 ranches offering tourism services that rely on Patagonia's natural and cultural assets and employ family labor. Other alternatives such as rearing of native wildlife like guanacos or rhea, while still in their infancy, may be options for alternative development in the long term.



Argentina



Los Glaciares National Park, Argentina



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Niger river

Building Resilience in Niger

The Arabic word *sāḥil* means “shore” or “coast.” From this root comes the English word Sahel, the transition zone in North Africa from the sandy and barren Sahara to the more fertile savannas of the south.

This shifting frontier cuts the nation of Niger neatly in half, placing the country and its largely rural population literally on the front lines in the effort to adapt to climate change, combat desertification, and reduce poverty.

One of the poorest nations on Earth and heavily dependent on agriculture, Niger’s population is at the mercy of an increasingly fickle climate; some recent years have brought devastating floods, but more often the problem is far too little rain, not too much. The most serious impact of climate change in Niger is an increase in the frequency, intensity, and duration of droughts, resulting in a decrease in agricultural production, an increase in grazing pressure on pastoral ecosystems, and consequently soil erosion on a vast scale.

To face this multiple onslaught, Niger turned to the GEF-managed Least Developed Countries Fund (LDCF) for help. This fund, established under the United Nations

Framework Convention on Climate Change and administered by the GEF, helps poor countries prepare and implement plans adapting to climate change, called National Adaptation Programs of Action. Other programs of the GEF help to address the effort to slow or reverse climate change. But the LDCF recognizes that no matter what we do now to mitigate climate change, some of its adverse impacts are already with us and in need of being tackled urgently. The Fund focuses on reducing the vulnerability in poor countries of those sectors and resources vital to development and livelihoods, including water, agriculture and food security, health, disaster risk management and prevention, infrastructure, and fragile ecosystems.

In Niger, the LDCF supported a project implemented by UNDP in collaboration with Niger’s National Council for Environmentally Sustainable Development. The initiative joined forces with national stakeholders including six ministries, Niger’s rural development agency, and municipalities, to enhance adaptation of the agriculture and water resources sectors to address urgent and immediate climate change impacts. UNDP is promoting climate-resilient development of the agriculture and water sectors, integrating the climate change risks those sectors face in Niger into relevant policies, plans and programs at the national and local level.

The project in Niger is climate adaptation at its most human level — gritty, often low-tech, but practical, tangible, and above all, vital to the people most directly at risk due to the harmful effects of a changing climate.

Among those most vulnerable are the people who live in the small oasis village of Aderbissinat. Deep into the Sahel, about 700 kilometers northeast of the capitol of Niamey, Aderbissinat lies on a major trans-Saharan route linking Algeria to Nigeria. The location accounts for the ethnic diversity of the village, a home to Tuareg, Hausa, and Arab families, and a busy marketplace that draws nomadic Fulani herders from the surrounding plains.

“Before there was no grass and fodder here,” he says. “Everything was dry. But now thanks to the banquettes, the grass and trees are growing everywhere. In a few years it will be forest here.”

For centuries, farmers here grew sorghum, millet, maize, and beans, and pastoralists moved their herds with the seasons in search of good grazing. With the worsening droughts, many areas that once supported these activities are no longer suitable. The culprit is reduced water content in the soil as a result of increased temperatures and “evapotranspiration.” This term refers to the loss of water to the atmosphere through evaporation and plant transpiration, and is a good measure of the amount of water needed for plants to grow healthy. Increases in temperature that experts predict will also further reduce the availability of water for both plants and people. The combined effect will be reduced agricultural productivity and fewer sources of water for rural communities. The recharge of surface and ground water resources will be reduced as a consequence of the increase in drought frequency and warmer temperatures, thus further impacting water availability for rural communities.

Agricultural productivity in Niger is also under pressure from rapid human population growth in the past decade, continuing at a rate of greater than three percent. This has led to an increase in livestock numbers in pastoral areas and an expansion of intensive agriculture into marginal landscapes, both of which have contributed to the negative spiral of soil erosion and loss of agricultural productivity.

An underdeveloped economy in rural areas further exacerbates the problem of declining agricultural productivity. Rural communities have insufficient technical and administrative capacity and infrastructure such as roads, schools, hospitals and municipal offices, deficits that slow economic growth and prevent people from starting new enterprises. Insufficient government capacity to mobilize financial resources for natural resource management helps perpetuate the cycle. Land tenure systems, meanwhile, lead to overuse and degradation of common-property resources with little accountability of environmental degradation. Finally, a decline in nomadism among pastoral people results in continual livestock pressure and inadequate resting periods for ecosystem recovery.

Against these pressures, new ideas are showing promise. Local farmers, government agencies in Niger, and international researchers have developed varieties of cereals and forage that grow well with limited water. These varieties could help poor rural communities become more resilient to climate change and wide swings in climate from year to



Niger



LDCF project in Aderbissinat, Niger



Niger

year. But barriers remain, including lack of money to buy seeds and the technical capacity to use them well. The seed or seedlings of such varieties are seldom available to local farmers because of ineffective distribution. LDCF funding supports an initiative to set up mechanisms for the sustainable dissemination of drought-adapted crop varieties to vulnerable communities.

With these seeds, farmers are already beginning to transform the landscape of Niger. UNDP and the Ministry of Agricultural Development helped provincial agencies distribute nearly 24,000 kilograms of millet, sorghum and cowpea seeds to farmers in Aderbissinat and seven other communities in southern and western Niger. The initial tests of the drought-resistant crops on 80 hectares produced more than 87,000 kilograms of cereal.

Food shortages still occur at the end of the dry season and will likely get worse with climate change. But the new seeds will improve yields, and this, in turn, will support cereal and fodder banks, another effort to help communities adapt and mitigate the impact of droughts. The principle of cereal and fodder banks is simple: Local farmers deposit grain into the banks during times of surplus, earning “interest” on the deposit, enabling them to withdraw the cereal or fodder during times of need. The banks also buy from farmers and the government at a subsidized rate during times of shortage. The number of functional banks will need to grow for communities to overcome increasingly intense climate pressures.

Properly managed cereal and fodder banks can increase food security. Mismanagement, however, frequently leads to misappropriation of the cereal stocks. Existing cereal banks are unevenly distributed among the different regions in Niger and many require rehabilitation. The project has established cereal bank committees that are democratically elected and comprised of women and men. These committees have the financial, administrative, and general management training needed to manage the cereal bank stocks and source and disseminate seeds of appropriate drought-resilient crop varieties.

No matter how hardy the varieties, the seeds by themselves will not be enough to restore the badly degraded lands in the Sahel. Erosion has taken a severe toll. As with the seeds, however, some possible solutions require relatively little money

but a lot of commitment and energy. Near Aderbissinat, for example, farmers and herders are using a variety of techniques to stabilize the soil, such as planting more than 40,000 trees.

In such dry climates farmers need to harvest not just crops, but water itself. Since the overall drying of the climate makes the occasional torrential rains even more destructive by removing the vegetation that holds the soil in place, the rains will actually speed desertification unless something is done to trap the water and keep it from carrying off all the topsoil. One water harvesting technique known in Niger as a ‘Zai’ entails digging half-meter wide holes one to two meters apart and filling these holes with a mixture of compost, manure and topsoil. Rainwater runs off the bare soil surface between the holes and drains into them. In this way, each ‘Zai’ hole becomes a biological hotspot, with a greater soil-water and nutrient content than the surrounding soil. Crops like millet, sorghum and maize are sown in the ‘Zai’ holes and their productivity is greatly increased relative to plants sown outside of these holes.

Banquettes and half-moons perform similar functions. Digging straight, narrow trenches through a level field (a banquette) or curved trenches along the contour or a hillside (a half-moon) forms barriers to wind and surface runoff and collect dust, water, and soil. As with the Zai, the trenches become zones of high productivity because of greater soil water and soil nutrient content than surrounding bare soil surfaces. Sowing seeds of drought-resilient grasses stabilizes the trenches, and they have the potential for reversing desertification and increasing the resilience of pastoralists to climate change.

The LDCF project in Niger has helped construct 1,500 banquettes and 17,500 half moons, leading to the restoration of 305 hectares of degraded lands. The barriers require maintenance and the livestock numbers need to be kept under control to prevent degradation of the fodder resource. Accordingly, the project involves working to develop the technical and administrative capacity at the local level for managing both barriers and livestock.

The people of Aderbissinat can see things changing for the better even now. Jadah Izahi, a member of the village committee that helps manage the project, knows the improvements



Tahoua, Niger



first hand. “Before there was no grass and fodder here,” he says. “Everything was dry. But now thanks to the banquettes, the grass and trees are growing everywhere. In a few years it will be forest here.” Alhousseini Ismaila, from the village of Edouk, roughly 200 kilometers due west of Aderbissinat, sees progress too: “Before it was a degraded land. Today with the support of the LDCF project, we built benches and planted trees. Thank God, hope is there.”⁵

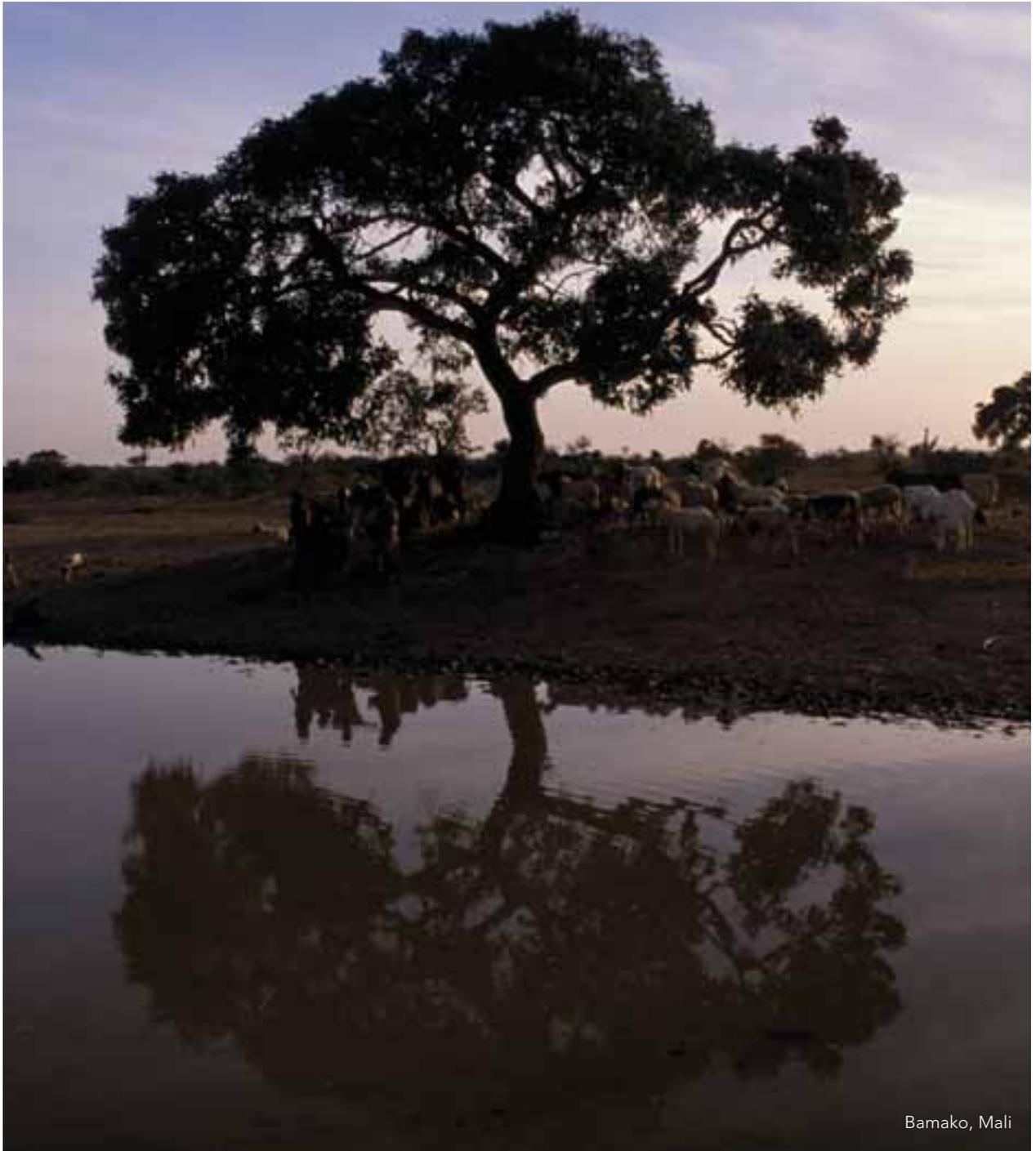
Broad-scale adaptation to climate change builds on these kinds of successes. The success of adaptation policies will be measured in terms of increased preparedness and resilience to climate hazards in local communities like Aderbissinat and Edouk, or Tamololo, Badoko and Tondikiwindi. Field-based activities in adaptation provide vital opportunities to test and improve practical approaches that can be applied elsewhere, in Niger, across the Sahel, and any drought-stricken, vulnerable rural community.

