

ENERGY AND THE ENVIRONMENT

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ENERGY AND MINING SECTOR BOARD



ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME



THE WORLD BANK GROUP

The Energy and Development Report is an annual publication by the Energy Unit of the World Bank's Energy and Mining Sector Board and the Energy Sector Management Assistant Programme (ESMAP). The topic for this year's edition is energy and the environment.

The foremost goal of the World Bank is the alleviation of poverty. Access to affordable energy is an essential element in successful development. Yet the inefficient use of energy carries costs in the form of environmental degradation that can have a profound effect on the lives of the world's poorest people.

In 1999, the World Bank published *Fuel for Thought: An Environmental Strategy for the Energy Sector*. The *Fuel for Thought* strategy called for the mainstreaming of environmental concerns into the Bank's efforts in the energy sector, and for addressing these concerns early in a project cycle for the sake of getting policies right from the start. The strategy paper laid out a series of strategic objectives for creating change in the way environment is treated in energy, bearing in mind the World Bank's antipoverty mission. This report examines the Bank's progress in putting the *Fuel for Thought* agenda into practice, and includes the views of outside commentators on various aspects of the Bank's approach.



ENERGY AND THE ENVIRONMENT



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FOREWORD



What is the World Bank Group doing to contribute to the environmentally sustainable development of the energy sector? How are the Bank Group's goals relevant to those of the World Summit on Sustainable Development? How is the energy sector able to contribute to the Millennium Development Goals*?

These questions matter because the World Bank Group devotes a large and growing proportion of its work in the energy sector to environmental matters. For example, by the end of fiscal 2001, the Bank had over US\$1.2 billion invested in current renewable energy projects, with a total value of over \$4 billion. Nearly 70 percent of all World Bank projects now have an environmental objective--and in the energy sector, we commit about \$1 billion a year

This year's Energy and Development Report sets out to answer these questions. It is a new departure for us; normally, we seek to raise important current issues that are relevant to energy sector practitioners. But with the Johannesburg Summit falling this year, we instead take this opportunity to inform the deliberations and provide an insight for participants (and those who are more generally interested) into our work in the energy and environment field. We draw on the World Bank Group's work to monitor its progress in implementing *Fuel for Thought*, its environmental strategy for the energy sector.



JAMAL SAGHIR

Director, Energy and Water

Chairman, Energy and Mining Sector Board

June 2002

*Global targets that the world's leaders set at the Millennium Summit in September 2000. The goals include Halving extreme poverty and hunger, halving the proportion of people without access to safe drinking water and ensuring environmental sustainability, achieving universal primary education and gender equity, reducing under-five mortality and maternal mortality by two-thirds and three-quarters respectively, reversing the spread of HIV/AIDS. They also include the goal of developing a global partnership for development, with targets for aid, trade and debt relief.

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ABBREVIATIONS & ACRONYMS

AAA	Analytical and Advisory Activity(ies)
APL	Adaptable Program Loan
AFR	Africa Region (within the Bank)
AFRREI	Africa Rural & Renewable Energy Initiative
ASTAE	Asia Alternative Energy Program
CAI	Clean Air Initiative
CAS	Country Assistance Strategy
CDM	Clean Development Mechanism
CNG	Compressed Natural Gas
CoP	UNFCCC Conference of the Parties
EAP	East Asia and Pacific Region (within the Bank)
EASEG	East Asia and Pacific Energy and Mining Development Sector Unit
ECA	Europe and Central Asia Region (within the Bank)
EER	Energy-Environment Review
ENV	Environmental Department (within the Bank)
ESCO	Energy Service Companies
EM-MAP	Energy Sector Management Assistance Programme
FY	Fiscal Year (the World Bank Group's runs from July 1 to June 30)
GEF	Global Environment Facility
GHG	Greenhouse Gases
GVEP	Global Village Energy Partnership
IBRD	International Bank for Reconstruction and Development
IAP	Indoor Air Pollution
IDA	International Development Association
IDF	Institutional Development Fund
IFC	International Finance Corporation
JI	Joint Implementation
LPG	Liquefied Petroleum Gas
LULULF	Land-use, Land-use Change & Forestry
LCR	Latin America and Caribbean Region (within the Bank)
MDG	Millennium Development Goals
MIGA	Multilateral Investment Guarantee Agency
MNA	Middle East and North Africa Region (within the Bank)
MW	Megawatts
NGO	Nongovernmental Organization
NSS	National Strategy Study (NSS)
PRSP	Poverty Reduction Strategy Paper
PV	Photovoltaic
RE	Renewable Energy
RELI	Renewable Energy and Energy Efficiency Fund
RPTES	Regional Program on the Transnational Environmental Sector (Africa Region)
SAR	South Asia Region (within the Bank)
SIL	Sector Investment Loan
SSP	Sector Strategy Paper
TA	Technical Assistance
UNFCCC	United Nations Framework Convention on Climate Change
WBG	World Bank Group
WCD	World Commission on Dams

All dollar amounts noted in this report are in US dollars.

PREFACE

The World Bank Group's foremost goal is the reduction of poverty. Access to modern energy services is essential to a thriving economy. But far more than that, without modern energy services, everyday life is fraught with difficulties and long hours of hard labor, as millions of people can testify. They are the ones who must rely on wood and dung for their energy needs and are condemned to the daily drudgery of collecting firewood, pumping water by hand, and living much of their lives without lighting or power. For economies as a whole and for ordinary people alike, energy has a vital part to play in reducing poverty.

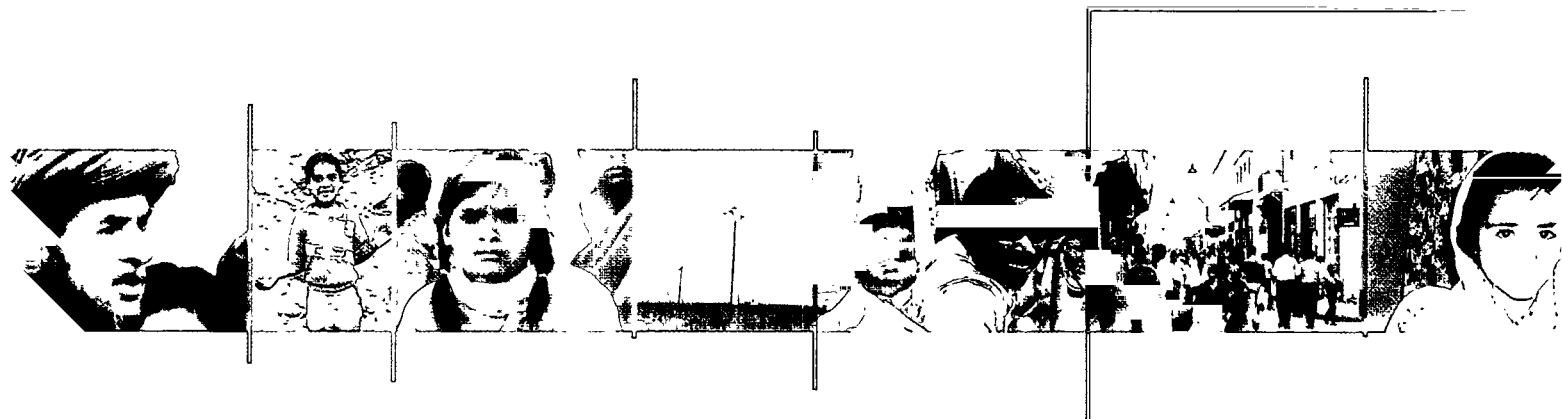
The poor also pay a much higher price for their energy requirements than do the rich. In some cases, poor people in a developing country may spend as much as 12 percent of their disposable income on energy, compared with as little as 2 percent for those who live in Europe, Japan or the USA. Both economic good sense and the objective of reducing poverty require energy sector investments to be made, with rare exceptions, in initiatives that provide energy in the most cost-effective manner possible. Yet the question of what constitutes "least cost" is the source of a very real debate, and that is why the question of the environmental impacts of energy use is so important.

Burning firewood inside an unventilated house in rural Africa, mining coal in Europe, producing oil in the Middle East, driving a bus in one of Asia's big cities, even building a wind farm in Latin America: each has an impact on the environment. And each impact has a cost, one that we are increasingly able to estimate. So, in the past few years, a more detailed picture of our world has emerged, along with a deeper understanding of what the true costs of energy supply and use are. Thus it turns out that using "free" firewood for cooking has an undeniable cost: to the user whose health is affected by years of inhaling smoke; to the local community, which loses the environmental benefit of the forest; and to the world at large, where inefficient use of the wood results in greater than necessary emissions of greenhouse gases. As with the firewood, so too with the coal mine, oil field, bus and wind farm.

In the mid-1990s, people inside and outside the World Bank Group asked whether a policy of "doing no harm" in its energy projects was being overtaken by events. Knowing the environmental costs of different options would allow them to be factored into the project calculations and help to identify the project option that will bring the greatest benefit. In other words, a more proactive stance of "doing good" might now be possible. As part of the preparation for *Fuel for Thought*, the Bank Group's environmental strategy paper for the energy sector, we learned that the Bank's experience of including environmental considerations in its energy portfolio had been slow and difficult. Perhaps this was a function of the "do no harm" mindset and its corollary, which posited that exceeding the barest minimum required to comply with environmental standards brought no extra benefit but did increase costs. Perhaps there were other, more subtle, forces at work.

The central tenet of *Fuel for Thought* was that, in fact, there *were* extra benefits to be gained from moving environmental concerns up on the priority list. A change in approach was deemed necessary. The 2001 Energy and Development Report reflects on the progress we have made in implementing *Fuel for Thought* in the two and a half years since it was presented to the World Bank Group's Board of Directors in July 1999. We look at the context in which the energy and environment debate is now set, and examine the three primary outcomes of this strategy in some depth. In Part V, at the end of this report, the reader will find some thoughts on the future direction of the agenda. We have drawn on progress reports prepared for internal use within the World Bank Group, data on individual activities and specially prepared case studies. There are also several invited pieces from outside commentators who express their views on how well the Bank Group is doing in bringing to life the ideas set out in *Fuel for Thought*.





PART ONE

“Access to affordable energy is an essential element in successful development”



THE CONTEXT FOR ENERGY AND THE ENVIRONMENT IN THE WORLD BANK GROUP

The presentation of *Fuel for Thought: An Environmental Strategy for the Energy Sector* to the World Bank Group's Executive Directors in July 1999 represented the culmination of an unprecedented level of debate, both internal and external, on the proper order of priorities within such a strategy, and how to go about addressing the objectives that were ultimately agreed upon.

This section provides a little bit of the background on *Fuel for Thought* so that the reader may become familiar with its main ideas. Needless to say, the world has moved on since 1999, and today many of the most important debates concerning development impinge on energy and environment. Here we evaluate how these may have changed the context in which *Fuel for Thought* operates and how they may affect the future. The Viewpoint essay at the end of Part I is provided by Karl Jechoutek, formerly of the World Bank and now a scholar and writer working in South Africa, who asks whether the Bank should content itself with incremental progress when it could, perhaps, facilitate a quantum leap forward.

About *Fuel for Thought*

Fuel for Thought was presented to the Executive Board on July 20, 1999, following an extensive period of consultation within the Bank Group and with external stakeholders, including client governments, donor governments, nongovernmental organizations (NGOs), and private sector entities. It examined the size and scope of the challenge facing developing countries--and the world at large--as continuing economic growth, and the energy consumption associated with it, threatened the environment

In looking at the Bank's record, *Fuel for Thought* found that more time than that typically estimated was needed to achieve results on environmental and social issues; that commitment from borrowers to stay the course of real change was often missing, and that the Bank Group's commitment to energy efficiency and the environment was not what it should or could be. It did report some change for the better--for example, the early introduction of the concept of power sector reform and energy efficiency--but, in general, the record was disappointing.

To some extent, we started with a fresh sheet of paper, and asked the question: What should the Bank Group be doing, and how should it be doing it? The principles, objectives and strategies set out in *Fuel for Thought* serve as

the answer to this question. It bears repeating, perhaps, that *Fuel for Thought* is an environmental strategy for the energy sector or, to put it another way, a means of mainstreaming environmental elements into energy sector activities. It is thus neither an energy strategy, nor a blanket environment strategy; both are covered in separate papers that are discussed here in Part I.

Principles and Objectives

The Bank Group's approach is based on some carefully considered trade-offs. In environmental terms, long-term and short-term objectives are often in conflict. In developing countries, for instance, a reduction in poverty would help the environment as national economies become better able to support regulation of polluting industries. Yet the alleviation of poverty demands development which, if done without regard for the environment, can create serious problems over time that could ultimately harm a nation's economy. When every year in developing countries some 4 million premature deaths are attributed to health damage caused by smoke and soot, making investments in such long-term global concerns as the amelioration of climate change seems a poor use of resources in these countries. Even so, we know that the poor are most vulnerable to the changes to be wrought by climate change over the course of the next century.

In making these trade-offs, three principles emerge to guide the World Bank Group: creating a framework for environmentally sound energy development, addressing local and regional environmental impacts, and helping to tackle global climate change. Because the structure of any policy shapes the trajectory of the action that flows from it, and the language it uses provides the prism through which a particular problem is viewed, creating the framework is *primus inter pares*--the first among equally important concerns

Having set itself principles, what outcomes would the Bank Group seek and what accomplishments would mark the achievement of these outcomes? In *Fuel for Thought*, the principles were expressed in terms of more concrete strategic objectives:

- Facilitate more efficient use of traditional fuels and their substitution by modern fuels in rural and peri-urban areas
- Protect human health of urban residents from air pollution due to fuel combustion in residential, transport, industrial and power sectors
- Promote environmentally sustainable development of energy resources
- Mitigate the potential impact of energy use on climate change
- Develop capacity for environmental regulation, monitoring and enforcement across all levels of governance
- Make the Bank more responsive to addressing the adverse environmental impacts of the energy sector



In developing countries,
smoke and soot cut short
the lives of 4 million
people each year.

Turning Principles into Actions

Any World Bank Group intervention can succeed only if it enjoys the strong support of those it is intended to help. That means that the government, businesses and people in the client country must take part in planning and carrying out the activity--and take ownership of it. In other words, there needs to be a partnership between the country and those who support its goals. To that partnership the World Bank Group brings three sets of skills and experience in particular. First, it is able to help client countries develop and promote sound policy. Second, it is able to act as a "knowledge bank"; transferring experiences from others and providing new ideas that can inform the debate and act as models. Last, and probably that for which the Bank Group is most widely known, it can support investments, both public and private, either from its own resources or by helping to mobilize those of others.

To use these tools most effectively in reaching its strategic objectives, some complementary changes in the Bank's approach to project development were also proposed:

- Devote more time and energy to shaping a project in its early stages--in essence, allocating additional resources further "upstream" in the project cycle
- Identify ways of bringing new methods and technologies into the mainstream of lending operations
- Improve standards of analysis of pollution problems--in particular, through improved project monitoring and more effective communication of the results to the stakeholders
- Strengthen the Bank's own ability to address the challenge of global climate change;
- Build new strategic partnerships
- Deepen the skills and knowledge base of World Bank Group staff

What Is It the World Bank Group Does?

This section is intended to help readers unfamiliar with the World Bank Group to understand the context in which it operates. As a multilateral institution, it answers to its members and, of course, exists to service the needs of its clients. How does it do that? First, through the Country Assistance Strategy, it helps set up the framework of cooperation between the client and Bank Group. Second, it provides a range of tools with which the strategy is implemented. This section takes a brief look at these two areas. (More information is available on the various Web sites of the Bank Group. www.worldbank.org, www.ifc.org and www.miga.org.)

Country Assistance Strategies and Country-Led Exercises

In its Country Assistance Strategy (CAS) papers, the Bank Group outlines its business plans for each of its member countries. Included in these plans are investments in the energy sector and the environment of the country for which a particular CAS has been designed. Efforts to mainstream environmental concerns into energy investments must therefore first be addressed in the Country Assistance Strategy paper, which articulates a business agenda driven by the demands of a particular country's economy--not one that simply reflects the Bank's global priorities. The CAS process is consultative in nature; the needs articulated by the client country are discussed in depth between the parties before the papers are presented to the Board. In countries that have developed or are developing a Poverty Reduction Strategy Paper (PRSP), the CAS is cast as the implementation instrument for the World Bank of the government's own development strategy as described in the PRSP. Emphasized in *Fuel for Thought* is the importance of firmly rooting its agenda in the client countries and in the World Bank Group's Country Assistance Strategies, reinforcing the Bank Group's status as a demand-driven organization.

However, bringing such upstream work as Energy-Environment Reviews and analysis of structural issues into the CAS process is not easily achieved. While many of these upstream activities find merit in helping to create a common vision of development priorities via the donor partnerships through which they are most often funded, they may not neatly fit the requirements of a Country Assistance Strategy, and so may not fulfill the goals set

out in *Fuel for Thought*. This problem was addressed in *Fuel for Thought* with a warning that without a shift to funding upstream work from the Bank's operational budgets, the energy and environment agenda can be only marginally implemented.

Box 1

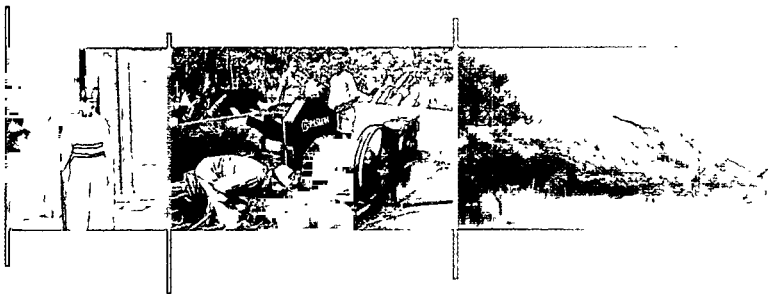
A Country Assistance Strategy for Bangladesh

One of the poorest countries in the world, Bangladesh is the subject of a wide-ranging poverty reduction effort. The current Country Assistance Strategy (CAS) for Bangladesh, presented in February 2001, seeks to tackle poverty comprehensively. The energy sector is central to the CAS, and several of the interventions are geared toward improving its environmental performance. In particular, the CAS outlines plans to help the government deal with.

- Rural electrification, increasingly reliant on renewable energy as the least-cost means of providing access;
- Urban air pollution, brought about by increasing levels of fuel consumption in the energy, transport and industrial sectors;
- Indoor air pollution, the result of using biomass (such as woodfuel and dung) in inefficient stoves;
- Exploiting the country's vast natural gas resource for power generation and other uses within Bangladesh, but also for export;
- Vulnerability to climate change which, though not a problem created domestically, requires a response.

Source Bangladesh CAS, February 8, 2001

Even so, discussions of the linkages between energy and environment are appearing more frequently in Country Assistance Strategy papers since the publication of *Fuel for Thought*, as shown by reviews of two groups of CAS papers. One, a random sample of 44 papers published between January 1, 1997, and December 31, 1999; the second comprised all 23 of the CAS papers published during fiscal 2001. Each of the papers was rated on a scale of 0 to 3, depending on the extent to which a discussion of, or reference to, energy and environment linkages appeared in the paper. The outcome indicates an increased awareness of energy and environment issues. (See Table 1.)



Discussions of the linkages between energy and environment are appearing more and more frequently..

Table 1		Incidence of Energy and Environment in the CAS			
		No Linkage	Summary or Indirect Reference	Some Discussion or Explicit Recognition	Thorough Discussion
44 CASs	No.	20	9	10	5
1/97 – 12/99	%	45	20	23	11
24 CASs	No.	6	1	9	8
7/00 – 6/01	%	26	4	38	33

Perhaps as important as the apparent increase in the percentage of Country Assistance Strategy papers that discuss energy-environment issues is that where there has been discussion of these issues in the fiscal 2001 CAS papers, it has generally been more substantive than appearing in earlier papers. The challenge nevertheless remains of bringing up the quality of the energy-environment discussion in a much higher number of CAS papers, and eventually, in all of them.

Just months after the publication of *Fuel for Thought*, the World Bank began using Poverty Reduction Strategy Papers (PRSPs) as the basis for assistance from the Bank and the International Monetary Fund (IMF), as well as for debt relief under the Heavily Indebted Poor Countries (HIPC) initiative. Poverty Reduction Strategy Papers are prepared by the country itself, taking into account the views not just of government, but of civil society and development partners. They are comprehensive and set out the priorities the country wishes to pursue. As part of the process of arriving at a strategy for reducing poverty within its borders, the client country provides information on who comprise its poor, where the poor live, and the obstacles they face to moving out of poverty.

There is some reason for optimism, too, in early sightings of energy and environment discussions in Poverty Reduction Strategy Papers (PRSPs). Because PRSPs were introduced only recently into the Bank's operations, just 10 final Poverty Reduction Strategy Papers have been presented by client countries at the time of this writing. Among these papers, two feature a thorough discussion of the issues, four had some reference to energy-environment linkages, and four made no reference at all (See Box 2 for details.) As the PRSP pipeline fills (a further 34 PRSPs have been presented in interim form), it is reasonable to expect this proportion to hold once interim papers have been finalized.



Box 2

Energy and Environment in Poverty Reduction Strategy Papers

In the 10 Poverty Reduction Strategy Papers reviewed, the main energy-environment issues covered included:

- Increased access for the poor to modern fuels and improved cookstoves. Interventions of this kind lead to reduced indoor air pollution and thus improved health, especially for women and children. Their use also reduces demand for fuelwood which, if overused, often leads to deforestation with consequences of loss of biodiversity, increased soil erosion, and loss of income from other non-timber forest products.
- Supporting rural electrification--often through renewable energy resource development--again to reduce indoor air pollution and provide the means to increase agricultural productivity, help the establishment of rural businesses and contribute to human development.
- Entering the carbon market to assist with developing other revenue streams for financing national priorities.

Source: World Bank internal review

A Word About Instruments

At first sight, the World Bank Group may appear to have a confusing array of different tools it uses in its work with clients. In essence, however, they can be reduced to three: financing, analytical and advisory activities (AAA) and training, each of which has an important role to play in economic development. (For more information about each of these tools and their subdivisions, see Box 3.)

Box 3

World Bank Group Instruments

The three main tools for assistance are financial support; analytical and advisory activities (AAA), and training and knowledge sharing. What the World Bank Group offers is summarized below.

Financing from the World Bank Group

The World Bank offers borrowers a number of lending instruments designed for different kinds of investment and adjustment projects. Most investment projects use Specific Investment Loans (SILs) or Sector Investment and Maintenance Loans (SIMs). Adaptable Program Loans (APLs) and Learning and Innovation Loans (LILs) were recently introduced to provide more innovation and flexibility. Adjustment loans provide quick-disbursing assistance to countries with external financing needs for the support of structural reforms in a sector, or the economy as a whole. Adjustment projects use Structural Adjustment (SALs) and Sector Adjustment (SECALs) loans.

In addition to direct lending, the World Bank's Guarantee instrument addresses the growing need to offer political risk mitigation products to commercial lenders contemplating financial investment in the infrastructure sectors of developing countries. Three sorts of guarantee are offered: Partial Risk (PRG), Partial Credit (PCG) and policy-based.

The International Finance Corporation (IFC) provides loans, equity finance and quasi-equity to private sector companies investing in developing countries. It also offers financial risk management products and intermediary finance through its B Loan Program.

The Multilateral Investment Guarantee Agency (MIGA) provides investment guarantees against certain noncommercial risks (that is, political risk insurance) to eligible foreign investors for qualified investments in developing member countries. MIGA's coverage is against transfer restriction, expropriation, breach of contract, and war and civil disturbance, and can be complemented by both coinsurance and reinsurance arrangements.

The Bank and IFC can also assist with resource mobilization--helping countries gain access to sources of finance available from other multilateral institutions, bilateral donors and the private sector.

Analytical and Advisory Activities

The World Bank, IFC and MIGA all offer analytical and advisory activities (AAA) in various forms. The World Bank's assistance includes policy studies, country economic research, sector analyses, and highly targeted work in specific sectors, much of which is discussed elsewhere in this report. IFC provides advice and technical assistance to private businesses and governments in developing countries. These services cover a broad spectrum including advice on privatization, business-related public policy and industry-specific issues. MIGA's Investment Marketing Services Department works to equip investment promotion intermediaries with leading-edge knowledge, tools, and techniques to strengthen their capacity to attract and retain foreign direct investment.

Training and Knowledge Sharing

Several parts of the World Bank Group are involved in training and knowledge sharing, including the World Bank Institute, the Development Economics Vice Presidency and Network Vice Presidencies.

Sources World Bank, IFC, MIGA

Lending Services

For the Bank to successfully bring energy investment with an environmental dimension into its general business line, *Fuel for Thought* proposed that mainstream energy lending be brought into the equation. Not only do these large, mainstream investment operations bring substantial capital to energy-environment efforts; operations on this scale lead to sustained, high-level engagement between the Bank, the client and the stakeholders on issues that arise during implementation. (World Bank Group lending from fiscal 1994 to 2001 is shown in Table 2.)

Table 2		Bank Group Lending 1998 · 2001							
	FY94	FY95	FY96	FY97	FY98	FY99	FY00	FY01	
IBRD/IDA lending									
Number of projects	20	25	31	23	21	9	13	13	
Commitments (US\$ millions)	2,771	2,870	3,995	2,346	3,521	773	1,122	941.9	
IBRD/IDA guarantees									
Number of operations	1	3	2	-	2	2	1	1	
Value (US\$ millions)	59	404	125	-	276	330	61	180	
IFC investments									
Number of investments	21	17	18	21	18	16	19	20	
Value (US\$ millions)	536	546	487	355	483	425	502	417	
MIGA guarantees									
Number of guarantees issued	n/a	19	18	12	14	10	17	10	
Value (US\$ millions)	n/a	319	391	135	200	207	653	617	

In the new World Bank Group Energy Plan, energy projects with an environmental bent are moved squarely into the mainstream, identified as core business components of the Bank's energy practice. Although the total number of energy projects in which the Bank is engaged has dropped significantly over the course of the last decade, there has been a seismic shift in the proportion of such projects that carry an environmental objective. In fiscal 1990, only 9 percent of the Bank's energy projects featured an environmental objective, and that percentage would go virtually unchanged when assessed seven years later — just two years before the publication of *Fuel for Thought*. Fiscal 2001, however, shows an impressive 69 percent of the Bank's energy projects incorporating an environmental objective.

When broken down by subsector (power, mining, and oil & gas), data show the more substantial progress made since 1997 occurring in the fields of power and oil & gas (as illustrated in Figure 1), primarily because all mining projects current in 1997 already had environmental components.

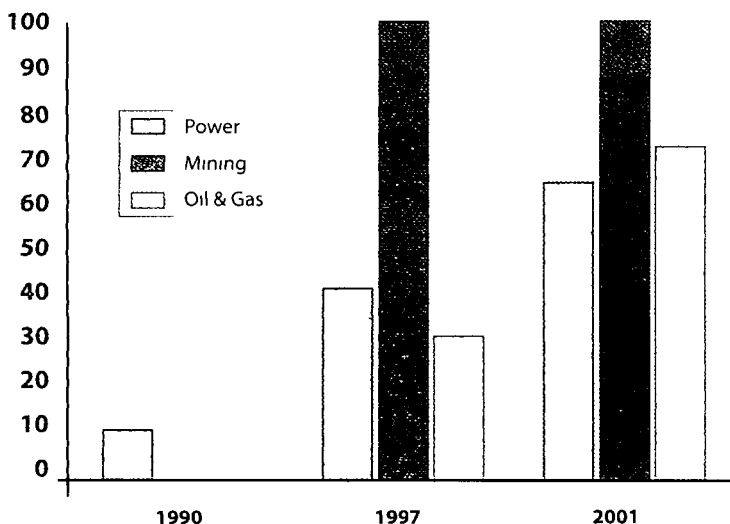


Figure 1

Projects with an Environment Objective as a Proportion of All Energy (% of total number of active energy projects)

Yet investment lending by the Bank is but one part of a wide range of financial instruments provided by the Bank. Other options include guarantees, and sector and structural adjustment lending. The International Finance Corporation (IFC), the World Bank Group's private sector arm, can provide equity and debt to private sector companies and can help raise syndicated financing through its B Loan program. Table 3 shows details of its investment portfolio.

Table 3 IFC Investments in Environmentally Benign Energy Projects (August 2001)*

Instrument Type	Value (US\$ millions)
Committed	
Equity	45.0
Quasi-equity	27.2
A Loans (made on IFC's own account)	409.8
B Loans (syndicated by IFC)	85.1
Other (warrants and swaps)	14.4
Total	486.5
Approved	
Equity	1.0
Quasi-equity	
A Loans (made on IFC's own account)	159.8
B Loans (syndicated by IFC)	165.0

*Hydro, combined heat and power, biomass, geothermal, energy service companies and funds

The Multilateral Investment Guarantee Agency (MIGA) can provide political risk insurance to private sector investors. Table 4 shows details of the guarantees outstanding against MIGA.

Table 4 MIGA's Portfolio of Guarantees in Clean and Renewable Energy (August 2001)

Country	Type	Capacity (MW)	No. of Contracts
Argentina	Gas-fired	240	2
Pakistan	Gas-fired	151	1
Brazil	Hydro	776	1
Costa Rica	Hydro	18	2
Nepal	Hydro	60	3
Ecuador	Hydro	230	1
Guatemala	Geothermal	24	4
Kenya	Geothermal	8	1
Nicaragua	Geothermal	70	4
China	Cogeneration	104	2
Czech Republic	Cogeneration	343	2
Subtotal		2,024 MW	23
Other Power		3,062 MW	30

Nonlending Services

While lending services are often crucial to the development of client countries, perhaps just as important are the nonlending services the Bank Group provides in the form of analytical and advisory activities (AAA) and access to cofinancing. “Analytical and advisory activity” is a catch-all term that includes economic and sectoral analysis, provision of technical assistance, and capacity building—in fact, just about any assistance that is not covered by the financing operations. All parts of the Bank Group carry out nonlending services

Analytical and advisory activities, as well as training, most often take place before investment operations and often shape them. As such, these activities are often referred to as “upstream” work, with the lending operations (and sometimes further follow-on investment activity) being described as “downstream.” One of the main recommendations of *Fuel for Thought* is that the Bank Group should shift emphasis towards upstream activities so that subsequent downstream lending is better designed and targeted. If that strategy is successful, there should be a point at which the feed-through of upstream work to downstream investment is marked by an identifiable link between the two (Part II looks in more detail at the upstream activities that the Bank Group has carried out and how they have fed through to investments.)

New Developments

In the two and a half years since *Fuel for Thought* was published, much has changed. Though nothing has happened to undermine the foundations on which the strategy is built, several developments, both within and outside the Bank, have transpired. Some reinforce the blueprint created in *Fuel for Thought*, and some subtly shift the emphasis. In this section we look at the most significant and assess their impact

Internal Strategies and Debates

A new strategy for the energy business

Early in 2001, World Bank Group management finalized *The Energy Business Renewal Strategy*, which evolved from a need to rethink the integration of the energy business into its main business lines. The new strategy was built to focus more keenly on the Bank Group’s overarching goal of poverty reduction, to be more selective in what it set out to do, and to ensure that what it did was more sustainable.



The new strategy is designed to make the results of Bank Group efforts more sustainable.

Drawing on the intellectual underpinnings of *Fuel for Thought*, the strategy stresses environmental sustainability as one of four major areas on which the Bank Group's energy operations should be concentrated. The others are direct poverty alleviation, assistance in attaining macro-economic and fiscal stability, private sector development, and energy sector governance. Investments that do not have a direct, positive impact on any of these should not be made by the Bank Group, according to this strategy, even if they have benefits to offer in other areas.

Continuing the trend toward integration and holistic design, *The Energy Business Renewal Strategy* proposes that, for maximum effect, financing, capacity building efforts, and the transfer of knowledge and advice be combined in World Bank Group energy investments, using the right mixture of instruments. (See Box 3.) For energy investments to succeed, the strategy paper argues, clients must be provided with a range of resources and services, including technical assistance, free-standing analytical and advisory services (such as Energy-Environment Reviews), and lending for programs, not just projects. Operations that bring energy components into other sectors are cited as particularly important.

New energy development goals for poverty reduction

As noted earlier, a recent innovation by the Bank Group is the introduction of Poverty Reduction Strategy Papers (PRSPs), which are prepared by a client country as the basis for assistance from the World Bank, the IMF and the Heavily Indebted Poor Countries (HIPC) initiative. To help client countries in their preparation, the Bank has developed a *PRSP Sourcebook*, which appears on the Bank's Web site, and is already in use by countries preparing the strategy papers. The sourcebook develops the links between energy and the means to achieve poverty reduction, such as income generation in agriculture and rural industries, improvements to health and education, and access to water and communications.

In its section on energy, the sourcebook strikes many of the same themes that run through *Fuel for Thought*, allowing Bank staff to share the lessons of *Fuel for Thought* with a wide audience. Linking the energy sector to the different poverty dimensions of income, capability, security and empowerment, the *PRSP Sourcebook* identifies the main themes of access to and reliability of energy supply, macro-economic and fiscal stability, governance and the environment. Access to energy is essential as a means of direct poverty reduction, while macro-economic and fiscal stability, along with governance, are important for arriving at least-cost solutions and sustainable development of the energy sector. In *Fuel for Thought*, the links between health, environment and poverty are explored with the expectation that improved environmental conditions will improve people's health and aid in the economic stabilization of developing countries. These themes are also picked up in the *PRSP Sourcebook*.