The project in Niger is already providing the most vulnerable population with increased food security and climate-resilient livelihood alternatives, as well as raising awareness

of climate risks, and increasing preparedness and prevention policies at the local level. More broadly, the project contributes to building adaptive capacity to climate change in the agricultural sector across Niger and even the broader Sahel. At the national level, government, NGOs, and businesses are strengthening their capacity to integrate climate change risk reduction strategies into development policies and programs.

The government of Niger has been an enthusiastic participant in these efforts and as a result national ministries are developing better-adapted policies and programs that support adaptive strategies. Institutional mechanisms for integrating, monitoring and evaluating adaptation across sectors and scales will enhance the adaptive capacity of Niger to address climate change risks. Through better adaptation measures and alternative financing mechanisms, and with the help of LDCF funding, the government will be able to put in place cost-effective measures of addressing climate change over the short term and build foundations for longer term success. Such small victories, replicated in thousands of villages like Aderbissinat, can add up to change on a global scale.

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Yunnan, China

Integrated Ecosystem Management in China

In March of 2010, Beijing residents awoke to skies turned an eerie yellow.

A dense fog of wheat-colored dust enveloped the city as choking whirlwinds filled Tiananmen Square, coating cars and bicycles and reducing visibility to near zero. With so many tiny particles in the air the pollution index reached 500 — the worst level possible.

Major cities in the People's Republic of China (PRC) can have days like this, usually caused by burning soft coal to feed the country's growing need for energy. In this case, however, the culprit was not coal, but sand. The topsoil from a huge swath of 16 provinces across west, central, and northern China blew east in sandstorms so large that some of the sand ended up in the Northwest United States, more than 10,000 kilometers away.

Much of the PRC is dry, so sandstorms are hardly unknown there, but they are becoming larger and more frequent. Sandstorms originating in the western region have increased from an average of one every two years in the 1950s to more than two each year in the 1990s. The storms stretch across 6.8 million square kilometers in five western provinces and autonomous regions, places that are naturally dry but now

face growing pressure from low and erratic rainfall, fragile soils, scarce surface and groundwater resources, and sparse natural vegetative cover. Climate change and poor agricultural land management practices make all those problems worse. The dust and sand storms bring ecological, social, and economic harm, impacting 250 million people living in western China — and much of East Asia as well.

Drylands account for 71 percent of China's land area, 31 percent of its forested land, and over 90 percent of its grasslands. Approximately half of this region — about 2.5 million hectares — suffers from moderate to severe land degradation. Desertification — defined as land under productive use that is progressively deteriorating, though not literally turning to desert — is spreading at an ever increasing rate. By the 1990s, the process was consuming land at twice the annual rate seen in the 1950s.

Pressure is increasing on these areas as demand for meat and other livestock products rises in conjunction with a growth in urbanization and a rise in living standards. Gansu, Qinghai, and Shaanxi provinces, and Inner Mongolia, Ningxia Hui, and Xinjiang Uygur autonomous regions account for 79 percent of the PRC's desertified areas and 92 percent of the country's degraded areas. While the western PRC contains large deposits of oil, gas, and coal, most people still live in

rural areas and depend on agriculture for their livelihoods. But given how little the land can produce and how susceptible it is to degradation, the drylands of western China are among the poorest parts of the country: approximately 100 million people here (40 percent of the population of the region) live on less than US\$1 per day. While the northern and western provinces and autonomous regions are home to 17 percent of the PRC's population, their combined GDP is only 7.2 percent of the national GDP. The economic losses due to land degradation in these six provinces and autonomous regions have been estimated at approximately 24 percent of their combined GDP.

Dryland degradation also has national and global consequences. In 2002, the direct economic losses due to land degradation were estimated at US\$21.2 million per day, mostly due to erosion, as with little ground cover what rain does fall washes off immediately and takes the topsoil with it. China's Ministry of Agriculture estimates that the loss of agricultural production due to land degradation is approximately 30 percent of agricultural GDP, excluding the downstream costs of damage to infrastructure and water quality.

The western region occupies an important ecological location: the provinces and autonomous regions cover 30 ecosystems, with more than 5,000 recorded species of wild animals and plants. The expansion of degraded areas is a growing threat to that diversity, particularly among endemic species in these fragile ecosystems.

The decline in forests and other vegetation in dryland areas that threatens biodiversity is also contributing to climate change through increased CO₂ emissions. Rehabilitating vegetation and improving farming methods will benefit carbon sequestration. It is estimated that improvements in the management of agricultural land in the western region could store more than 25 million tons of carbon each year; improvements to forest quality and forest land management could sequester 87 million tons of carbon each year.

In the face of such complexity, with so many variables over so large an area and with so much potentially to be lost, or gained, no single approach will suffice. The government of the PRC recognized the need for a broad-based way of thinking about the problem of land degradation, and approached the

“As the experience in China demonstrates, a piecemeal, sectoral approach in which individual technical agencies follow strategies focused on only part of the wider problem will not succeed over the long haul.”

GEF in 2003 for help. What emerged was an innovative ten-year program to address desertification as major national priority and the first country partnership for the GEF.

The key to this partnership is the commitment of the PRC to its success. Since ratification of the United Nations Convention to Combat Desertification in 1997, the PRC has progressively increased its efforts to slow and eventually reverse land degradation. The willingness of the PRC to drive the partnership with the GEF and to generate global benefits in the context of desertification provides important lessons on how to evolve effective mechanisms to coordinate policies, programs, and actions by various sector agencies operating in the areas of agricultural and rural development; land, forestry, and water management; and environmental protection, finance, and planning; and introduce effective and transparent monitoring and evaluation systems to assess the outcomes and impact of efforts to combat land degradation and reduce poverty.

The PRC, GEF, and their partners, particularly the Asian Development Bank (ADB), saw an opportunity to address the



China



connected problems of land degradation and rural poverty through Integrated Ecosystem Management, or IEM. This holistic approach includes multiple sectors, institutions, and governance frameworks based on understanding the natural resource characteristics of individual ecosystems, the services those systems provide, and the opportunities for — and obstacles to — sustainable utilization of an ecosystem's natural resources to meet people's welfare and economic needs. IEM thus represents an ecological approach to natural resource management that aims to ensure productive and healthy ecosystems by integrating social, economic, physical, and biological needs and values.

Rather than treat each resource in isolation, IEM seeks to treat all ecosystem elements together to obtain multiple ecological and socioeconomic benefits. That requires integrating natural and social science disciplines, such as agronomy, animal husbandry, silviculture, ecology, sociology, and economics, offering hope for a better understanding of the natural properties of ecosystems and society's dependence on them, and the social, economic, and political factor that contribute to their disturbance.

Integrated Ecosystem Management also makes explicit the trade-offs inherent in practically any decision regarding how to use natural resources: planting too many trees may diminish the local water supply; a focus on agriculture may have an impact on the other ecosystem services the land provides. In drylands, be they in western China or anywhere else on Earth, understanding these tradeoffs and their consequences is essential to both conserve biological diversity and to provide benefits to people.

The GEF and ADB sought initially to lay the foundation for applying IEM to dryland ecosystems in China. A five-year project led by ADB helped improve policies, laws, and regulations for controlling land degradation, fostered better coordination and planning among the institutions responsible for land management, and established systems for monitoring and evaluating land degradation in western China, all within a common IEM agenda. As a result of the project, the PRC Government has essentially embraced IEM as the approach to combating land degradation and desertification in drylands, and for which the government is channeling major investments as part of the country's

development strategy in the affected provinces and autonomous regions. GEF financing has played an important role in advancing the Government's vision, and could serve as an important driver for other countries.

The project provided a mechanism to institutionalize IEM across the government of the PRC, from local to provincial to national levels. The initial US\$25 million grant from GEF has also become a model for its catalytic effect, as it generated US\$300 million in funding from the government, and changed how the government approaches the broad issue of sustainable land management. The fundamental idea of using diversified practices can be applied in other natural resource sectors as well, such as forestry, and the willingness to measure results over a long time frame marks an important change in perspective for resource management in general.

The GEF/ADB project piloted innovative ideas to link components of the ecosystem — land, vegetation, and water, for example — directly to communities that depend on them. This included providing new land management technologies, new animal breeds and crop varieties, and new skills and methodological approaches for the communities. Each village was provided with a better understanding of land degradation, was introduced to the IEM approach, and was helped to collectively choose locally appropriate IEM-based interventions.

Although limited in area, the pilot demonstration sites strengthened the PRC-GEF Partnership by showing how to build IEM capacity through testing and validating locally appropriate small-scale technical interventions. Overall, household livelihoods improved as a result of the technical interventions and vocational training. Furthermore, efficiency improvements, new technology, and skills training provided farmers with opportunities to realize additional income through increased yields and livestock weights while reducing erosion and improving soil quality.

In the provincial pilot sites, the PRC-GEF Partnership played an incremental role in introducing a range of alternative natural resource-based enterprises to local populations that conformed to the requirements for IEM. In Huangyuan County, Qinghai province, for example, the project helped



China

initiate a series of greenhouse and mushroom farm trials. Villagers saw net profits increase their annual income per capita by CNY\$1,100. In 2008, a further 80 greenhouses and mushroom farms were built. Farmers are now considering establishing a cooperative to sell directly in Xining, the provincial capital. With the support of the PRC–GEF Partnership, more than 500 greenhouses were built at the pilot sites.

In Minhe County, also in Qinghai Province, and other pilot sites introduced courtyard vegetable gardens. Courtyards are a traditional PRC architectural feature, but they are rarely utilized for vegetables. These gardens have improved household nutrition and reduced expenses, and provided opportunities for small-scale experimentation with new crops.

Land degradation is a multidimensional problem that demands multidimensional solutions. As the experience in China demonstrates, a piecemeal, sectoral approach in which individual technical agencies follow strategies focused on only part of the wider problem will not succeed over the long haul. Tackling land degradation in drylands requires developing strategies that respond to local environmental and economic realities but that fit within a broader and commonly understood framework. That will form the basis for development and implementation of a comprehensive, multisector, and interagency action plan for restoring, sustaining, and enhancing the productive capacity, protective functions, and biodiversity of natural ecosystem resources.



Pepper farmer in Gansu province, China





Yunnan, China

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Himalayan glacier melt lakes

Averting a Himalayan Tsunami

The most famous medical advice in history actually had nothing to do with medicine.

Benjamin Franklin's well-worn adage that an ounce of prevention is worth a pound of cure referred not to illness but fire. Among his many other pursuits, Franklin was a pioneer of public safety and created Philadelphia's first fire company in 1736.

Franklin's insight was so powerful, and applied to so many things, that from it we remember a simple and ageless lesson: it is far better to prevent disaster than attempt to deal with the consequence afterward.

That lesson can be seen in action in countless circumstances, none more compelling than a climate change adaptation project now underway in one of the most remote and rugged places on Earth, a Himalayan glacial lake in Bhutan called Lake Thortormi. The lake lies at an elevation of 4200 meters, on the southern slopes of Gangchen Singye or Table Mountain, near Bhutan's border with Tibet. Just below the lake runs the Pho Chhu River, which flows into the Puna Tshang Chhu, the country's longest river, along which there are emerging townships, important historical

structures, major hydropower projects, farmland, and public infrastructural projects.

To see Lake Thortormi today, even from space, is like to see a lake being born. The lake sits at the lower edge of Thortormi glacier, held in place by a moraine dam at the southern end made up of rocky debris left behind as the glacier has retreated to the north, higher and higher into the mountains. Formation of glacier ice from the winter snowfall, and some melting of such ice in summer is a normal phenomenon. However, the warming climate of the past decade has significantly increased the rate of glacier melting, causing the glaciers to retreat. While the lake for the moment remains largely a slurry of rocks, sand, and water, meltwater pours into the basin at an ever increasing pace.

That poses an enormous threat for the downstream communities, human and otherwise, in the Punakha-Wangdi and Chamkhar Valleys. Particularly worrisome is the unstable moraine dam separating Lake Thortormi from its neighbor to the west, the deeper and more fully formed Lake Rapstreng. Ice cements the moraine together, so as temperatures rise and the ice melts the dam may give in. That would send water from Thortormi Lake cascading into Lake Rapstreng, forming a super lake with more than 53 million cubic meters of water.

A lake that massive would place enormous pressure on the remaining moraines holding it in place. Should they burst, the results would be catastrophic. In 1994, a partial collapse of a moraine of the neighboring Lake Luggye resulted in flood that killed 21 people and swept away livestock, crops, and homes. A flood from Lake Thortomi would be three times that size, and given how fast the water is rising, it could happen at any time.

Scientists have a name for these disasters: Glacial Lake Outburst Floods, or GLOFs. Since Bhutan's northern territory abounds with glaciers and glacial lakes — by one estimate 677 glaciers and 2,674 glacial lakes — the country faces a great risk for this particularly fierce and unpredictable scourge, like a mountain tsunami. Of all Bhutan's glacial lakes, 25 pose potentially high risk for GLOFs, with Lake Thortormi one of the most critical of all.

Time is of the essence. The urgency of adapting to climate change is brought home in stark terms — approximately 10 percent of the Bhutanese population lives in the Punakha-Wangdi and Chamkhar Valleys, and their very lives are at stake, along with hydropower plants, farms, and important cultural sites.

The Government of Bhutan recognizes the threats but lacks the capacity to address them. Thus, it requested funding from the Least Developed Countries Fund (LDCF), established under the UN Framework Convention on Climate Change (UNFCCC) and managed by the GEF to mobilize additional resources for climate change adaptation projects. With financial support from the LDCF, the Department of Geology and Mines and the Disaster Management Division, in partnership with the United Nations Development Programme (UNDP), developed a project to reduce the risk of GLOFs in the Punakha-Wangdi and Chamkhar Valleys.

The project is among the most concrete, tangible approaches to climate change adaptation anywhere in the world. In a combination of technical sophistication and backbreaking manual labor under the most challenging conditions imaginable, a team of geologists, glaciologists, engineers, and 250 workers — most from local villages but some from more far-flung parts of Bhutan — are lowering the water level in Lake Thortormi.



For three months in late summer, when the weather turns favorable, workers set up a tented village on the valley floor to the south of the lake. Every day, they make the 90 minute hike over the ridge separating their temporary home from the lake, carrying their sledge hammers, pickaxes, shovels, ropes, and burlap bags; given the elevation and the rugged terrain, heavy machinery is not an option. Standing in the bone-chilling water on the glacier, the workers haul boulders and clear mud entirely by hand. Like slowly turning a giant spigot, the workers cut channels to allow a controlled flow of water off the glacier, into the Pho Chuu River and down the valley.

The LDCF funding came just in time. If Lake Thortormi had developed for another year, it might have been too late to do anything about it. As it stands, by dint of shovels and pick axes, the level of the lake has fallen more than two



The Lake Thortormi project highlights the role local communities can play in climate adaptation. They are the true heroes of this story.

meters, and levels in two subsidiary lakes have fallen by as much or more. The goal of the project is to eventually lower Lake Thortormi's water level by a full five meters.

The immediate benefits of the project are clear, and twofold. The first and most apparent, the risk of catastrophic flood has been markedly reduced. This is climate adaptation as prevention, literally a hands-on application of Franklin's adage — rather than compensate individuals and even nations for damages, avoid them altogether and save both lives and money. The project also demonstrates how much can be accomplished with a relatively small investment. While climate adaptation is a global challenge requiring sophisticated science, it will come about at least in part in small steps, with specific tasks tailored to local circumstances, some of them as basic as breaking rocks with hammers.

The Lake Thortormi project also highlights the role local communities can play in climate adaptation, and they are the true heroes of this story. Some of the workers trek for many days and must cross a 5,200 meter pass to reach the lake, one of most remote work sites on the planet. They earn about US\$10 a day for the three-month stint, five times the average national wage.

The money the workers earn will make a meaningful difference in their lives. For Shan Dorji Doya, who walked for fourteen days to reach Lake Thortormi, this was an opportunity to start a new life. "With the money I earn from working," he says, "I plan to open a small store so I can support my family." The benefits also extend to people beyond those actually clearing the rocks and sand. The project considered using helicopters to bring in the 60 tons of supplies the project needs, but chose instead to employ local horse and



yak herders. As a result, local communities earned more than US\$150,000, helping them pay for school for their children and expand businesses. The project has thus improved the overall quality of life in the area, providing new investments and new opportunities.

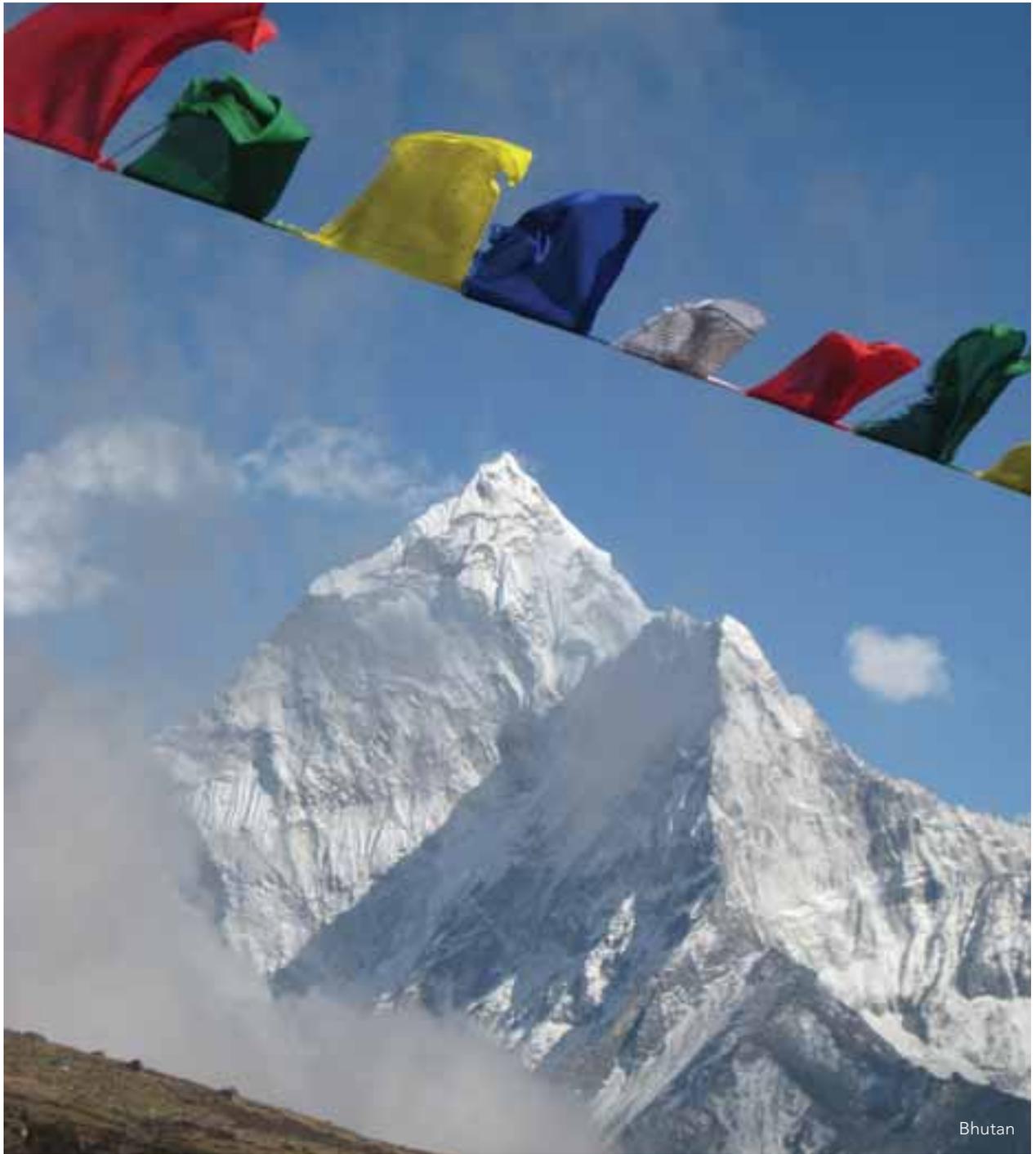
Lowering the water level in Lake Thortormi is just part of a larger effort to reduce the risk of glacial lake outburst floods in Bhutan. With LDCF funding, UNDP is helping the government integrate the risk of climate-change induced floods into the existing disaster risks management framework. A Disaster Risks Management Bill has been drafted and has gone through a comprehensive review and stakeholder analysis and is awaiting approval by the Parliament. Moreover, based on a hazard zoning exercise, a government circular for GLOF-resilient land use planning has been disseminated to local authorities in Punakha, Wangdi, and Bumthang. This has prevented new construction in potentially hazardous sites and a number of planned construction efforts have been put on hold as a result.

Several rounds of awareness and advocacy programs on GLOF risks and the existing, manual early warning system and procedures have been conducted in 21 vulnerable communities along the Pho Chhu River basin. Installation

of an automated early warning system has begun, including the construction of 14 siren towers and a control room. The system is targeting more than 90 percent of the households in the vulnerable communities downstream of the Punatsangchu River in the Punakha-Wangdue valley, in addition to a vital hydropower project, schools, health centers, and other important infrastructure.