Debating trade-offs between short- and long-term goals

Programmatic lending is a recent development designed to support long-term structural or policy changes through phased investment. Unlike more typical investment lending, programmatic loans are made in several phases, all of which are approved up front. Each phase hinges on the achievement of agreed outcomes, which then trigger the start of the next phase. The trigger conditions are not tied to a timetable but to specific actions or outcomes—for example, such policy changes as the passage of a law or the making of particular investments that might precede greater private sector participation. This allows the adaptation of the program to suit changing circumstances both in terms of timetable and, if necessary, the design of the subsequent phases. The merit of this approach is that it helps the client carry the project through in a logical sequence while at the same time reducing the risks that normally come with innovation and long-term programs, such as the possibility that the outcomes originally sought are not achievable.

The Bank has started to work with several clients on long-term policies that have local and global environmental benefits; those that support energy efficiency and development of renewable energy resources are typical examples. As the work has gotten under way, debate has emerged over the wisdom of embracing projects that may bring lower financial returns in the short term, but higher economic or social returns in the long term--



The pressing need for poverty reduction can lead to tension in balancing local and global concerns.

perhaps beyond the standard 20-year investment horizon. This debate centers around the concept of external costs. External costs and benefits, or externalities, are those not considered in the financial decision-making process. For energy efficiency and renewable energy projects, the external costs and benefits may typically include carbon abatement credits and the reduced health costs that result from lower levels of local pollution.

Many investments in newer technologies represent the least financially costly means of delivering energy to a targeted locality, particularly those designed to increase energy efficiency or to provide electricity, through the use of renewable resources, to those who live outside the power grid. Others, however, show costs that outweigh directly identifiable benefits, even after factoring in the short-term external costs and benefits. Since the Bank's stated policy is to provide energy at the least economic cost and to place priority on local and regional improvements, such projects, per Bank policy, should be dropped.

Yet in dealing with long-term problems such as those posed by global climate change, some argue that an exception should be made because of the anticipated payoff far beyond the normal investment horizon, when future costs are presumably reduced as a result of early investments. Here we face the crux of the debate over long- and short-term priorities, most often characterized by the tension in balancing local and global considerations. Trade-offs in favor of long-term priorities are often difficult to embrace while the short-term need for poverty reduction and economic growth remain so pressing.

An environment strategy for the World Bank

In July 2001, the Bank completed work on a new, institution-wide strategy paper, *Making Sustainable Commitments: An Environment Strategy for the World Bank*. While it and *Fuel for Thought* are mutually compatible, *Making Sustainable Commitments* brings an emphasis on communication between the Bank and client countries to the top of its agenda. It also builds on the concept of intensified upstream work articulated in *Fuel for Thought* by proposing the development of strategic environmental assessments, setting out to improve project and program design so that environmental priorities are built into the structure of the Bank's undertakings.

Three key objectives shape the Bank-wide environmental strategy:

- Improving people's quality of life;
- Improving the prospects for growth, and enhancing the quality of growth;
- Protecting the quality of the regional and global environmental commons.

To achieve these objectives, *Making Sustainable Commitments* first states a need to demonstrate to stakeholders both the benefits of environmental improvements to social and economic life, and the links between

development and environment objectives. As in *Fuel for Thought*, the Bank's environmental strategy paper argues that environmental issues are most effectively addressed through their integration into the various economic and business sectors in which the Bank normally works, and emphasizes collaboration with clients for the mainstreaming of environmental objectives into investments, programs, sector strategies, and policy dialogue. Building on the foundation laid in *Fuel for Thought*, *Making Sustainable Commitments* also proposes that interdisciplinary efforts be drawn across such infrastructure sectors as transport, water, and urban development.

Country dialogue--back-and-forth discussion between the client country and the Bank--is given high importance, with the goal of bringing environmental objectives into the Bank's usual methods for arriving at country-specific policies, such as Country Assistance Strategy papers and Poverty Reduction Strategy Papers. *Making Sustainable Commitments* also calls for the Bank to improve the analytical and advisory services it provides to clients, along with the systems by which the Bank safeguards the inclusion of its environmental and social policies in all of its activities. The strategy also takes into account the manner in which development assistance is evolving, especially with regard to community-led initiatives.

In essence, *Making Sustainable Commitments* makes the case for accelerating the Bank's integration of environmental objectives throughout its development assistance efforts, and so calls for a realignment in the allocation of resources, in the type of incentives offered to Bank staff, and in the skills mix of its staff and consultants. The strategy presented in *Fuel for Thought* is thoroughly complementary to that laid out in *Making Sustainable Commitments*.

External Developments

United Nations Framework on Climate Change Conference of the Parties (COP)

As the parties to the United Nations Framework Convention on Climate Change (UNFCCC) continue to meet, as they did in Bonn at the July 2001 Conference of the Parties (CoP 6-Bis) and in Marrakech in December 2001 (CoP 7), elements of international climate change policy continue to evolve in ways that are sure to significantly affect the World Bank's efforts in this area. Agreements reached at the Bonn meeting include the establishment of the carbon market, which essentially sets global targets for the emission of greenhouse gases and sets rules and guidelines for the mechanisms under which the carbon market would operate. The carbon market facilitates compensation to countries that trade parts of their emission quotas to other countries that expect to exceed their own quotas.

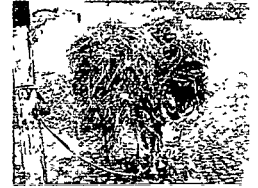
Since it is expected that the industrialized nations will want to exceed their quotas for some time to come, the carbon market approach could create a powerful incentive for the development of cleaner, more efficient energy technology for developing countries via the prospect of advantages to be reaped through carbon trading credits. In these most recent discussions, the carbon market was established through agreements on such flexibility mechanisms as the Joint Implementation and the Clean Development Mechanism. (For more information, go to www.unfccc.int.)

Other core elements of the agreements include: consensus on land use, land use change and forestry activities (LULUCF); compliance standards; and funding for capacity building and adaptation in developing countries, including technology transfer to and among them. At Marrakech, carbon sequestration was also covered by the parties, resulting in new rules on afforestation and reforestation. For developing countries, this provides a new revenue stream targeted at setting up and managing plantations for meeting fuelwood needs.

Though the carbon market has now been established, its size and projected growth remain uncertain. Growth in the demand for carbon emissions reductions will depend on how rigorously the industrial countries observe the cap on emissions to which they have agreed. The more rigorous the observance and enforcement, the greater the demand for carbon emissions reductions from outside the industrial countries. The policies of governments and regional bodies (such as the European Union) will ultimately determine this, and so it remains quite

impossible to forecast the benefits of participation by the Bank Group's clients. Will carbon trading generate financial flows substantial enough for use by developing countries for domestic investment priorities? No one really knows.

However, the parties to the Bonn agreement accepted the need for measures to help Bank Group client countries adapt to the effects of climate change, a decision that is likely to have a significant impact on the Bank's own climate change work, as well as its work within the energy sector. Commitments for the setting up of three new funds to cover adaptation activities undertaken by the Bank's clients were made by the parties to the Bonn agreement. These are to be managed by the Global Environment Facility (GEF), a body that provides concessional funding to developing countries for investment in environmental projects, in entities separate from GEF's existing climate change funds.



Box 4

The Global Environment Facility

Many of the World Bank Group's investments in the field of energy and environment are cofinanced by the Global Environment Facility (GEF), which provides concessional financing for projects that would otherwise not meet the Bank's lending criteria. By providing incremental funding for both project preparation and implementation, GEF/World Bank partnerships facilitate the Bank's involvement in projects with a global benefit that would be deemed unattractive based on local and regional considerations alone. In the climate change area, GEF financing has been applied primarily to renewable energy and energy efficiency projects, as well as to projects focused on transport issues and fuel-switching.

Unfortunately, the demand for GEF funds exceeds their availability. In fiscal 2002, the Bank Group expects to commit \$275 million of GEF financing to Bank projects for four focal areas:

- climate change
- biodiversity
- international waters
- ozone depletion

Historically, some 37 percent of this allocation has gone to climate change efforts, which in the current commitment would amount to \$102 million. The limited availability of GEF funds can hamper further development of projects initiated through the GEF. Experience shows that these funding constraints can lead to delays in the implementation of existing projects, preventing them from effecting real change on the ground.

The ongoing shortage of GEF concessional financing could ultimately hinder the Bank Group's efforts to mainstream global environmental objectives into its investment operations.

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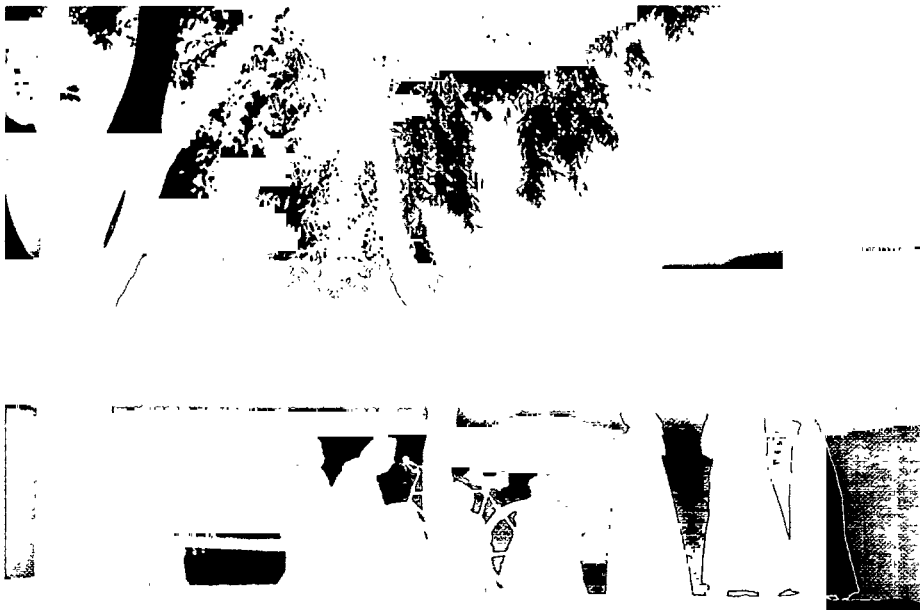
These measures are being taken, in part, in response to the assessment report delivered by the Third Intergovernmental Panel on Climate Change convened in Kyoto five years ago, which confirms that the poor are most vulnerable to the threats posed by climate change. The report also calls for climate change concerns to be integrated into investments in sectors as diverse as agriculture, forestry, water resources and health.

Other Developments, Briefly Noted

Large-scale hydroelectric projects

The World Commission on Dams (WCD) was set up in response to a workshop held in Gland, Switzerland in April 1997. The WCD set out to reconcile the conflicting viewpoints of proponents who point to the social and economic development benefits that dams make possible (such as providing electric power, irrigation for agriculture, and water supply to growing towns and cities) and critics who argue that project funders, public and private, systematically downplay the adverse environmental, social and economic impacts of dams. Though the debate is about dams, and not energy, their potential impact as providers of electric power make this debate relevant to discussions on energy and environment.

On November 16, 2000, the World Commission on Dams released its final report. (To view it, visit www.dams.org.) The Bank has acknowledged the contribution of the report to the debate on large dams, and is following up with an action plan designed to enhance the planning, implementation and operation of dams. This preliminary action program includes specific elements concerning the use of strategic environmental and social assessments in their planning process, as well as measures for strengthening the application of safeguard policies in projects that support dams. (The Bank's full response may be found on its Web site at www.worldbank.org/water.)



The WCD has fostered debate over the positive and adverse effects of dams.

Oil, natural gas and mining: The Extractive Industries Review

Because of the World Bank Group's involvement in the extractive industries, where it plays a number of roles, questions have been raised about how--and indeed whether--such industries can make a positive contribution to sustainable development and poverty reduction in the Bank's member countries. As lessons drawn from experience begin to emerge and new issues move to the forefront, World Bank Group senior management believe that a review of the World Bank Group role is now timely, especially in light of increasing concerns, as well as changes in the focus of its own activities and in the industries themselves.

Initiated at a Planning Workshop held in Brussels in October 2001, the Extractive Industries Review is being carried out by the Mining Department and the Oil, Gas and Chemicals Department of the World Bank Group, both of which are joint IFC/World Bank departments with overall responsibility for the mining and oil & gas operations of the World Bank and IFC. Also involved in the Extractive Industries Review are other relevant

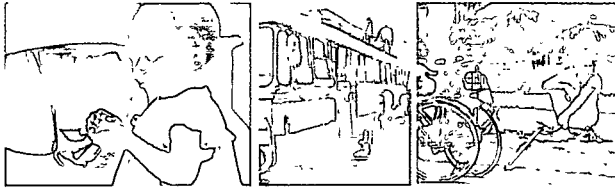
departments of the World Bank Group, including the Multilateral Investment Guarantee Agency (MIGA), the Operational Vice Presidents, the Environmentally and Socially Sustainable Development Vice Presidency (ESSD) of the World Bank's and IFC's environmental and social departments, and the International Center for Settlement of Investment Disputes (ICSID). The format of the proposed Review was presented at a Technical Briefing of the Executive Directors of the World Bank Group and has the full support of the president of the World Bank Group and senior management. Completion of the review is targeted for June 2003.

In parallel to the Extractive Industries Review, various relevant evaluation processes are taking place in the World Bank. Its Operations Evaluation Department and Operations Policy Committee will jointly carry out an independent evaluation of World Bank Group experience in extractive industries. At the same time, the office of the Compliance Advisor/Ombudsman (CAO) of IFC/MIGA is managing a review of the impact and implementation of the environment and social safeguard policies in mining and oil & gas operations supported by the Bank Group. Contributing to the Extractive Industries Review, the CAO will also complete a compliance review of recent extractive industries projects in IFC/MIGA portfolios. All of these activities will feed into the *Extractive Industries Review Report*.

Specific objectives for the Extractive Industries Review are:

- To better obtain and understand the views of stakeholders about the best future role of the World Bank Group in the extractive industries if it is to promote sustainable development and poverty alleviation.
- To identify, where possible, areas of consensus on the role of the World Bank Group and the relevant issues, and to identify significant alternative or dissenting views in this respect.
- To make recommendations on the basis of such better understanding to focus, redesign, or reconsider, as needed, future World Bank Group policies, programs, projects and processes in the sector.

Because the review will focus specifically on the role of the World Bank Group in the oil & gas and mining sectors, it is not intended to be a standard-setting exercise for the extractive industries at large. (For more details on the Extractive Industries Review, go to the Web site, www.eireview.org.)



Setting the Springboard for the Quantum Leap: Energy and Environment in the Developing World

VIEWPOINT

by Karl G. Jechoutek

The next big jump in technological innovation won't come anytime soon, says the author, unless private enterprise is given the incentives to fast-forward progress.

"It's not that easy being green," philosophized a famous amphibian around the turn of the millennium. And nobody ever claimed that making the world's energy industry more green would be a walk in the park, either. The World Bank Group's framing of an environmental strategy for the energy sector, together with the search for a consensus within the development community, produced in *Fuel for Thought* a document awash in the blood, sweat, and tears of all involved. And that was just the beginning. Implementation was going to be tough.

The Bank is now looking back at two years of efforts to implement this ambitious strategy, and is concluding that things are going reasonably well. Some progress is evident on all major fronts: environmental improvement objectives are proliferating in energy projects and the environmental agenda is steadily migrating upstream into the early stages of decision-making and knowledge sharing. Any necessary improvements are considered to be more of the same, and in the nature of fine-tuning at the margin. So, when looking ahead, why do I have a sense of unease about the current record? Why does there seem to be little qualitative change in the reactions of vociferous stakeholders to the Bank's environmental credentials?

Renaissance lessons

The 15th century experience of Portuguese explorers struggling to find a way down the West Coast of Africa is instructive in this respect. Adverse winds and currents beyond the Northwestern African capes made it difficult for ponderous Mediterranean galleys to return from their careful probing down the coast. The cautious gradual approach achieved modest progress, but soon stalled before major milestones could be reached. Critical voices were growing stronger, demanding tangible results. Gradualism in exploration was a sound policy, avoiding excessive loss of men and ships in hitherto uncharted territory, but, to keep the stakeholders on board, breakthrough concepts were needed.

These quantum jumps were first characterized by innovative rigging and instrumentation of sailing ships, making them more nimble to tack against the wind and sail the open ocean. Later an ingenious institutional vehicle brought rapid progress: leases for commercial exploitation rights to stretches of the African coast by private entrepreneurs in return for an obligation to explore a minimum length of new coastline per year.

By combining a “disruptive technology” (new engineering and instrumentation) and cleverly harnessed private initiative, the Portuguese authorities launched an acceleration of the gradual progress, ultimately freeing up resources for use in the “big plays,” such as eventually outfitting Bartolomeu Diaz to round the Cape of Good Hope, and Vasco da Gama to reach the spices of the East.

Disruptive technologies

For a large institutional player without in-house capability to undertake research and development in technology, the wisest technology strategy is to carefully observe the work of innovative thinkers and practitioners, co-opt the technologies that appear practical and workable and promote them vigorously. Steady introduction of new technology in small steps is preferable to big dollops at a time, since the instant scaling up of new developments carries high risks for clients. The first Portuguese caravels equipped with triangular lateen sails were “pilot projects” in the true sense of the word, but their proven effectiveness in the Atlantic soon made them an important cutting-edge part of the fleet.

The Bank and its clients have taken this path successfully so far. Small injections of renewable and other environmentally sound technologies under the auspices of Global Environment Facility (GEF), the Prototype Carbon Fund or International Finance Corporation (IFC) are steadily undermining any inertia that encourages the clinging to traditional technologies only. A fuel-cell bus project here, a solar power financing effort there, urban waste methane pilots, improvements of stoves for traditional fuels, all buttressed by small funds that keep the momentum going (such as the PCF, Solar Development Capital, the Renewable Energy and Efficiency Fund), maintain a certain measure of forward movement.

These individual interventions rarely exceed a financing volume of \$25 million, but manage to keep up a steady trail of pinpricks that lead to a mindset. Compared to a few years ago, these interventions are now more

accepted and regarded as integral parts of a respectable energy program. From here, it will not be long until efficient renewable or otherwise cleaner technologies form the standard leading edge of any self-respecting energy investment.

Not much would have moved without the accompanying noise of many studies, workshops and networking vehicles. It is the continuous pressure of ESMAP/ASTAE activities, Village Power networks, vehicle fuel cleanup and replacement studies, household cooking pollution investigations, clean technology Web sites, solar power training manuals and a plethora of other knowledge-spreading efforts that creates the fertile environment in which new technologies can take root.

The Bank Group, together with willing bilateral and private partners, has been putting a lot of effort into this creation of an atmosphere conducive to innovation--a sound investment of time and modest funds. Even the preparation of *Fuel for Thought* itself, although fairly costly and not always appreciated by stakeholders, was a building block in the raising of this edifice of awareness. If nothing else, it has accomplished the feat of forcing the discussion of clean energy concepts into the framing of Country Assistance Strategies in the Bank, and into other upstream decision processes in the developing world. On the whole, then, the clean technology record looks good, and can be paraded without embarrassment.

Scaling up: harnessing entrepreneurship

What then about the second building block of accelerating gradual progress? The record of promoting self-sustaining local initiative and private enterprise in the clean energy field is mixed. Granted, this has not been neglected by any means. Every one of the knowledge-intensive efforts to introduce new technology has dealt with the best way to create local ownership of the concepts, offering incentives to achieve a commercial take-off without undue lingering reliance on subsidies. The days of parachuting unfamiliar new technology gratuitously into the laps of unsuspecting villagers are definitely a thing of the past (at least as far as the Bank Group is concerned). But the focus of many clean energy initiatives remains the small player, supported by public policy:

- West African villages are assisted to make woodfuel supply sustainable;
- Ugandan entrepreneurs are encouraged to go into the local energy business;
- Bangladeshi rural women learn how to market solar lanterns;
- Small solar power distributors gain access to long-term financing;
- Local small energy enterprise taps existing gas pipelines.

All of these interventions are highly valuable, and contribute to the creation of clean energy entrepreneurs who will become the new foot soldiers of an enlightened energy industry. It will, however, take a very long time to gain sufficient environmental ground if one relies too much on the steady penetration of small local enterprise. Every village that can supply itself by a hybrid off-grid system gains a few inches towards the goal of environmentally sustainable energy. What is needed, however, is the entrepreneur who can gain miles at a time.

The actors capable of making these long strides are the enterprises within and outside the traditional energy industry that have the resources, incentives, and inclination to embark on a venture in a new direction. Some of the big players in the petroleum industry have already gone to great lengths to demonstrate their environmental responsibility and responsiveness. Similarly, the biggest electricity utilities of the world have pooled their clean energy interests to become more visible in their advisory activity. Electricity and petroleum giants are looking for alliances, such as that formed by Shell and ESKOM in the drive to supply affordable off-grid energy packages to consumers in southern Africa. There are large enterprises in the waste management, municipal services, or private energy fields that are well placed to take on environmentally sound ventures. Many of these big players are groping in the dark and, to guide their efforts, seek to tap the Bank Group's experience and knowledge in the developing world to guide their efforts.



“The Bank Group has been nervous about getting too close to commercial interests.”

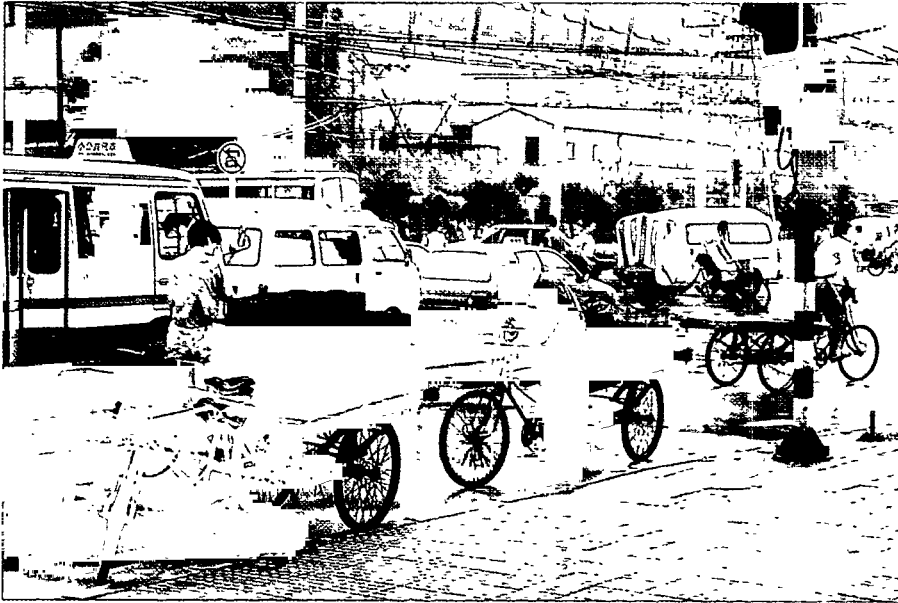
This elusive dialogue has not yet yielded much. Understandably, the Bank Group has been nervous about getting too close to major commercial interests for fear of losing its credentials as an objective advocate of sound policy for clients. The possibility of a conflict of interest, or of being co-opted as unwitting partner in corporate marketing, always looms large. Nevertheless, this is too good an opportunity to pass up. Legal risks always exist in a partnership that affects somebody's bottom line, unlike one based on unobjectionable general knowledge-sharing in the public domain. But the Bank Group has overcome legal timidity in the past, and has emerged the better for it. This may be the time to jump this old barrier, to think of subcontracting with selected big private enterprises to push the frontier of environmentally sound energy forward at a faster pace.

There are, of course, existing efforts to operate on a bigger scale. Supporting the franchising of rural areas of Argentina to private electricity suppliers, with an obligation to expand service by using clean technology, is an example. The rehabilitation and institutional overhaul of Eastern European district heating and energy systems is another. And omnibus energy sector assistance in places like Cape Verde carries large chunks of environmentally sound technology such as wind energy. But these initiatives still remain safely in the traditional Bank *modus operandi*, working with or through the public sector on a country-by-country basis.

Why not complement the established project-based and fund-management cooperation with the private sector by a few bold joint ventures with big-ticket energy enterprises? How about contracting out the distributed-energy approach, tied to a performance commitment that a minimum volume of self-sustaining new clean energy is put in place in specified regions of the developing world? Why not do a deal with the likes of Shell, in places where there is no efficient local ESKOM to carry the ball?

But what is the best way to do this without dropping a lucrative monopoly into the hands of an eager multinational company? How to ensure that this approach results in a net benefit for the ultimate clients? Food for thought, both for the Bank and for decision-makers in developing economies.

On the global scene, the accelerating momentum for greenhouse gas emissions trading presents another opportunity. The recent labor pains of government negotiators in Marrakech produced a reasonable step forward in establishing credibility for trading emission credits, making the Kyoto process a bit more realistic. At the same time, increasing numbers of the big players in the global energy and insurance industry are joining hands in the Emissions Market Development Group (EMDG), devoted to creating a business-friendly market mechanism that can give life to the government-sanctioned trading principles. Vigorous participation of the Bank Group in this private effort will accustom the industry and the Bank to each other's thinking, and may open



“Forget the defensive concept of ‘environmental safeguards’; adopt a philosophy of ‘environmental activism’ ”

the way towards closer cooperation. Crashing such private parties as the EMDG has never been a forte of the Bank Group, but it would be well worth the effort.

High-profile environmental operations

Raising the profile of the Bank as a serious initiator of large-scale energy investments and actions that visibly improve environmental performance is a logical complement to the reliance on private initiative for ensuring steady, small-scale and gradual progress. Sadly, this is not yet evident to the outside observer. Established critics of the Bank’s environmental record have yet to see a reason to upgrade their image of the institution’s resolve in pursuing a robust environmental agenda.

The prevailing wisdom is that most major energy investments need defense against the criticism that they are environmentally damaging. Whether this is objectively true or not is immaterial – perception counts. Snapshots from events of recent months vividly illustrate the defensive stance:

- The Bujagali hydro project in Uganda is defended as not harmful and lacking a good alternative.
- The financing of power plants has to struggle to show that it “fits into the Bank’s energy business strategy.”
- The Bank’s Extractive Industries Review has to fight off strong criticism even before it starts, and is asked to demonstrate that oil, gas, and mining are legitimate business lines.
- The Chad-Cameroon pipeline continues to face severe criticism.
- China’s coal-fired projects, although introducing more efficient technology, are under attack.

These are just a few examples of highly visible energy business items that overshadow the good progress that is being achieved on the smaller-scale, gradual front, evoking a picture of business as it was before *Fuel for Thought*. It may, of course, be an exercise in character building to go through frequent ordeals of searing criticism before coming out the other side smelling like a rose when it is revealed that the inquisitors have no case. I would submit, however, that there are less masochistic ways of making one’s point.

One such way would be to step boldly into more and bigger energy sector operations that feature environmental improvement as the central objective, not just as a secondary goal. Forget the defensive concept of “environmental safeguards” that just promises to do no harm, and replace it with a philosophy of “environmental activism”: Seize the initiative in the green wars; play the big funding card that others do not hold in their hands. Supporting massive environmental cleanups of the pollution-heavy energy industries of Russia, China, India and Central Asia comes easily to mind as a useful high-profile vehicle--the thought has occurred to

the Bank already, and some Russian pipelines and Indian coal-fired power complexes already bear witness to this enlightened assistance strategy. More of the same, please.

But not all fixes are such no-brainers. In much of the developing world, it is not the cleaning up of the legacy of the past that is paramount, but the rapid expansion of energy systems that can stand the environmental test of time without defensive mumbling. Given customers' loudly-voiced needs for more and cheaper energy--delivered fast--this is a tall order. It is all the more relevant, then, that the brains behind *Fuel for Thought* take up this challenge, searching for major energy investments that are unambiguously environment-centered.

The long-term solar energy cooperation between GEF and key clients is certainly a building block in this effort. However, it may be time to break out of the narrow alleys of the GEF ghetto and go for some highly visible flagship operations that could dominate the Bank's mainstream energy business in the next couple of years. An unexpected sudden turnaround in the center of gravity of the Bank's energy business will do wonders for outsiders' views of the institution's credibility. The first Portuguese fleets returning from Asia did not bring back much in spice cargo, but did generate a shock wave of awareness throughout Europe that things had changed irrevocably.

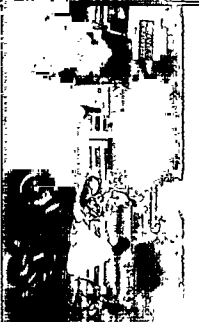
Finally, energy alone is not going to cut it in the green world, try as hard as we may. The energy business has to be melted into other lines of business, in order to take advantage of the full spectrum of interventions that together make an environmental whole. The budding alliance between the energy, urban development, and transport sectors to tackle air quality issues in a holistic way is a good start, preferably to be followed by many more. One could think of an alloy of energy, rural development, agriculture and forestry, or a coalition of capital and commodity markets, energy, and specialized funds to move forward the emissions trading business. The opportunities are there.

The bottom line

Is the glass half full or half empty? Let's just say that the Bank's servers need to keep pouring faster and with more panache if they are to keep up with the thirst for results of the global environmental clientele. Good progress has been made on the technology front, allowing the steady trickle of innovation into the business. Private initiative must be harnessed more creatively to accelerate the pace of gradual achievement. And some big, bold strokes must be brought to the canvas to establish the Bank Group as a market leader in the energy/environment field, not just a follower.

After they went for the big plays, the Portuguese enjoyed about a century of dominance in the trade with Asia before competitors closed in. Not bad for a small country on the margins of Europe. As a large institution that is already at the center of the development debate, the Bank should be able to emulate this success. The well-being of its clients could well rest, in part, on how well the Bank learns the lessons of the explorers.

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PART TWO

Intellectual capital
is one of the Bank's
most important
resources



CHANGING THE RULES: CREATING THE FRAMEWORK FOR ENERGY AND ENVIRONMENT

Of the Bank Group's resources, intellectual capital is one of the most important it has to offer its clients. In recent years, the energy sector has helped lead the way toward the creation of market frameworks and away from lending for single transactions. Many of the ideas promoted in *Fuel for Thought* depend on such frameworks for their introduction to the development plans of client countries.

Given the World Bank Group's relatively small share of all energy investments, market frameworks allow the Bank far-reaching influence without making massive investments in hard infrastructure, often effecting behavioral changes in the private sector well beyond those entities that are directly influenced by the Bank Group's operations

When physical investments are left to players outside the Bank, the role of analytical and advisory activities begins to crystallize, especially in light of the scope of work involved in putting a framework into place. Before investment can flow, intensive effort is given to constructing these frameworks--just one example of upstream work. *Fuel for Thought* makes the point that upstream work is consequential for the downstream payoff of getting other investors to commit their money once the framework is in place

Part II takes a look at the kind of upstream work in which the Bank Group gets involved and how effective it has been in implementing the *Fuel for Thought* agenda. We look at Bank Group- and country-led exercises, as well as specific areas of work that *Fuel for Thought* singled out as being particularly significant: helping our clients improve environmental regulation, and changing the approach of Bank Group staff to the energy and environment business. We also take in two views, from Dina El Naggat of Egypt and Shen Longhai of China, both of whom put upstream work into a country context in light of their experience as practitioners.

Building Capacity in the World Bank Group

Among *Fuel for Thought*'s six strategic objectives is one that calls for internal capacity building, a demand for real change to take place within the Bank Group. The seeds of that change were sown with the publication of *Fuel for Thought*, which called for upgrading the Bank's skills mix and knowledge base. And indeed, in answer to that call, significant growth has taken place in the Bank Group's capacity to respond to the environmental challenges inherent in most energy work. Through the education of individuals and the synergy created by the multi- and

cross-sector teams that have become commonplace, our capacity to deliver energy-environment projects has increased greatly.

This enhanced capacity is found not only in the energy sector operations units, but also in the environment, urban, transport, and social sector groups in the regions. The growth of cross-sector teams--especially those that bring together environment and energy experts--has broadened the Bank staff's understanding of the range of issues involved, making it possible to foresee potential pitfalls further upstream. Cross-sector teams are becoming ever more diverse, including staff from transport, urban, health, social and education sectors. (A case study on the growth of the indoor air pollution multisectoral team can be found at the end of Part II.)

More staff are involved in energy-environment work than ever before, and the work itself occupies a larger chunk of the Bank Group's work plan than it did two years ago. A number of different Bank Group entities and programs continue to dedicate substantial funding to energy and environment activities and projects. These include the donor-funded programs, the Asia Alternative Energy Program (ASTAE), the Africa Rural & Renewable Energy Initiative (AFRREI), the Africa-based Regional Program on the Traditional Energy Sector (RPTES), and the Energy Sector Management Assistance Programme (ESMAP), which are discussed in more detail in Box 5.

Box 5

Donor-Funded Programs Working on Energy and Environment

There are four main donor-funded programs that do work on energy and the environment. They are:

- Asia Alternative Energy Program (ASTAE), the purpose of which is to bring alternative energy into the mainstream of World Bank's Asia energy portfolio. It provides support mostly to project preparation and implementation, including World Bank and GEF loans, credits and grants.
- Africa Rural and Renewable Energy Initiative (AFRREI), which focuses on rural poverty reduction through nonfarm income generation and job creation via small- and medium-sized enterprises and agroprocessing; improving rural quality of life through facilitating health and education services, thus helping even those who cannot afford electricity; and developing renewable energy where appropriate, thus using a local resource with some benefits for the global environment.
- Energy Sector Management Assistance Programme (ESMAP), a global technical assistance program that provides innovative solutions to accelerate the delivery of energy services to the poorest populations. Its work benefits governments, the private sector, and other stakeholders, focusing on policy and pre-investment work, and on knowledge generation and transaction. It is intended to complement the work of other development and private sector institutions, and is largely funded by bilateral donors and the World Bank.
- Regional Program on the Traditional Energy Sector (RPTES), the mission of which is to help client countries in the review, formulation and implementation of policies, programs and projects in the traditional and biomass energy sector in Africa. It works to help rationalize the structure and function of the sector within a socially equitable and economically and environmentally sustainable framework; and to promote an orderly energy transition toward modern fuels in the household and small- and medium-sized enterprise sector.