The Bhutan project provides important lessons about how to reduce climate vulnerability and increase the adaptive capacity to climate change by financing efforts to foster climate-resilient development. The first lesson was how to put in practice the initial concrete actions on the ground, and to use the available knowledge about vulnerability as the basis for proactive, preventive adaptation actions. Since water from Himalayan glaciers is crucial to Bhutan's economy, the project is helping put adaptation in the context of development, an important step in addressing adaptation issues across entire regions and the globe.

The project also illustrates how to achieve climate-resilience by taking into account national circumstances and economic and social priorities. By increasing disaster risk management capacity in affected valleys (including the integration of climate change risks), lowering the water level in Lake Thortormi,



creating early warning systems, and integrating all these measures into existing development plans, the project in Bhutan resulted in a reduced risk of expected significant destruction of economically important areas, and prevention, or at very least limitation, of human and economic losses.

The risks of climate-change induced floods extends far beyond these Bhutanese districts and covers the entire Himalayas. This project marks the first time that a comprehensive approach to the problem has been attempted, and is a pioneering effort on prevention of GLOF related hazards and plans are being made to replicate the efforts in neighboring countries like Nepal to reduce the GLOF related risks throughout the region.

Even more broadly, preventing glacial lakes from bursting can have impacts across all of South Asia. That entire region, home to more than a billion people, depends on the rivers that have their headwaters in the Himalayas. The Pho Chhu River, for example, fed by Lake Thortormi, flows eventually into the Brahmaputra, which is considered the life-line of India and provides water for irrigation, transport,

and hydropower in its basin. Drastic and sudden changes in the hydrological regime would have profound consequences in these countries downstream of the glaciers. Projects like that on Lake Thortormi will not prevent such changes, which if they occur will likely be driven by the global climate, but such efforts may be able to help limit the damage.

The project in Bhutan has been one of the most successful under the LDCF, which set the precedent for funding climate adaptation projects. One of the main accomplishments of the LDCF portfolio has been to test and demonstrate adaptation measures on the ground, as in Bhutan. The LDCF and the Special Climate Change Fund, which also prioritizes adaptation action and is managed by the GEF, provide practical operational knowledge. They offer vulnerable countries and communities, through the GEF network of agencies who implement projects and national and local stakeholders, initial resources to finance this pioneering portfolio. This experience has resulted in a much clearer sense of what climate adaptation means in practice, how to implement it, and how to estimate its costs.



Himalayan mountains



LDCF project in Bhutan



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Fighting Climate Change with New Refrigerators

The kitchen in a modern home or apartment in Beijing, Hong Kong, or any of China's booming cities can look sleek and inviting, with all the conveniences the upwardly mobile urbanite has come to expect.

The appliances have all the best features, use the most high-tech materials, and meet the current standards for design. Perhaps the most important feature of all, however, is also the easiest to miss. Look closely at the refrigerator in a Chinese kitchen these days, and tucked away unobtrusively in an upper corner is a small label. That label has changed things for the better in China, both economically and environmentally. It is just one of a set of innovative market incentives targeted at the manufacturers and retailers of environmentally friendly refrigerators and the customers who purchase them, and it offers lessons for the future that extend far beyond any single country as well.

The refrigerator label shows potential buyers which models are the most energy efficient. While a common sight in Japan, the United States, and Europe, in the mid-1990s manufacturers in China did not make such information

available to consumers. Given that newer refrigerator models usually cost more up front — though they are cheaper in the long run — the lack of information about efficiency and the average consumer's lack of understanding about why an efficient appliance makes more economic sense than a cheaper but inefficient one, posed significant obstacles to making energy-efficient models more popular.

That might cause little concern but for one fact: The choices Chinese consumers make about how they use energy have global implications. In 1985, only 7 percent of urban households in China had refrigerators. By 2002, that number had grown to 87 percent, an annual growth rate of 15 percent. To meet the needs of that exploding market, refrigerator production in China jumped from 1.4 million units in 1985 to 48 million in 2008, making it the largest refrigerator market in the world.

For most of that period of explosive growth, those millions of refrigerators failed to measure up to international standards in several key ways. First, Chinese refrigerators were inefficient; the average model used half-again as much power as comparable imported refrigerators. Second, throughout the 1980s most manufacturers in China used chlorofluorocarbons (CFCs) like Freon (the trade name for Dupont's line of CFCs) to cool their refrigerators. While effective and cheap,

CFCs also deplete the ozone layer. Left unchecked, ozone depletion leads to more ultraviolet radiation reaching the surface of the Earth, with harmful effects on human health, agriculture, and biodiversity.

Changing the market for refrigerators in China would thus pay dividends twice over. Greater efficiency in such a large market would lead to significant savings in the need for energy, which in China is largely produced by burning coal and thus generates tons of CO₂ along with other health threatening emissions, sulfur dioxide and particulates, to name two. Making refrigerators CFC-free would be a big step toward eliminating them from all commercial and industrial uses. Building this kind of synergy across two global environmental conventions — the United Nations Framework Convention on Climate Change and the Montreal Protocol on Substances that Deplete the Ozone Layer — is a key strategy for the GEF.

In the mid-1990s, government agencies and experts inside and outside China realized that unless Chinese manufacturers improved the efficiency of their refrigerators, the country would require more than 5,700 megawatts of new annual power generation, equivalent to an annual average of 60 million tons of additional CO₂ emissions. Excessive energy consumption by refrigerators thus became an extremely pressing issue.

At the same time, policy, economics, and technology were coming together in China to create an ideal moment for transforming the market of refrigerators. China had ratified the Montreal Protocol in 1991, joining the treaty that sets out a schedule for the phase-out of the manufacture and use of CFCs. The Montreal Protocol created a Multilateral Fund to help China and other developing countries make the transition away from CFCs. China also wanted to export refrigerators overseas, particularly to Europe, but those markets were increasingly dominated by CFC-free models, so if China wanted to compete it would need to adapt. That was a powerful incentive; “If we could obtain a good market share [for CFC-free refrigerators],” one manager explained, “we could conduct ODS [ozone-depleting substances] reduction even if there were no financial support [from the Multilateral Fund]. But if we could not obtain a good market share, we would not carry out ODS reduction even if financial support were available.”⁶

6 Quoted in Dauvergne, 2010.

“By 2005, refrigerators were 29 percent more efficient on average than they were in 1999, resulting in savings of 12 million tons of CO₂ emissions. By 2010 that figure soared to 46 million tons.”

Technology was also rapidly changing the industry. Scientists from Lawrence Berkeley National Laboratory in California began working with Chinese manufacturers on developing efficient, CFC-free technologies in 1995. Those technologies could reduce energy consumption by refrigerators in China by as much as 40 percent, and the political and economic trends toward efficiency were favorable. Still, significant barriers remained to the widespread commercialization of energy efficient refrigerators.

In 1998, the GEF and UNDP launched a project to overcome those barriers. After a year of planning, the GEF approved US\$9.6 million for project which, with funds from other sources, would ultimately total more than US\$40 million to bring efficient, CFC-free refrigerators to China. As with the lighting market in Poland (see Chapter 6), market transformation has potential for enormous and lasting impact, and a huge leverage of the



Shandong, China

GEF investment. The project in China, however, is even more daunting than the lighting project in Poland. Refrigerator technology, for one, is far more complex than a light bulb, with multiple components and hence multiple manufacturers, each with processes, standards, and competitors. The kind of incentives offered in Poland to make compact fluorescent bulbs cheap and available would be just a part of the transformation in China, where a far broader effort to educate both producers and consumers would be needed.

A new refrigerator market meant convincing manufacturers that switching production to more expensive but more energy efficient models would be profitable even though they would need to transform their entire supply chain. Retailers would also need to believe that they could sell more expensive refrigerators and consumers would need to overcome sticker shock and understand the long term benefits. As if this was not challenging enough, existing energy efficiency standards would have to be revised in a way that was technically feasible, commercially viable, and in line with international standards.

Manufacturers were understandably nervous about market demand for and cost-effectiveness of high-efficiency models. Little research has been done about either the potential demand for such models or the costs of developing them. Due to historically low electricity prices and little emphasis on energy efficiency in the Chinese economy, both producers and consumers were uninterested in energy-efficient products.

The majority of Chinese manufacturers also lacked the engineering and design expertise to develop new energy-efficient refrigerator models or modify existing designs to make them more energy-efficient. Most domestic manufacturers relied heavily on imported or licensed technology such as high-efficiency compressors, and since those manufacturers featured a limited and unchanging product line, they had limited experience in product design or redesign.

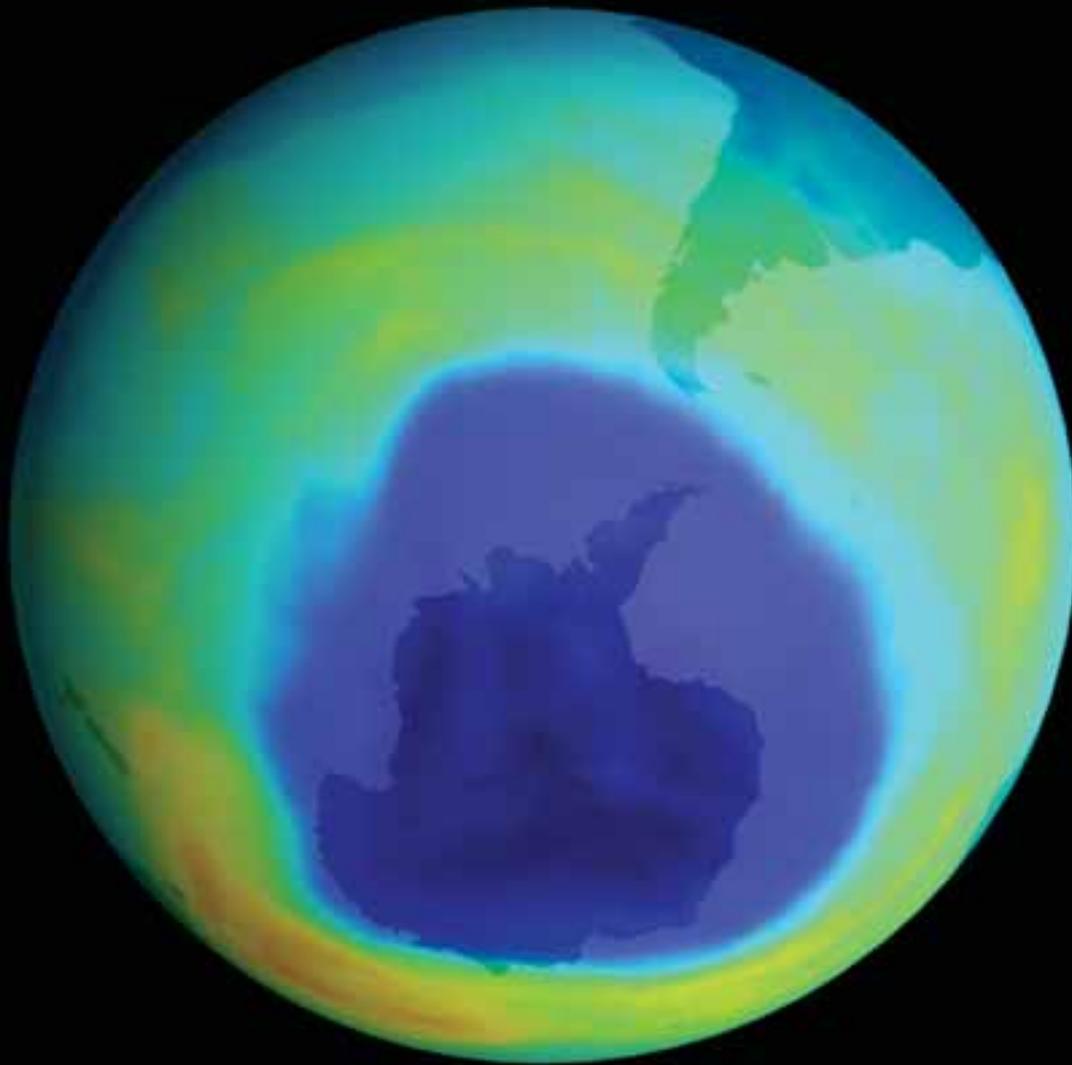
The UNDP/GEF project began with the recognition that effective commerce requires both buyers and sellers of goods ready to participate at the same time. The project was designed to address the problem of refrigerator efficiency not only through spurring the development and

manufacturing of energy-efficient refrigerators, but also by assuring a market for them.

The two major elements of the project were consumer education, though the energy-efficiency label, for example, as well as improved standards and training and financial incentives for manufacturers. The efficiency labels identify an appliance as meeting minimum energy efficiency standards and achieving a rating of level 1 (most efficient) to 5 (least efficient). The project funded a program to educate retailers, focusing on the large retail electronics and appliance stores that dominate in major urban markets in China, as well as the public through articles, advertisements, documentaries, and posters. All these efforts promoted awareness of the environmental and economic benefits of energy-efficiency refrigerators. Many customers were exposed to the environmental impact of their own energy use patterns for the first time, as well as the potential for energy efficient appliances to translate into energy bill savings.

The project targeted 16 major refrigerator companies and 10 manufacturers of compressors — the vital components responsible for determining how much energy a refrigerator uses. To help these companies understand what the switchover would entail, the project organized domestic and overseas training aimed at introducing engineers to international technology options, computer design modeling, energy efficiency measures and expert technical assistance. Participating manufacturers were then entered into a competition in which they received a modest monetary incentive (ranging from US\$60,000 to US\$120,000) to design and produce energy efficient refrigerators and compressors. The companies that could produce and sell the product that saved the greatest total energy over a 12-month period received a US\$1 million prize.

The national campaign drew wide participation from competing manufacturers. The winner among refrigerator manufacturers was Kelon, a company that produced and sold 442,000 units during the first six months of the contest and one million units within the first year. Its refrigerator turned out to be 67 percent more efficient than the prevailing norm and went on to achieve the distinction of being one of the most energy efficient refrigerators in the world. Among compressor manufacturers, Huangshi Dongbei



Ozone layer destruction seen from space

won the US\$400,000 main prize with a package of 18 highly efficient compressors.

The project simultaneously worked to build public preferences for energy efficient refrigerators and to demonstrate to retailers that there was a profit to be made. In late 2003, 57 nationwide electronics and appliance retailers were selected to participate in this program. These companies were sensitized to the links between energy efficient appliances, environmental impacts and the implications for cost savings for consumers. The new refrigerator efficiency standards and labels were explained to staff, who also received sales and marketing training on how to persuade consumers to purchase these new products.

The results have been dramatic. There are currently 256 models of domestically manufactured energy-efficient refrigerators on the market today that meet the energy efficiency requirement of Grade 1 of the national standard for refrigerator energy consumption, an even stricter standard than

the European Grade A rating. By 2005, refrigerators were 29 percent more efficient on average than they were in 1999, resulting in a savings of 12 million tons of CO₂ emissions. By 2010 that figure soared to 46 million tons. That is equivalent to the output of about ten 600 megawatt coal-fired power plants. Counting the entire savings over the lifetimes of the refrigerators, the new models will have saved by 2025 a total of nearly 700 million tons of CO₂.

The success of this project demonstrates that it is possible to find creative solutions that are both environmentally friendly and attractive to consumers in China and elsewhere. The ideas that underlie this effort can work in many different contexts and in many places — with commercial air conditioners and refrigeration, more efficient residential, commercial, and industrial buildings, even the development and marketing of “next generation” automobiles. This kind of innovation and experimentation will be an essential part of finding solutions to pressing global problems, be they climate change, biodiversity loss, or pollution, and is fundamental to the GEF’s approach.



Yichang city, central China



Shanghai, China

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Osprey, Baja California, Mexico

Finding Alternatives to DDT

In May, 2001, as delegates gathered in Stockholm for final negotiations on an international treaty to rid the world of a class of particularly harmful and persistent chemicals, they faced a tough choice regarding perhaps the best known of them all.

Dichloro-Diphenyl-Trichloroethane or DDT, has been infamous as an environmental hazard since the 1960s, when scientists identified it as a severe health and environmental threat. DDT accumulates in animal tissue and thus magnifies as it works its way up the food chain. Its impact is particularly severe on predatory bird species such as eagles, pelicans, and falcons, as it weakens their eggshells, causing them to crack prematurely. Widespread use of DDT led to a significant decline in the abundance of these and other bird species wherever it was used.

Since countries began banning the use of DDT in the 1970s, many of those species have made great comebacks. In that sense, the campaign against DDT has been one of the most spectacular environmental successes of the past half-century. On that basis alone, a casual observer might have predicted that DDT would be on the top of the list of chemicals banned under the Stockholm Convention.

In fact, negotiators faced a rather more complex choice. While few people dispute the harmful effects of DDT on the environment, it also fills one important purpose: It is extremely effective in killing or repelling mosquitoes, and hence has long been a key weapon in the fight against malaria. So when the Stockholm Convention compiled the list of chemicals to be eliminated immediately, DDT was not among them. Instead, DDT was on a second list of chemicals that the Parties to the Convention agreed to restrict as much as possible, but with exceptions for acceptable purposes such as malaria control.

The challenge then was to find ways to control malaria that did not include the use of DDT. The need for a substitute to be at least as effective as DDT is clear: Malaria continues to be endemic in the developing world, causing more than one million deaths every year. According to the World Health Organization (WHO), nearly half of the world's population is at risk of malaria. In Mexico and Central America nearly 109 million people live in areas that are environmentally favorable to the transmission of the disease, and 35 percent of them are at high risk. Because of the ongoing failure to develop a truly effective anti-malaria vaccine, the major public health intervention remains focused on controlling the mosquito vector of the parasite that causes the disease.

During the last decade, Mexico and other Central American countries have gradually discontinued DDT sprayings for mosquito control. But even in countries that no longer use DDT it remains relatively inexpensive and effective, so there continues to be the risk that a sudden outbreak in malaria would force government agencies to begin using DDT again unless there were other proven options.

Developing DDT-free methods of controlling malaria has a double benefit. It removes a persistent organic pollutant (POP) from the environment and has a significant impact on public health. The links between these steps and a vibrant, sustainable economy are clear: As long as POPs remain in the soil and water they pose short- and long-term threats

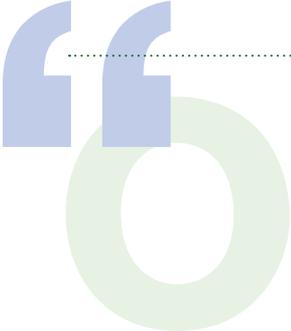
to the ability of people to contribute to their communities economically and socially, and threaten wild species locally and around the world.

In an effort to speed the development of alternative methods to DDT, in 2004 the GEF funded nearly US\$7.5 million for a regional project through UNEP and the World Health Organization to prevent reintroduction of DDT for malaria control. The program promoted new techniques for controlling mosquitoes and implemented a coordinated regional program to improve national capacities. The WHO builds its approach for controlling vector-borne disease, called Integrated Vector Management, on the recognition that controlling the disease requires cooperation across health, agricultural, and environmental sectors, and depends in large part on the involvement and empowerment of local communities.

With Integrated Vector Management as the framework, the GEF/WHO project worked with 202 communities of 50 municipalities in eight countries — Mexico, Guatemala, Belize, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama. The work covered close to 160,000 people directly and an estimated 6.8 million indirectly representing nearly 30 percent of those in the highly affected areas.

In the Talamanca region of Costa Rica, for example, residents of this largely rural area undertook a variety of efforts to control mosquitoes and the spread of malaria. These included clearing stream banks of vegetation that can harbor mosquito larvae, draining stagnant water from ditches and water channels, cleaning houses and patios to remove any potential breeding sites, whitewashing houses with lime as an insecticide, and experimenting with plants that repel mosquitoes, such as the neem tree, an Indian native. Native fish species and bacteria that eat mosquito larvae were also released into local streams.

Other strategies tested in Talamanca and elsewhere included bed nets and mesh screens on windows and doors. People in rural communities also learned how to recognize the signs of malaria and the importance of rapid and thorough treatment of suspected cases, as this can significantly reduce the risk of transmission. Community participation thus became a central axis of the malaria control activities.



Overall, the project achieved a 63 percent reduction in malaria cases and a more than 86 percent decrease in cases linked with *Plasmodium falciparum*. In Mexico, Guatemala, Nicaragua and Honduras, the replication was very extensive — Guatemala alone has extended control methods to 600 towns.



Anopheles mosquito



The project transformed towns into healthy communities — clean, without rubbish or weeds in the open areas, with neat and tidy houses and yards. In Guatemala, community leaders say that the “clean houses” strategy had other positive impacts as well, such as reduction in vector born diseases like dengue and scabies, reduction of common house fly, the improvement of community safety (because it is possible to see intruders from a longer distance), basic environmental sanitation, and improvement of the streets.

Communities that worked with the project are now able to respond effectively to new challenges. The floods that occurred in Panama, Guatemala and Costa Rica in 2008 and 2009, for example, were followed by a strong reaction of the community, as they worked to eliminate mosquito breeding sites and refuges, cleaned houses and patios, and actively searched for patients with fever. That community engagement enabled the prevention of malaria outbreaks without the use of insecticides.

Overall, the project achieved a 63 percent reduction in malaria cases and a more than 86 percent decrease in cases linked with *Plasmodium falciparum*, the malarial parasite that causes the most severe kind of infection and the highest death rate globally. For instance, there was a reduction from 2,439 people with malaria in 2004 to 914 in 2007, surpassing the goal of reducing malaria morbidity 50 percent by 2015, according to the Millennium Development Goals. In Guatemala, places for watering farm animals and cattle called “aguadas” saw the frequency of malaria cases in the community drop from once every month to once every three months. Several communities registered zero malaria cases in 2007 and 2008. In Panama in 2008, 90 percent of the controlled localities registered zero local transmission (autochthonous) cases of malaria.

The project has demonstrated that it is possible to control or even eliminate malaria with environmentally friendly methods and without the use of persistent insecticides,

and that such an approach is cost effective, highly replicable, and sustainable. The main conditions are the combination of control strategies, the intersectoral approach and community participation. The strategies needed for this kind of intervention, such as the control of mosquito breeding sites, cleaning houses and patios are easily adopted by the communities. They also contribute to the empowerment of the communities and to the change of the understanding about their participation in malaria control.

Building coalitions across the agricultural, health and environmental sectors and with the general population is essential to reducing the use of DDT. Such coalitions are in fact essential to implementing the Stockholm Convention in general, not simply in relation to DDT.