Source: ASTAE, AFRREI, ESMAP and RPTES

Yet greater change is still needed inside the Bank on the environmental consequences of energy production, especially in the development, already under way, of better knowledge-sharing techniques and practices, improvement in the application of safeguards, and in making existing best practice notes on the energy sector and energy efficiency more useful to clients by presenting their policy content in a distilled and accessible manner. In today's demand-driven environment, this is what clients are asking for.

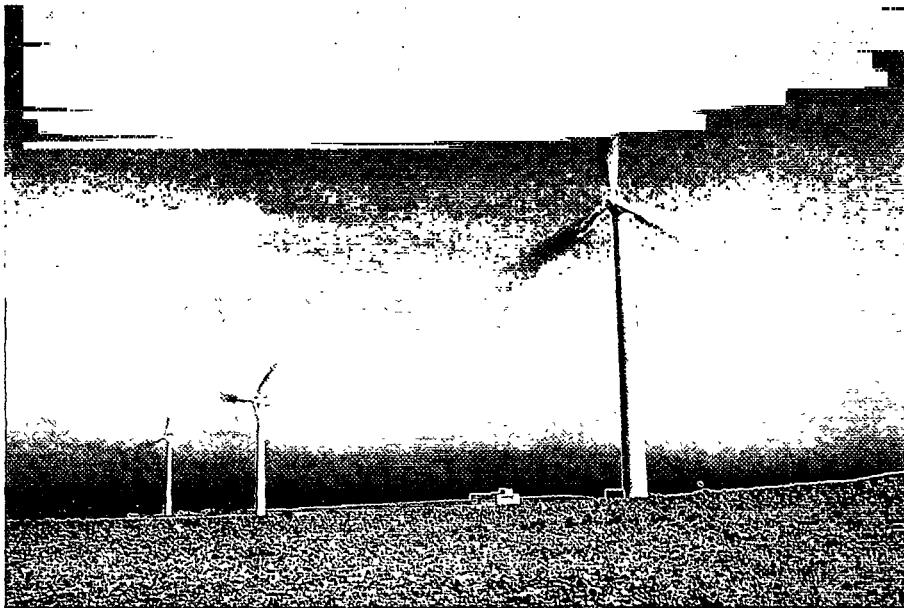
Knowledge Creation and Dissemination

Exchange of knowledge between the Bank and its clients is one of the Bank's three main tools for executing the environmental strategy for the energy sector. *Fuel for Thought* identifies analytical and advisory services as the major means of knowledge creation and dissemination. Under this rubric, several new instruments, or means of delivering such services, were created.

- Full-scale Energy-Environment Reviews (EER), planned as substantial pieces of country-specific sector work, covering a broad review of the environmental impacts of energy supply and use,
- Rapid Energy and Environment Assessments, conceived as country-specific reviews that can be executed on quick turnaround time for the purpose of setting priorities;
- Activities on key selected topics, supporting narrower objectives, such as improved urban air quality management.

The first two instruments, Energy-Environment Reviews and Rapid Energy and Environment Assessments, have yet to be fully utilized by World Bank clients. Indeed the small number of EERs carried out and the handful of Rapid Energy and Environment Assessments now under way suggest that the Bank Group's limited role in assisting clients with upstream investment planning may be inhibiting the use of these instruments. It is also possible that Bank staff are unaware of the existence of these instruments, or that downstream analytical and advisory activities are still given priority by staff and clients, as suggested by the more than 30 downstream deliveries of analytical and advisory services have been made in response to clients' requests for help in solving specific problems.

While the demand for the two upstream instruments has been lower than expected, they have proven to be valuable when used. (A summary of the activities of the four EERs that have been completed is found in Box 6.) And as programmatic lending increases, demand for full-scale Energy-Environment Reviews may well accelerate. In this lending context, EERs will likely prove to be a vital aid in mapping out both the direction of the program and the triggers for moving from one phase to the next



“Greater change is still needed in the Bank on the environmental consequences of energy production.”

Energy-Environment Reviews

The main purpose of the *Bulgaria Energy and Environment Review* was to develop and test a methodology that would better integrate energy sector development and investment plans within the country's environmental objectives. It was undertaken at the request of Bulgaria's State Agency for Energy and Energy Resources (SAEER). The Energy-Environment Review (EER) highlights the intrinsic trade-offs between Bulgaria's objective to ensure least-cost energy supply to the country and its concurrent objectives of being a dominant energy supplier in the region (minimizing its dependence on imported energy), and meeting its national and international environmental commitments. Crafting an energy supply strategy that is cost-effective, provides adequate energy security, and reinforces the national goals of economic growth and poverty alleviation will indeed be challenging. Formulation of such a strategy could benefit from a wider debate among key stakeholders such as energy suppliers, industrial and other consumers, policy-makers, regulators and investors. The Energy-Environment Review provides a useful analytical framework for such a debate.

The *Mexico: Environmental Strategy for the Energy Sector* activity has aimed at assisting in the development of a bottom-up energy supply and demand forecast model, and the identification of the links to a computable general equilibrium (CGE) macro-economic model. Using the bottom-up model, the ESMAP team has worked with the Ministry of Energy to follow through on its interest in the identification of pricing policy options that would eliminate subsidies in the power sector and, among other things, to evaluate impacts on greenhouse gas (GHG) emissions. Using the CGE model, the Environment Ministry has concentrated on vehicle emissions standards and the improvement of vehicle emissions performance. The EER has served as a means for improving communication between the energy and environment ministerial authorities.

The *Sri Lanka: Energy-Environment Review* has three parts. The first is an electric power technology review, concerned with investigating the relative merits of coal, oil and gas as the generating technology of choice to supplement hydropower, which has now been fully developed. It found that coal-fired steam generation was the most likely option, except under some oil price conditions. The second part of the study investigated the GHG implications of conclusions reached on the coal-fired steam option. The third part, which is ongoing, is investigating transport and environment interactions. One important outcome from the work has been to identify a project, now under preparation, that includes a grid-connected renewables component.

The activity, *Turkey: Key Aspects of Energy-Environment/GHG Strategy*, was largely motivated by a desire among decision-makers to compare different options for mitigating GHG emissions, and to examine the nature of commitments that Turkey might agree to in the context of accession to the UNFCCC and the Kyoto Protocol. However, the modeling undertaken in the completed second phase has also provided specific guidance on least-cost sulfur and particulate emissions control strategies for the power sector. Equally significant, the embedded hydropower expansion analyses have provided a forum for public debate on project-siting and the social impact mitigation measures. The third phase, now under way, examines the specific investment potential in seven environmentally beneficial energy subsectors.

Source: ESMAP

Meanwhile, further downstream in project cycles, Bank staff working with clients in areas that provide analytical and advisory services have tackled a range of issues, from indoor air pollution to the phase-out of leaded gasoline to specialized energy efficiency studies. The demand for these services exceeds expectations, and they

are providing an effective means of informing the Country Assistance Strategy process. They are also helping to identify and shape future Bank interventions, such as the Thailand Motorcycle Upgrade and Mongolia Cookstoves Projects detailed in the case study at the end of Part II. Some earlier examples of knowledge transfers that have found their way into Bank operations appear in Box 7.

Box 7

Upstream Work Feeding Through to Operations : ESMAP's Contribution

Over the years, certain upstream activities have resulted in World Bank lending projects. Of particular interest in the energy and environment field are several here noted.

One of the earliest pieces of work carried out by ESMAP in the renewable energy field was the *India: Opportunities for Commercialization of Nonconventional Energy Systems*. Begun in 1988, it looked at integrating renewables into the Indian power sector. As a follow-up to this activity--and based on the strategy it evolved--the government requested feasibility studies for potential project sites. Cost information was developed on a cohort of sites and capacity was built among ministry staff. Eventually, the work formed the basis for the World Bank/GEF *India Renewable Resources Development Project* which has financed some 50 megawatts of wind and 4.2 megawatts of photovoltaic capacity.

With ASTAE in 1996, ESMAP cofinanced case studies of options for electric power in China. The resulting wind and photovoltaics studies were used as foundations for the \$205 million *China: Renewable Energy Development Project*, which includes a \$13 million loan from the Bank and a \$27 million grant from the GEF, with the balance coming from private investors and commercial banks.

Also in 1996, an ESMAP concept paper on techniques for financing photovoltaics elicited a \$1.5 million pledge from the World Bank and the Rockefeller Foundation to develop what became the Solar Development Group (SDG). SDG was ultimately capitalized at \$50 million and launched with the purpose of providing financing for companies providing off-grid electrification services for rural people in developing countries.

ESMAP funded, in 1997, a pre-investment study for grid-connected wind farms and off-grid electrification in Cape Verde.

A Bank project on reform of the energy and water sectors was expanded to include GEF financing and a renewable energy component was incorporated. A concession for the provision of off-grid electricity is now under preparation, and facilities for a total of 8 megawatts of wind capacity are under construction.

Source: ESMAP

The demand for analytical and advisory services exceeds expectations



The promotion of best practice to its clients has long been a priority of the World Bank Group, and it is a crucial component of environmentally sustainable energy production. A notable shift from supply-driven to demand-led knowledge activities continues to gain momentum, as seen in several recently developed issue- or task-specific tools currently in use. Most analytical and advisory activities feature task-specific knowledge dissemination components; others such as the Indoor Air Pollution initiative in South Asia have created a widely-used Web page (<http://wbi1018.worldbank.org/sar/sa.nsf>). Others, such as the Asia Alternative Energy Program (ASTAE) and the Africa-based Regional Program on the Traditional Energy Sector, exchange knowledge through their own publications and events. ESMAP has gone further than most with a fully diversified knowledge transaction strategy.

Building Capacity in Client Countries

Though not often called by name, capacity building provides the subtext that runs throughout *Fuel for Thought* and is one of its specific objectives. Capacity building has many facets, supporting policy formulation, helping to establish regulatory and enforcement bodies, encouraging knowledge exchanges in the upstream phase of a project cycle, enhancement of operations downstream and monitoring implementation.

Just as there are many places where capacity building can be useful, so too are there as many different activities that can build capacity as there are ways to carry them out. They can range from intensive training courses and partnering arrangements (between experienced and less-experienced utilities, for example) to locally based workshops, Web sites and literature. The scale of capacity building varies, as well: sometimes it is incidental to other activities; in other cases it is the whole activity. Ensuring that the effort is properly targeted, timely and relevant is key to its success. (Box 8 gives an example of capacity building as a part of an EER in Mexico.) At the end of Part II is a case study of a project devoted entirely to capacity building among indigenous people in Bolivia. The project aimed to help indigenous groups take part in the environmentally sustainable development of gas and oil resources.

Box 8

Capacity Building as Part of the Mexico Energy-Environment Review

In the Environmental Strategy for the Energy Sector for Mexico, the Ministry of Energy, with assistance from local and international consultants, used a top-down as well as a bottom-up computer model to study the impact of different energy policy options on the future energy demand, pollutant emissions, and on Mexico's macro-economy. The bottom-up model, Excel-based, was developed substantially in-house by the staff of the Ministry of Energy in close collaboration with the World Bank. The model allowed demands for energy from all major sectors, and tracked the impact on emissions through a detailed linking to the technologies used to meet these demands. A manual for the model was written by the Ministry of Energy, and a number of staff members from the energy and environment ministries were trained to run the model. The top-down, computable general equilibrium model was designed to calculate the impact on various social and economic indicators—the gross domestic product (GDP), government budget, trade, employment and welfare—of different energy supply and demand scenarios arising from different policies. Two academics, one Mexican and one American, ran the model, and they in turn trained a number of staff from the energy and environment ministries. The results were used to assist the Government of Mexico in formulating its position on climate change policy.

Source Masami Kojima



Examples of upstream work with important capacity building elements include the Latin America and Caribbean Clean Air Initiative, and a number of activities in the donor-supported energy programs, particularly the Energy-Environment Reviews. One example of upstream capacity building is the National Strategy Studies Program, which is described in Box 9.

Box 9

Building Capacity to Deal with Climate Change

The National Strategy Studies (NSS) Program provides assistance to Bank client countries that are preparing to play an active role in international greenhouse gas (GHG) emission reduction trading. It supports host countries involved in both Joint Implementation and in the Clean Development Mechanism by enhancing awareness and understanding of the opportunity and rules of the flexible mechanisms and their gradual implementation. The NSS Program has become one of the major international capacity building programs addressing carbon market issues and the related flexible mechanisms that promote a cost-effective international cooperation in reducing GHG emissions. In nearly all host countries that have completed NSS, follow-up activities are taking place. The program achieves its objectives through demand-driven studies and other capacity building activities.

The NSS Program comprises 31 host countries in Central and Eastern Europe, Latin America, Asia, and in Africa. To date, 10 studies have been completed (in Argentina, Bolivia, Colombia, Czech Republic, Kazakhstan, Russian Federation, Slovakia, South Africa, Uzbekistan, and Zimbabwe), and a further nine are at an advanced stage of preparation (in Chile, China, Egypt, Guatemala, India, Indonesia, Papua New Guinea, Peru, Sri Lanka, Ukraine, and Vietnam). The preparation of others is under discussion (for example, Brazil, Fiji, Paraguay, Poland, Romania, Vanuatu, and a regional study in Central America). The World Bank provides administrative, logistic and budgetary support, while individual studies are funded by bilateral donors including Switzerland, Germany, Australia, Canada, Finland and Austria.

Further downstream, project preparation is often an important vehicle for capacity building. In particular, Bank-GEF projects often include capacity building elements. Examples of this include the Bank-GEF *China: Renewable Energy Development Project*, in which the capacity of the Chinese photovoltaic (PV) industry to manufacture, market, install, and service solar home systems to international standards of quality was heavily supported. In this case, the main beneficiaries of the support were some 17 private sector companies operating in China's North West. Another GEF project on solar water heating in Tunisia has supported the establishment of about 100 enterprises.



Sources: NSS Annual Report, ENV, EAP

Capacity building has been financed by the World Bank's Institutional Development Fund (IDF) in, among others, a project on environmental compliance and enforcement in Moldova, and another on clean air and fuels in Sri Lanka. Projects such as these feature capacity building activities at the local level, where municipal governments are often the beneficiaries of capacity building elements of the Clean Air Initiatives. Other groups and entities targeted for capacity building include women's groups for gender and sustainable development in Central America, and cooperatives for energy financing in Kenya. (See Box 10.)

Box 10**Capacity Building for Energy Finance Cooperatives in Kenya**

Where grid-based rural electrification is constrained, solar home systems (SHS) powered by photovoltaics provide a cost-effective, viable alternative for limited household and business power requirements. Yet these systems are expensive, and financing is not widely available in Kenya. The activity, sponsored by ESMAP, focused on developing cooperation between technical and financial partners in developing the necessary skills for supplying and financing rural solar home systems in Kenya. The results of the effort, and how to do it, have been set out in an Implementation Manual: *Financing Mechanisms for Solar Electric Equipment* (ESMAP Report 231/00, July 2000).

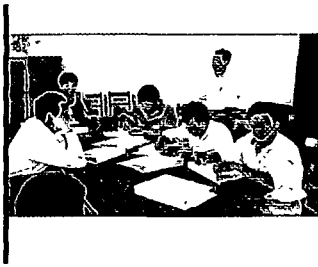
Source: ESMAP

While recognizing that weak capacity at all levels of governance is a limiting factor, *Fuel for Thought* underlines the role of regulation, monitoring and enforcement. The development of management training for regulators is a field to which a growing number of analytical and advisory activities are devoted, especially over the course of the last year. These activities have been used in a variety of projects, including the Industrial Pollution Prevention Project in India, and the Environmental Action Project in Sri Lanka.

In China, Indonesia, Mexico, Moldova and Peru, sector work is addressing the same issues of governance. Support for regulation and enforcement are commonly included in environmental capacity building efforts in the form of technical assistance. Other aspects of environmental capacity building that aid in the pursuit of this objective are quite varied, and include legislation and the creation of systems for monitoring and recording air quality, usually addressed through a technical assistance component. These capacity building efforts are found in projects located in several sectors, including energy, urban, transport and environment projects. Where there is no project, analytical and advisory services are provided in a stand-alone fashion.

Still, all the capacity in the world will not, once built, make a difference unless it is maintained and used in the role for which it was created. Regulations are only as good as their enforcement; monitoring systems are useless unless violators of environmental measures face consequences for their actions. Because effective regulation so depends on the political will, governance structures and legal systems of a client country, achievement of this objective is one of the greatest challenges facing the Bank in carrying out the *Fuel for Thought* strategy.

To fulfill its mission in a socially and environmentally responsible manner, the Bank has in place a number of safeguard policies on environmental and social themes to which Bank projects must conform. Safeguard policies and their related consultation and disclosure requirements are about to be implemented in a more effective manner throughout the Bank, including in the energy sector. An integrated safeguards monitoring system that will allow for improved oversight of compliance with these policies during project preparation and implementation is currently being constructed. Once it is fully operational, this system will allow for an overview, in the near future, of safeguard compliance in the energy sector portfolio.



CASE STUDY

Bringing it All Home **Oil Industry Training for Indigenous Peoples in Bolivia**

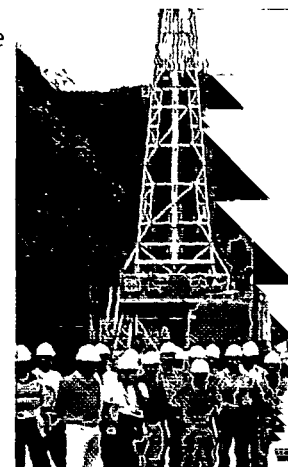
In Bolivia, home to one of Latin America's most dynamic organized movements of indigenous peoples, tensions were rising. Throughout the 1990s, Bolivia's indigenous communities suffered significantly from the adverse environmental and social effects of growing hydrocarbon, mining and forestry operations in their native territories, and concerns mounted as the national oil company, Yacimientos Petroliferos Fiscales Bolivianos (YPFB), began exporting gas. As time wore on, YPFB's investments came to pale in comparison with those made in Bolivian oil by other entities--public and private, Bolivian and transnational. Together, these new investments marked the end of the decade with a 10-fold increase over YPFB's stake, amounting to some \$800 million a year

For the Bolivian government, expansion of oil and gas operations holds the promise of significantly increasing national revenues. The Bolivia-Brazil gas pipeline, a project financed in part by the World Bank and now operating, will yield some \$180 million in taxes during the first 20 years of the contract, along with a considerably higher sum from royalties stemming from new gas exploitation. But the pipeline will also run through some of the most environmentally sensitive areas on the planet--areas that belong to the "traditional territories" of Bolivia's indigenous people.

The nation's indigenous peoples are not without recourse in shaping the pipeline's future, and could stand to benefit from the exploitation of resources in the territories they inhabit. Convention 169 of the International Labor Organization (ILO) asserts the guaranteed right of indigenous peoples to be consulted and to enjoy the benefits of the development of natural resources in their territories. In 1991, Bolivia ratified Convention 169 into its own law. But rights are only as good as the ability of those who possess them to exercise them, just as obligations committed to paper are only as good as the ability of the obliged to carry them out.

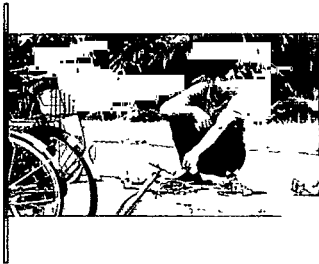
So when the Bolivian government and the Confederation of Indigenous People (CIDOB) went looking for support for a training program for local indigenous leaders--one that would not only apprise them of their rights and responsibilities in the exploitation of natural resources, but would increase their understanding of the industries they encounter--a willing partner was found in the Energy Sector Management Assistance Programme (ESMAP), which is led jointly by the World Bank and the United Nations Development Programme (UNDP). ESMAP agreed to join with the Canadian International Development Agency (CIDA) in launching a pilot program.

In the initial phase of the program, 35 representatives of indigenous peoples gained knowledge of the regulations that govern the hydrocarbon sector in indigenous territories, and conveyed to trainers concerns particular to their individual communities. Together with the program's promoters, representatives from indigenous groups decided on the subjects to be discussed, the number of participants, and the methodology to be applied. A two-week training course for 20 indigenous participants in Santa Cruz included field visits to oil operations, and intercultural discussions with representatives of oil companies. Then five representatives selected from the original group of 35 traveled to Calgary, Canada, to share experiences with representatives of the Canadian First Nations, which possess rights and business in the oil and gas industries in the province of



Alberta. These five were trained as instructors, and upon their return from Canada, helped train a new group of 15 indigenous representatives.

The enthusiasm and focus of the indigenous participants marked the program as a success, one that resulted in a true knowledge exchange--between indigenous communities in Bolivia and Canada, and between indigenous participants and representatives of oil companies, who came away with a new understanding of the concerns of people who hold some of the cards that will determine the outcome of new energy operations in Bolivia. More such programs are planned for the future, including one requested by the government of Ecuador.

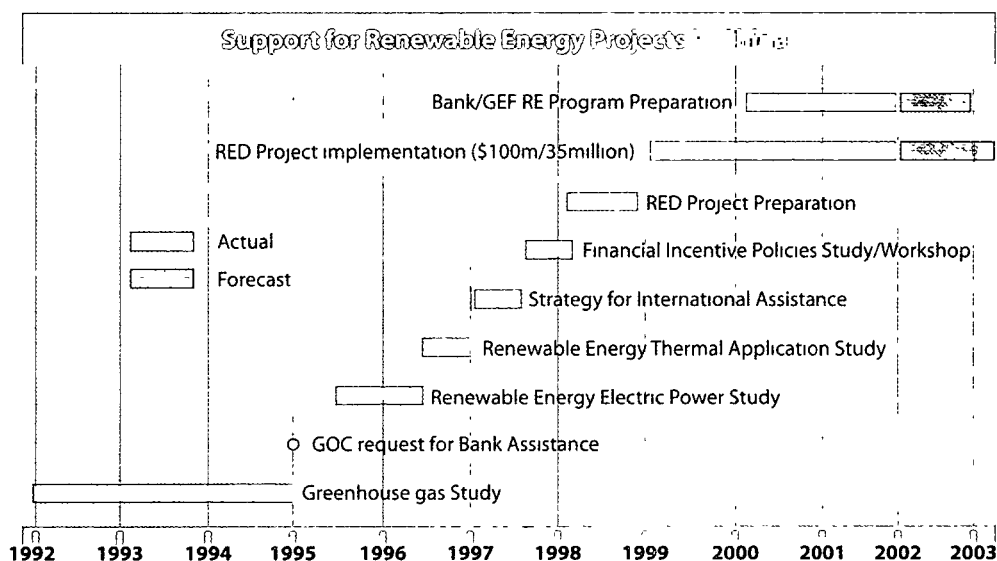


CASE STUDY

Evolving Support: Renewable Energy Technology in China

Beginning with a greenhouse gas study that took place between 1992 and 1995, Bank involvement in bringing renewable energy systems to China has spanned the last decade. Support for these efforts has flowed through the Bank's Asia Alternative Energy Program (ASTAE) and the East Asia and Pacific Energy and Mining Development Sector Unit (EASEG).

Following a request from the Government of China for Bank assistance, a series of studies and technical assistance activities were launched. They included technical studies on renewable energy for electric power and thermal applications, and policy studies. During this time, the Bank and the government developed a strategy for international assistance. These analytical and advisory activities led to the preparation of the Bank-GEF Renewable Energy Development Project, which supports investment in on-grid wind farms and off-grid solar home systems, as well as development of technologies and quality improvement. The evolution of this program of work is illustrated in the graphic below:



Following the introduction of the World Bank-GEF Strategic Partnership for Renewable Energy, a Renewable Energy Scale-up Program is in early stages of preparation. Unlike regular investment operations, this scale-up aims to support, through an Adaptable Program Loan (APL) structure, policy reforms, technical assistance and, if required, investments. During preparation and implementation, this program will employ a range of policy, capacity building and technical assistance activities that outweigh in importance GEF-Bank investment for infrastructure. The infrastructure investments will be supported by commercial financing.

Source: ASTAE/EASE



CASE STUDY

A View From the Field

Long-term Effects of Delay

Mexico City's Reluctant Introduction of Stringent Vehicle Emission Standards

by Adrián Fernández, Ph D

Bowing to the protests of manufacturers, it took Mexico 13 years to adopt automotive emissions standards that were on a par with standards introduced in 1981 in the United States. When Mexico incentivized the adoption of manufacturing standards, however, automotive manufacturers rushed to meet them and saw their best sales year in a decade. Still, despite improving conditions, says the author, Mexico City still suffers the consequences of that 13-year lag.

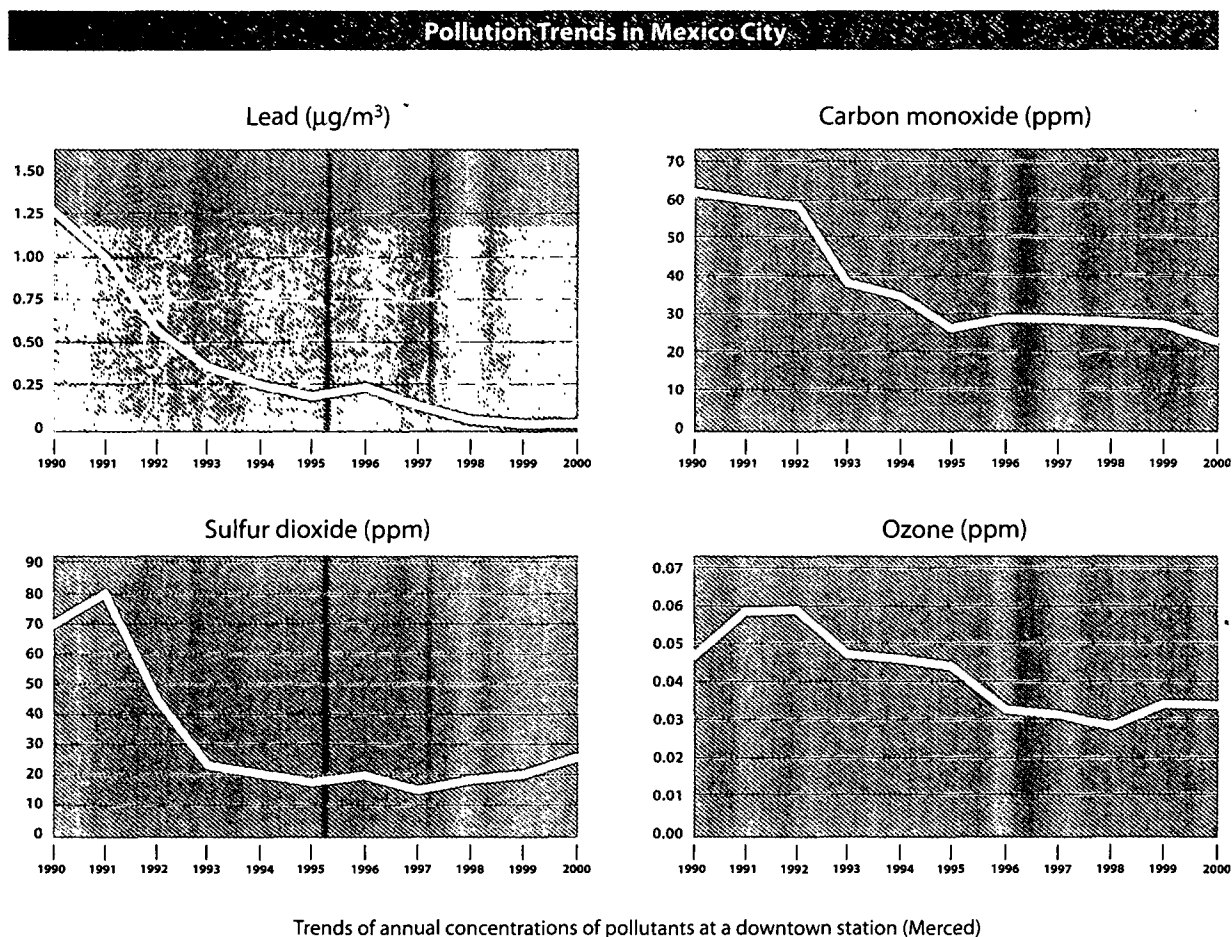
One of *Fuel for Thought's* strategic objectives calls for protecting the health of urban residents from air pollution due to fuel combustion in the residential, transport, industrial and power sectors. This objective considers outcomes such as the phase-out of leaded gasoline and reduction of the sulfur content of motor diesel less than 0.5 percent in all borrower countries by 2010. It also sets a target for the reduction of atmospheric particulate concentrations by at least 20 percent in 20 large cities within the same time frame. If these goals are to be met, the Bank should help client countries to develop a cost-efficient time frame for the introduction of progressively more stringent emission standards for new vehicles, especially as the market share of unleaded gasoline increases over the next years.

In this regard, the 15-year fight to control air pollution in Mexico City offers some interesting lessons related to the regulations--or lack thereof--for fuels and vehicles.

Pollution trends in Mexico City

In Mexico City, the early 1990s saw ambient concentrations of lead, carbon monoxide, sulfur dioxide and nitrogen dioxide very frequently rise above emissions standards. (See Figure.) These four pollutants are now under control and only seldom do they violate the norm. It is important, however, to note that for the last three years, annual concentrations of sulfur dioxide (SO₂) are once again on the rise. These higher SO₂ levels have been

detected in a northern sector of the city where some companies have been smuggling fuel oil from neighboring states in order to cope with substantial increases in the price of natural gas.



Ozone peaks have also experienced a substantial reduction over time. Ten years ago, ozone levels exceeded three times the standard on more than 50 days per year. While today ozone concentrations still exceed the standard, they do so less than 30 days a year at a rate of about double the standard.

These substantial improvements in air quality are the result of four major decisions regarding the introduction of cleaner fuels and vehicles:

- Introduction of unleaded gasoline in 1991, reaching a complete phase-out of leaded gasoline in 1997;
- Introduction of three-way catalytic converters in new vehicles starting in the 1993 model year;
- Ban of the use of fuel oil (any fuel with more than 1 percent sulfur) in the city;
- Liquid-fuel substitution for natural gas in power plants and in the majority of the large industrial facilities within the valley.

Despite these efforts, ozone still exceeds the standard on at least 85 percent of the days, and both the daily and annual standards for fine particulate matter of 10 microns diameter or less (PM10) are still violated. Although no fine particulate matter of 2.5 microns or less (PM 2.5) routine measurements exist in Mexico, it is estimated that the proposed 24-hour standard of 65 micrograms per cubic meter of air ($65 \mu\text{g}/\text{m}^3$) will be exceeded on about 73 days a year, and the annual mean of fine particles will be at least $30 \mu\text{g}/\text{m}^3$ (twice the proposed annual standard). It is difficult to ignore the role that foot-dragging in the introduction of automotive emission standards has played in perpetuating this still unhealthy state of affairs.

Late introduction of Tier 1 in Mexico: still paying the price

In 1999, Mexican authorities finally persuaded car manufacturers to meet emissions limits similar to those adopted by the USA in 1994, often referred to as EPA 94 or Tier 1. However, full compliance with a US-type of durability standard or extended warranty is still pending. The auto manufacturers recently agreed in principle to a gradual four-year phase-in of a durability standard of 80,000 kilometers (the amount of ground a vehicle must be able to cover and still meet the emission limits) that began this year. In the US, where the average sulfur content of gasoline is around 300 parts per million (ppm)—about half the average content of sulfur in Mexican gasoline—a durability standard of 99,200 miles (160,000 kilometers) has been mandatory since 1996. A similar commitment will be requested in Mexico when the sulfur content in gasoline is comparable with that of the gasoline sold in the US.

It's important to note that in spite of the relatively close integration of the Mexican and US auto markets, multinational auto manufacturers established in Mexico have traditionally been reluctant to introduce vehicles built to state-of-the-art safety and environmental standards, at least for those vehicle types that are produced only for sale in Mexico and South America; cars built in Mexico for export meet much higher standards.

The time lag for the adoption of stringent standards in Mexico can be only partially explained by the delay in the supply of adequate fuels by the state-owned oil company, Pemex. This can be illustrated by comparing the different timing for the introduction of emission standards in the US and in Mexico. For instance, standards introduced in 1981 in the US were not adopted in Mexico until 1994, in what amounts to a 13-year delay. During that lag period, autos were allowed to emit between two and three times more hydrocarbons, carbon monoxide and nitrogen oxides in Mexico than in the US. It is important to note that although unleaded gasoline has been available since 1991, it was only in 1993 that three-way catalytic converters were customary on all vehicles sold in Mexico.

In 1994, the US Environmental Protection Agency (EPA) replaced auto emissions standards first adopted in 1981 with what became known as Tier 1 standards, which called for a 30 percent reduction from previous standards in hydrocarbon levels, and a 60 percent reduction in nitrogen oxide levels. In 1997, the Mexican Environment Ministry requested car manufacturers to meet the same standards by 1999, without considering any obligations concerning durability standards or on-board diagnostic (OBD) systems. This five-year time lag for compliance with the Tier 1 standards was considered by the Car Manufacturers Association to be too tough. The association instead proposed the 2001 model year as the earliest possible time to make the move.