The success of DDT-free control methods had a catalytic role across the region. There was an extension of the interventions to other neighboring localities and municipalities due to an initiative of the community leaders and health workers. In Mexico, Guatemala, Nicaragua and Honduras, the replication was very extensive — Guatemala alone has extended to control methods to 600 towns.

The most important outcome, however, may not be the local or regional impact of the project, but the adoption of DDT-free control methods at even broader scales. The GEF, WHO, and UNEP are now using a similar approach in some 40 countries in Africa, the Eastern Mediterranean, and Central Asia. The aim of the new projects, a major initiative of the GEF and UNEP, with close to US\$40 million funding, is to achieve a 30 percent cut in the application of DDT world-wide by 2014 and its total phase-out by the early 2020s, if not sooner, while staying on track to meet the malaria targets set by WHO.

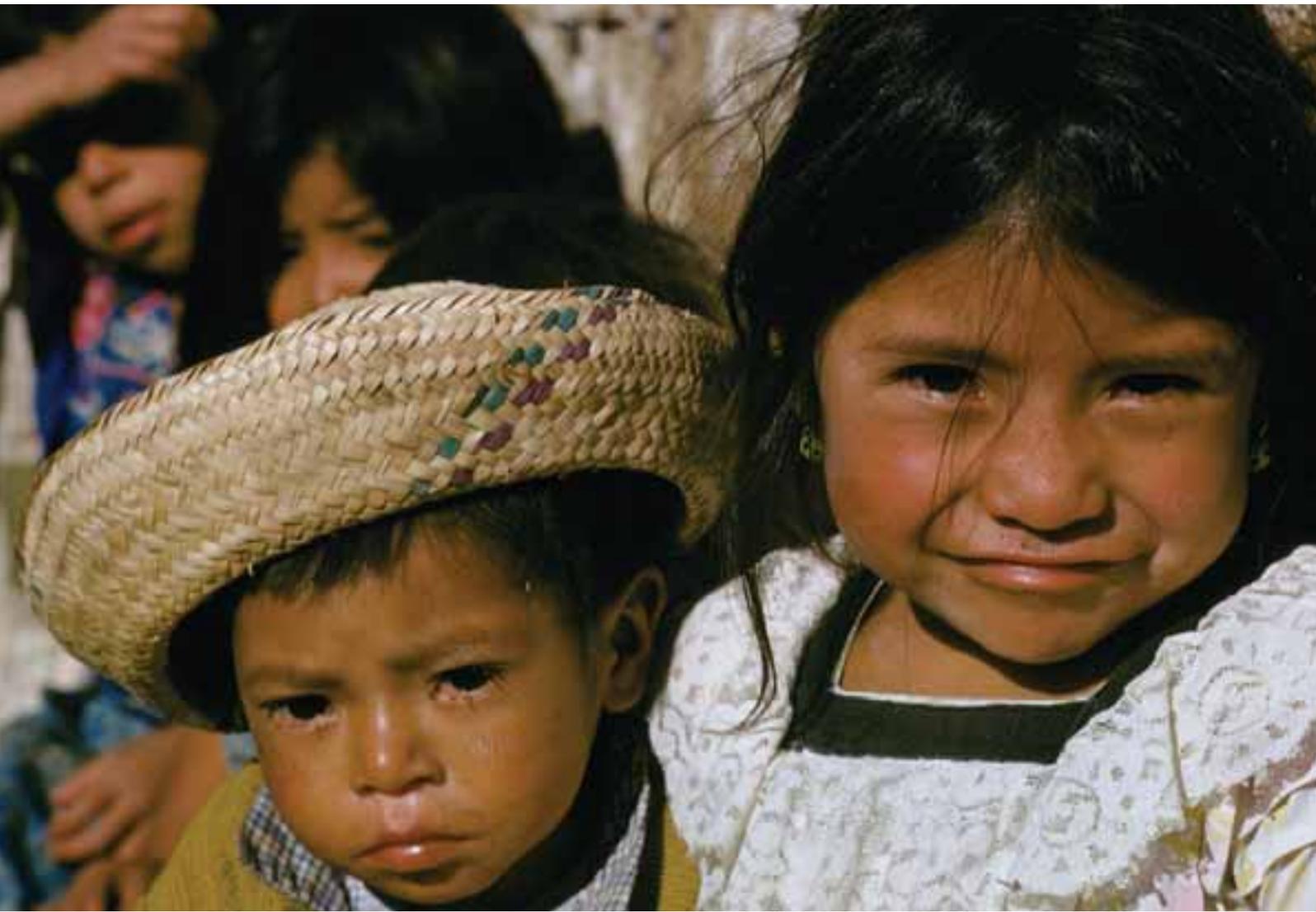
The new projects underline the determination of the international community to combat malaria while realizing a low, indeed zero DDT world. The efforts by the GEF, UNEP, and WHO are catalyzing innovative solutions and sustainable choices to meet vital health and environmental aspirations. By offering solid evidence for the effectiveness of combinations of locally-adapted, cost-effective and sustainable vector-control methods, these efforts are facilitating a sustainable transition away from DDT. The dividends from these investments will mean a cleaner, safer and sustainable environment for future generations.



Fresh neem leaves, used in pesticide control



Posotelga, Nicaragua



Nicaragua





White-bellied Sea Eagle

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Copacabana Beach, Rio de Janeiro, Brazil

Conclusion

In 1992, as nations gathered at the first Earth Summit in Rio de Janeiro, the need to find new ways to finance global environmental protection was clear.

Yet hardly any among the world leaders, the hundreds of delegates and thousands of observers assembled had a clear idea of how exactly a global environment financial mechanism would work. It had never been tried at such an ambitious scale and with such urgency. The Global Environment Facility thus began with few relevant models on which to build. This may have been an advantage. No model meant no precedents, and no old ways of doing things that would have to be given up and replaced. The twenty projects described in this book provide a sense of the innovation and creativity that have driven the GEF mission from its inception. They offer a small sample of the GEF's efforts during the period of tumultuous change that followed the Rio summit, and the picture that emerges is of an institution evolving to meet new challenges, and laying the foundation for a new philosophy of the global environment and global economy.

The global changes of the past two decades have left some fundamental principles undisturbed. The three pillars of sustainable development codified at that first Rio

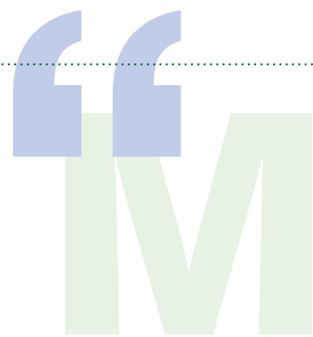
Conference and deeply enmeshed in the GEF's founding — environmental protection, economic development, and social justice — are as important as ever. Solving problems that are of global significance lies at the heart of the GEF's work, whether the challenge be climate change, biodiversity conservation, transboundary marine and freshwater resources, land degradation, or pollution. Their resolution remains a linchpin in the campaign for a prosperous, secure and sustainable future for earth's people and for the planet itself.

That campaign can report tangible progress, a result of innovative and often heroic efforts by governmental and non-governmental actors alike. But ongoing environmental damage and persistent poverty are daily reminders of the continuing challenges. Two decades of pilot projects, studies, and negotiations have brought sustainable development closer to fruition, but major barriers and systemic gaps remain in the implementation of internationally agreed commitments. Millennium Development Goals and the 2010 biodiversity targets, painstakingly crafted and adopted amid hope and expectation, remain unmet in many countries, despite notable achievements on several fronts, such as the legacy of more than 12 percent of all the terrestrial surface of the planet under some form of protection, and the control of the CFC-led scourge over the protective ozone layer.

The world now faces a host of new and urgent challenges. The acidification of the world's oceans is increasing, as is the overuse and pollution of transboundary freshwater resources. Arctic sea ice may soon disappear during summertime, just one of many signs of the need for climate adaptation. Land degradation continues to threaten human and natural communities, while the importance of using forests sustainably becomes ever clearer. The pace of global environmental change is unlikely to slow and the windows of opportunity for shifting that change in a positive direction are becoming progressively narrower.

So it is fair to ask: Will the GEF be suited to the challenges of the next 20 years? The record of success of GEF projects illustrated in this book, and the organization's careful stewardship of scarce resources have demonstrated that it will continue to be a powerful mechanism to bring about change, alongside other supporting mechanisms and programs. The hallmarks of the GEF have been its flexibility in taking on new approaches and new methods and its ability to provide tangible benefits in a cost-effective manner. Those characteristics, in combination with a renewed commitment by donor nations to provide the necessary funding and resources, will be perhaps the most telling factors in determining the ability of the GEF to continue making lasting global contributions to conservation and sustainable development.

The GEF's flexibility stems in large part from the understanding, evident from its very first days, that it must act primarily as a catalyst. The experience of the GEF has borne out the reasoning behind that approach. Even with significantly more resources, the GEF would play only a limited role in advancing environmental protection and sustainable development without the ability to leverage other important sources of funding, support, and engagement. To date, for every dollar the GEF has generated from donor nations, it has been able to raise nearly five dollars in cofinancing from other sources, such as international institutions, NGOs, private partners, and recipient national and regional governments. This record is critical to achieving the scale of activity needed to bring about global change. The GEF's knowledge of how to move from pilot efforts to transformative national, regional, or even global projects will become even more important as the need to innovate and rapidly spread successful innovations grows in the coming decades.



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As the community of nations renews its commitment to sustainable development and pursues the green economy in the context of poverty eradication, the scientific, economic, and cultural understanding of how and when to exploit the services we receive from nature will need to grow. The GEF, with its increasingly transparent and science-based methods, can help lead this effort to expand our understanding.

Since the first meeting in Rio in 1992, and with gathering speed, governments, NGOs, and the scientific and business communities have sought ways to use the concept of ecosystem services as a mechanism for both the conservation of biological diversity and sustainable development. This holds both promise and peril. The GEF's practical experience leaves it well-positioned to address the key questions about ecosystem services. These include investigating which components of biological diversity are essential for



Heads of State and Government at the 1992 Earth Summit in Rio de Janeiro

providing ecosystem services, quantifying changes in the provision of services that are driven by the loss of such diversity, and establishing monetary and nonmonetary values placed on ecosystem services by different sectors of society in different regions.⁷

If done with care, investing in natural capital and ecosystem services offers significant opportunities to create jobs and build businesses that will last and thrive. The goal is to realize the enormous economic potential of such endeavors as public works for environmental protection and restoration, sustainable land and water management practices, ecological farming, organic production systems, sustainable forest management, community forestry, rational use of biodiversity for economic purposes, and new markets linked to renewable and unconventional energy sources. The GEF has been a lead investor in each of these areas, and while not all of those investments have fully yielded the hoped-for returns, drawing on that experience will be essential.

Natural capital and ecosystem services are part of a new language for conservation and sustainable development.

As it becomes the *lingua franca* for global conventions, the parties to those conventions and the international agencies and organizations that support them must understand that the evolution of the GEF has been remarkable both for what has changed and what has remained the same. A vital role for the GEF at its inception was to be the financial mechanism for the Convention on Biological Diversity, and it took as a starting point the need to secure the world's protected areas. Those areas remain a constant for biodiversity conservation in a rapidly changing world.