Tailpipe emission limits for light-duty vehicles (g/km)			
	Hydrocarbons	Carbon monoxide	Nitrogen oxides
USA federal emission limits			
1972	2.2	24.2	Not required
1975	0.9	15.0	1.94
1981	0.25	2.13	0.62
1994 (TIER 1)	0.16	2.13	0.25
2004-2007 (TIER 2)	0.08	1.07	0.13
Mexican federal emission limits			
1976	2.1	24.2	Not requested
1991	0.7	7.0	1.4
1994	0.25	2.13	0.62
1999 (TIER 1)	0.16	2.13	0.25
2006-2009 (TIER 2)	0.08	1.07	0.13

The members of the association argued that due to a diversity of factors, such as Mexico City's altitude, the fuel specifications and huge incremental costs for improvement of their pollution control equipment, it would be impossible to comply with the new standards in 1999. Additionally, car manufacturers stressed that environmental authorities should focus their efforts on getting rid of the old carbureted cars that pollute much more than do more recently manufactured models with catalytic converters.

These technical and financial arguments commonly used by car manufacturers to resist environmental standards are not consistent with the fact that, in 1997, about half the vehicle brands offered in Mexico were already in compliance with Tier 1 emission limits. Vehicles in compliance were those manufactured in Mexico for the North American market and those vehicles imported from Europe or the US. On the other hand, vehicles produced in Mexico for the local and South American markets produced substantially higher emissions.

Some car manufacturers, especially those that for years dominated the compact car, family van and delivery van niches of the auto market, strongly opposed the introduction of the new emission limits. Their lower manufacturing costs, and subsequent commercial success, were partially due to their perpetuation of obsolete engine technologies and use of pollution control devices that barely met the outdated environmental standards.

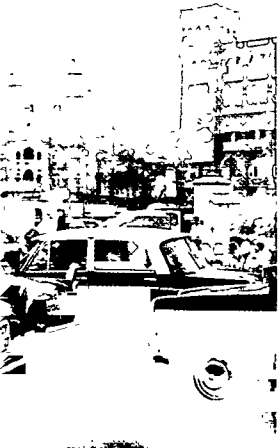
Since environmental authorities in Mexico cannot introduce obligatory standards without the consent of the trade and commerce authorities (who were supportive of the auto manufacturers' position), an innovative scheme was developed to push compliance with Tier 1 emission limits while sidestepping the imposition of mandatory standards. This consisted of granting a two-year waiver of the semi-annual emission test to 1999 model year vehicles that were built to meet Tier 1 standards.

This scheme would give, for the first time, a competitive advantage to cleaner-running vehicles. Consumers would be given the choice between buying a car that did not have to be inspected in two years versus a car that had to be inspected twice a year. The anticipated damage to the image of companies lagging behind in environmental performance as well as the potential market share losses were estimated to be so large that all automobile companies decided to make the necessary investments to move swiftly to comply with the new standards in their 1999 model year vehicles.

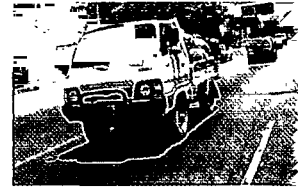
In most cases, incremental costs for car manufacturers were marginal while environmental benefits were substantial. For some of the most popular vehicles, those produced for the 1999 model year were at least 50 percent cleaner than vehicles of the previous model year. Additionally, it should be noted that in 1999 and 2000, auto sales topped annual sales figures for every previous year in the decade. Conservative estimates suggest that emission savings from Tier 1 vehicles sold in 1999 and 2000 will amount to at least 500 tons of hydrocarbons and 1,000 tons of nitrogen oxides per year, thanks to the upgrading of pollution control technology applied to the Mexican automotive market.

Tailpipe emission limits for light-duty vehicles

In 2000, the auto manufacturers in Mexico agreed to introduce Tier 2 compliant light-duty gasoline vehicles with a two-year lag, starting in 2006 and scheduled to reach 100 percent compliance by 2009. Although this agreement was reached without considering a particular time frame for the introduction of low-sulfur gasoline, the Energy Ministry has recently stated that Pemex intends to introduce two new types of gasoline in the year 2006: one with a sulfur content of 50 ppm for the Tier 2 vehicles and a 300-ppm sulfur gasoline for all other vehicles. Discussions concerning future standards for sulfur content of diesel fuel and diesel engine emissions are scheduled for early 2002.



Lessons learned: the need for stringent standards worldwide



Although carbureted cars sold during the 1970s and 1980s account for approximately one third of today's private vehicle fleet in Mexico, they contribute more than 75 percent of the total pollution produced by cars. It is often asserted that these vehicles produce high levels of emissions because of their high odometer readings, or simply because they are old. Although emissions do tend to increase the more miles a car has traveled, carbureted cars produce high emissions because they are technologically obsolete and usually lack pollution control devices. If we were able to buy today a brand new car similar to those made and sold in Mexico in 1985, the vehicle would emit at least 20 times more pollution than a 1999 model year car. This hypothetical 1985 Mexican-made car made would also emit substantially more pollution than a 1985 model year car with an odometer reading of 124,000 miles (200,000 kilometers) sold 16 years ago in the US.

Today, one of the great challenges to the further reduction of air pollution levels in Mexico City is the dilemma of eliminating those obsolete vehicles, which will continue to emit large amounts of ozone and aerosol precursors for many more years unless some additional measure is taken to increase the elimination rate of this segment of the fleet. Emission standards for in-use vehicles in Mexico are already quite stringent, especially in Mexico City. Further pollution reduction from old vehicles is expected with the revamping of the Inspection and Maintenance Program that is currently under way. This program includes better quality assurance and control, as well as more effective enforcement at both testing facilities and on the roads to prevent, as otherwise may happen, grossly polluting vehicles from obtaining their emissions certificate or to circulate without taking a test.

In order to help other countries to avoid the mistakes that Mexico made in the past, the World Bank should actively disseminate information about the state of the art in emission standards among policy makers in the developing world. Over the next decade, these countries are likely to experience very high rates of motorization. Now that more and more countries are eliminating lead from gasoline, the international community should ensure that only the best vehicle technologies are introduced worldwide in accordance with specifications of available fuels in any given country. The importance of adoption of stringent standards worldwide is supported by the fact that about half of the vehicles that will be in the streets of the world's main megacities in the year 2010--the target year for emission reductions cited in *Fuel for Thought*--have yet to be manufactured.

Within this fact lies a great opportunity for the World Bank to take a leadership role in emissions reduction by offering assistance to countries that are attempting to introduce new emissions standards. As clearly stated in *Fuel for Thought*, the Bank can and should capitalize on its comparative advantage in several areas of energy-environment knowledge management.

One specific recommendation I would make to the Bank is that it produce country-specific guidelines for the transport sector in developing countries, expanding on some of the technical reports it has already published. An example of this kind of work is found in the form of the report *Policy Issues in Revising Transportation Fuel Specifications in Mexico* (Kojima and Bacon, 2001), an excellent paper that has already come to be regarded as a seminal reference for environmental and energy authorities. This publication opens the door to understanding how international trends for fuels and vehicles are likely to influence future policy decisions in Mexico on these matters.

Access to the best knowledge of the issues will help the Bank clients produce plans that efficiently target their particular environmental issues, such as the promotion of a better performance of urban transport (both private and public) through improved fuel specifications and engine characteristics. Standards delayed can too easily become standards deferred--a consequence that benefits no one.

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CASE STUDY

Shining a Light on the Poison Hearth

A Multisectoral Team on Indoor Air Pollution

Mention the phrase “air pollution” and what immediately comes to mind are images of smokestacks and exhaust pipes, machinery and factories--the stuff of industrialization. Yet the most devastating form of air pollution, at least to those who breathe it, has been with us since humans first built fires in caves. In the developing world, according to the World Health Organization, indoor air pollution kills more people than does smoking. And most of that pollution is produced by a family’s means of cooking and heating--a stove or open pit fire fed with wood, coal, dung or vegetation. Still, because it is a problem as old as humankind, it has often been overlooked.

For Kseniya Lvovsky, an environmental economist at the South Asia Environment and Social Development Unit, it all began at a conference on environmental health held in India in 1998. Lvovsky was slated to deliver a presentation on the economic cost of urban air pollution--a grave threat to the health of low-income city-dwellers--in India and other developing countries. But at that conference, Lvovsky heard a presentation by Kirk R. Smith, professor of environmental health at University of California (Berkeley), that forced her to rethink the whole issue of air pollution. (Professor Smith’s essay, “Sustainable Energy and the Environmental Risk Transition,” appears on page 60.)

The topic was indoor air pollution in India, where 69 percent of households use biomass fuels for cooking and heating. Its toll on human health as reported by Smith was mind-boggling. “His numbers with regard to the health impact of indoor air pollution were much higher than mine were for urban air pollution,” Lvovsky explains. “His numbers were bleak.”

Estimates of premature deaths in India due to indoor air pollution exposure, Smith reported, range between 500,000 to 2 million per year. The labor required by women to collect the fuel sources that caused the pollution were having additional health impacts: miscarriages, prolapsed wombs, and other health problems due to hours of back-breaking drudgery required for collecting the wood and crop residues commonly used to feed the hearth. Smith’s estimates, however, were based on the very small number of studies that had been conducted on the problem. Lvovsky came away convinced that indoor air pollution needed to be accorded high priority in development research, and set about gathering like-minded colleagues to work on the issue. Because of the range of disciplines required to tackle the problem, it seemed that a multisectoral team devoted to indoor air pollution offered a real opportunity to realize Fuel for Thought’s emphasis on upstream analytical and advisory activities, and the importance of creating viable policy frameworks.

Douglas Barnes, a sociologist known for his work on rural energy issues, had just joined the Bank’s South Asia Energy and Infrastructure Unit, and his expertise was put to work almost immediately on what was fast becoming a multisectoral team on the indoor pollution (IAP) issue. Rounding out the team are Masami Kojima, a petroleum sector and air quality expert in the Bank’s Oil, Gas and Chemicals Department; Sameer Akbar, an engineer with a doctorate in environmental health; and Priti Kumar, an environmental specialist with experience in public awareness campaigns. Together they form the Bank team working on the “India: Household Energy, Air Pollution and Health,” an activity funded by ESMAP and the Government of Norway. Members of the Bank team

work in concert with counterparts in various ministries and entities of the Government of India and the Indian State of Andhra Pradesh.

In addition, study teams composed of academics and scholars at Indian institutions and the University of California (Berkeley) were created to tackle three specific project components: exposure assessment and modeling, assessment of India's program to encourage the use of more efficient stoves, and evaluation of a scheme undertaken by the State of Andhra Pradesh to promote fuel-switching by low-income households from biomass sources to liquefied petroleum gas. Kirk Smith agreed to lead the exposure assessment team. Participating in India are Sri Ramachandra Medical College in Chennai, Institute of Health Systems and the National Institute of Rural Development in Hyderabad, and Winrock International India and the Tata Energy Research Institute (TERI) in Delhi. (An essay by TERI Director-General R. K. Pachauri, "The Unmet Challenge of Rural Energy Supply For The Poor", appears on page 66.)

TERI was also a partner in organizing a regional workshop in Delhi on the findings of the study and other household energy and indoor air pollution issues, one of the largest-ever gatherings of experts on these issues in the developing world. Convened in May 2002, the workshop brought together more than 150 people--from some 15 countries--who work in various sectors and represent a spectrum of organizations.

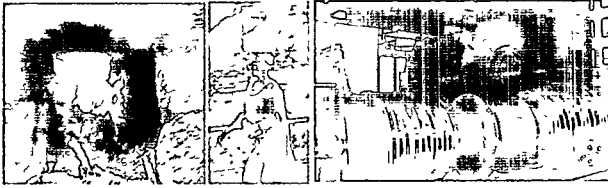
An interdisciplinary approach

Taken alone, access to better technology, whether through improved incomes or other means, will not prove a cure-all.

When addressing a situation as deeply personal as the means by which people make their meals, cultural considerations and human behavior come into play, whether one is collecting data from households, or convincing families to either cook on a new kind of stove or switch their fuel source altogether. Sameer Akbar recounts the story of a fuel-switching program in a town in northern India that encountered difficulties because village men preferred the taste of bread cooked in a dung-cake fire. An assessment of several stove programs, undertaken by TERI and Winrock, shows that improved stoves whose purchase by poor families enjoyed a high level of government subsidy were less likely to be properly cared for than those purchased at near-market value. The Indoor Air Pollution newsletter issued as part of the study reports that "many programs that had the potential of alleviating indoor air pollution...met with limited success because of the lack of consideration for women's needs and preferences."

In addition to raising awareness among development experts about the danger of indoor air pollution and exploring a range of solutions, the South Asia Indoor Air Pollution multisectoral team is engaged in a number of activities designed to spur the change needed to protect the health of women who spend most of their lives tending the hearth, along with that of their children. Soon to be published is a report on the IAP team's research that will make specific policy recommendations based on study findings, and will put forth the recommendations that emerged from the regional workshop in Delhi. The Indoor Air Pollution newsletter published by the team highlights and assembles, in an accessible manner, studies and data on various themes in the team's purview: a review of India's improved cookstove programs, the importance of energy choices in the quest for gender equity, a recap of lessons learned at an international conference on respiratory diseases. Work in the field includes collaboration and knowledge-sharing with government entities at all levels in India, encompassing ministries and agencies across sectoral divides, including those responsible for health, energy, environment, housing and rural development.

Already the IAP team has succeeded in shining a light on the problem of indoor air pollution, and its multisectoral approach has been adopted by Bank teams addressing the same issue in Guatemala and China. Time will tell how its work affects the lives of the families who today still gather at poison hearths.



Perspectives on Sustainable Energy Systems

by Dina El Naggar

VIEWPOINT

As concern grows over the consequences of the global patterns of energy use, strategies for the production and delivery of energy are being rethought by leaders of governments, international organizations, and private enterprise. The term “sustainable energy” is increasingly used to describe energy systems that are compatible with broader concepts of sustainable development. However, argues the author, the task of creating positive change within the energy sector is complicated by rapidly shifting financial, economic and political realities, particularly in developing countries.

Over the course of the next two decades, investment in the international energy market is expected to rise to \$5 trillion¹ in the developing world, where most growth in energy use will take place. Truly effective use of these investment dollars will require unprecedented international and regional cooperation in the development of markets and the promotion of all sorts of partnerships between the public and private sectors. Within this scope, new opportunities will emerge to ensure that this expansion of the energy industry—from upstream operations to downstream deliveries—is environmentally sustainable and climate-friendly.

At the G-8 summit held in 2001, leaders of member countries reiterated their commitment to carry on “the research and investments to promote the diffusion of renewable [energy] all over the world.” This statement begs a number of questions, including several that are particularly pressing. To what extent does the statement of the G-8 hold the promise of meeting, by 2010, the energy demands of the 2 billion² people who live without electricity? If the G-8 are to meet their commitment

to renewable energy, what might the necessary new partnership arrangements look like? And what kind of new relationships between governments, private sector entities, multilateral financial institutions, development and nongovernmental organizations are required for the pursuit of this goal?

Clearly the consensus among the G-8 nations (and much of the rest of the world) is that energy supply and consumption must be developed in a sustainable manner--be less polluting, more efficient, and more accessible to the general public. But unless governments and international stakeholders devote due attention to increasing energy efficiency, developing renewable technologies, and promoting the conditions that attract and maintain investment in this sector, the "sustainable energy" concept will remain in the realm of wishful thinking.

Energy policy institutions and technology transfer

In developing countries, a plethora of inconsistent administrative rules and procedures often limit the capacity of energy policy institutions to guide sustainable and effective investment within the sector. Today the governments of many of these countries rely on energy planning institutions that either maintain their autonomy within the government system or occupy specialized ministries. Even when they're not, as they often are, a direct product of development assistance organizations such as the World Bank, these structures are commonly enabled by other players in the global development community. Yet, in most developing countries, such institutions simply don't work. The problem often stems simply from the contrast in salaries between public- and private-sector positions. When so many of a nation's best minds are lured by the rewards of private-sector employment, governments are left to make do with a limited number of professionals who have adequate experience and skills for the crafting and maintenance of effective institutions. In this respect, all forms of knowledge exchange and capacity building (including adequate compensation for government professionals) are critical to achieving a sustainable energy future.

The resources of governments and multilateral institutions are, however, not enough. In the long run, only the broad dynamic reach of the market economy offers the ability to address the world's energy requirements. Perhaps the most crucial role governments can play in the creation of a sustainable energy future is in leveling playing fields so that markets will work most efficiently. The removal of economic barriers to technology transfer from industrialized to developing countries would go a long way to meeting this end.

Unfortunately, the wisdom of facilitating the transfer of environmentally sound technologies to developing countries is still debated. Too often, packages designed to promote technology cooperation and the transfer of necessary technological know-how are not rooted in an integrated approach to addressing the economic, technical and managerial requirements for efficient use and further development of the transferred technology. When these schemes run out steam due to poor design, naysayers are handed the means to bolster their arguments.

If it only had the resources, the Global Environment Facility (GEF) would hold one of the keys to ensuring a sustainable energy future. A substantially replenished GEF would, among other things, continue to provide support, within its mandate, for capacity building and the transfer of technology for the advancement of energy

† One trillion = 1,000 US billion

‡ One billion = 1,000 million

for sustainable development in developing countries. International financial institutions should, through their lending policies, support capacity building and technology transfer along the same principles.

For energy solutions to be compatible with sustainable development principles, the participation of all stakeholders, including the everyday citizen, is critical. Community-based organizations are ideally placed to facilitate participatory approaches to energy for sustainable development. Their capacity to do so should be strengthened, taking into account Principle 10 of the Rio Declaration on Environment and Development, which asserts that “environmental issues are best handled with the participation of all concerned citizens...” The Principle goes on to outline the rights of citizens to know of the environmental threats they face and to participate in the decision-making process on environmental issues.

The role of markets in sustainable energy

With 2 billion people across the world lacking access to the most basic of modern energy sources, there exists a need to identify sustainable choices and success criteria for overcoming this global energy poverty. This calls the question of how best to realize an international mix of energy sources, public-private partnerships and standards for guiding market forces in energy deregulation.

Driven by forces of competition, markets often do a better job than administered systems in allocating resources. But unless proper incentives are created, the marketplace will fail to adequately account for the social and environmental costs of energy provision and use. Policies that reduce market distortions are likely to produce energy solutions that are compatible with sustainable development. By removing existing obstacles to renewable sources, energy efficiency measures, security of supply measures, effective pollution control and the introduction of new and advanced energy technologies, policies that reduce market distortions would constitute a first step towards sustainable development.

National energy markets are in need of functional improvements that will support sustainable development. As a means to harness the capital and expertise of private enterprises, many countries are turning toward markets for the development of energy production and the management of distribution and consumption activities.

Nevertheless, markets alone cannot ensure broad access to energy for poor populations or the further introduction of environmentally sustainable technologies. Governments should build on the strength of markets while addressing their limitations through selective market regulations.

More emphasis should be given to creating open and competitive energy markets within a regulatory framework that is effectively administered by governments at central and local levels. Among other tools, governments need to be encouraged to promote environmental cost internalization. Due account should be given to the “polluter pays” principle, whereby polluters meet the costs of correcting negative impacts on the environment such as clean-ups and pollution-control measures.

Based on international experience, a number of factors have been identified that contribute to the sustainability of energy services provided by the private sector:

- Price signals that are predictable and reflect the true cost of services
- Clear market rules, evenly and impartially enforced
- Unrestricted business environment for offering new forms of energy services
- Access to customer information for marketing purposes
- Introduction of retail competition among profitable market segments
- Market rules that allow the same firm to offer combined supply- and demand-side energy services

Marshalling the resources

As many of the recommendations made here require financial investment, the agreements reached at the 2002 International Conference on Financing for Development in Mexico could have important consequences. Furthermore, the agreements reached in the Marrakech accords on the means of implementation of the Kyoto Protocol, as well as the outcome of the 2002 World Summit on Sustainable Development, are likely to facilitate the implementation of some of the interventions called for in this essay.

Together with other partners and players in the development sector, the Bank should continue to seek opportunities for the allocation of resources to the design and execution of energy policy in the poverty reduction strategy papers (PRSPs) that form the basis of the Bank's work in a given country. The development of innovative financing models, such as microcredit lines, should be pursued, with special emphasis on the needs of the lower-income developing countries. In this context, consideration should also be given to how official development assistance can be best used to leverage private funds for the creation of energy solutions that are compatible with sustainable development.

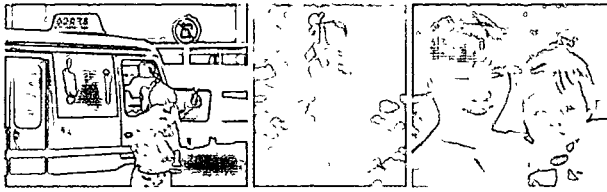
In the interest of achieving market stability, the ongoing dialogue between producers and consumers of energy should be strengthened. Establishing an international resource of policy options may be helpful in channeling this type of guidance to developing countries--if it is aimed at capacity-building and offers policy options for the design of appropriate, attractive environments for infrastructure investments by the private sector.

Within this context, cooperation between developing countries should be effectively facilitated, particularly as it relates to the experience of the successful implementation of assistance programs for cleaner energy. The Bank should strengthen its mechanisms to facilitate and finance access to, and the transfer of, environmentally sound technologies and corresponding know-how that are available mostly in the industrialized countries. These should be offered on favorable terms in line with those called for in the Report of the United Nations Conference on Environment and Development (also known as Agenda 21) that came out of the 1992 Earth Summit in Rio de Janeiro.

The road to sustainable energy systems will require travel along many paths--in governments and markets, in cities and farm towns, at global summits and in village councils. The means are within our grasp; the end is a matter of will.

At the time of writing this Viewpoint essay, Dina El Naggat was director of the International Affairs Department at the Ministry of the Environment in Egypt, where she was active in the Government of Egypt's programs in local and global environmental issues. She now works for the United Nations in Egypt.





Pay Now, Reap Later: Investing in China's Environment and the Global Environmental Commons

VIEWPOINT

by Shen Longhai

Making a case for the long view, an energy expert and former government official of the People's Republic of China advocates for improving energy efficiency and increasing renewable energy use in developing nations.

In the development of a nation's economy, the energy sector can be said to be the undergirding infrastructure of that economy, without a developed and integrated energy system, it is unlikely that any nation can advance its economy or much improve the standard of living of its people

Indeed, the impact of energy systems on the general well-being of a nation--at both the societal and individual levels--is gaining recognition, for the burden of inefficient modes of energy generation and consumption borne by the environment ultimately affects human health, placing stresses on both society and economy. This growing awareness of the relationship between energy and well-being is in part owed to strategies designed and implemented by the World Bank Group, the Global Environment Facility (GEF) and other international organizations that promote sustainable development by building environmental components into energy projects

Today, as we take on the urgent task of economic development and its attendant energy needs, we face serious challenges. How do we avoid severe damage to environment while consuming energy? How best to save energy and use it economically? What must be done to create a benign cycle between energy and economy and environment to achieve sustainable development and raise the standard of living? In my view, the Bank and other

large players in development could create positive change by investing with conviction in efforts to produce and use traditional energy sources more cleanly, in those that seek to develop and implement technologies for new and renewable energy sources, and still others that result in more efficient uses of existing technologies

Traditional energy

Promoting more effective uses of traditional energy and increasing the use of clean traditional energy rank foremost among the energy priorities for sustainable development. For the foreseeable future, traditional energy, such as coal, petroleum and natural gas, will continue to be the main energy sources for most countries as they seek to meet the needs of their populations and develop their economies.

China is rich in coal, which has long been the country's main energy source. After 10 years of concerted effort, however, the use of coal in both primary energy production and consumption has been reduced. In 1990, 74.2 percent of primary energy production came from coal; by 2000, coal generation accounted for 66.1 percent of primary energy production. In the area of consumption, even greater strides were made in reducing coal use, with a 15 percent reduction achieved between 1990, when coal accounted for 76.2 percent of energy consumption, to the 61 percent share of energy consumption it held in 2000.*

Yet, despite the reduction in coal's share of overall energy production and consumption, levels of carbon dioxide, sulfur dioxide, and soot from the burning of this dirty energy source continue to climb. Currently, China ranks second in the world--just behind the United States--in carbon dioxide emissions. In order to reduce pollution and environmental degradation from the burning of coal, we will have to do the following:

- Optimize the primary energy mix, gradually reduce coal use, and decrease its proportion in primary energy production and consumption
- Vigorously promote clean coal technology, such as coal washing, coal gasification and liquefaction, and the use of coal briquettes and coal slurry.
- Increase the use of such clean traditional energy technologies as natural gas and hydropower.
- Adopt new technologies and equipment to improve efficiency of traditional energy sources for end-users
- Improve the efficiency of household coal-burning in rural and suburban areas, and replace coal and other dirty sources with clean energy as soon as possible, reducing indoor and outdoor air pollution.

Clean and renewable energy

Taken alone, more efficient use of coal does not amount to a sustainable energy strategy for China or any developing country. If we are to thrive in the years ahead, we must vigorously develop new clean energy and renewable energy

With its broad prospects for sustainable development, renewable energy, though regarded as cleaner than traditional energy sources, is likely to only partially replace traditional energy well into the future, taking a small portion of the primary energy production and consumption mixes in developing countries.



“China’s vast rural
and remote off-grid areas
are rich in resources for
renewable energy”

Yet the vast rural and remote off-grid areas in developing countries are rich in resources for renewable energy, both traditional and alternative, and only a small proportion of these have been exploited. Nonetheless, technologies for the production of renewable energy should be supported and developed, even if their immediate development is not economic in focus. The payoff over the long run that renewable energy sources and new energy stand to yield far outweigh any short-term economic liabilities they may carry. The use of such technologies will certainly help to raise the standard of living of certain populations, as well as protect the ecological balance of those areas to be served by renewables.

For example, China is currently carrying out plans to use renewable sources of energy (excluding the traditional use of small hydropower and biomass sources) to bring electricity to 1.3 million households in remote rural areas where the local population derives its livelihood primarily through animal husbandry. China measures energy in terms of the amount of oil that would be required for the same output by another energy source; the measure is expressed per ton of oil equivalent, or “toe.”

From now until the year 2005, China plans to exploit and consume 13 million toe of new and renewable energy annually to serve this rural population, whose more than 1 million households account for 5 to 6 million people. As these households become less dependent on the burning of coal, the implementation of this plan is expected to reduce greenhouse gas emissions by 10 million tons, and the combined discharge of sulfur dioxide emissions and soot by more than 600,000 tons. A number of different new and renewable energy sources offer promise. A wise approach will encompass a mix of new technologies, embracing the following mandates:

- Develop windpower. Construct large-scale windpower fields in grid-connected areas that are rich in wind resources. Extend the use of wind and solar energy, diesel and other co-generation systems in off-grid areas. Develop small-scale windpower apparatuses for the scattered populations that tend herds.
- Increase the use of solar photothermic energy sources, including solar photovoltaic technologies.
- Make use of biomass sources that produce methane.
- Make use of geothermal energy. Integrate geothermal energy with energy conservation in larger buildings, promoting the use of ground-source heat pumps in the heating, ventilation and air-conditioning (HVAC) systems of buildings.
- Adjust measures to local conditions when exploiting small-scale hydropower plants, adding new facilities in response to local needs and tailoring existing facilities to unique local requirements.

Improving efficiency

At present, the efficiency of energy production and consumption is relatively low in developing countries, with a large amount of highly energy-consuming and highly polluting equipment still in use. If further environmental degradation is to be avoided, vigorous efforts must be made to improve the efficiency of energy production and consumption.

In China, the country's main products--from washing machines to air conditioners to motor vehicles--expend 40 percent more energy than similar products made in more industrialized countries. Therefore, there exist huge potentials for energy conservation and reduction of greenhouse gas emissions. Through the manufacture and use of more energy-efficient equipment and vehicles, China plans to save 340 million toe of energy from 2001 to 2005. This will lead to a reduction in greenhouse gas emissions by some 150 million tons of carbon equivalent. Other energy-saving measures are also called for:

- Improve energy production efficiency. In addition to generating energy by more efficient means, overall production efficiency would be enhanced by reducing the level of loss in the production of traditional energy, new energy and renewable energy. Such losses occur through the spillage of petroleum and gas, natural gas flaring, and electric power transmission losses.
- Improve energy consumption efficiency for end-users. In developing countries, the burning of fuel is often done wastefully by inefficient means, severely damaging environment and affecting people's health and quality of life. This issue must be addressed *as soon as possible*; change in this area is urgently needed.

Different sectors, different needs

The various sectors of the economy will, of course, require different approaches:

- **Agriculture, China's primary industry** - Technologies that conserve water and save oil will increase overall energy efficiency while promoting environmental sustainability, as will the reduction of the agriculture sector's dependence on petroleum.
- **Manufacturing, China's secondary industry** - Standards of energy efficiency have yet to be set for equipment, construction materials and durable goods, depriving the nation of a double-bonus. The implementation and enforcement of such standards will not only improve the environments in which these products are used, but will make such products more desirable in the export market. The time has come for the elimination of highly energy-consuming but low-efficiency products from product lines. Aggressive promotion of energy-saving new technologies and high-efficiency products will further their acceptance by cost-conscious consumers. When making efforts to save energy, emphasis should be placed on the energy-consuming metallurgical, non-ferrous, chemical, petrochemical and building material sectors.
- **Service or tertiary industries** - Emphasis here should be on the systemic conservation of energy in the buildings that house such industries, such as large commercial buildings, office buildings, hotels and hospitals.

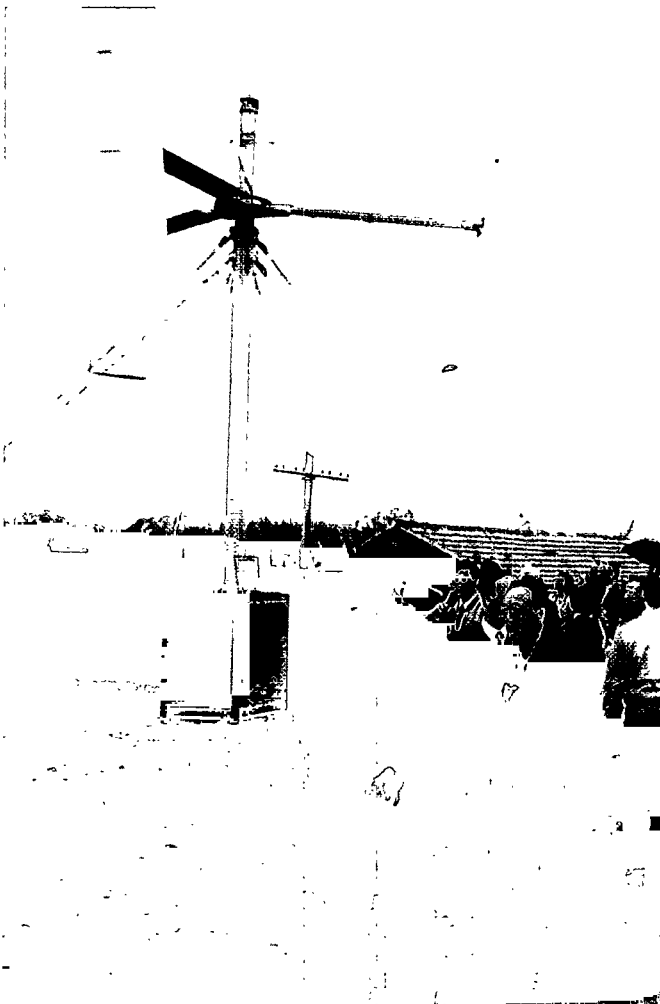
As a whole, the conservation of petroleum and electricity is being given priority as a means of increasing efficiency. We in China will continue to improve petroleum use efficiency and develop alternatives to oil. We will also continue to reform the country's electric power system and promote the demand-side management of the sector. In the meantime, unremitting efforts will be made to popularize energy-saving lights and high-efficiency electricity-saving designs of such products as transformers, motors and household appliances.

The role of the global community

Although the World Bank Group has embarked on projects designed to improve energy efficiency and make renewable energy available, this support must be strengthened if it is to yield significant results. The study and assessment of indicators in developing countries for the implementation of projects that link energy to environment is not yet strong enough to be broadly effective. Indeed, the World Bank has made great and fruitful efforts in this respect, setting short- to medium-term and long-term indicators for the appraisal of projects in different regions, but more is needed. Since indicators change with the development of economies and societies, it is essential that further study and frequent revisions be made.

Capacity building, information exchange and dissemination of knowledge offer the possibility of truly sustainable energy and development. Although the Bank places great emphasis on these activities, current levels could stand improvement.

Funding for the development of renewable energy remains spotty, and projects and activities that increase access to energy-efficient technologies could use a shot in the arm. Greater support for reform and transformation mechanisms in developing nations will accelerate the pace of improvements. For example, popularizing the creation and introduction of energy performance contracting and developing energy service companies (ESCO), which are based on market mechanisms, would enhance sustainability efforts. With support from WBG and GEF, China has set up and is successfully operating three ESCO pilot projects and an energy conservation information dissemination center. We hope for continued support for the promotion of ESCOs in China, including training, committed funding, and capacity building.

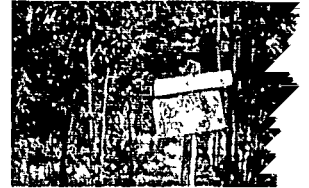


“Support for renewable energy and energy efficiency must be strengthened.”

Saving energy throughout the world

Finally, in my opinion, the World Bank and other international organizations should continue to support worldwide energy-saving efforts with the following measures:

- To advance the cleaner and more efficient use of energy, further increases are needed in the proportion and support for funding of projects that link energy to environment.
- Improving energy efficiency and increasing the use of new energy technologies and renewable energy add up to an effective formula for reducing greenhouse gas emissions and protecting the environment. Special measures taken to help developing countries eliminate difficulties in conserving energy and overcome obstacles to--and reduce the cost of--the use of regenerative energy will pay off soundly down the road.
- Better coordination and collaboration is needed between the entities of the World Bank Group--including its Asia Alternative Energy Program (ASTAE), Energy Sector Management Assistance Program (ESMAP), and the Multilateral Investment Guarantee Agency (MIGA)--and the United Nations Development Program and the GEF, in addition to more bilateral and private funding.
- Adopt vigorous measures to promote and apply the energy performance contracting mechanism in developing nations, help them eliminate barriers to getting information and financing, and develop ESCOs that conform to their own needs and conditions.
- Provide support to developing countries for the development and use of new energy technologies and renewable energy sources, and help them to remove market development barriers, especially in certain impoverished areas.
- Keep priorities straight when assessing the energy sector in relation to poverty and environment. In impoverished areas, the primary task--before other considerations--must be to reduce the number of people living in poverty. In other areas, efforts should be made to achieve coordinated growth between energy, economy and environment, and to reduce outdoor air pollution.
- Provide more energy services to rural areas in developing countries. In China, for example, the implementation of the strategy for the development of the western part of the country will be greatly expedited by the assessment of markets for renewable energy in the rural, northwestern region. Support for use of new energy technologies and renewable energy sources in western China, while promoting coordinated growth in energy, economy and ecological environment, will round out an integrated strategy.

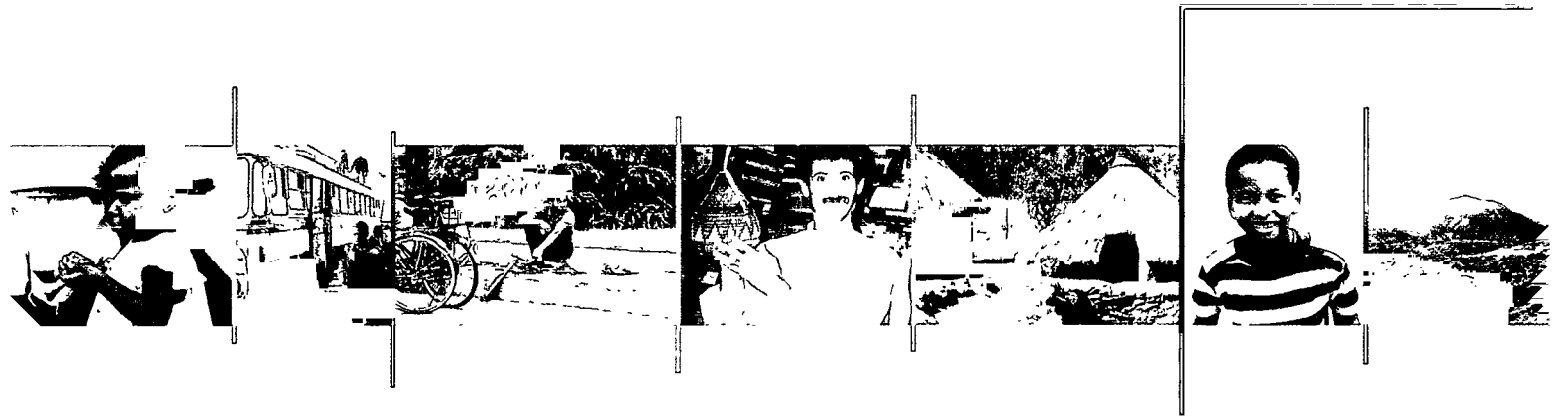


Perspective on the long haul

As a nation with a long and storied history of technological development and innovation, China enjoys a perspective on the future that is enhanced by the length of its past. From this perspective, we can easily see the day when today's investments in new technologies--even if a bit pricey in the present tense--will improve the quality of life for our people and, indeed, the better part of the world's.

Shen Longhai has held many government positions in the People's Republic of China, including director general for Energy in the State Economic Commission and for Resource Conservation in the State Planning Commission. He has served as vice chairman of the China Energy Research Society and was economic counselor at the Chinese Embassy in Washington. He is currently advisor to the China Energy Conservation Investment Corporation.

* State Development Planning Commission's 10th Five-Year Plan, People's Republic of China



PART THREE

The poor are
most vulnerable
to air pollution



BREATHING EASIER: REDUCING AIR POLLUTION

The link between air pollution and fuel use is not simple but, as city dwellers know from their own experience, breathing polluted air is more than unpleasant; it is often harmful, too. The effects of exposure to high levels of some pollutants can have serious consequences for people's health and, as illness takes over, affect the quality of their lives. In industrial countries, the problem is well on its way to being solved by a combination of improved technology and more stringent regulation. But in the developing world, air pollution remains a huge problem.

The poor are most vulnerable, because they are the ones who find it most difficult to escape or avoid the pollution. *Fuel for Thought* estimated that there were 4 million premature deaths worldwide caused by smoke and soot--fine particulates in the jargon--of which nearly 60 percent were among children under the age of five. The most common forms of pollution-related disease are respiratory infections.

There is also an economic effect both at a personal and national level. As poor health begins to sap a person's ability to work, income falls as that person is forced to take time off work. For example, drivers of three-wheel taxis in Dhaka, Bangladesh, have to, on average, take off seven days a month as the result of respiratory infections that are at least partially attributable to exposure to the smoke from their own machines.

Meanwhile, getting treatment (where that is possible) adds to the cost of living. The same effect feeds through to the economy as a whole: lost days at work and increased healthcare costs are thought to absorb up to 5 percent of the national income in China and a comparable amount in many other countries. So where do we find the culprits?

In homes throughout the world, burning fuels for cooking and lighting--especially when there is no means to let the smoke escape--results in high levels of indoor air pollution. Some fuels are worse than others, but typically biomass--wood, crop residues or dung--create the most, and the most harmful, pollutants. For many, particularly the poor, using these traditional fuels is unavoidable because they cannot get access to or afford the more modern, cleaner burning fuels such as kerosene and gas. And for the poorest, access to electricity remains an elusive goal.

In urban areas, concentrations of buildings, vehicles, industry and commerce, all consuming fuel and emitting the products of combustion, combine to produce high levels of pollutants in the air. Sometimes, too, local

climatic conditions add to the problem by trapping the polluted air. The worst pollutants are again fine particulates: lead, which is often added to gasoline to improve engine performance, and the various oxides of sulfur and nitrogen.

In addressing airborne pollution, *Fuel for Thought* identified two major areas for action: first, helping the transition from traditional fuels to modern; and second, dealing with urban air pollution. Positive effects on reducing poverty, as well as improving the quality of people's lives, are expected from these actions; by helping to reduce illness and premature death, people will be free to lead more productive lives, and resources that are now spent on caring for people to be diverted to other uses. And since using energy in a way that causes less pollution at the local level also involves using it more efficiently, it yields an added bonus of helping to address global environmental problems. More often than not, higher efficiency means that carbon dioxide (CO₂) emissions are reduced, with positive effects for the global environment.

Part III looks over what the Bank Group has done to address clean air concerns in its energy programs since the publication of *Fuel for Thought*. At the end, we have a case study that looks at approaches to battling urban air pollution, both indoor and outdoor, in Asian cities. Two Viewpoint essays from experts in the field, Kirk R. Smith of the University of California at Berkeley and R. K. Pachauri of the Tata Energy Research Institute in India, close our discussion.



The need to address indoor air pollution is now widely recognized.

Facilitating the Transition From Traditional to Modern Fuels

Fuel for Thought calls for significant progress to be made in three areas. First, it advocates a move toward improved household access to the cleaner commercial energy sources such as kerosene, liquefied petroleum gas (LPG) and electricity that cause less harmful pollution inside the homes of users. Because stoves and lanterns that use modern fuels also tend to be more efficient than those that do not, household expenditures stand to be lowered by a need for less fuel. There is also an increasing body of evidence to suggest that children tend to study more and do better when their homes are lit by electric light.

Second, the *Fuel for Thought* agenda proposes an increase in wood fuel production by improving sustainable agriculture and land management. This element of the strategy recognizes that in the short to medium term, many people cannot afford or get access to modern fuels. Rather than having to rely on intermittent supplies of such fuels as crop wastes or on wood harvested unsustainably, the idea is to help people get access to a more reliable and sustainable source of these biomass fuels. One side-benefit of improved land management is its income-generation potential; jobs are created as gathering and selling wood becomes a community enterprise.

Third, by increasing production and use of cleaner forms of traditional fuel such as charcoal and biogas, *Fuel for Thought* suggests an intermediate approach. Switching to these cleaner sources of energy can reduce indoor

air pollution without household investment in modern fuels and the equipment needed to use them. This is particularly attractive in remote rural areas where the supply chains for liquid fuels such as kerosene and diesel may be very long and unreliable, as well as costly.

Improving Access to Modern Energy

In upstream undertakings that address these goals, progress has exceeded expectations. Pre-project activities, such as Energy-Environment Reviews and outreach to clients, have taken place at levels a good bit higher than had been planned for the short term. The Regional Program on the Traditional Energy Sector (RPTES) for Africa has been expanded and now involves 16 countries, with its work integrated into a number of downstream projects in, for example, Chad, Mali and Mozambique.

One of the main conclusions of a recent joint study carried out by the Bank and the World Liquefied Petroleum Gas Association in four countries in West Africa is that there is a large potential market, especially in rural areas. As the study points out, LPG has the advantage of providing a healthy, convenient, portable fuel, while also reducing deforestation in the region.

Extending electricity supply to those without it, of which there is a long history in World Bank Group operations, is still being actively pursued. The Bank has nine operations under way and IFC is supporting several distribution operations that will extend access to rural localities that are typically left out of distribution schemes. In recent years, a marked growth has been seen in the use of renewable sources of energy. These include the use of small hydropower and solar photovoltaics for meeting demand where inclusion in the more traditional central grid is not economically feasible. In all, the Bank Group has 15 investment operations in this area. Beyond investment operations, the Bank Group is also assisting countries develop and implement an improved enabling environment for private sector investors.

ESMAP has proposed the Global Village Energy Partnership (GVEP) to capitalize on the main lessons learned over the past two decades from a wide range of investments and efforts in rural energy. Propelled by a sense of urgency to achieve the Millennium Development Goals and fulfill the poverty reduction strategies of the Bank Group's clients, the Global Village Energy Partnership is put forward as a way to do more, better and faster, in providing modern energy services for the transformation of the rural sector. The proposed objective is to build bridges between rural customers, markets, research, private investors, governments and financiers by providing services that enable each stakeholder to increase its level of activity and efficiency. The undertakings of GVEP would cover a range of energy services, with emphasis on motive power, lighting, low-grade process heat, and modern cooking fuels. The idea is to integrate those services with income-generating and social uses, making the critical link to direct poverty reduction.

Dealing with Indoor Air Pollution

The need to address indoor air pollution is now widely recognized by many international aid organizations, governments, academic institutions and NGOs as an important development challenge. In fact, ESMAP-sponsored studies have identified indoor air pollution as having the most serious impact on human health, ahead of hydro dam development (resulting in water-borne diseases) and fossil fuel combustion.

The World Health Organization (WHO), with contributions from the World Bank, prepared a paper for the Commission on Macro-economics and Health that summarizes substantial evidence of the health impacts of traditional household energy use, assessing a range of interventions and calling for an upscaling of global efforts for concerted action. Several international forums have already taken place to advance the research and policy agenda in this area. A Web-based dialogue on household energy and health launched by the Shell Foundation resulted in active participation and discussion by various stakeholders around the globe. A year and half ago, ESMAP launched a study that is exploring various linkages between household energy interventions and



exposure to indoor air pollution in India. This action has led the government to attach a high priority to indoor air pollution in the environmental health sections of its new five-year plan document.

Over the last year, the Bank has helped a number of client countries embark on new initiatives to combat indoor air pollution (IAP). Guatemala is undertaking a study of the health impacts of traditional energy use and mitigation strategies. China and India are designing intervention-based studies to evaluate the health benefits derived from the use of various models of improved stoves and other household-level approaches, and to develop and market rural energy programs more effectively in the future. In Mongolia, a project with GEF support includes measures to lessen indoor air pollution. Armenia integrates IAP considerations into its heating strategy, prepared with the help of the Bank. In South Asia, IAP-related work is expanding to Nepal and Pakistan, while a new study in India will specifically assess the impact of petroleum sector policies on access of the poor to cleaner household fuels.

While the increase in knowledge, awareness and interest in the issue across countries, sectors and different segments of societies has been most impressive, the challenge remains in identifying and scaling up cost-effective and sustainable solutions. Because of the high level of activity on this objective in regions most affected by indoor air pollution and the use of traditional fuels, the Bank-wide review of this issue called for in *Fuel for Thought* is no longer necessary.

Protecting the Health of Urban Residents From Air Pollution

In its attack on urban air pollution, the World Bank has zeroed in on a manageable number of the world's most polluted cities, and trained its focus on a limited number of pollutants: particulates, lead from gasoline, and sulfur. This focus allows the Bank Group to target those things causing the greatest harm that can be remedied in the most cost-effective manner.

The task is broad; addressing this problem will require the conversion of large energy consumers--district heating systems or power stations--from dirty fuels to cleaner ones (for example, a switch from coal to gas). The same must be done by thousands of small consumers in transport, businesses and homes

Tackling this range of activities again employs the three major tools at the Bank Group's disposal: getting the right policies in place, making knowledge available and providing financing. The task involves helping to finance new equipment and appliances, eliminating price distortions between fuels and regulating fuel and air quality. There is, nevertheless, a broad consensus that reduction of any one pollutant cannot be tackled in isolation, but



The reduction of
any one pollutant cannot
be done in isolation...

must be viewed as one of the first steps in a broad, integrated air pollution management program. The aim over the longer term is to match the restructuring of the commercial fuels sector, including the commercialization and privatization of clean fuel distribution and marketing, with integrated air pollution management. Thus many of the Bank's activities on pollution rank among its most interdisciplinary in the energy sector, requiring input from specialists in other Bank sectors, such as transport, environment, and urban.

Eliminating Lead from Gasoline

Lead is a cumulative poison to the human central nervous system. While one of its most well-known effects is to permanently lower the IQ of children, it also harms adults as well. The problem of lead poisoning arises in urban areas because lead compounds are added to gasoline which, when burned in car engines, are emitted as particulates that contaminate the air. The urban poor tend to be worst affected because they live at street level and often on the busiest roads in a city, leaving them the least opportunity to escape from the pollution.

Lead-elimination programs have shown themselves to be easily replicated from one country to the next, attracting *strong interest from our clients*. Countries in all of the Bank's six regions have either eliminated lead from gasoline, or are committed to do so. Further replication is being promoted through programs on clean air and clean transport fuels.

Fuel-Switching

Promoting fuel-switching--most usually from coal to some other fuel that produces lower emissions--can make significant contributions to reducing air pollution. In urban areas, fuel-switching projects and the promotion of cleaner fuels are running at about the level called for at this stage in *Fuel for Thought*. Several activities, both upstream and investment, promote fuel-switching from coal to gas, which tends to reduce at once emissions of particulates and the oxides of sulfur. Some projects are focused on the larger users--for example, converting district heating plants from coal to gas in Beijing, or the substitution of geothermal energy for coal in Poland. Other projects take place at the grassroots level: helping urban residents get access to liquefied petroleum gas (LPG), for instance, is being promoted by three projects supported by IFC. (See Box 11.)

Box 11

IFC Projects Promoting Use of Liquefied Petroleum Gas (LPG)

IFC is evaluating a number of projects promoting the use of gas as a substitute for other household fuels, thus helping alleviate the effects of indoor air pollution. One project in northwestern India would establish an LPG bottling plant that will market bulk and bottled gas to commercial establishments and households. In another proposed investment in Argentina, IFC financing would expand the reach of a natural gas distribution company's network to households. A proposed project in Hebei province in Northern China will alleviate the inadequate and inefficient supply of LPG. In each of the projects, the gas will substitute for the kerosene or fuelwood (India and Argentina) and coal (China) used in households, all fuels that generally produce high levels of indoor air pollution, a major cause of respiratory disease, especially among women and children.

Source: IFC

Where switching to a cleaner fuel is not possible, the next best choice is to ensure that the fuel is used in as least harmful a way as possible. In practice, this often concerns coal. The Bank Group is not extensively involved in traditional coal-fired plants, and its influence in this area is comparatively small, though many private firms and companies report that, regardless of the source of financing, they adhere to the standards for emissions set out

in the *Pollution Prevention and Abatement Handbook*. The Bank continues to support efforts to develop cleaner coal for power production with, of particular note, a substantial amount of work having been done in China under ESMAP and Japanese funding, and also to support an integrated gasification combined-cycle coal plant in Slovakia.

Clean Air Action Plans

A number of projects on urban air quality improvement have moved into the implementation stage, including the Clean Air Initiative launched in the Latin America and Caribbean Region. (See Box 12.) The Bank is now in the process of launching a similar initiative in the Africa Region. Meanwhile, the Bank's South Asia Region has begun developing a regional air quality management strategy.

Box 12

Latin America and Caribbean Region Clean Air Initiative

The Clean Air Initiative (CAI) is a partnership between the World Bank, city governments, private and public institutions, development banks and agencies, ESMAP and NGOs interested in collaborating to improve the understanding of problems and provide tools to city leaders for making the difficult choices involved in addressing air pollution and mitigating its health impact. CAI activities include city action plans and workshops, clean air toolkits and distance learning courses, along with the promotion of public-private partnerships for the introduction of clean technologies.

The CAI has been successful in raising awareness of urban air quality issues in major (and highly polluted) cities in Mexico and South America. In 2000, the CAI supported city-specific action plans and workshops in Buenos Aires and Santiago, following the those held the previous year in Lima-Callao, Mexico City, and Rio de Janeiro. A CAI Web site has been developed to facilitate exchange of experience. Leveraging consultant trust funds, private sector contributions, and in-kind contributions from technical, bilateral, and multilateral agencies, the CAI can execute a work program that includes continuation of workshops and development of air quality action plans in major cities (Lima-Callao, Rio de Janeiro and Buenos Aires), the application of a health-based economic toolkit to establish priorities, a clean technology information pool (in advanced stage of preparation), distance learning courses, and other products (such as the preparation of an emission inventory for stationary source for Buenos Aires, which recently started).

Source LCR

As the work on pollution reduction expands, it shores up the case for pollution reduction as an instrument for poverty reduction. Projects increasingly provide evidence of benefits to the poor from clean air, not only in terms of health, but also in terms of income. Local benefits from emissions reductions plead the case for investing in remedies to issues that were, in the public mind, once located solely in the realm of the global commons. Designing incentives for creating policies and attracting investment in such win-win solutions, however, remains a challenge.



CASE STUDY

Getting Personal About Particulates

A Tale of Two Cities: Grassroots Work in Bangkok and Ulaan Baatar

As capital cities, they represent two extremes: Bangkok, Thailand's center of government and commerce, is a modern, congested metropolis whose 7.5 million residents race about unfazed by the perpetually steamy weather and annual floods. In Ulaan Baatar, Mongolia's capital, 300,000 of its 700,000 denizens reside in traditional tents (gers) in one of the coldest urban climates on the planet. In fact, Ulaan Baatar has the distinction of being the world's coldest national capital.

What, then, might these two Asian cities have in common? Both suffer from a high level of air pollution of the type thought to be most damaging to human health: airborne particulates composed of unburned fuel. In both cases, these particulates find their source in indispensable devices that represent their owners' means of survival.

At home in Ulaan Baatar

In Ulaan Baatar, the coal stove used for both heating and cooking dominates the tent of the city's poorer citizens, and it burns coal most hours of the day during the eight months of frigid cold that Mongolians endure every year, polluting the air both indoors and out. For residents of Bangkok, the ubiquitous motorcycle is a year-round vehicle, and vital to the livelihoods of many lower-income citizens. As in much of Asia, most of Bangkok's motorcycles feature simple but inefficient two-stroke engines, many of which are poorly maintained and incorrectly fueled. These engines are believed to account for as much as 40 percent of ground-level emissions of greenhouse gases in cities such as Bangkok, where they propel the majority of motor vehicles. The sight of men in surgical masks revving their bikes amid clouds of white smoke is one of Bangkok's most common. And, in both cities, the poor are more susceptible than others to the damaging effects of air pollution, as they often find themselves trapped in polluted environments, with little access to health care.

To the people of Mongolia, Thailand and the World Bank, it was clear that nothing short of personal contact with stove owners in Ulaan Baatar and motorcycle riders in Bangkok could hope to make a dent in local pollution levels. And no one solution to these apparently simple problems presented by inefficient devices would suffice, since circumstances differed among both stove-owners and motorbike riders. So hands-on projects were designed for each city.

Before solutions were undertaken for Ulaan Baatar's problematic stoves, ESMAP carried out a survey of 40 households, and performed various tests on existing stoves in order to pinpoint problems in design. Since the elimination of coal as a household fuel in Ulaan Baatar is an unrealistic short-term goal, the project focused on design improvements to new stoves, and ways of increasing the efficiency of the homemade stoves most commonly in use. Tests and surveys were carried out with the help and input of a number of players, both in and out of government. (The Mongolian Women's Federation, a 75-year-old umbrella organization for the women's groups whose members administered the survey, played a crucial role.)

The design issue was approached at three levels. First, a local manufacturer of an already well-designed stove was provided with technical assistance to improve its efficiency even further. Second, a kit for the improvement

of existing stoves was designed, and technicians trained to install its parts. The kit and installation were then offered to stove owners for a fee about equal to the first year's savings in coal costs estimated to result from the improvements. (Coal savings through use of this kit amounted to between 30 and 40 percent.) Third, for those unable to pay for an upgrade, instruction was given on how to improve the performance of their stoves through their own efforts, using inexpensive materials such as construction blocks.

Together with the Mongolian government, ESMAP is pursuing its goal of making improvements to 70,000 stoves in Ulaan Bataar's ger district through a combination of education (disseminating "best practices" information to owners), incentives for upgrades and assistance to the stove manufacturer. The project holds the additional promise of helping Mongolia's transition to a market economy through micro-credit schemes for the finance of new stove purchases, and aid to small businesses built around the installation of improvement kits

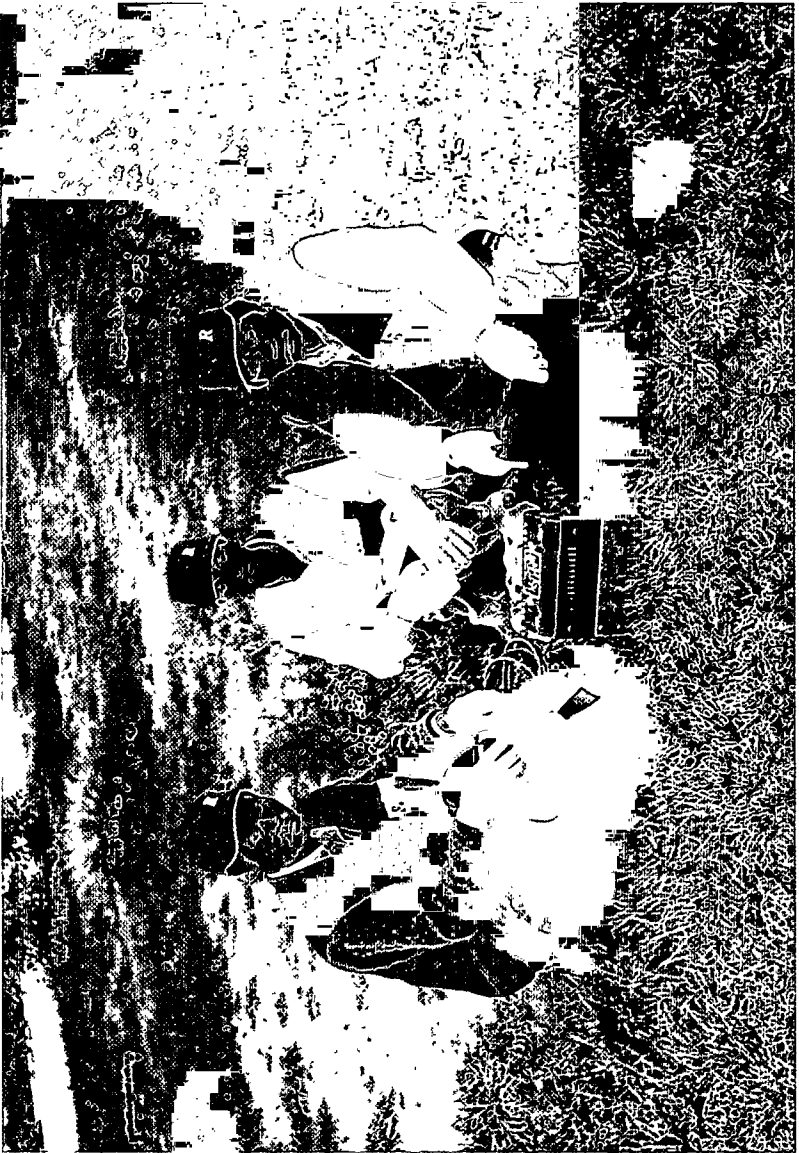
On the streets of Bangkok

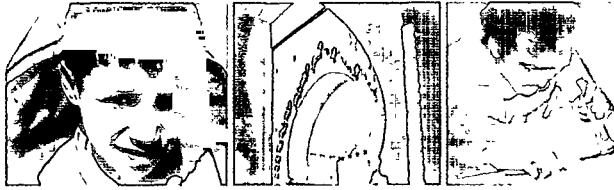
In Bangkok, ESMAP—in partnership with the Thai government, the Bangkok Municipal Administration, motorcycle manufacturers and petroleum companies—drew motorcycle riders to free tune-up clinics with colorful banners, free soft drinks and other treats. While riders got their engines tweaked, ESMAP got an opportunity to assess the condition of Bangkok's motor bikes and an idea of what percentage of the fleet can be improved with repairs, and how many may simply need to be replaced.

At two clinics held in 2000, mechanics combed over some 1,500 motorcycles, adjusting carburetors and chokes, and testing the tuned-up bikes for emissions. Of the bikes tested, some 300 failed even after improvements were made. Their owners were then offered an opportunity to replace their existing bikes with new, cleaner-burning four-stroke models, for which the manufacturer agreed to make the down payment and assume insurance costs, while the owner takes on the monthly payments.

Through this innovative ESMAP project, the World Bank hopes to educate the driving public on how best to fuel and maintain motorcycles, and achieve a general upgrade of Bangkok's growing fleet of motorcycles. In both the Bangkok and Ulaan Baatar projects, everyday people hold the keys to a healthier future for their communities.







Sustainable Energy and the Environmental Risk Transition

by Kirk R. Smith, Ph D

VIEWPOINT

An expert in public health explains how the environmental risk transition works, and its role in making sound decisions in the design of sustainable energy solutions.

If the ultimate goal of development is an enhanced quality of life for all the world's people, the most essential measures of developmental success are those that pertain to human health. Transition frameworks--models that plot shifts in conditions within a given population--have a long tradition in development thinking.

Foremost among the different types of transition frameworks is the demographic transition, which describes the sequential shifts in birth and death rates and the resulting shifts in population growth during development. A model called the epidemiologic transition, which describes the shift in societal mortality patterns due to various health conditions, offers a particular view of the demographic transition. In the epidemiologic transition, assessments of the impact on longevity of a range of causes, from acute and infectious ailments to those due to chronic and non-communicable diseases, are measured, along with increases in life expectancy as development proceeds.

Less recognized, however, is the fact that before disease and mortality patterns can change, the risks that lead to disease must change. Thus, before arriving at demographic and epidemiologic transitions, the "risk transition" must be calculated.

Energy's role in the environmental risk transition

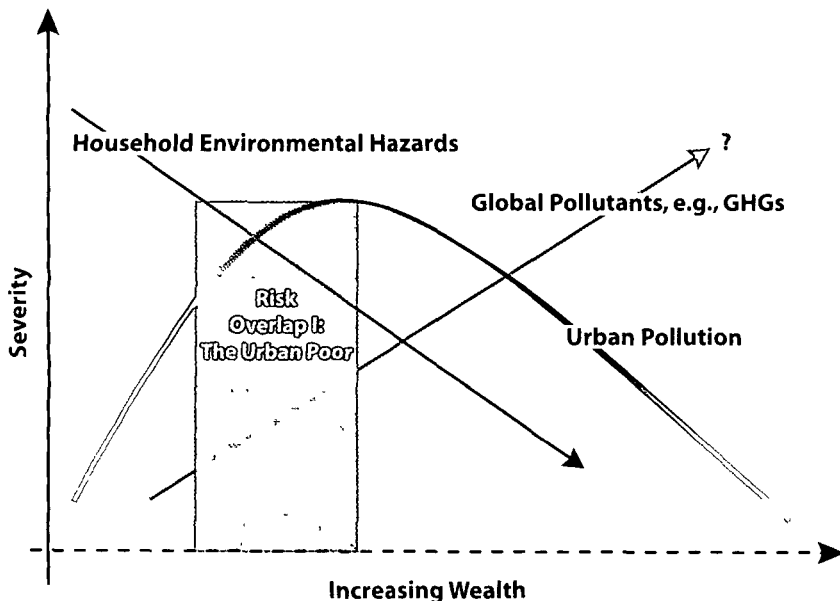
In any such risk transition, environmental risks related to energy systems play important roles. These risks generally unfold in three stages.

The first set of environmental risks operates at the household level, where the effects of poor food, water, and fuel quality, along with lack of sanitation and proper ventilation, take their toll. Factors such as crowding, malnutrition, and lack of education exacerbate these risks. Urbanization, industrialization, increased use of motor vehicles and other development processes usually lead indirectly to a reduction of these household risks, due to positive changes in income, education, housing, and collective action.

Such processes, however, also tend to bring a second set of environmental risks, including exposure to hazardous chemicals, industrial waste and outdoor air pollution. In urban settings, these affect health primarily at the community scale. Due in part to their obvious visual and olfactory insults, these are the risks that prompted the rise of the modern environmental movement in developed countries.

As countries addressed these community risks, however, a third set of risks emerged, operating on an even larger scale. Most prominent among these are the global risks accompanying greenhouse gas (GHG) emissions, which are emitted in largest amounts by those countries that have dealt best with household and community risks. (See figure.)

The Environmental Risk Transition



This is as if society started by sweeping household pollutants and related risks out the door and into the community at large. To handle the resulting problems, cities then pushed the risks off into the world as a whole. Alarming as this sounds, the net change at each stage has been positive for health, although the jury is still out on the health impacts of climate change.

Across the development spectrum, the environmental risk factors that most affect human health flow from energy systems. Carbon dioxide from fuel combustion is the main driver of global climate change, creating potentially significant global health risks. In cities, health risks due to pollution from fuel combustion are the most prevalent among the many community-level environmentally driven health problems. Air pollution from solid fuels--wood, coal and biomass--form an important part of the household-level environmental health risk, although risks associated with poor water, hygiene, and sanitation are deemed more deadly when examined in the global context.

During the risk transition, the temporal as well as spatial scale of risks generally increases. In other words, time spans and geographic reach tend to expand as the transition progresses. For example, the most significant category of diseases resulting from household risks are those that primarily affect young children, especially such acute conditions as diarrhea and life-threatening respiratory infections. Here, because the time constants are on the order of days and weeks, interventions ought to produce nearly immediate improvement. At the community level, however, chronic diseases such as cardiopulmonary disease and cancer tend to be the most troubling results of environmental risks. Here intervention will likely produce major change only over a period of years. Move to the global level and we find that, because of the long time constants of the climate system, noticeable improvements due to interventions are likely to be expressed only over a span of decades.

Risk overlaps

Groups most threatened by environmental risks are those who live in what might be called the "risk overlap areas". (See Figure) Overlap Region I is occupied by the urban poor, who still live with the household risks associated with rural poverty (poor fuel, bad water, little sanitation) but who also tend to live in areas with the worst of the community risks (garbage, air and water pollution, industrial waste). Synergies--the creation of risks and vulnerabilities that would not exist in either of the stages separately--account for the high level of total risk in this overlap situation. Those who live in Overlap Region I, for example, may be more vulnerable to infectious diseases due to exposure to chemical agents. Indeed, the biggest impact of community-level risks may occur in this population, which generally does not participate in the processes that create the risks.

A category known as Overlap Region II (not shown in Figure) represents the entire population most at risk today from household pollutants as that ultimately most at risk from climate change. Here it is nearly certain that the health risks associated with climate change are highest in those groups least responsible for the greenhouse gases that may cause it.

Consequently, these two risk overlap regions represent the most egregious cases of global environmental inequity. Here we see that those who absorb the greatest environmental health risks neither cause nor enjoy the benefits of the processes that have created the risks they endure.

In truth, these risk transition models track generalized trends; in reality, there is much variation and a lack of sharp boundaries between phases. Even in the richest societies, for example, household risks are not eliminated entirely, and greenhouse gases are emitted even by the poorest. Chronic diseases produced by household risks and acute conditions are exacerbated by community risks. Environmental inequity is not merely a problem between rich and poor societies; it exists *within* rich societies as well. As a general framework, however, the risk transition model helps to conceptualize shifts in the largest risks and their relationships to each other. In addition, although such transition frameworks are useful general constructs, they should *not* be considered

descriptions of unavoidable destinies. Indeed, they are better described as management tools--ways to map out the trends of important parameters--for the making of informed decisions.

Risk transition and Fuel for Thought

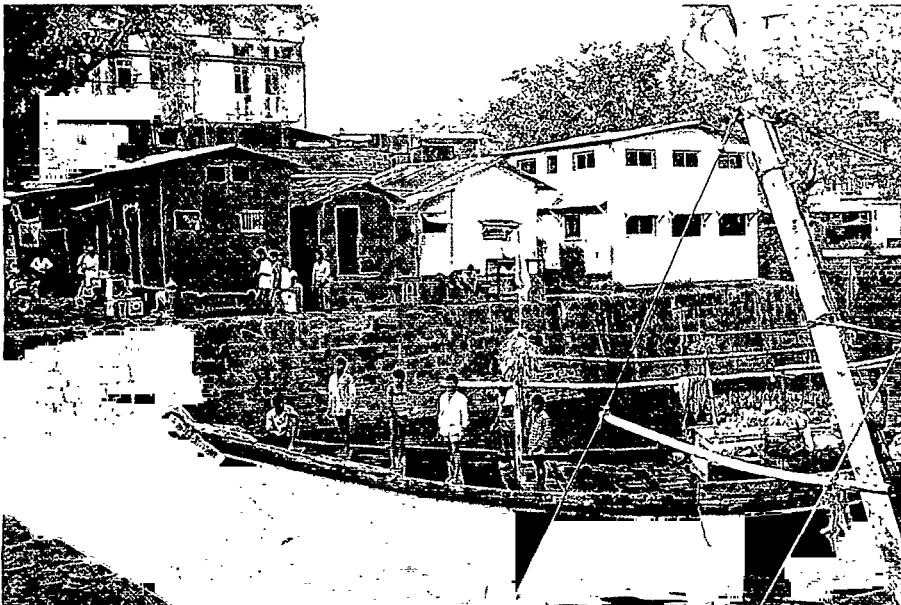
The environmental risk transition holds real promise as a tool for meeting four of the six strategic objectives set out in the Bank's sector strategy paper, *Fuel for Thought*:

- Facilitate more efficient use of and substitution from traditional fuels in rural and peri-urban areas to reduce health damage from indoor air pollution and pressures on natural resources.
- Protect health of urban residents from air pollution due to fuel combustion in the residential, transport, industrial and power sectors.
- Promote environmentally sustainable development of energy resources.
- Mitigate the potential impact of energy use on global climate change

These objectives focus on reducing the most important of the energy-related health risks worldwide. The first, which is probably the largest of the three, speaks to a problem, use of traditional fuels, that disproportionately affects the world's most vulnerable and least enfranchised populations and household members. The second takes on an issue, air pollution due to fuel combustion, that reduces the health and productivity of those segments of societies that tend to be the most economically productive. In the third objective, that regarding sustainable energy development, one finds a guiding principle for the crafting of energy solutions: making sure that oil, gas and coal production are done in a way that has minimum negative environmental impact--even, preferably, a positive impact. The fourth objective cited here addresses a trend, global climate change, that puts at greatest risk those who are already most stressed.

In a transition situation, there are two general approaches to ameliorating hazard: improve existing practices or accelerate movement through the transition. The first *Fuel for Thought* objective rightly targets both by proposing to improve the efficiency and cleanliness of existing fuels for populations that, for decades to come, will have little access to alternatives and, for those populations nearer the transition point, accelerate movement up the household energy ladder to cleaner fuels. Success in these endeavors will, however, require a better understanding of these market segments than that held today in development circles.

Which local conditions (fuel availability and demand, household income, time use, cash use, agricultural type, skill levels, space-heating needs, etc.) are predictive for the application of which marketing approach? Some populations are nearly ready to move to liquefied petroleum gas (LPG) or kerosene for household needs, with



“In essence, society started by sweeping household pollutants out the door and into the community at large...”

perhaps little external incentive beyond the stabilization of supply. Others may be induced by reasonably small, short-term subsidies of various kinds. In some developing societies, a willingness to pay for sophisticated improved stoves with long lifetimes may evolve once people are convinced that these represent true household assets. Those in greater poverty may be able to afford only simple stoves with short lifetimes that are made from local materials. For the poorest communities--those that rely on biomass for fuel--perhaps only hygiene education as part of primary health care is appropriate at present. Once the spectrum of niches is better understood, appropriate tools and measures can be marketed with a higher degree of success.

Some observers will question whether encouraging those in biomass-burning households to switch to fossil fuels for household needs would qualify as the sustainable energy development set forth as a strategic objective in *Fuel for Thought*. In this context, I propose that it does, for two reasons: First, it is believed that a significant number of such households are harvesting biomass fuels nonrenewably or taking them from more productive applications, such as soil maintenance. Thus, current practices are not entirely sustainable. Secondly, even if all such households switched to LPG, the resulting impact on world petroleum supplies would be so small as to be easily offset by the slight reductions expected in the growth rate of vehicle fuel demand. Given that nature has provided us with a one-time gift of high-quality, low-cost liquid and gaseous fuels, should not they be allocated to the highest-value uses? And what higher value is there than providing a convenient, long-term, clean and efficient fuel for the kitchens of the world's poor? If sustainability is defined by long-term use that promotes health and environmental quality, the efficiency clearly fostered by a move from biomass to fossil fuels for household use surely qualifies as sustainable energy development.

The interaction between phases of the risk transition provides some interesting possibilities for optimizing strategies to meet the *Fuel for Thought* objectives. For example, one of the principal sources of urban air pollution in much of the developing world is household use of solid fuels by the urban poor. From the standpoint of overall outdoor pollution, such fuels are rarely the major cause of outdoor pollution over the entire city, although they are sometimes a major component.

But because it is released in areas where people are most likely to breathe it in over prolonged periods of time, the waste produced by these household fuels account for a much more important portion of total exposure than other pollutants. Indeed, the intake fraction (also called, variously, exposure/dose or efficiency/effectiveness) for emissions from household fuels is higher than that for nearly all other sources. Obviously, this is so when the pollution is released indoors, but is true even when its pollution flows outdoors (either out the windows or out a chimney). Thus, per unit of outdoor pollution, household sources tend to be more damaging to health than other urban sources.

This can be seen in the so-called neighborhood pollution effect in which solid-fuel burning residential areas--where people, including the very old, young, and ill, spend a great deal of time--have higher local outdoor levels than the city as a whole. Add in the substantial level of emissions produced indoors (where the intake fraction is even higher) by solid household fuels, and one finds the total impact per unit emissions to be higher by orders of magnitude than those of typical outdoor sources.

Clearly, then, addressing the problem of highly polluting household fuels in poor areas of cities is among the most effective means of reaching *Fuel for Thought's* second strategic objective. Given the intake fraction of household releases, acceleration up the energy ladder to LPG will have better results than a mere switch to improved stoves that simply move the pollution outside.

Although not a major cause of the build-up of greenhouse gases (GHG) in the global atmosphere, simple stoves using solid fuels produce substantial measures of GHG emissions per unit of energy delivered. This is because they divert a substantial amount of the fuel carbon into products of incomplete combustion, most of which, like methane, rate more strongly as greenhouse gases than does carbon dioxide. Combined with the low overall efficiency of simple stoves such fuel/stove combinations can produce substantially more GHG per meal than

an equivalent LPG stove, even when their biomass fuel is harvested renewably. This implies a convergence of interests between *Fuel for Thought* Objectives 1 and 4: Increasing combustion efficiency will not only lower household health damage but also reduce GHG emissions. Indeed, in many circumstances, moving up the energy ladder to LPG would actually accomplish both goals.

A worthy goal

Clearly, neither urban pollution nor global warming find their primary sources in household emissions. Indeed, eliminating household emissions would do relatively little to completely solve either. However, as demonstrated through the use of risk transition models, the cost effectiveness of urban and global pollution control is quite high in the household sector. Of course, overall cost effectiveness of these controls is generally high, but is almost certainly so when the substantial household benefits of control are included as well

Why not then target control measures first in the places where benefits per unit investment are highest at the low end of the cost-effectiveness curve? Doing so has the additional advantage of addressing risks of the very populations most imperiled by all three categories of pollution, a worthy goal indeed.

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The Unmet Challenge of Energy Supply for the Poor

by R. K. Pachauri, Ph.D.

Meeting the energy needs of the poor, argues this expert in sustainable energy, will require trusting and empowering local players to implement small-scale, community-based solutions.

The past five and a half decades have seen unprecedented growth in the global economy and expanding prosperity in countries on nearly every continent. Unfortunately, this has also been a period when the economies of other nations stood still, while large segments of their populations actually slipped deeper into poverty. The problem is not merely that of static or declining incomes among the poor, but stems from an actual scarcity of essential and basic necessities required for human existence.

VIEWPOINT

Crisis in crucial commodities

Cooking fuel and other forms of energy are particularly crucial commodities for the world's poor. The scarcity of cooking fuel, which in most countries takes the form of fuelwood and twigs (and even, in some cases, undried leaves), has actually reached levels that border on a crisis. In recent years, the World Bank and other development assistance organizations have focused their attention on this problem, but the backlogs of the past and the paucity of workable models of success require unprecedented efforts and innovative solutions that do not, as yet, appear on the horizon.

National plans in developing countries (which often emulate the policies and strategies of industrialized nations) for the creation and expansion of energy supply industries often lack the requisite intellectual effort or material resources needed for the provision of modern energy solutions to rural areas. Development assistance organizations in the past have favored large power plants and other conventional energy supply facilities, several of which continued to receive financing even as the rates of return from these projects declined precipitously.

By its own account, the World Bank's record of power-project financing, as shown in an internal analysis carried out in the early 1990s, established a trend of declining rates of return, perhaps because these projects were almost invariably placed in the public sector of developing countries that had inadequate capacity for implementation and lacked the resources for proper project management. Among the driving forces behind the Bank's investment in these operations was an energy sector staff composed of professionals steeped in experience of conventional power projects.

However heartening it is to see, in recent years, more attention paid to basic cooking energy and other end-uses of energy essential for household activities, these efforts represent but small forays into a vast and largely uncharted territory.

Keeping it local

First among its objectives, the 2001 World Bank *Report on the Status of Implementation of Fuel for Thought* rightly lists the facilitation of more efficient use and substitution of traditional fuels. Among the indicators on which measures of progress are based are improvement of household access to cleaner commercial energy, increased wood fuel production, and increased production and use of charcoal and biogas. Serving this strategic objective, the report cites 14 projects that are either under way or in the pipeline. While this is a start, the sheer enormity of the task requires a substantially higher level of effort. The World Bank must also mobilize other sources of financing in this area, and, during implementation, move away from its traditional reliance on governments and public sector players, and toward NGOs and other actors in civil society.

While the strategy is right to focus on the environmental benefits that could flow from reforms to the use of traditional fuels, the impact of various modes of traditional fuel use on the health and welfare of the users demands equal attention, especially in the area of household fuels.

In a major project carried out by the Tata Energy Research Institute (TERI), it was established that, in India alone, 2.5 million people die prematurely due to air pollution—primarily indoor air pollution. City slum-dwellers are most at risk for early death due to pollution. Not only do they face indoor air pollution due to the use of inferior fuels, inefficient cook stoves and ill-ventilated homes; they often live on urban roadsides, close to the worst pockets of outdoor air pollution. Still, more information is needed on this subject: studies on the health impacts of indoor air pollution should be carried out extensively in a number of countries, and their results disseminated effectively to policy makers.

National banks and other stakeholders should become more proactive in the field, so that suitable substitutes for the use of inferior fuels are created, and resources allocated adequately for well-structured programs in this area. Unfortunately, in the past, the area of rural energy, as well as the parallel energy dilemma found among the urban poor, has never been addressed, simply because it was believed that growing incomes would fix the problem.

As incomes increased throughout the world, it was reasoned, people would move, step by step, up an “energy ladder” that placed inferior traditional fuels on the bottom rungs, and superior and less-polluting fuels at the top. But this simply did not happen—firstly, because incomes in many countries never changed appreciably for the vast multitude of the poor, and, secondly, energy supply organizations have generally proved totally ineffective in extending supply arrangements to areas characterized by extensive poverty. Innovative approaches, therefore, are essential if we are to break out of the current crisis.

Community ownership

One reason why energy programs for the poor have not generally succeeded is because energy interventions were considered and implemented in isolation. A better approach is one that seeks to integrate interventions and initiatives in several matching areas, so that opportunities are created for the poor to enhance their incomes and utilize energy—not only for household purposes, but also for productive uses that would have a market value.

A strategy formulated by TERI called INSTEP (Integrating New and Sustainable Technologies for Elimination of Poverty) Global is based on such an approach, whereby energy interventions would be combined efficiently with innovations in agricultural technology, information technology, and microfinancing, as well as in technology for efficient uses of natural resources such as water.

The program would target local societies as the main players in decision-making and implementing programs. Typically, in the work that has been done by TERI, a committee is established in a poor village which makes decisions related to new technologies and new choices for energy supply based on its own assessment of basic needs. Government schemes in India provide subsidies for the use of renewable energy and other such interventions, and the benefit of these should be provided directly to the community.

The committee in the village, while being responsible for the provision of different technologies and devices, also becomes responsible for collecting payments against services provided. For example, the establishment of a community solar water heating system in a Himalayan village in northern India would work something like this: Householders line up for hot water from this device and make payment to the energy committee for each bucket used. These fees are then applied to the cost of running and maintaining the device.

Microfinancing, naturally, becomes an essential part of initiatives of this kind, and this is an area in which conventional banks are not likely to succeed, since the effectiveness of the scheme depends on community involvement, and on more informal systems of credit and recovery than banking systems would permit.

Development assistance organizations, undoubtedly, cannot implement programs of this type, since they have neither the wherewithal to plan and implement these activities, nor the direct links to communities that would

ensure success. It is here that a coalition, composed of research and academic institutions together with NGOs, needs to work to form an effective instrument for action

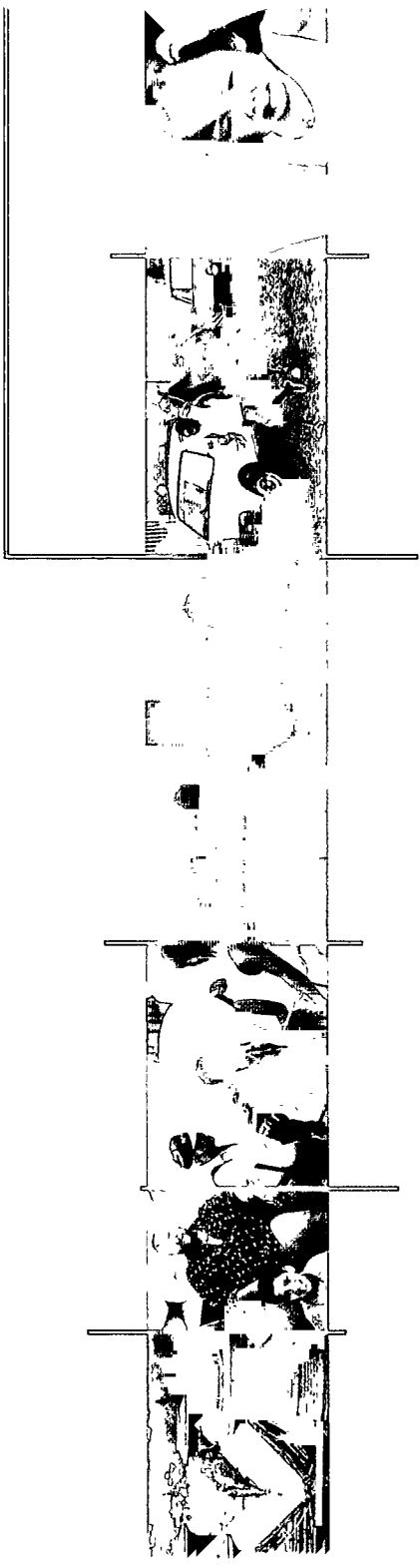
Road to controversy, or to a better life?

Admittedly, such an approach is bound to be controversial, since a large program of this nature would require a sharp departure from typical operations of most development assistance organizations. But if success is to be measured in terms of the number of lives improved, along with the environmental benefit that would accrue to both the local and global communities, the choice is very clear.

The *Fuel for Thought* process should not be permitted to end with a single document, no matter how enlightened its content. Innovative thought requires vigilance. It is essential that the World Bank radically alter its approach to the energy problems of the poor, because by bringing civil society further into the process, the vexing problem of poverty may also find solutions.

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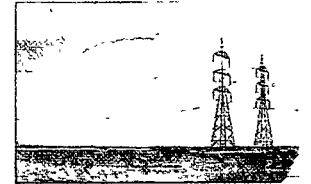


PART FOUR

Win-win solutions

integrate local and

global concerns



GETTING BETTER PERFORMANCE FROM THE ENERGY SUPPLY BUSINESS

Making sure that energy is used in a way that causes the least environmental harm is half the battle in the quest for sustainability. Equally important is ensuring that it is *supplied* in ways that do not damage the environment. The environmental effects of the energy supply side can be highly localized, such as the dirty tailing heaps surrounding a coal mine. The effects can also be global, as when power plants emit large amounts of carbon dioxide (CO₂), a significant greenhouse gas and the main contributor to global climate change.

Through two of its objectives, *Fuel for Thought* focused on the energy supply side: promoting environmentally sustainable development of energy resources, and helping to tackle climate change. Part IV looks at the results achieved so far, and features a case study on one partnership that is working to address both objectives by *reducing* gas flaring. We have Viewpoint essays from Bernard Bulkin, the chief scientist of BP, and Thomas Johansson, a scholar and practitioner in the field of climate change, on how further progress may be possible.

Promoting Environmentally Sustainable Development of Energy Resources

With this objective, the World Bank Group aims to reduce the level of environmental degradation throughout the energy-use chain. The goals this objective seeks to meet include environmentally sound exploration, reduction of spills and gas flaring, environmentally sustainable mining operations, and better handling of byproducts and residuals.

The short-term targets for Bank activity on this objective have been met, including the start of rapid environmental assessments in India, and a broadening of the portfolio of Energy-Environment Reviews to include work in several regions. Analytical and advisory activities are inspiring the creation of innovative projects. One particularly ground-breaking effort in Bolivia, described as a case study at the end of Part IV, grew out of analytical and advisory work on energy development and indigenous peoples.

The investment portfolios of the International Development Association (IDA) and International Bank for Reconstruction and Development (IBRD) in the rehabilitation and restructuring of mining activities are strong.

Currently, eight coal mining rehabilitation and restructuring projects are being implemented or are in the preparation stages. Oil and gas projects serving this objective include the Chad-Cameroon oil pipeline (see Box 13), the West Africa Gas Pipeline, environmental performance improvement projects in the Russian Federation and Romania, and an onshore oil clean-up project in Azerbaijan.

Box 13

Chad-Cameroon Pipeline

Components of the Chad-Cameroon Pipeline Project include:

- Development of Chad's Doba oil fields
- Construction of a 1,070-kilometer pipeline that runs from the Doba oil fields to Cameroon's Atlantic coast at Kribi
- Installation of an offshore floating storage and offloading vessel and related facilities
- Construction of an 11-kilometer submarine pipeline that will extend from the Atlantic coastline to the offloading vessel

To mitigate the potential environmental and social impacts resulting from the construction activities, an environmental management plan has been developed. It includes:

- Measures to mitigate biodiversity loss through environmental offsets
- Provisions for compensation and, where necessary, resettlement of affected people
- Programs to offset the indirect impacts of the project on local communities, including indigenous people
- An oil spill contingency plan
- All the normal environmental precautions associated with oilfield development and with building and operating a pipeline and an offshore loading facility.

In addition, the project is putting in place emergency funding to address the induced impacts of the project, in particular HIV/AIDS, substance abuse and other impacts associated with large construction sites.

Parallel capacity building operations for Chad should also help, among other things, to mitigate and minimize potential negative environmental and social impacts, and in the case of Cameroon, capacity building operations are designed to develop and establish a national capacity in Cameroon for the environmental management and monitoring of the Chad-Cameroon Pipeline Project. Support for environmental management and technical assistance will help both countries to realize their development objectives, namely to increase expenditures on poverty alleviation activities in Chad, and to increase funding for Cameroon's strategy for economic growth and poverty reduction.

Source. AFTEI

Work in the area of trade--a means to avoid environmental harm in the first place--requires improvements to the policy and regulatory framework. Thus, in the initial phases, it is centered on technical assistance and capacity building. The Bank Group, with financial support from ESMAP and bilateral trust funds, is providing technical assistance on natural gas in East Asia, and on electricity trade in Southern Africa, South America, the greater Mekong region, the Baltic countries, South Asia and the Nile basin.

The International Finance Corporation's strategy on energy and environment issues, as articulated in *Fuel for Thought*, is built around its renewable energy and energy efficiency activities. However, IFC's *conventional* energy projects and its nonenergy investments can also produce important environmental benefits. Indeed, the impact of IFC's efforts to improve the environmental performance of its conventional projects may be more substantial than its efforts to fund renewable energy projects. In fiscal 2001, IFC's conventional power projects included



development of large power projects fired by fossil fuel, such as gas-fired power plants and efficient combined heat and power plants, as well as financing for the elimination of losses, technical and nontechnical, in existing electricity distribution systems. Also during the year, IFC launched its Sustainability Initiative, which is described in more detail in Box 14.

Box 14

IFC's Sustainability Initiative

Many people see growth and sustainability as in conflict; you can have one, they say, but not the other. The "business case" is a key to transcending that perceived conflict: if firms can truly become better, more profitable businesses through improving their environmental, social and corporate governance performance, then the prospects for sustainable growth in developing countries are much brighter.

IFC proposes a dual approach. At the project level, it aims to:

- Maintain compliance with minimum environmental and social standards as a prerequisite for IFC funding
- When it makes good business sense, help firms go beyond minimum standards with assistance from IFC in identifying where and why this would be the case.

At the country level, IFC aims at projects with a strong developmental focus, which implies strengthened project economic analysis and a sharper articulation of the impact, and contributing to the public debate on the contribution of the private sector.

While the Sustainability Initiative covers more than just matters relating to energy and environment, it nevertheless offers a potentially important focus for the energy sector.

Source. IFC

Often associated with oil deposits is natural gas, which is also brought to the surface during the operation of an oil well. Yet in many petroleum-producing countries, natural gas has yet to become a commodity. Where there is neither a local market for the gas nor a means of distributing it to somewhere where there is, flaring (burning) disposes of the gas more cost-effectively than capturing it.

Although flaring around the world contributes at least one percent of global greenhouse gas emissions, data are hard to come by, increasing the difficulty of formulating adequate responses. Available statistics show that the volume flared is about 110 billion cubic meters annually, approximately equivalent to the combined gas consumption of Germany and France. A case study at the end of Part IV shows how the Bank, in partnership with the Government of Norway, has started to work with developing countries to find ways of reclaiming the value from this resource.

MIGA insurance is contributing, as well, to sustainable energy projects. This year, MIGA added to its portfolio an import facility for liquefied petroleum gas in the Dominican Republic. In the area of energy efficiency, MIGA has supported cogeneration in coal-fired and oil-fired power plants, as well as improvements in electricity distribution systems. In Moldova, a project to rehabilitate power transmission systems, with commensurate improvements in efficiency, in also received MIGA support this year.

Mitigating the Potential Impact of Energy Use on Climate Change

Helping to address the issue of global climate change is one of the three key principles of the strategy described in *Fuel for Thought*. At the moment, however, the Bank's level of activity in the field of climate change exceeds that anticipated in the strategy. It is not just direct investments in energy efficiency and renewables that contribute to mitigating climate change. Because of the relative size of the energy sectors in many countries, energy sector reforms can be particularly effective. These include reforms that encourage the removal of subsidies, the introduction of transparent pricing, competition, and restructuring of enterprises and the sector as a whole.

In investments relating to energy efficiency, renewables and transport, the Global Environment Facility (GEF) is the Bank Group's principal partner. Consequently, the level of GEF-World Bank Group joint activity is a good indicator of progress on this issue. Since 1997, the number of active climate change projects cosponsored by the GEF and the Bank Group has risen from 22 to 44. In fiscal 1997, the value of those 22 projects amounted to \$2.6 billion, of which \$593 million was Bank, and \$231 million GEF financing. By the end of fiscal 2001, the total value of active projects (that is, allowing for new projects starting and older ones completing) was \$4.2 billion, of which \$1.2 billion is from the Bank Group and \$414 million from the GEF. The growth of Bank Group financing is shown graphically in Figure 2. Many are cross-sectoral and rooted in the transport, health, environment and education sectors; others are stand-alone energy efficiency projects and renewable energy investments.

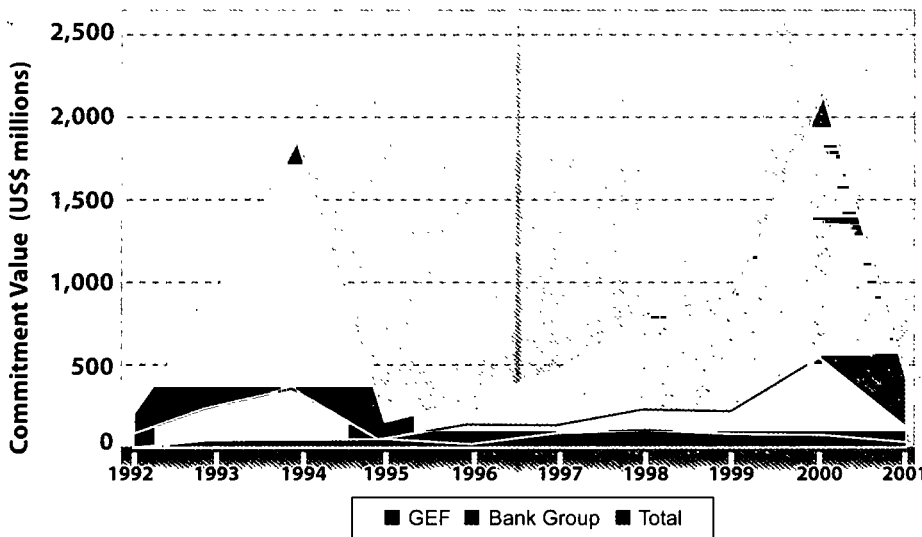


Figure 2

World Bank Group-GEF Commitment Value
Climate Change Projects

These supported projects fall under four of the GEF's operational programs. One category covers energy efficiency and includes fuel-efficient boilers, efficient chillers for air conditioning, fuel-switching (from coal to gas), promotion of efficient lighting and demand-side management activities. The second category covers promotion of renewable energy, including the technologies that are expected to be economic in the near term, as well as those that have potential to make a significant contribution to fossil fuel substitution in the long term. The last category is the relatively new area of transport, with efforts aimed to help reduce the amount of fossil fuel consumed in the sector. In that field, work includes traffic management, improving opportunities for increasing use of bicycles, using unconventional fuels in the transport sector.

The tail-off in GEF-supported commitments in 2001, as illustrated in Figure 2, may be explained by three phenomena. First, the limited GEF financing available has not leveraged funds from other sources.

Second, the growth of the World Bank-GEF Strategic Partnership for Renewables is aligned towards policy interventions that put in place frameworks for renewable energy investments. These investments are independent of the Bank-GEF projects and thus will not appear in the data.

Third, the growth of the carbon market means that many projects have other sources of finance, leaving GEF to focus on more programmatic and long-term activities. One such source of alternative finance is the Prototype Carbon fund, which is discussed in Box 15.

Box 15

The Prototype Carbon Fund: An Update

During its second year of operation, the Prototype Carbon Fund (PCF) pioneered emission reduction purchase transactions based on the Joint Implementation and Clean Development Mechanism that helped to demonstrate how the Kyoto Protocol's flexibility device could be translated into results on the ground. Particular achievements include:

- Completing the first PCF transaction, a \$2.48 million emissions reductions purchase from Latvia related to the Liepaja Solid Waste Management Project (partially financed by the World Bank);
- Building a strong pipeline of more than 45 additional projects, equivalent to more than double the fund's \$145 million in capital;
- Preparing baselines and innovative financial engineering for a variety of transactions in the pipeline;
- Developing a coherent approach to carbon purchasing, pricing and risk assessment.

The PCF disseminated the lessons learned through this experience, not only to its 23 public and private participants, but also to negotiators and market participants. To do so, PCF organized two workshops for host countries, side events at UNFCCC meetings, fellowship programs for host countries as well as participants, and a training program led by the World Bank Institute. It also issued papers on topics such as baseline development and pricing of emissions reductions, disseminated through its Web site, www.prototypecarbonfund.org, which receives an average of 2,000 "hits" a day.

These efforts enable PCF participants and other market players to gain a better understanding of how the negotiating text translates into real-world projects.

Source: PCF



IFC's own investment in sustainable energy projects, for which it assumes full risk, currently amounts to \$118 million, or about 12 percent of the Corporation's outstanding power portfolio which, as of September 2001, totaled almost \$1 billion. IFC's portfolio also includes several energy efficiency projects, some involving energy enterprises not involved in the resource or generation end of the business, for example in electricity distribution for efficiency upgrades (primarily loss reduction activities) and expansion of facilities. IFC's Executive Board approved an investment in a 21-megawatt grid-connected wind power project in India--its first--in May 2001.

The IFC portfolio also has several private equity funds such as the global Renewable Energy and Energy Efficiency Fund and Solar Development Capital, an investment fund that works with an associated technical assistance facility (Solar Development Foundation, which is partly financed by the World Bank) to expand the use of off-grid solar photovoltaic power.

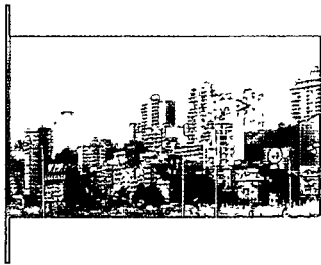
MIGA continues to complement IBRD and IFC efforts to promote policies that support renewable energy and sustainable energy development by offering to insure eligible foreign direct investments. Clean fuel and renewable energy projects are significant components in MIGA's portfolio of insured investments. The portfolio, as of June 30, 2001, continues to feature projects in geothermal, hydro, and gas-fired power generation, as well as others fostering clean fuel distribution.

One new hydropower generation project in Ecuador concluded this fiscal year. However, a hydropower project in Bolivia and a geothermal project in the Philippines were dropped from MIGA's portfolio by the choice of

the investors. As a result, the percentage of “clean” energy in MIGA’s total portfolio in the power sector stands at roughly 40 percent this year, with 2,024 megawatts in 23 contracts out of a total of 5,086 megawatts in 53 contracts. In fiscal 2000, clean fuel investments accounted for 45 percent of MIGA’s power sector portfolio.

MIGA has also been collaborating with IBRD and IFC in efforts to pilot a GEF program aimed at supporting geothermal energy. A private investor currently insured by MIGA is in discussions with the GEF for assistance in expanding its existing operations.

As the business evolves, so opportunities increase for interventions that improve the environmental performance of the energy supply business. Increasingly, the challenge is to integrate local and global concerns into win-win solutions. In so doing, the Bank Group is able to bring to bear an increasing number of instruments to support this objective. The following case studies show the breadth of these interventions.



CASE STUDY

District Heating: Where Central Planning Meets the New Markets

In the countries of central and eastern Europe, and all of those that once formed the Soviet Union, block upon city block of apartment houses derives its heat from a single source. More often than not, that source is a large boiler, fueled by coal or light oil, located far from the points of delivery. The heat travels a labyrinth of pipes that can foster energy losses of up to 50 percent between the point of generation and delivery.

Despite the losses incurred in transmission, the dwellings served by the system are often intolerably hot in the wintertime, for the residents have no means of controlling the temperature inside their apartments. So, in the dead of winter, windows are opened, allowing precious energy to escape, and inviting polluted urban air indoors. Meanwhile, inefficient boilers generate far more heat than is needed, producing unnecessary amounts of the fine particulates and greenhouse gases that can cause respiratory diseases.

A product of the centrally planned economies of yesteryear, district heating was once envisioned as a means of increased efficiency in the energy sector, designed to be supplied by power plants via cogeneration schemes that would capture the excess heat produced by power plants and then distribute it through the network of underground pipes. In practice, however, often the heating networks were never linked to power stations, or, when economies began to transition to a market model, the links were severed as different parts of a city’s energy network were parceled off to various entities.

Throughout the course of these countries’ economic transitions, district heating systems, for the most part, have only deteriorated, threatening the health of city dwellers and contributing to the suspected cause of global warming. However, no easy fix appears in the offing. Wholesale conversion to other forms of heating—individual apartment house boilers, for instance—is simply not feasible given the fragile state of these developing economies. Yet, because of the economic challenges faced by nations in the throes of economic and political transition, potential improvements are often hampered at every level.

District heating companies are usually municipal entities that are frequently overstaffed due to the political nature of municipal employment. Overstaffing drains resources that could otherwise be devoted to the upgrade and better maintenance of district heating systems.

Fees, or tariffs, for heat delivered to end-users, are commonly priced well below cost, prohibiting recovery of revenues adequate for the proper upkeep of the system. Even so, many consumers, economically strapped themselves, cannot afford to pay their heating bills. Those who can often simply don't, since consequences for going into arrears on one's heating bill tend to be negligible. (Not only can apartment dwellers not control their heat by unit, most systems offer no means of shutting off heat to an individual unit.)