Just as the GEF can help answer important questions about the role of ecosystem services in building the green economy, so too it is poised to address the challenges and opportunities for global protected area networks. GEF projects have contributed significantly to one of the great conservation achievements of the past quarter century: reaching — and in places even surpassing — the global target of bringing 10 percent of the terrestrial surface of the planet under protection. The oceans, however, remain largely unprotected, hence the agreement of Aichi, Japan in 2010, on a new set of biodiversity targets that include

7. Sutherland et al 2009.

coastal and marine areas. The GEF will support countries in their efforts to meet these new Aichi Biodiversity Targets, offering insights into the effectiveness of different types of protected areas at conserving biodiversity and providing ecosystem services. As part of this effort, the GEF will help make explicit the tradeoffs and the costs and benefits, in financial, human, and environmental terms.

As this book illustrates, GEF's legacy on environmentally sound technologies for residential, commercial, industrial, and electric power applications remains current as a powerful tools to mitigate climate-change induced emissions. Since its early days, GEF has supported more than 30 climate-friendly technologies for energy efficiency, renewable energy, sustainable urban transport, and methane reduction. GEF played catalytic roles in mobilizing investments, creating enabling environments, pioneering innovative financial instruments, and promoting market-based mechanisms leading to widespread adoption and dissemination of climate-friendly technologies. In no small measure, this experience laid the foundation for other climate change programs to take root in a host of multi-lateral finance institutions, particularly since the early 2000s.

Much of the GEF's work flows from the recognition that reinvigorating the global partnership for sustainable development will be essential to success. The partnership model that works best includes virtually all sectors at the international scale, via technical agencies, multilateral development banks, nongovernmental organizations, and the private sector. This comprehensive partnership brings to bear the most sophisticated technical skills and the best economic understanding at a relatively lower cost. Sustainable development will require these sorts of partnerships among women, children and youth, indigenous peoples, non-governmental organizations (NGOs), local authorities, workers and trade unions, business and industry, the scientific and technological community, and farmers. All members of civil society will need to play a meaningful role at all levels, and to be actively engaged in sustainable development by incorporating their specific knowledge and practical know-how into national and local policy making.

Coordination among international, national and local partners goes hand in hand with coordination among the various environmental challenges that make up the

GEF's mandate. Increasingly over the past two decades, the GEF has worked not only on individual environmental challenges but also on the many intersections between them. A wastewater treatment program in North Africa may arise from issues of scarce water resources; it may also relate to the preservation of fragile marine biodiversity. Sustainable forest management may protect endangered species and provide steady work for local communities, but it also helps store carbon that would otherwise add to the atmosphere's CO₂ load.

As the financial mechanism for four major international environmental conventions, and with a mandate spanning many additional focal areas, the GEF will continue to be in an ideal position to tackle complex, multi-faceted problems requiring multi-faceted solutions. Building a green economy is just such a task; it will require addressing a variety of daunting challenges, including poverty eradication, food security, sound water management, universal access to modern energy services, sustainable cities, management of oceans, and improved resilience and disaster preparedness, as well as public health, human resource development, and sustained, inclusive and equitable growth that generates employment.

Such a complex endeavor demands differentiated strategies tailored to the needs of different countries and different sectors, and working at a range of project scales from very small to very large. It clearly cannot be accomplished entirely at the level of global agreements. As the GEF has seen firsthand, the bottom-up revolution that derives from community participation and empowerment complements and plays an increasingly important role in finding the path to sustainable development.

Significant progress towards building green economies will require new investments, new skills, and technology development, transfer, and access. The GEF has seen throughout its history the need to provide new, additional, and scaled-up sources of financing to developing countries. The GEF has witnessed the power of financial mobilization. While GEF resources are small by themselves, the willingness of the GEF to invest in a project lends credibility and draws donors to developing country projects they might otherwise avoid. That helps win support from host governments as

well, and with government co-financing the GEF achieves much more than simply creating larger budgets.

As governments become invested partners, projects move into the mainstream and project goals can become national goals, with locally driven and funded projects and policies responding to new challenges and opportunities. Among the most compelling lessons of the GEF's work is that global environmental protection investments can indeed attract significant co-financing from national and multiple international sources, and those leveraged funds can expand the scope and enhance the effectiveness of project investments.

Everything the GEF does, from a tiny grant in support of an organic garden to a massive regional project involving dozens of partners, agencies, communities, and governments across thousands of square kilometers, occurs in the context of global climate change, the other constant, with biodiversity conservation, in the GEF's work across the past two decades. The effects of climate change are already apparent in many

terrestrial, freshwater, and marine systems, with profound consequences for all life on Earth. The challenges to the GEF's vision for the future of human cultures and economies, and for the biotic communities that form the foundation for both, are equally profound.

As with the ideas of natural capital and ecosystem services, the GEF's long involvement in climate adaptation and mitigation provides a unique opportunity to help answer the key questions the international community will face in the next two decades, especially as the GEF becomes more sophisticated in designing projects as experiments. That approach, still nascent, will help reveal, for example, which elements of biodiversity in which locations are most vulnerable to climate change, and how human responses to climate change such as changes in agriculture or energy production will affect biodiversity and development. The shift to evidence-based conservation and development represents a sea-change for the GEF and its partner agencies, and one that will play a vital role in efforts to build a green economy.

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Flamingos, Ngorongoro Conservation Area, Tanzania



The Global Environment Facility (GEF) was established in 1991 by the World Bank, the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP).

It is a groundbreaking partnership which provides new and additional funding to developing countries to help them meet the costs of measures to achieve global environment benefits in critical focal areas. Today it unites 182 participating States, ten multilateral institutions and a network of civil society representatives.

By leveraging the comparative advantages of the different entities in the GEF network, extended today to include 7 executing agencies, the GEF has promoted intensive knowledge sharing and coordination among these diverse organizations. Critically, the partnership ensures the mainstreaming of global environmental issues into core development programming and has led to increased coherence and results at the national, regional and global levels. For example, the GEF has achieved remarkable success in developing synergies between biodiversity conservation, local development, resilience to climate change and community empowerment.

As the financial mechanism of a number of multilateral conventions, this synergistic role of GEF is increasingly critical in a carbon constrained world with fast changing ecological boundaries. Today more than ever, the GEF is uniquely positioned to assist developing countries in identifying and implementing cost-effective approaches to address in an integrated manner global environment challenges.

UNDP is proud to be part of the GEF partnership. Since 1991, over 156 countries have selected UNDP to assist them in accessing over US\$ 3.9 billion in GEF grant funds. These grant funds have been combined with over US\$ 10.0 billion in co-financing, with UNDP providing technical support to over 1,600 global, regional and national programmes and projects. UNDP's role as a GEF Implementing Agency has evolved from supporting countries through investments in demonstration projects to initiatives that have the potential to transform entire sectors and markets. For example, UNDP interventions for biodiversity conservation have moved from conservation of individual protected areas to unleashing the economic potential of protected areas for sustainable development, and to mainstreaming biodiversity conservation in forestry, agriculture and fishery sectors. In climate change, UNDP focuses on supporting the establishment of enabling policy environments necessary to catalyze public and private finance for low emission and climate resilient investments and practices. This can include the development of information, regulatory and economic incentives such as standards and labels to phase out of energy-inefficient domestic appliances, or feed-in tariffs to promote access to affordable and clean energy.

Many of the successes achieved through the GEF partnership are highlighted in this publication, and I would like to congratulate the GEF Secretariat for its leadership in preparing it and for the contribution to the important progress made over the past 20 years. The support provided to countries through the GEF represents a significant contribution to improving the state of our planet. It also provides a wealth of innovative and successful measures that have been taken in support of a green economy in many countries around the world. UNDP looks forward to working with our GEF partners to continue this progress, and I hope this publication can support the critical dialogue underway on the international community's support for a green economy over the next 20 years and beyond.

Rebeca Grynspan

Associate Administrator, UNDP



About the Global Environment Facility

The Global Environment Facility (GEF) is an independent financial mechanism that provides grants to developing and eligible countries for projects that benefit the global environment.

The GEF supports projects in biodiversity, climate change, international waters, land degradation, the ozone layer and persistent organic pollutants. These projects link local, national, and global environmental challenges while promoting sustainable livelihoods. The GEF serves as the designated financial mechanism for the United Nations Convention on Biological Diversity (CBD), the Framework Convention on Climate Change (UNFCCC), and the Stockholm Convention on Persistent Organic Pollutants (POPs), as well as a financial mechanism for the United Nations Convention to Combat Desertification (UNCCD).

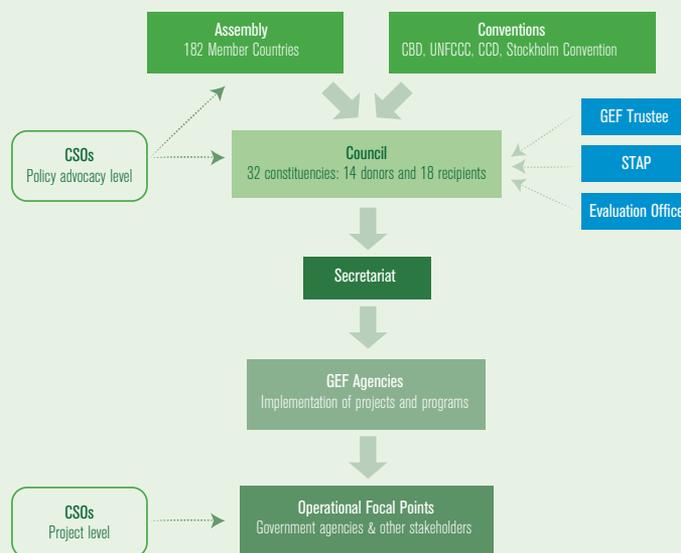
By uniting 182 member countries, the GEF works closely with governments, Civil Society Organizations (CSOs), the Convention Secretariats, and various international Agencies. Cooperation with CSOs is particularly valuable to the GEF, since its projects and policies have greatly benefited from a diversity of views, experiences and perspectives. Since its inception in 1991 as a pilot program to address global environmental issues, the GEF has evolved into an effective and transparent entity with a solid, outcomes-driven track record.

THE STRUCTURE OF THE GEF

To fulfill its mandate of addressing global environmental issues, the GEF partnership has a unique structure. Its governing structure is composed of the Assembly, the Council, the Secretariat, ten Agencies, a Scientific and Technical Advisory Panel (STAP) and the Evaluation Office (see Chart 1).

The Conference of the Parties (COP) from the Conventions for which the GEF serves as the financial mechanism provides

ORGANIZATIONAL STRUCTURE OF THE GEF



strategic guidance to the Council. The close interaction among these actors ultimately results in the implementation of projects and programs. These on-the-ground actions are implemented through a partnership of national stakeholders, under the coordination of the Operational Focal Point (OFP) in each country. As key partners, CSOs contribute to the achievement of GEF goals in various and distinctive ways — from project identification and execution, to influencing its governance and decision-making process.

THE ASSEMBLY

The GEF Assembly is composed of all 182 member countries, or Participants. It meets every three to four years at the ministerial level to:

1. Review the general policies,
2. Review and evaluate the operation of the GEF on the basis of reports submitted by the Council;
3. Keep under review the membership of the Facility;
4. Consider, for approval by consensus, amendments to the *Instrument for the Establishment of the Restructured Global Environment Facility* on the basis of recommendations by the Council.

THE COUNCIL

The GEF Council is the main governing body of the GEF comprising 32 Members appointed by constituencies of GEF member countries: 14 from donor constituencies and 18 from recipient constituencies (see Box 2). The constituencies are formulated and distributed taking into account the need for balanced and equitable representation of all Participants and giving due weight to the funding efforts of all donors. Council Members rotate every three years, or until a new Member is appointed by the constituency.