At the national level, regulatory frameworks for the energy sector often overlook the problems of the heating systems or, conversely, are too stringent to be implemented in a practical way. So, the quest for solutions to the environmental problems created by deteriorating district heating systems encompass a range of capacity building and analytical assistance activities and all levels—from the building associations of apartment dwellers, to the restructuring of municipal governments, to the creation of national regulatory and governance structures. In addition, an increased availability of loans for various improvements and activities is desperately needed in most of these countries.

In 2000, World Bank economist Anke Meyer, together with her colleague Wolfgang Mostert, authored a comprehensive report on these heating systems, *Increasing the Efficiency of Heating Systems in Central and Eastern Europe and the Former Soviet Union*. In this ESMAP-sponsored work, the authors undertook an assessment of the heating sector in six cities last examined in case studies conducted by ESMAP in 1996: Dnipropetrovsk, Ukraine; Kaunas, Lithuania; Orenburg, Russia; Sofia, Bulgaria; Timisoara, Romania; and Wroclaw, Poland.

The environmental sustainability of various options was included in Meyer and Mostert's assessment as a major factor. In their study, the authors sought to arrive at the preferred heating option for each of the cities, be it an upgraded district heating system, decentralized heating with natural gas, or a combination of elements that would foster competition between methods. In many cities, however, the current limits of the energy infrastructure make alternatives to district heating systems unfeasible at the present time, and in some, the conversion to other systems would in itself have negative environmental effects.

Faced with this set of circumstances, the authors make a strong argument for the reintroduction of the cogeneration concept as a means of producing heat more efficiently for district heating systems, and urge that the cost benefits yielded through cogeneration of heat and electricity be distributed evenly across the two sectors. "The report is really a plea for cogeneration," says Anke Meyer.

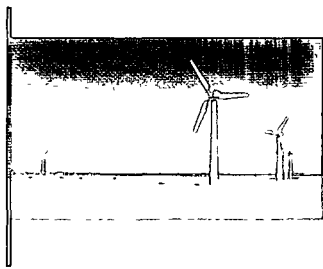
Still, Meyer and Mostert have no illusions of a universal fix for the problems posed by the heating systems in transitioning countries. Each faces its own unique set of challenges, and some have fared better than others as they convert to market-based economic systems. So, for instance, where in Orenburg, the preferred (and most competitive) heating option was found to be individual building boilers, in Wroclaw several factors, including the existing use of cogeneration, combined to make district heating a competitive heating option. Case studies of Kaunas and Dnipropetrovsk, on the other hand, found that no one heating option stands out as being preferable to others.

Meyer's work on centralized heating systems has recently extended to Central Asia and the furthest reaches of Europe. On a World Bank mission in Azerbaijan, she found a population so poor, and a heating system in such disrepair, that urban dwellers were burning woodfuel in their apartments. As a consequence, deforestation has become a major problem there, and one that has both local and global significance. "I actually went out and spent time looking for trees," Meyer explains. Similar work is being undertaken in the Kyrgyz Republic, as well. For all of the difficulties faced by those who wish to effect positive change in the heating sector of Central and Eastern European nations, and those of the former Soviet Union, the most challenging can be the changes

required in human behavior to get the process started. In a struggling economy, overstuffed municipal entities are loath to cut employees loose. At last savoring individual autonomy, many apartment dwellers are disinclined to assemble for the collective decision-making required for determining the investments needed to heat their buildings in a way that benefits all. And at the provincial and national levels, the nuances of setting energy fees correctly often become embroiled in political trade-offs.

The analytical and advisory services undertaken by the World Bank Group and ESMAP in this sector, however, offer real help to governments that seek to foster market competition as they attend to the natural environment. There are hard cases, to be sure, but also true successes, as in Poland, where measurable environmental benefits have resulted from the integration of district heating in cogeneration schemes. Here, the emphasis in *Fuel for Thought* on capacity building and analytical and advisory activities has paid off.

Source: Increasing the Efficiency of Heating Systems in Central and Eastern Europe and the Former Soviet Union (ESMAP); additional information from Anke Meyer.



CASE STUDY

Power to the People India: Environmental Issues in the Power Sector

Journey through each of India's 29 states, and the traveler is struck by topography that ranges from lush to arid, and people whose languages and cultures can vary widely from town to town, as do their economic fortunes.

Though each state clearly has its own character, all share something in common: an ailing, polluting power system run by insolvent State Electricity Boards. In 1998, as discussions took place on what would become the World Bank's environmental strategy for the energy sector, ESMAP published *India: Environmental Issues in the Power Sector*, the paper that would become the prototype for the Energy-Environment Review (EER) concept that has since become a fundamental component of the Bank's energy-environment strategy process. *India: Environmental Issues* has come to illustrate the value of the upstream work emphasized in *Fuel for Thought*.

This early Energy-Environment Review did more than simply identify problems; it also looked at the potential impact of sector reform on local environmental conditions. Its most innovative contribution, however, may be the authors' design of a decision-making tool kit for policy makers. Included in the tool kit are the *Manual for Environmental Decision Making* published by ESMAP in 1999, and a computer-based interactive program that calculates estimates of future demand and the estimated impacts of a given decision. Four modeling activities comprise each of the modules in the computer-generated part of the kit: demand forecasting, power system planning, environmental analysis and financial analysis.

The process of creating the decision-making toolkit began in 1996, when senior officials of the Indian government and energy sector experts at nongovernmental organizations (NGOs) responded to an ESMAP questionnaire on their primary concerns for the environment as affected by the power sector. Then a number of

meetings were convened among scientists, decision-makers from Indian ministries, local consultants and leaders of NGOs to arrive at a method--through a wholly consultative process--for addressing the issues.

Chosen as case studies for the review were two contrasting states: Bihar, a landlocked industrial center with a low per capita income; and Andhra Pradesh, a fertile sprawl of land hugging the Bay of Bengal, governed from the prosperous city of Hyderabad, one of India's great intellectual centers.

Various scenarios for future power sectors of each state were considered against the backdrop of a "business-as-usual" model. Business as usual in India's power sector would mean the continued sale of electricity at below-market prices. It would perpetuate the large-scale theft of electricity and other losses in India's transmission and distribution of energy--to the tune of between 30-50 percent. The paltry revenues gleaned due to theft shrinkage and low pricing make for electricity boards unable to maintain and upgrade plants for compliance with environmental regulations. As a result, reviewers found that in this scenario, emissions of harmful gases could be expected to quadruple in Andhra Pradesh by the year 2015, and to double in Bihar. And rates of return on investment in the sector could be expected to dip into negative numbers.

Another challenging feature of India's power sector is its heavy reliance on coal--an indigenous resource--for electricity generation. The Indian economy is growing by leaps and bounds; gross domestic product is expected to triple over the course of the next 15 years. With 70 percent of the nation's electricity coming from coal-fired plants, the threat of increased air pollution as a side-effect of increased demand is very real, especially as the efficiency of plants spirals downward.

Using the models created in the consultative process, it was revealed that no single solution existed for the environmental impacts of the power sector in any one state, but rather a mix of actions and new technologies tailored to each state would be required to achieve the desired results at least cost. Most important among them are the loss-cutting potential of privatizing the distribution and transmission of power via medium-sized companies, and the economically viable pricing of electricity, which would draw the revenues needed to invest in plants and infrastructure. Pricing and other decisions based on demand rather than supply are also crucial, since demand is currently repressed by many consumers' lack of access to a reliable source of power.

Now when stakeholders set out to assess future demand, they can do so using the demand forecasting module of the toolkit, which projects future demand by examining historic demand while factoring such variables as income growth, price reform, demand-side management and rehabilitation of transmission and distribution networks (which may have the effect of increasing demand further by increasing consumer access). Using the power system planning module, stakeholders may calculate the schedule of investments in power plant that will meet the forecast demand at least cost. When examining the environmental costs of new power plants, the environmental analysis module allows the user to estimate the impact of power plant emissions on local air quality. And the financial analysis module allows the user to compare and contrast the financial impact of various power development options. All in all, the toolkit is constructed in such a way as to help decision-makers arrive at the correct mix of actions to best suit the needs of a given state or locale.

The outcomes of *India: Environmental Issues for the Energy Sector* paved the way for analytical and advisory activity that resulted in a significant policy document for yet two more Indian States: Uttar Pradesh and Karnataka. Together with Andhra Pradesh and three other states, they have begun to privatize their power sectors. The State of Orissa has already privatized electricity distribution. A fact-finding mission recently conducted by the Energy & Infrastructure Unit of the South Asia Regional Office and the Energy and Water Department of the Bank's Private Sector & Infrastructure office found the results decidedly mixed. But the lessons learned hold great hope for improving the process for other states, and for further improvement of Orissa's privatization process.



CASE STUDY

The Global Gas Flaring Reduction Initiative

A Special Partnership: The Government of Norway and the World Bank Group

In a village in the Niger Delta, it seems that night never comes. Lit by a 300-foot column of fire, the sky remains bright after sunset. The fire roars with a ferocity that drowns out all other sound.¹ The noise, light and heat emanate from a gas flare, one means of disposing the natural gas that is a byproduct of the petroleum extraction process.

Today in the industrialized world, this natural gas would most likely be captured and put to use as an energy source in its own right. But in the developing world, where local energy markets are still in their infancy and infrastructure is lacking, petroleum producers have often found it cheaper to burn off the gas into the atmosphere than to capture and transport it to faraway markets. Yet in the glare of many of the world's gas flares lie villages whose citizens enjoy no access to electrical power or other modern energy sources.

"Around a quarter of the world's population are living in extreme poverty," Norwegian Minister of the Environment Børge Brende told an audience gathered at an event held during the Conference of the Parties (CoP7) to the United Nations Framework Convention on Climate Change last November in Marrakech. "By the year 2015, the aim is to reduce this proportion by half...Access to energy is fundamental to development, [but is] an often overlooked theme in the development debate...Therefore, energy wasted means development opportunities wasted. And waste of energy in this context also means more waste to the environment."²

As a donor nation that produces petroleum--and one with a demonstrated sensitivity to environmental issues--the Government of Norway has set its sights on reducing the incidence of flaring throughout the world. Early in 2001, Norwegian leaders presented the World Bank Group with a plan for a Global Gas Flaring Reduction Initiative. In June, the Bank Group launched the initiative in collaboration with the Norwegian government, which in 2001 contributed \$1.7 million to this effort. Initial work will take place in Nigeria, Chad, Kazakhstan, Azerbaijan and Russia.

The Global Gas Flaring Reduction Initiative is designed to be collaborative all around, for it represents not only a collaboration between the Bank group and a donor government, but one within the Bank Group itself. Its impetus comes from the Oil, Gas and Chemicals Department, which is itself a joint department of the World Bank and the International Finance Corporation (IFC).

In keeping with the Bank Group's environmental strategy for the energy sector, the Global Gas Flaring Reduction Initiative addresses or touches upon four of the six objectives outlined in the 1999 sector strategy paper, *Fuel for Thought*:

- Promote environmentally sustainable development of energy resources
- Mitigate the potential impact of energy use on climate change
- Develop capacity for environmental regulation, monitoring and enforcement across all levels of governance
- Make the Bank more responsive to addressing the adverse environmental impacts of the energy sector

"We do not know exactly how much gas is flared globally," explains Olav Kjørven, Norway's secretary of state. "Available statistics indicate flaring of about 110 billion cubic meters of natural gas per year. But satellite pictures of the world show red gas flares around the globe in numbers that suggest, in some places, a good deal more flaring than is demonstrated by available statistics. There is good reason to fear that the real amount of natural gas flared could be twice that reported--about 200 billion cubic meters annually."

To put the 200 billion figure in context, Secretary Kjørven's citation amounts to twice the gas consumed annually by Germany and France combined.³ Or to put it another way, the amount of gas thought to be wasted annually through flaring is equivalent to nearly all the commercial energy used per year in sub-Saharan Africa, not counting South Africa.⁴ (Because of a lack of hard information on flaring, creation of a methodology for analyzing data in countries with the highest numbers of gas flares has recently been carried out as part of the initiative.)

"This amount of energy, used in the right way," says Olav Kjørven, "would be a major contribution to the battle against poverty."

If the only price to pay for flaring was loss of untold sums of potential energy, that would be bad enough. But calculate the lost productivity due, in some cases, to the health effects of flares on those who live in their close proximity--respiratory conditions and the like--and the impact of flaring on poor people can become acute. In the grip of the towering flares, ecosystems suffer as well. Air temperatures in the immediate vicinity of a gas flare can exceed, by 10-30 degrees Fahrenheit, those experienced in similar environments under normal climatic conditions.⁵

On the planetary scale, the amount of natural gas burned into the atmosphere could account for more than 2 percent of annual global emissions of carbon dioxide, the foremost culprit in the pantheon of greenhouse gases (GHG). At the very least, it's certain that flares account for more than 1 percent of GHG.

But if flaring is to stop, to what use should recoverable gas be put? To that end, an assessment of the technical feasibility and economic viability of routing gas to new applications is being undertaken as part of the initiative. Possible applications include rural electrification and commercial and industrial usage, as well as the development of small-scale natural gas and distributed power generation schemes. Pilot projects with strong potential for reducing poverty will be identified.

In some instances, gas produced with oil cannot be used in any other way, neither for power production nor re-injection, making a total elimination of gas flares impossible (During oil extraction, gas must be released in some way, and in these cases, flaring is the safest means for doing so.) Nonetheless, efforts in industrialized nations demonstrate the feasibility of dramatic reductions in flares. Norway, Canada and the United Kingdom have already achieved impressive results within their borders by virtue of their national governments' work in concert with petroleum companies. Already the Bank has, as part of the flaring initiative, engaged a team of senior experts on petroleum sector issues in ongoing consultations with international oil companies, host governments and other stakeholders in the flaring problem. Bank staff members have also visited with national authorities in a number of developing countries in which flares remain an issue to be dealt with.

Still, much more needs to be done. In order to move the phase-out process along, the World Bank Group is approaching its Global Gas Flaring Reduction Initiative from a number of different angles. The main focus areas of the initiative are:

- Improve the political and regulatory framework for investments in flaring reductions
- Improve market access for gas
- Disseminate information on international best practices

A particularly exciting possibility is the inclusion of gas flaring in the carbon-trading mechanism called for in the Kyoto Protocol of the United Nations Framework Convention on Climate Change. As put by Rashad Kaldany, director of the Oil Gas and Chemicals department, this would mean that nations that reduce

the incidence of flaring in their countries earn carbon credits, a hopefully powerful incentive for standing down legions of gas flares. The Bank Group's own Prototype Carbon Fund may address flaring in a similar manner. One study currently under way will assess this possibility, along with other financial and earmarked environmental funding mechanisms for gas flaring reduction projects.

Other ways of reducing flaring include mainstreaming the reduction of flaring into projects financed by the Bank Group through such means as building viable governance and regulatory structures. A preliminary report analyzing current regulatory frameworks for gas flaring in 38 countries has already been completed, and more studies of international best practices are under preparation. Future studies will examine petroleum sector governance and the feasibility of developing industry standards for gas flaring and venting.

At the Initiative's launch in November 2001 Conference of the Parties 7 in Marrakech, presentations on gas flaring made by the Bank Group's Rashad Kaldany and Norway's Børge Brende generated true excitement. In April 2002, Norway will host an international conference in Oslo devoted solely to the topic of gas flaring. In September 2002, the initiative will be examined in depth at the United Nations Conference on Environment and Development (UNCED) World Summit on Sustainable Development in Johannesburg ("Rio+10"). Here results will be presented, stock taken and a course charted for the future.

Key activities of the Global Gas Flaring Initiative

- International consultation with key stakeholders
- Knowledge improvement and dissemination
- Development and dissemination of international best practices
- Maximizing the poverty reduction impact of gas utilization
- Incorporation of flaring management into petroleum sector governance
- Introduction of improved contractual and regulatory frameworks dealing with flaring
- Design of financing mechanisms to reduce flaring by monetizing global externalities in projects
- Identification of pilot projects for flaring reduction
- Conducting international conferences to provide a framework for international discussion and concrete agreements on flaring reduction.

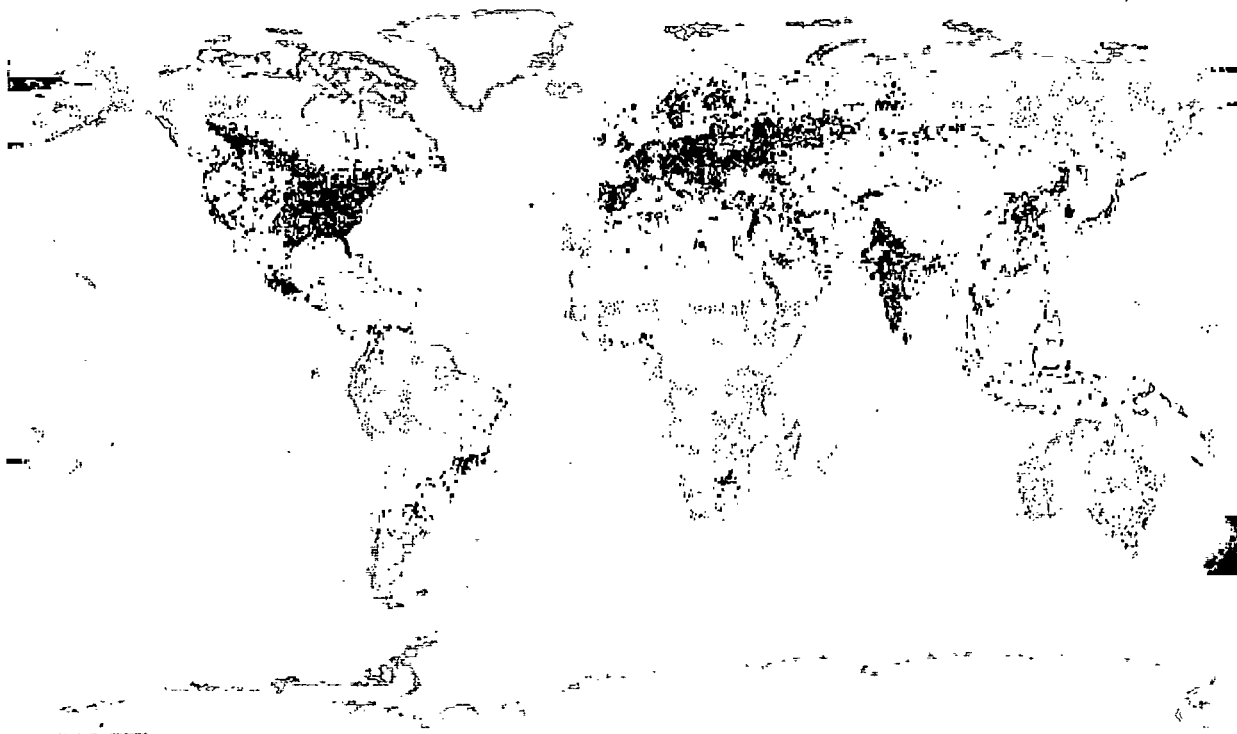


In Norway, optimism for the Initiative runs high, according to Olav Kjørven. "At the turn of the turn of the 19th century, Norway was one of the poorest countries in Europe," he explains. "We industrialized and prospered because we had access to abundant energy from hydropower. Later we [became] a major producer and exporter of petroleum. This has been a blessing for our economic and social welfare, but it has also tied the Norwegian economy to the roller coaster called the international oil market and posed environmental challenges.

"In the early days of oil and gas development in our own country, we viewed our gas flares with pride, as signs of coming prosperity," continues Secretary Kjørven. "And we did indeed prosper, but not before we came to comprehend the threats to human health and ecosystems posed by the flaring of natural gas. So we approach the challenge of flaring reduction with a keen understanding of how important energy is to development, and how difficult the economics of the energy sector can be."

The main next steps for the Initiative will include a public-private partnership to provide technical assistance and policy advice on the creation of domestic and local markets to utilize such gas. The Initiative will also investigate the need for a specific carbon credit fund for gas flaring and for international standards for monitoring flaring and venting, including improvements to available data. Partners in the next steps of the Initiative will be the stakeholders from governments, companies and civil society.

City Lights and Gas Flares



1994-95 Satellite data

Flares (white) City Lights (grey tones)

To view differentiation between city lights and gas flares, go to page 8 of the following document, which is posted on the IFC Web site: <http://www.ifc.org/ogc/docs/MarRas.pdf>

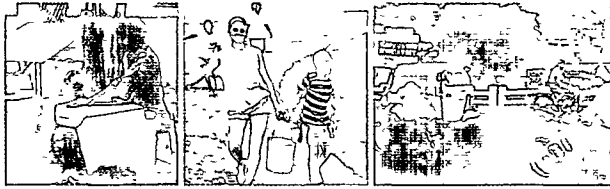
¹Campbell, Greg, "That Giant, Roaring, Gas Torch Next Door", *Christian Science Monitor*, Boston, Massachusetts, USA, May 1, 2001

²Brende, Børge, speech at side event on international initiative on reduced flaring of natural gas, COP7, Marrakech, November 8, 2001 (Available on www.worldbank.org)

³Anders, Sten, "Global Gas Flaring A Norwegian Initiative", unpublished, December 2001

⁴Brende, Børge, at Marrakech, 11/8/01

⁵Campbell, Greg, "That Giant, Roaring Gas Torch Next Door"



Sustainable Energy: We Have the Technology (Now What Do We Do with It?)

by Bernard Bulkin

VIEWPOINT

What is the role of technology in energy development? What is the role of the World Bank Group in technology? Is this role mission-critical, asks a top scientist in the petroleum business, or merely supportive?

In its sector strategy paper, *Fuel for Thought*, the World Bank Group lays out a comprehensive set of principles and goals for energy development across most of the world's population. These principles set high standards for the role of environmental considerations in decision making while recognizing that the role of the World Bank Group must be responsive to local needs and preferences. There is a clearly articulated view that environmental considerations must encompass both local and global air quality, in other words, they must be responsive to the climate change issue.

However, one particular aspect of energy development is underrepresented in *Fuel for Thought* and the September 2001 World Bank *Report on the Status of Implementation of Fuel for Thought* that is the role of technology in implementing the principles.

Technology is mentioned explicitly in the *Fuel for Thought* strategy only in the context of climate change, exemplified by the statement "The biggest challenge is to encourage the use of new technologies that reduce emissions of greenhouse gases." The plan goes on to say that "[a] crucial role in this for the Bank Group is to help open markets for commercial and near-commercial renewable energy and energy-efficiency technologies in its client countries." The specific actions focus heavily on renewables.

Isn't this statement far too limiting? I think it is. The role of the World Bank Group with respect to technology must reach beyond greenhouse gases, because technology will be central to solving local environmental problems. And it should go well beyond renewables, because their contribution, while potentially important, is likely to be small over the next two decades.

The role of technology

It should be taken as given that in future energy scenarios, technological developments will play a major role. In recent history, this has certainly been the case. We have already seen these impacts on both the supply and the demand sides, from upstream in project cycles to the experience of end-users

Technological developments over the last 20 years have yielded more available oil and gas than we thought possible, at lower prices. Technology has brought liquefied natural gas (LNG) to market broadly and flexibly, as well as unleaded gasoline, low-sulfur gasoline and diesel, ethanol from corn, fuel-efficient cars, combined cycle gas turbines and microturbines. The energy efficiency of many electrical appliances has increased dramatically.

There are numerous areas of technological development under way. Solar photovoltaics and wind energy facilities continue to improve in efficiency even as their costs decrease. While today most such projects require subsidies, we can envision a time in the coming decade when that will no longer be necessary. Enabled by cleaner fuels, cars are increasing in fuel economy, and we can foresee the possibility of doubling the fuel economy of the global fleet. There are large, well funded projects in turning gas to liquids, fuel cells for both stationary and mobile applications, and carbon sequestration. At the same time, exploration and production of fossil fuels continues to progress.

Finally, some areas of technology where work has been going on at a very low level, or which have not been in favor for some time--nuclear power, clean coal technology, biomass--may return to active life.

All of these developments will affect both local and global air quality, and many could have enormous import over the next 10 years for projects aimed at meeting the Bank Group's goals in ways consistent with the principles identified in *Fuel for Thought*.

Assessing technology critically

If it is to achieve its environmental strategy in the energy sector, the Bank Group must cultivate a keen awareness of technology trends and developments, along with the ability to implement new developments once they become commercially viable. It must track technologies that are approaching commercialization, and be able to distinguish real promise from hype

In assessing new technologies, the Bank must be convinced, and convince its clients, that a new technology really offers greater advantages than tried-and-true methods. Here, critical assessment holds the key. In this

context, the Bank must guard against going for an alternative to conventional technology just because it is an alternative, or even the best alternative. For example, *Fuel for Thought* mentions the use of compressed natural gas (CNG) as a road transport fuel as a means of improving local air quality. Although a few cases exist in which this is a good alternative, research has shown that they are very few, and that great care must be taken with the vehicles to ensure their achievement of the desired emissions improvements. Many adoptions of CNG as an alternative road transport fuel have led to increased rather than improved emission levels. Sure, it's an alternative, but it may not be any better than the one it displaces.

Energy efficiency is also a key parameter. Once capital is installed, retrofitting of technology to improve efficiency is rarely cost-effective. There are good arguments for doing all new capital projects at the state of the art in energy efficiency. But this requires clarity as to what constitutes true state-of-the-art status, and the implications for the life cycle of the thing being so improved.

In all energy projects, environmental problems are best dealt with upstream in a project cycle, rather than via "end of pipe" fixes. At the very least, the best solution will start by looking upstream in energy projects for ways to minimize environmental impact. Once again, this speaks to the need to look at the technology of energy developments in a holistic way, across the entire value chain, incorporating both fuel and its use. No one said it would be easy; this sort of technical analysis is difficult, especially as the nature of technology is to continually evolve.

Facilitating key relationships

These issues are not easily dealt with by one sector of the community. It is clear now that fuels and vehicles constitute a system, and environmental problems of transport will be dealt with effectively only by considering the two as one. This means that partnership between the oil and auto industries is required--partnership the Bank can facilitate. A simple illustration is found in the *Fuel for Thought* goal of completing the transition to unleaded fuel throughout the world. If this is to be accomplished, it will not suffice for oil companies to decide to sell only unleaded fuel. Rather it requires a concerted action and coordination between automobile manufacturers, oil companies and governments. This scheme will require auto-makers and dealers to bring to market new vehicles equipped for the change in fuels--for example, agreeing to sell only cars equipped with catalytic converters in place of old technology, creating a clear market. Oil companies, for their part, should offer both unleaded product and technology for "lead replacement gasoline" for older cars. Government approval of these new products will need to proceed without impediment, accompanied by an appropriate level of taxation, as well as the provision of consumer information.

If the Bank works to understand the motivation of each party involved and the technology behind the planned action, it can facilitate this transition. There are similar stories to be told and partnerships to be formed around areas such as power generation from gas versus coal, regarding industrial energy consumption at improved efficiency, and about domestic heating and cooking fuels.

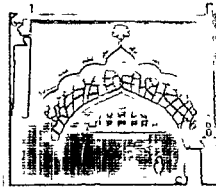
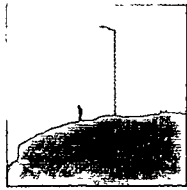
Finally, when taking on the task of capacity building, one must consider just what sort of capacity to build in the client countries--the capacity simply to take and absorb technology, or capacity to generate new technology. Many client countries of the Bank are traditional "technology takers", worrying mostly about technology transfer into the country, and how to choose, use, and maintain that technology. But it seems to me that in the long term it must be at least a secondary goal of the Bank Group to help make innovators of its clients, to develop the capacity of these countries to be technology *generators* and *exporters*. This is a way of creating sustainable wealth, and there is no better area than energy in which to do it.

The technology dimension of *Fuel for Thought* is substantive and important. If it is handled properly, it can lead to real progress across the spectrum of goals that are enunciated therein. Done poorly, it can lead to wrong decisions with long-lasting consequences. This is the time to choose to do it right.

Bernard J. Bulkin is chief scientist of BP.







Bringing It All Together: Integrating Sustainable Development and Energy Policy

VIEWPOINT

by Thomas B Johansson

To make the energy sector clean and green is a matter of political will, argues this expert in industrial development. New energy strategies are more than mere complements to sustainable development; all development begins with energy, he writes.

The need for a new approach to energy and its impact on the environment is well established. The publication of the World Bank 1999 sector strategy paper, *Fuel for Thought. An Environment Strategy for the Energy Sector*, clearly advanced the Bank's thinking on these issues and indicated a willingness to strengthen its role in the environmental work worldwide.

Over the past decade, international efforts to bring environmental issues to the fore have yielded an ongoing dialogue between nations on the balancing act of advancing development while addressing environmental concerns. Most recently, the Seventh Conference of the Parties (CoP) to the Framework Convention on Climate Change, which took place late last year in Marrakech, provided a setting for discussion of the major changes to the world's energy systems that will be required if the objectives of the Kyoto Protocol and the Convention are to be met.

In 1997, the Special Session of the General Assembly decided that more focused attention would have to be given to key areas for the implementation of the agenda outlined in the Report of the United Nations Conference on Environment and Development (also known as Agenda 21) that came out of the 1992 Earth Summit in Rio de

Janeiro. Energy was one of these. In fact, a new approach to energy is frequently mentioned in Agenda 21, as well as in the negotiated texts from the other major global conferences of the 1990s.

The Ninth meeting of the Commission on Sustainable Development (CSD-9) in April 2001 focused on energy for sustainable development, based on an intergovernmental preparatory process. Energy is also incorporated in the Programme of Action of the Third United Nations Conference for the Least Developed Countries, held in May 2001. The 18th Congress of the World Energy Council in October 2001 emphasized that the energy industries must renew their commitment to long-term and global solutions for environmentally sound energy production. In the preparations for the 2002 World Summit on Sustainable Development, energy is a significant element.

Addressing the challenges

Energy for sustainable development refers to those energy approaches and solutions that provide energy services while addressing major challenges related to energy, including:

- Creation of a secure supply of energy for economic growth and sustainable development worldwide
- Bringing energy to the two billion people without access to electricity
- Addressing the household energy needs of two billion people who today cook on traditional fuels, which requires hours of labor each day for the carrying of fuel and water by more than 100 million women
- Environmental challenges such as indoor air pollution, urban air pollution, acidification, and climate change

The prevailing paradigm, however, appears to take energy in relation to economic growth as the major theme, and then to address, as possible within this scheme, elements related to other objectives. For example, the Poverty Reduction Strategy Papers (PRSP) do include energy as a major issue, and *Fuel for Thought* focuses mainly on how to bring environmental concerns into the World Bank's energy projects and activities. Energy security is another aspect of energy policy that is receiving international attention.

A perception of conflict

Still, a danger exists that, in each of these instances, the approach taken will lead to energy solutions that largely address the concern in focus, be it energy and the environment or energy security, but may in fact have a negative impact on efforts to meet other objectives. Thus, energy must be seen as an entry point for achieving the set of objectives that define sustainable development, and energy approaches must be supportive of reaching all of these objectives. Thus, an integrated approach to the role of energy in overall efforts toward sustainable development is essential.

The importance of this concept should not be underestimated. At the climate negotiations, most participants, especially those from developing countries, perceive one conflict between economic growth and sustainable development, and another between growth and measures taken to mitigate climate change. This sense of competing interests has become a major hurdle in the negotiations, and is likely to become increasingly so in future talks.

In order to ensure that criteria in not only one but both areas are met, it is essential that environment and development objectives be combined. Take rural development, one of the Bank's overall areas of priority. It is widely recognized, as stated in various World Bank publications, that the two most pressing needs related to energy for rural development are access to electricity and clean cooking fuels. Traditional cooking methods, fuels and stoves expose women and children to very high levels of indoor air pollution. The World Health Organization has estimated that this exposure leads to more than 2 million deaths per year in India alone, along with additional respiratory and other medical problems. In order to arrive at corrective measures that support both environment and development objectives, an evaluation of technology options is required.

In any earnest pursuit of the aforementioned objectives, the magnitude of change required to the world's energy systems can hardly be overstated, as illustrated by the number of people without access to modern energy carriers, and the need to substantially reduce emissions of greenhouse gases. At the same time, a 10-fold or so expansion of the world economy over the next half century will be necessary in order to meet poverty reduction goals. Technological development and dissemination are urgently needed in the generation and consumption of energy for sustainable development. I urge the pursuit and implementation of the following

- More efficient use of energy (large potential for all countries)
- Increased use of renewable sources of energy (vast resource; the energy flow from the sun is some 10,000 times the world's commercial energy use). Technologies are available and becoming available, although development is slowed by market hurdles
- New technologies for fossil fuels (decarbonization through syngas, hydrogen for fuel cells, and carbon (CO₂) sequestration in geological formations)
- Nuclear energy (if concerns related to cost, safety, waste and proliferation can be allayed)

A matter of will

By combining certain elements of the technology options listed above, energy can be developed in a sustainable manner that also adequately addresses all concerns related to social, economic, security and environmental (including climate change) issues. Some of these options are still under development or too expensive to be implemented in a practical manner. Nonetheless, investment in technologies that are costly at this stage of development will pay off down the road. For while the cost of bringing new technologies or energy solutions to reality will be substantial when compared with all the economic activity related to energy, these costs no longer look so large. On the global scale, energy sales amount to some \$1 trillion a year. Meanwhile, subsidies to conventional energy sources and methods amount to some \$150 billion a year, and investments in all forms of energy account for \$300 billion a year, mostly in the developing world. In comparison, it has been estimated that buying down the cost of photovoltaic systems to levels where they would be competitive in major markets with conventional power would require some \$30 billion in total over a 10-20 year period.

Clearly, the only obstacle to making the necessary investments to this renewable, solar technology is one of political will, not capability. If only the will were found, the near future would offer energy systems that could meet energy service needs in a manner safe and secure for both local sustainable development and economic growth needs, while protecting the local, urban, regional and global environment.

Making a real commitment

The future energy scenario as set out in *Fuel for Thought* will make intensive use of the next-generation technologies for both generation and use of modern energy carriers in all sectors, including the use of fossil fuels. The growing interest in syngas strategies, the gasification of coal to generate hydrogen and/or other clean energy carriers with sequestration of carbon dioxide is a significant area where step-by-step strategies can be constructed. It would thus seem desirable that the Bank's operations become more supportive of overall technological leapfrogging to help build such energy futures. However, there is no indication in *Fuel for Thought* of the Bank's intentions with regard to bringing new technologies into the development process.

Key to the future health of the global population and economy is the design and implementation of energy systems that meet all the objectives of sustainable development (economic growth, poverty reduction, health and environment, security) at the same time. Such energy systems are feasible for the future, as supported by many elements already available, or soon to be available, in the marketplace. The World Bank is one of the few actors that could help make such systems a reality.

Unfortunately, current policies promulgated by institutions at both the national and international levels will not bring about the change that is needed. The challenge, then, is in formulating and implementing policies that will bring about a desirable future for the energy sector.

Important policy issues occur in a number of areas:

- **Making markets work better** - Investment conditions that will attract sufficient capital from the private sector should be created, so that energy is not a constraint on development. Subsidies to conventional energy should be reduced or eliminated. Furthermore, if external costs are internalized, renewable sources of energy will become more competitive, and stimulate energy efficiency improvements.
- **Regulation** - A stronger effort is needed in this area in order to pave the way for energy solutions supportive of sustainable development.
- **The innovation chain** - Investment in research and development, demonstration projects, and cost buy-downs that result in widespread dissemination in the marketplace
- **Electricity** - Power sector reform with a view not only to economic efficiency but also to social and environmental issues
- **Rural energy** - Access to electricity and modern fuels for cooking are key concerns.
- **Capacity building** - Energy must have a much larger role in development cooperation to help create investment-friendly environments for energy that complements the goals of sustainable development.

Measuring progress

According to the September 2001 World Bank *Report on the Status of Implementation of Fuel for Thought*, significant progress has followed the publication of the original sector strategy paper. A set of indicators is used to follow developments since the adoption of the new strategy. By and large, these indicators reflect conditions in client countries. Progress in such indicators is, of course, the ultimate objective of the work. However, the numerical value of an indicator, for example, on air pollution levels, is affected by many actions impacted by the Bank's operations, and therefore weak in reflecting the outcome of the Bank's strategy. Indeed, it will take years before the effects of a strategy as comprehensive as that laid out in *Fuel for Thought* are fully known, and with only two years of implementation, it is really too soon to judge the strategy's effectiveness.

In coming evaluations, several important measurements of progress should be considered. Few indicators of the Bank's operations are presented in the current report, such as volume of lending going to different types of projects. Yet it is stated in the report, for example, that lending to projects with at least one "environmental objective," a term not clearly defined, has increased from 10 to 69 percent during the 1997-2000 time period. However, the description of such lending included in the report is too limited to allow for an overall evaluation. It would be interesting to know the distribution of lending and the extent of other Bank activities on projects in the oil & gas sector, in power investments, and end-use efficiency improvements. It would be useful to know the extent and status of projects focused on exploration, mining, generation, sector reform, etc.; and which technologies are actually in use.

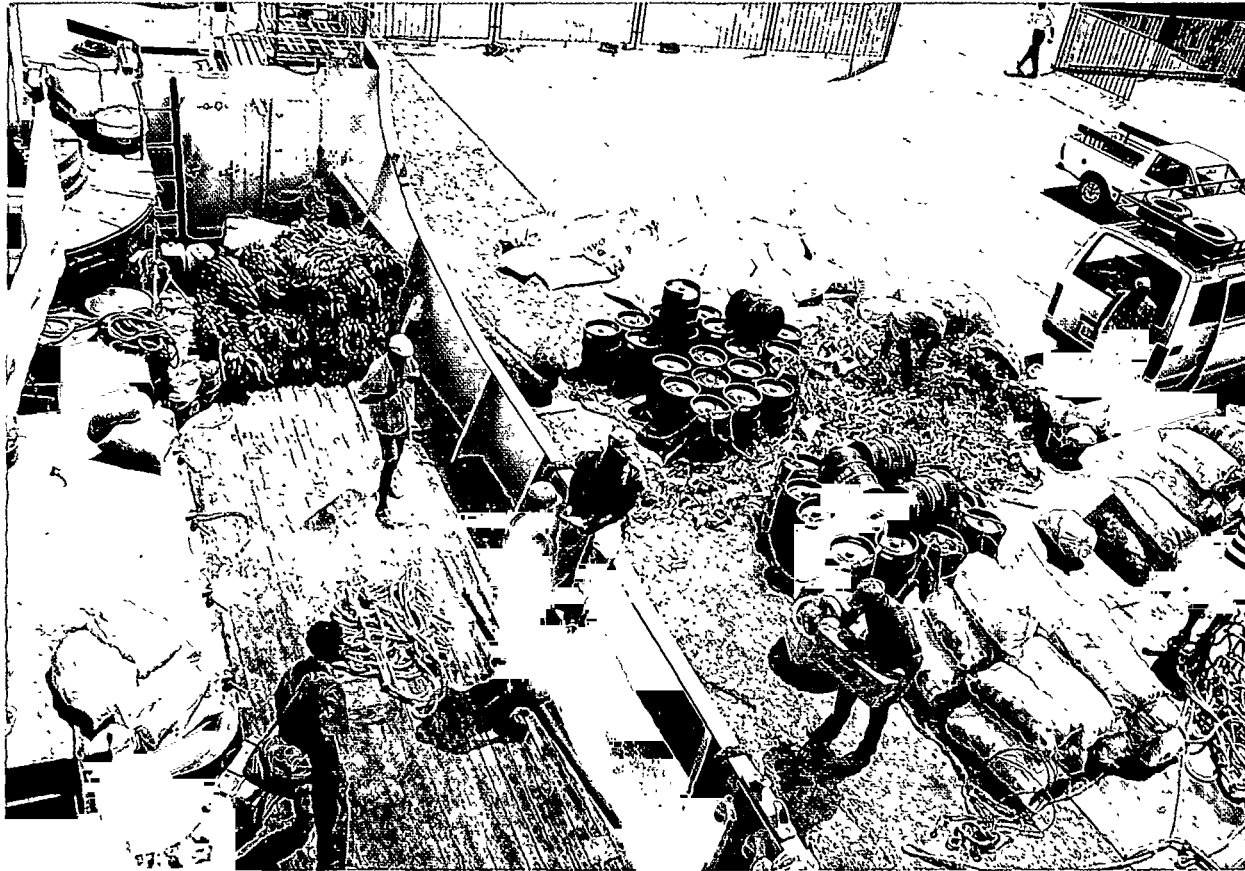
It is not clear from the available documentation what portion of lending and other activities are supportive of the energy for sustainable development agenda. For example, Annex 8 in the September 2001 *Status of Implementation* report is limited to "environmentally benign" projects; however, in order to understand the scope of the report, it would be interesting to know the level of funding for the other, "non-benign" projects. Annex 9 goes on to suggest that guarantees for clean and renewable projects amount to 40 percent of the MIGA

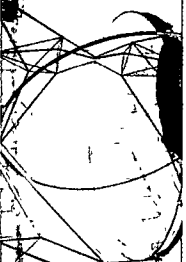
portfolio. But how is “clean” defined? The report is vague on this term. The significance of this achievement depends strongly on how ambitious a definition is accorded the word “clean”.

As indicated above, creating the regulatory and institutional framework that will attract investments is a critical policy issue. It is thus considered positive to include regulatory elements in a project. Yet the real issue is *what* the regulatory elements are, and if the total market and regulatory situation is attractive for investors *and* is likely to address social, economic and environmental concerns.

Because of their central role in economic growth, as well as in socio-economic development, poverty reduction, and protection of health and environment, energy issues deserve continued attention at a high level. The World Bank’s contribution to the development of energy for sustainable development will be critical to the future health of the global economy, and people throughout the world.

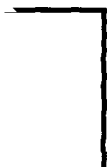
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PART FIVE

Internal Bank Group
processes and outputs
are well on course



WHERE NEXT? THE BANK GROUP'S FORWARD AGENDA

One of the main purposes of evaluating and reporting on *Fuel for Thought* is to let the stakeholders in the strategy know how well the Bank Group is doing in bringing it to life. It also helps us to get a read on whether implementation of the strategy is on course, or if any mid-term corrections are warranted. We have not found any areas of work under way that should be dropped, and new work undertaken since the publication of *Fuel for Thought* appears to be addressing concerns that have arisen since that time. In short, the strategy still seems sound. That is not, however, to say that nothing needs to be changed. At the very least, change is called for by virtue, if for no other reason, of having achieved as much as we expected over the past two and a half years. For example, there is still a need to strengthen the linkages between energy-environment issues and solutions and the mission of poverty reduction, both at the local and the global level. Furthermore, as Karl Jechoutek asks: Shall we make the quantum leap?

The strategy distinguished between indicators of short-term Bank outputs and long-term outcomes for clients. The short-term outputs had a horizon of fiscal 2002 and were focused on the measures that have been reported in the preceding pages. The long-term outcomes have a time horizon of 2005-2010 and are expressed in such terms as reductions in targeted atmospheric pollutants, by certain amounts, in specified numbers of our clients' cities.

Short-Term Outputs

Evidence suggests that internal Bank Group processes and outputs are well on course. Among the major process trends, it is notable that upstream work is informing Country Assistance Strategy papers as well as the support and assessment processes for Poverty Reduction Strategy Papers, and that this upstream work is building knowledge and capacity that feeds through into operations. Moreover, there is a measurable increase in the number of energy operations that have an environmental objective.

Similarly, the level of short-term outputs set out by the end of fiscal 2002 has, by and large, met expectations. In the areas of indoor and urban pollution and climate change, outputs significantly exceed predictions. Concurrently, we have substantially increased the level of support to our clients in environmentally sustainable development of fuel sources, and the field of environmental regulation, monitoring and enforcement.

Relative to the original output indicators, the objective of improving the Bank Group's own responsiveness to addressing the adverse impacts of the energy sector would appear to be weakest. Yet it is probable that the indicators do not adequately reflect the dynamic within the Bank Group, given the growth over the past two years in the proportion and pervasiveness of energy and environment activities.

There are two areas where the Bank needs to improve on delivery. The first deals with environmentally sustainable development of energy. This largely concerns the coal, oil and gas industries, and is covered by the Extractive Industries Review. Regional and anchor energy staff will continue to work with those undertaking the review to ensure that energy-related issues are represented. As it is an independent initiative with its own reporting arrangements, we have not covered it here in any depth.

The second area requiring attention is improvement in the sharing of knowledge both within the Bank Group and with the broader audience of partners and clients. Such work would allow staff to develop a core of best practice knowledge and share it with others working in the same field.

Turning Outputs into Outcomes and Results

If the strategy is on target with the deliverables set for the short term, does that mean that it is on course to deliver the longer-term outcomes envisaged? Sound measurement of the environmental results achieved from the Bank Group's work is difficult due to the diversity and number of activities, time lags between initiating programs and seeing their end results, and difficulties of documenting a causal relationship between a Bank Group output and a country or regional outcome. A full impact assessment would be a truly major undertaking, particularly given the growing presence of energy and environment work in the Bank Group's activities. At this relatively early stage of implementing the strategy, it would not be appropriate to carry out such an assessment.

The challenge, then, is to set up a system for monitoring the outcomes of the strategy. As a start, we will need to establish and document, preferably using existing data sources, a baseline of where the Bank Group has intervened significantly with the objective of achieving the desired outcomes.

The second half of the exercise will be to measure whether a desired outcome has been achieved by the expected date, and to determine the extent to which its achievement can be attributed to the Bank Group's efforts from analytical and advisory activities and adjustment lending, as well as investment operations. A more detailed methodology will need to be worked out, keeping in mind the parallel efforts of other development partners and indirect impact made through catalyzing private sector participation.



The Forward Agenda

Trade-offs Between the Poverty, Environmental Agendas in the Energy Sector

At the time that *Fuel for Thought* was prepared, the Environment Sector Strategy Paper (*Making Sustainable Commitments*), the Energy Business Renewal Strategy, and the Poverty Reduction Strategy Paper process were not foreseen. Over the past two years, these efforts have contributed to understanding the trade-offs between the poverty and environmental agendas in the energy sector—especially in the cases of indoor and urban air pollution. They give an excellent basis for sharpening and refining the objectives, priorities and commitments made in *Fuel for Thought*, thus binding energy environment work more tightly into the fabric of the Bank's core mission. The report of the World Commission on Dams and the Extractive Industries Review are similarly expected to contribute.

Environmental Regulation

The range of the Bank's work in environmental regulation has increased considerably over the past year; there are many more activities under way and they represent a greater level of engagement with those involved in environmental regulation—policy makers, regulators and the regulated. Turning this engagement into lasting improvements in the setting up and enforcement of environmental regulations will be the real test. The results, to a large extent, will depend on how circumstances at the country level develop in parallel, for example, with respect to policy making, governance and the rule of law.

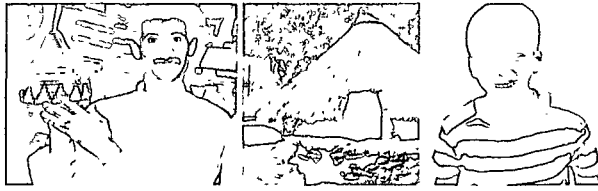
Climate Change

The climate change portfolio is strong, and is benefiting from cofinancing from GEF and, increasingly, from the emerging carbon markets. The Bonn agreement on climate change paves the way for carbon markets to develop further. The extent to which the Bank Group's work in this area will enter the mainstream depends on how the negotiations on the Kyoto Protocol evolve, and how our clients begin to address the practicalities of turning a negotiated text into actions on the ground. The early experience with the Prototype Carbon Fund indicates that learning by doing is a practical and cost-effective solution. The Bank needs to work through how it will support a considerably greater effort in this area, which will necessarily involve a larger number of energy staff.

Working With Partners

The main priorities are to work to improve delivery in areas where the greatest difficulty appears (including knowledge sharing and dissemination) and to build the capacity to work proactively in new areas as they emerge. During the course of the coming year, we will.

- Review and update the Progress Indicators (see Annex) of World Bank Group outputs for the period of fiscal 2002-2005. This will be done through a process of consultation within and between the regional and anchor sector units, including energy, environment, transport and urban.
- Undertake baselining actions for Progress Indicators of outcomes at the country and regional levels.
- Develop, in consultation with OED, a method for reliably linking short-term Bank Group outputs with the achievement of the country and regional outcomes set out in the strategy, and selectively start putting this method into practice.
- Provide support, as required, to staff working on the Extractive Industries Review, implementation of the Bank's preliminary action program for dams, and implementation of the environment strategy and the Energy Business Renewal Strategy. This will ensure that, as these begin to come on stream, any conflicts or discrepancies can be resolved.



PROGRESS INDICATORS ON THE IMPLEMENTATION OF FUEL FOR THOUGHT

ANNEX

Strategic Objective One

Facilitate more efficient use of and substitution from traditional fuels in rural and peri-urban areas to reduce health damage from indoor air pollution and pressures on natural resources (land and forestry).

Goals for Outcomes

Significant progress in household access to cleaner commercial energy:

- Increase share of cleaner commercial energy by 5-10 percent for at least five borrowers by the year 2005 and by 10-20 percent for at least 10 borrowers by the year 2010
- Significant increase in wood fuel production by increasing sustainable agriculture and land management
- Substantial increase in production and use of biogas and charcoal

Actions Needed	FY00-02 Bank Outputs	Current Status
<p>Short-to medium term (FY00-05): In at least eight borrowers, examine rural energy options and agree on the need for sustainable use of traditional fuels and reducing indoor air pollution, integrate these issues in CAS preparation, include traditional fuel use and rural energy access components in Bank projects, and facilitate government commitment to addressing the problems</p>	<p>Five traditional fuel activities/project components</p>	<p>Five operations under implementation, in Chad, Mali, Mongolia, Mozambique, Nicaragua, five more under preparation Substantial analytical and advisory activity/technical assistance (AAA/TA) portfolio including RPTES (Africa) and India.</p> <p>Nine operations under way in Argentina, Cape Verde, China, Panama, Sri Lanka, Uganda, Vietnam, 20 under preparation AAA/TA further building pipeline</p>
<p>Long-term (FY08): Integrate energy access to rural communities and urban poor in Bank operations in about 10 borrowers, and in other borrowers have firm government commitment to improved rural energy access, promote an approach focusing on private sector, communities and innovative financing for small local schemes</p>	<p>Bank operations in about 12 borrowers on rural energy (with renewable energy components for off-grid/isolated areas where appropriate)</p> <p>Review of Bank experience with traditional fuels and indoor air pollution</p> <p>Consultation/dissemination workshops in at least four Regions</p>	<p>Nine operations under way in Argentina, Cape Verde, China, Panama, Sri Lanka, Uganda, Vietnam, 20 under preparation AAA/TA further building pipeline</p> <p>Work in Latin America and Caribbean Region (LCR) and South Asia Region (SAR) covers this topic</p> <p>Continuing dissemination effort with consultations reported in several regions including on rural energy/gender, biomass and energy sector review</p>
	<p>Sector reports, at least for five borrowers that analyze the impact of traditional fuel use on health and natural environment, and identify options (grid and decentralized) to improve access of commercial fuels in poor communities</p> <p>Regional issues and options papers identifying interventions and specific targets to improve energy access to the poor and implementation strategy including local institutional strengthening to address indoor air pollution problems and sustainable forest and land management</p>	<p>Reports complete in three regions, five more under preparation</p> <p>Regional papers on traditional fuel wood use and a regional policy review conducted in AFR, and on renewables for rural electrification in LCR and environmental health in SAS (India)</p>

Strategic Objective Two

Protect health of urban residents from air pollution due to fuel combustion in the residential, transport, industrial and power sectors.

Goals for Outcomes

- Measurable improvements in air quality in at least twenty major cities worldwide by the year 2010
- Reduction of atmospheric particulates concentration by at least 10 percent of current levels in ten large cities by 2005, and by at least 20 percent in 20 large cities by 2010
- Leaded gasoline phased out in the major cities of half of borrower countries by 2005, and all countries by 2010
- Sulfur content of motor diesel reduced to less than 0.5 percent in half of borrower countries by 2005, and all countries by 2010

Actions Needed	FY00-02 Bank Outputs	Current Status
<p>Short to medium term (FY00-05): Focus dialog on reducing air pollution in a selected number of severely polluted cities. Facilitate dirty to clean fuel conversion of district heating and industrial boilers, and individual household stoves and heating appliances by providing financing, and working with governments towards the elimination of price distortions and commercialization/ privatization of gas distribution and clean fuels and marketing. Assist governments in addressing the emissions problems arising from two-stroke engines. Facilitate the phasing out of lead and increasing the market share of unleaded gasoline worldwide through technical assistance. Facilitate the restructuring of the petroleum sector, improving fuel specifications and pricing policies</p>	<p>Establish multisectoral teams to address urban air pollution involving energy, environment, transport and urban staff</p> <p>Sector work and other activities on lead phase-out and/or cleaner vehicle fuels/ emission standards in at least four Regions.</p> <p>Preparation and/or implementation of about fifteen dirty to clean fuel (e.g., coal to gas) conversion projects</p>	<p>Multisectoral teams established in all regions, especially Energy and Environment but also including Education, Health, Transport, Water and Urban.</p> <p>Lead phase-out completed or committed to in at least seven countries in East Asia and Pacific Region (EAP), Europe and Central Asia Region (ECA), LCR and Middle East and North Africa Region (MNA). Cleaner fuels work in EAP, ECA and LCR.</p> <p>Seven projects under implementation, 10 under preparation. Three further AAA/TA to support uptake of gas</p>
<p>Long-term (FY08): Have comprehensive air pollution control programs in place at least in ten major cities, and introduce similar programs in at least 10 other major cities.</p>	<p>Preparation of clean air action plans (with city governments) for at least 10 cities</p>	<p>Four operations under implementation, one under preparation. Clean Air Initiative in LCR, being replicated in two other regions. Other clean air AAA, especially in the ECA region</p>

Strategic Objective Three

Promote environmentally sustainable development of energy resources.

Goals for Outcomes

Air and water pollution and land degradation from the extraction, processing and transport of commercial sources of energy reduced by:

- Promoting environmentally sound exploration and production of oil, gas and coal
- Reducing spillage (of oil), flaring (of gas) and waste
- Rehabilitating and clean-up of selected degraded facilities and areas
- Improving utilization and disposal of byproducts and residuals
- Where applicable, making progress towards compliance with the protocol on long-range transboundary sulfur dioxide and nitrogen oxide pollution
- Increased international trade in electricity, especially hydroelectricity, and natural gas

Actions Needed	FY00-02 Bank Outputs	Current Status
Short to medium-term (FY00-05): Initiate dialogue and reach agreement with about 10 borrowers on the need for controlling the adverse environmental impacts of energy development, identify specific policies and investment operations, agree on a strategy with about 10 borrowers to meet identified outcomes and agree on specific policy measures and investment operations to meet these outcomes, and finance the closure of environmentally unsustainable coal mining operations in several large mines. Initiate and sustain dialogue on electricity and gas trade in at least three sub-regions	Agreed strategy and action plans for at least six borrowers	Action plans completed with six clients on Coal and Liquefied Natural Gas issues. A further 11 are under way
	Preparation and/or implementation of about eight mining rehabilitation and restructuring projects	Five rehabilitation projects under way, and three under preparation, in ECA and SAR
	At least two projects or project components to address gas flaring	Two projects under preparation in Africa Region (AFR)
Long-term (FY08): Implement strategy and launch several rehabilitation, clean up, coal waste (ash) management, utilization, disposal, gas flaring and leakage reduction, and energy trade projects	At least two projects or project components to improve the environmental performance of oil operations	Five projects under implementation in AFR and ECA, AAA in three countries relevant
	At least one sector study/workshop on energy trade	Five trade areas under study/discussion in Southern Africa, West Africa, Mekong Basin, East Asia (for natural gas), Latin America and South Asia

Strategic Objective Four

Mitigate the potential impact of energy use on global climate change.

Goals for Outcomes

For Bank-financed projects in at least 10 countries, 5- to 10-percent reduction in cumulative GHG emissions projected for the year 2015 relative to the case without Bank Group financing. This expected outcome will be achieved through the implementation of a combination of:

- Power sector reform and energy efficiency programs in 10 states or countries by fiscal 2008
- Development of cleaner sources of energy (for example, hydropower, gas) and, where economically feasible, substituting for dirty fuels
- Regional integration of power grids; and increase the volume of energy trade between at least six countries by fiscal 2008
- Doubling of power generation through renewable energy sources in at least 10 borrowers by fiscal 2008

<i>Actions Needed</i>	<i>FY00-02 Bank Outputs</i>	<i>Current Status</i>
<p>Short to medium-term (FY00-05): Continue to build consensus on the need for power sector reform and promote the removal of energy price distortions; reach agreement with at least five governments (central or state) to implement pilot efficiency/DSM activities; foster ESCOs and strengthen relationships with strategic partners to develop alternative energy programs, agree with country/state governments to promote at least six renewable energy development projects, reach agreement in principle with at least six governments on the need for integrating regional grids and other links for promoting regional energy trade, and examine Bank support (leading, guarantees, advisory services) for clean energy projects and energy trade</p>	<p>About six power sector reform projects.</p>	<p>Virtually all power projects contain an element of reform. Eighteen projects under way have identifiable sector reform objectives/ components. An additional 11 similar projects are under preparation.</p>
	<p>At least 15 energy efficiency/DSM/ renewable energy projects or project components (e.g., of power sector restructuring and rural electrification programs).</p>	<p>Twenty-five projects now under implementation are either wholly devoted to EE/DSM/RE or have components. A further 32 similar projects under preparation.</p>
<p>Long-term (FY08): Have in place policy, institutional and regulatory framework to develop clean energy projects in at least 15 countries and an advanced dialogue with other governments; and mainstream advisory services to promote energy trade and renewable energy and energy efficiency projects</p>	<p>Agreed strategy with at least four borrowers on promoting and implementing energy efficiency and renewable energy projects</p>	<p>AAA/TA is under way with 11 counterparts at country or regional level</p>
	<p>Agreed hydro power and gas development strategies with at least four countries</p>	<p>Several project preparation activities include development strategy work (e.g., those under Bank/GEF Strategic Partnership) and nine pieces of AAA are relevant</p>
	<p>10 GEF-supported activities.</p>	<p>Including Bank-GEF, stand-alone GEF medium-sized projects, and short-term measures, the Bank Group is implementing some 42 GEF projects</p>
	<p>Launch Prototype Carbon Fund (PCF) activities</p>	<p>PCF has now completed one transaction and has a pipeline of 45 projects plus an active TA program.</p>

Strategic Objective Five

Develop capacity for environmental regulation, monitoring and enforcement across all levels of governance.

Goals for Outcomes

Efficient environmental policies and regulations related to energy production and use; and transport fuels and vehicle emissions are enacted and enforced by 2010 in at least half of the client countries (with significant progress in enforcement achieved by 2005).

Actions Needed	FY00-02 Bank Outputs	Current Status
<p>Short-to medium term (FY00-05): In borrowing countries: Training/building local capacity for EAs, strengthening environmental regulations for private sector development (IPPs, etc), developing monitoring capabilities, improving enforcement capacity of regulatory agency and legal system, and supporting local level governments and communities, promoting private-public partnerships and participation</p>	<p>Develop and implement an actions-oriented management training program for regulatory authorities</p>	<p>Stand-alone AAA and TA with four clients, and as part of lending with two more is helping develop environmental management frameworks</p>
	<p>Environmental management capacity building components in Bank energy projects, including power reform projects</p>	<p>At least six energy projects have a relevant component Environmental management capacity for energy- related matters is part of many projects under implementation in the environment, transport and urban sectors as well Building capacity is one objective in at least 12 energy AAA/TA</p>
<p>Long term (FY08): Establishing a coherent regulatory framework consistent of improved standards, regulations and incentives for internalizing externalities and backed up by sound economic analysis of environmental impacts for planning and effective implementation programs</p>	<p>Intensive advisory and consensus building activities</p>	<p>Seven "full scale" EERs provide consensus-building platforms In addition, several projects address this Most ESMAP activities have explicit participation/advisory components</p>
	<p>Coordination and partnership with other donors, coherent outreach and communication strategy</p>	<p>Globally, ASTAE, AFRREI, ESMAP and RPTES undertake workshops/ outreach in relevant areas, in addition several ESMAP activities include coordination LCR CAI is also coordinating efforts of several donors</p>

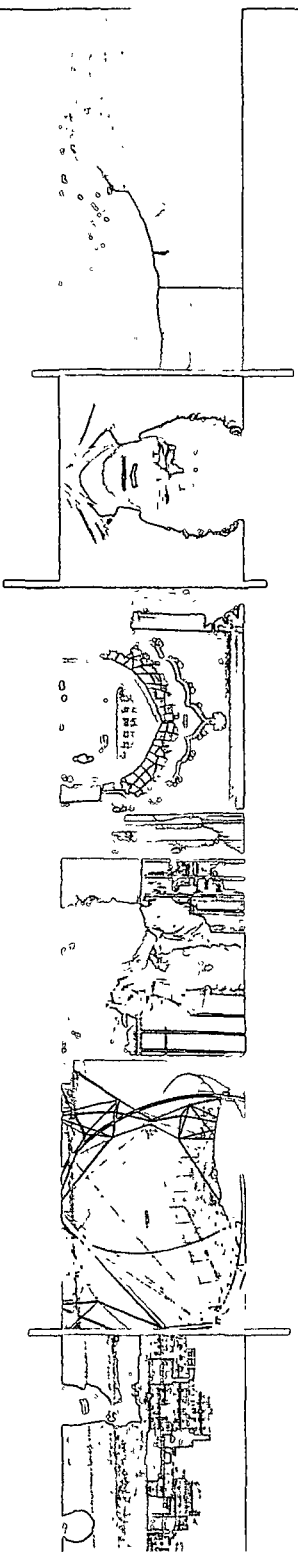
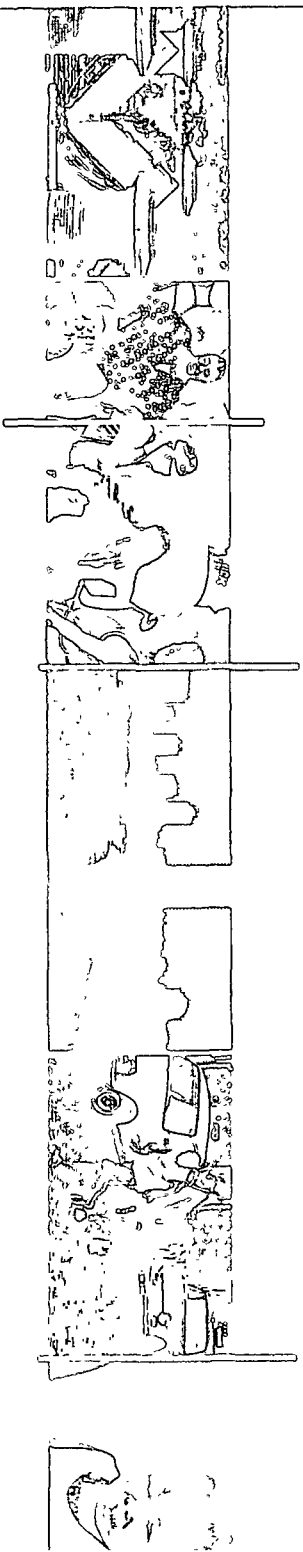
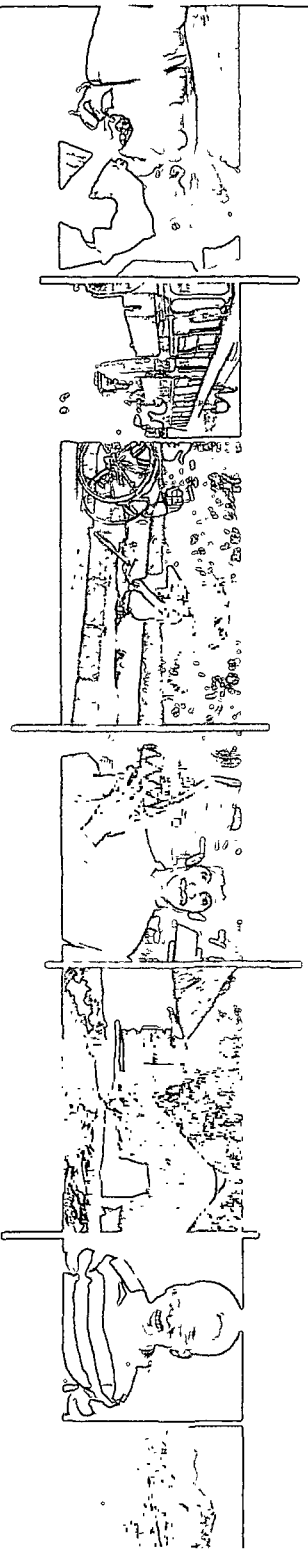
Strategic Objective Six

Make the Bank more responsive to addressing the adverse environmental impacts of the energy sector.

Goals for Outcomes

- Develop more effective ways of generating and sharing knowledge; enhance awareness campaigns; build partnerships with strategic partners; and establish a framework for wider participation of NGOs and civil societies
- Full compliance with Bank safeguards policies
- Distill the policy content of existing good practice notes on the power sector and on energy efficiency into Operational Policies (OPs)

Actions Needed	FY00-02 Bank Outputs	Current Status
<p>Short -to medium-term (FY00-05): Improve the process of estimating ambient and emissions data related to Bank projects, share and disseminate information, launch awareness campaigns, identify champions of change in borrowing countries and promote wider participation of NGOs and civil societies; and facilitate partnerships with other donors and NGOs.</p>	<p>Review and reorganization of the thematic groups dealing with energy- environment nexus across PSI, ESSD and HD Networks (and define the work program of these TGs according to the priorities of this Strategy)</p>	<p>Review pending part of wider SB business</p>
<p>Long-term (FY08): Mainstream creating and dissemination of knowledge, and environmental considerations in energy operations</p>	<p>Evaluation of staff skills and training and recruitment to fill skill gaps</p>	<p>See above</p>
	<p>Research and development on specific issues relevant to implementing the energy environment strategy, e.g. economic analysis of environmental externalities</p>	<p>Ad hoc research undertaken</p>
	<p>At least six Energy-Environment Reviews (and six more in progress) completed and made available</p>	<p>Seven full scale EERs under way or completed, two more planned About 30 "specialized" activities also under way</p>
	<p>Periodic Knowledge Management Notes and workshops on energy/environment issues</p>	<p>Little action taken</p>
	<p>Data on the environmental impacts of Bank energy operations is regularly assessed and made publicly available (by the respective TG)</p>	<p>Bankwide safeguard policies monitoring system being implemented Additional action will be required for evaluation of environmental impacts and public dissemination of this information.</p>
	<p>Joint activities with UNDP, WHO, etc , and local and international NGOs on awareness and consensus building</p>	<p>Joint activities initiated Around 30% of ESMAP portfolio is in energy and environment field which has leveraged substantial additional financing from bilaterals (Japan, Canada, Denmark, Germany) and the private sector (in LCR) CAI has also launched joint work IAP team collaborates with WHO</p>



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