The Council meets bi-annually and is responsible for developing, adopting and evaluating the operational policies and programs for GEF-financed activities, as well as reviewing and approving the work program (projects submitted for approval). The Council acts in conformity with the policies, program priorities and eligibility criteria decided by the Conference of the Parties of the Conventions concerned. Council decisions are made by consensus.

The contact information for Council Members and Alternates can be found at: www.thegef.org/gef/Council_Members_Alternates

THE SECRETARIAT

The Secretariat coordinates the overall implementation of the GEF activities. It services and reports to the Assembly and the Council. The Secretariat is headed by the Chief Executive Officer (CEO) — Chairperson, who is appointed by the Council to serve for four years, and may be reappointed.

It is structured in different teams, including a Climate Change and Chemicals Team, a Natural Resources Team, an External

Affairs Team and an Operations and Business Strategy Team. Relations with Civil Society Organizations (CSOs) are handled by the External Relations Team. The Secretariat's main functions are to implement the decisions of the Assembly and the Council; coordinate the formulation and oversee the implementation of program activities; ensure the implementation of the operational policies, in consultation with the Agencies; chair interagency group meetings to ensure the effective execution of the Council's decisions and to facilitate coordination and collaboration among the Agencies; coordinate with the Secretariats of other relevant international bodies, in particular the Secretariats of the conventions; among others.

In addition, the Secretariat provides Conflict Resolution services. The purpose of this service is to enhance the overall GEF internal climate of transparency, effectively mediate and resolve any issues raised, as well as to manage and build knowledge on what these issues are. A Conflict Resolution Commissioner at the Secretariat reports directly to the CEO. Government agencies, CSOs and other stakeholders may raise an issue of importance to the GEF operations, launch a complaint, or ask for a Dispute settlement, by sending a formal request directly to the CEO. More information can be found at <http://www.thegef.org/gef/node/2131>

THE GEF TRUSTEE

The World Bank serves as the GEF Trustee, administering the GEF Trust Fund (the contributions by donors). Among its main responsibilities are the mobilization of resources for the Trust Fund; the financial management of the Trust Fund, including the disbursement of funds to the GEF Agencies as well as the preparation of the financial reports regarding the investment and use of resources; and the monitoring of the application of budgetary and project funds.

The GEF Trustee is accountable to the GEF Council for the performance of its fiduciary responsibilities.

THE GEF AGENCIES

The GEF Agencies are the operational arm of the GEF in project implementation. The Agencies work closely with

project proponents — government agencies, CSOs and other stakeholders — to design, develop and implement GEF-funded projects and programs.

Every Agency has a unique area of expertise, which gives each one a specific comparative advantage for the GEF:

- **Asian Development Bank (ADB)** — promotes investment projects at the country and multi-country level in Asia as well as the ability to incorporate capacity development and technical assistance into its projects. The ADB has strong experience in the fields of energy efficiency, renewable energy, adaptation to climate change and natural resources management including water and sustainable land management.
- **African Development Bank (AfDB)** — although in the initial stages of tackling global environmental issues, the AfDB is in the process of integrating its environmental policy into its operations. Its environmental projects are related to Climate Change (adaptation, renewable energy and energy efficiency), Land Degradation (deforestation, desertification) and International Waters (water management and fisheries).
- **European Bank for Reconstruction and Development (EBRD)** — works in market creation and transformation, and ensuring sustainability through private sector (including small and medium-sized enterprises) and municipal environmental infrastructure projects at the country and regional level in the countries of eastern and central Europe and central Asia, especially in the fields of energy efficiency, mainstreaming of biodiversity and water management.
- **United Nations Food and Agriculture Organization (FAO)** — provides technical capacity and experience in fisheries, forestry, agriculture, and natural resources management. The FAO has strong experience in sustainable use of agricultural biodiversity, bioenergy, biosafety, sustainable development in production landscapes, and integrated pest and pesticides management.
- **Inter-American Development Bank (IDB)** — focuses on investment projects at the country and regional level in Latin America and the Caribbean. The IDB finances

operations related to Biodiversity (protected areas, marine resources, forestry, biotechnology), Climate Change (including biofuels), International Waters (watershed management), Land Degradation (erosion control), and POPs (pest management).

- **International Fund for Agricultural Development (IFAD)** — works on issues related to land degradation, rural sustainable development, integrated land management. IFAD has been working intensively on marginal lands, degraded ecosystems and in post-conflict situations.
- **United Nations Development Programme (UNDP)** — specializes in technical assistance, especially for capacity development programs and technical assistance projects. The UNDP has a global network of country offices, experience in integrated policy development, human resources development, institutional strengthening, and non-governmental and community participation.
- **United Nations Environment Programme (UNEP)** — the only UN organization with a mandate derived from the General Assembly to coordinate the work of the United Nations in the area of environment. UNEP is the designated authority of the United Nations system in environmental issues at the global and regional level. The UNEP provides the GEF with a range of relevant experiences, in particular by catalyzing the development of scientific and technical assessments and norms, assisting countries to meet their obligations to the environmental conventions, and in advancing environmental management in GEF-financed activities.
- **United Nations Industrial Development Organization (UNIDO)** — involves the industrial sector in GEF projects in the following areas: industrial energy efficiency, renewable energy services, water management, chemicals management (including POPs and ODS), and biotechnology. The UNIDO also has extensive knowledge of small and medium enterprises in developing countries as well as those with economies in transition.
- **The World Bank** — promotes the development and management of investment projects and mobilizes private sector resources. As a leading international financial institution

at the global scale in a number of sectors, the World Bank has strong experience in investment lending focusing on institution building, infrastructure development and policy reform, across all the focal areas of the GEF.

THE SCIENTIFIC AND TECHNICAL ADVISORY PANEL

The Scientific and Technical Advisory Panel (STAP) is an advisory body to the GEF, with the mandate to provide objective, strategic scientific and technical advice on policies, operational strategies, programs and projects.

The Panel consists of seven members, who are internationally recognized experts in the GEF's key areas of work, and are supported by a global network of experts and institutions. Also, the STAP interacts with other relevant scientific and technical bodies, particularly with the subsidiary bodies of the CBD, the UNFCCC, the UNCCD and the Stockholm Convention on POPs.

The STAP is administratively supported by a Secretariat provided by the UNEP, which also acts as its liaison with the GEF.

THE EVALUATION OFFICE

The GEF Evaluation Office has the central role of ensuring the independent evaluation function within the GEF. The Evaluation Office is responsible for undertaking independent evaluations that involve a set of projects. These evaluations are typically on focal areas, institutional issues or on cross-cutting themes. Some examples of these evaluations include:

- Annual Performance Reports, which provide feedback for the ongoing improvement of the portfolio as well as the quality of project monitoring and evaluation across the portfolio.
- Thematic Evaluations — reports from evaluations covering programs, processes, cross-cutting themes or focal areas, providing a basis for decision making and lesson learning.
- Overall Performance Study (OPS) — undertaken every four years to inform the donors before every replenishment, providing an independent assessment of the

achievements of the GEF in a replenishment cycle. Also, the Evaluation Office supports knowledge sharing and follow-up of evaluation recommendations. It works with the Secretariat and the GEF Agencies to establish systems to disseminate lessons learned and best practices emanating from monitoring and evaluation activities and provides independent evaluative evidence to the GEF knowledge base. It works independently from the Secretariat and reports directly to the Council. It is headed by a Director, appointed by the Council, who coordinates a team of specialized evaluators.

THE GEF FOCAL POINTS

Each of the GEF member countries has designated government officials responsible for GEF activities. These officials, known as the GEF Focal Points, play a critical coordination role regarding GEF matters at country level and serving as the liaison with the Secretariat and the GEF Agencies and representing their constituencies at the GEF Council. There are two types of GEF Focal Points — Political Focal Points and Operational Focal Points. Their functions and responsibilities are different. All of the GEF member countries (donors and recipients) have Political Focal Points, while only recipient countries eligible for GEF support have Operational Focal Points.

The GEF Political Focal Points are mainly responsible for issues related to the GEF governance, including policies and decisions, and relations between member countries within their constituencies. Usually, the Political Focal Points are those who follow the Council discussions, and represent their countries at the Assembly. The GEF Operational Focal Points are responsible for the operational aspects of GEF activities within their countries, including reviewing and endorsing project proposals to ensure consistency with national priorities, and facilitating GEF coordination, integration, and consultation at the country level. The complete list of the GEF Focal Points, including name, position, government agency and contact information can be accessed at: http://www.thegef.org/gef/focal_points_list



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he United States has been proud to support the GEF's two decades of achievement in promoting green growth. The GEF has a strong track record demonstrating that lifting the lives of the poor and protecting the environment can go hand in hand. GEF-funded demonstration programs have led to the widespread dissemination of solar hot water heaters and other clean technologies. GEF land and oceans programs have reduced environmental degradation and improved food security for people around the world. And the GEF has invested in establishing and managing 2,302 protected areas, covering 634 million hectares, or more than 1.5 billion acres. ”

Lael Brainard

Under Secretary for International Affairs, U.S. Department of the Treasury

“THE HEALTH OF OUR PLANET IS IN PERIL. The dangerous impacts of climate change are ever more apparent; biodiversity is declining at unprecedented rates; too many of our day-to-day practices and choices are still far from sustainable. The Global Environment Facility, the financing mechanism for UN conventions on biodiversity, climate change, desertification and persistent organic pollutants, has played an important role in addressing these challenges over the past 20 years. Drawing on the strengths of UN agencies, multilateral development banks and other national and regional institutions, the Facility’s efforts have shown that when resources are made available to developing countries, accompanied by careful planning at all levels, seemingly intractable problems can be solved.”

Ban Ki-moon

Secretary-General of the United Nations

“INSPIRINGA POWERFUL ACCOUNT OF THE GEF’S WORK, WITH PROOF THAT SUSTAINABLE DEVELOPMENT IS POSSIBLE.

If you’ve ever doubted that land degradation and desertification pose serious threats to humanity or that these threats can be overcome then turn to the three chapters in this book for evidence.”

Luc Gnacadja

Executive Secretary, United Nations Convention to Combat Desertification

“WE ARE ON THE CUSP OF A MASSIVE, GLOBAL SHIFT TOWARDS PUBLIC AND PRIVATE FINANCING OF CLIMATE-FRIENDLY, SUSTAINABLE DEVELOPMENT

for the simple reason that governments and companies see no economic or business model can thrive in the long term without it. Over the past two decades, starting long before sustainable investment became a central part of official and corporate thinking, the Global Environment Facility was helping to define the principles we need to deploy these funds at the much greater scale that is required. This timely book illustrates how to avoid the old pitfalls and seize the new opportunities.”

Christiana Figueres

Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC)

“WITHOUT THE GLOBAL ENVIRONMENT FACILITY ACTING AS THE FINANCIAL MECHANISM OF THE CONVENTION ON BIOLOGICAL DIVERSITY, HUNDREDS OF DECISIONS TAKEN AT THE INTERGOVERNMENTAL LEVEL WOULD NOT HAVE SEEN ANY ACTION ON THE GROUND.

It is this targeted financing of projects in the developing world, home to the bulk of the world’s biodiversity, that has assured nations that environmental sustainability and a green economy are indeed achievable and beneficial to all humankind.”

Braulio Ferreira de Souza Dias

Executive Secretary, Convention on Biological Diversity



GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET