

# Privatesector

# 21277

## RISK MANAGEMENT

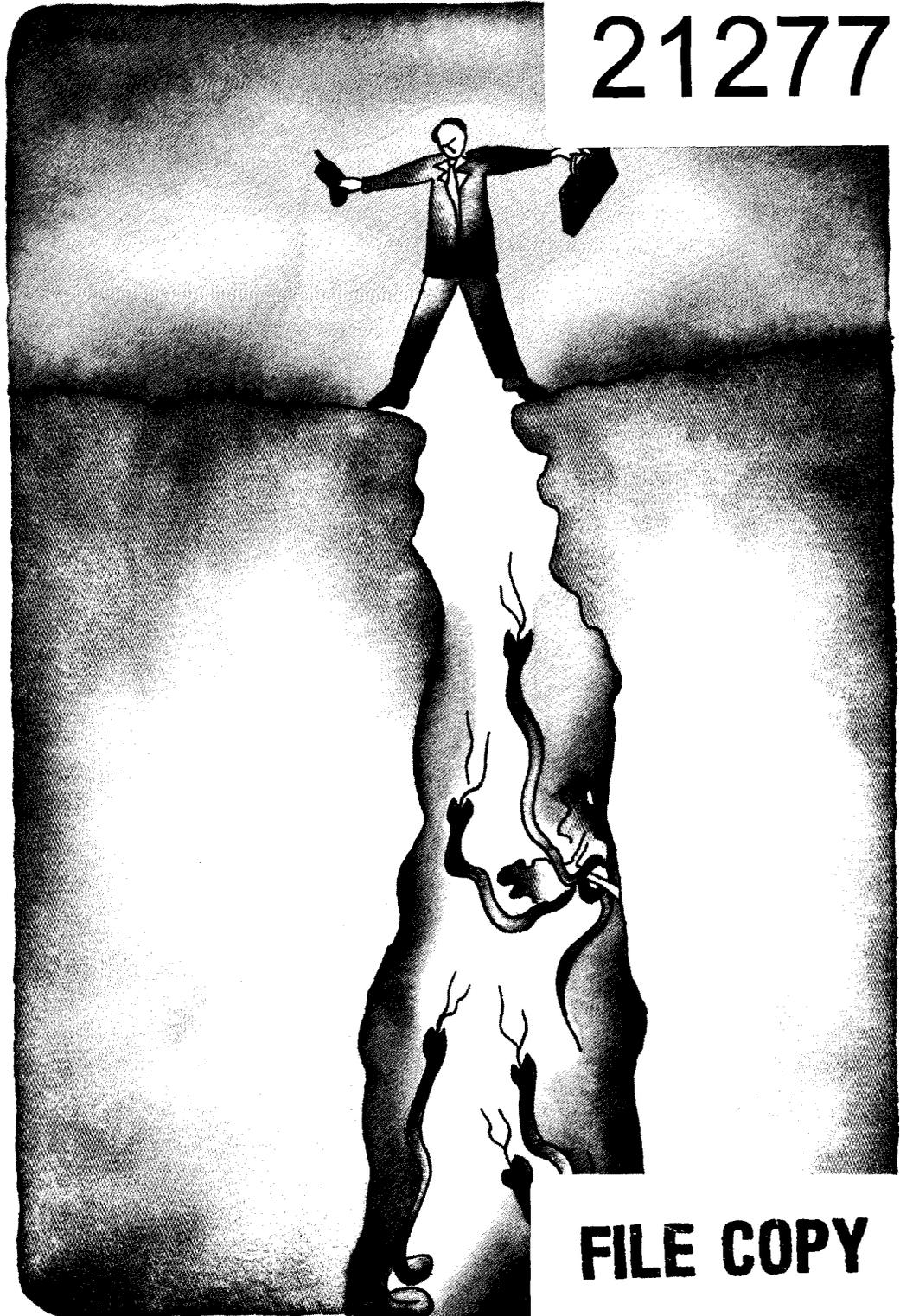
- 5 The East Asian Financial Crisis—  
Fallout for Private Power Projects  
*R. David Gray and John Schuster*
- 13 Contingent Liabilities for  
Infrastructure Projects—  
Implementing a Risk Management  
Framework for Governments  
*Christopher M. Lewis and  
Asboka Mody*
- 17 Risk Management Systems  
to Improve Contract Design  
and Monitoring  
*Christopher M. Lewis and  
Asboka Mody*
- 21 Financing Water and Sanitation  
Projects—The Unique Risks  
*David Haarmeyer and  
Asboka Mody*
- 25 Pooling Water Projects to Move  
beyond Project Finance  
*David Haarmeyer and  
Asboka Mody*

## ENERGY TRADE

- 29 International Gas Trade—  
The Bolivia-Brazil Gas Pipeline  
*Peter L. Law and Nelson de Franco*
- 33 Promoting Regional Power  
Trade—The Southern African  
Power Pool  
*Donal T. O'Leary, Jean-Pierre  
Charpentier, and Diane Minogue*

## PRIVATIZATION

- 37 Why Performance Contracts  
for State-Owned Enterprises  
Haven't Worked  
*Mary Shirley*
- 41 Private Participation in the  
Water and Sewerage Sector—  
Recent Trends  
*Gisele Silva, Nicola Tynan, and  
Yesim Yilmaz*



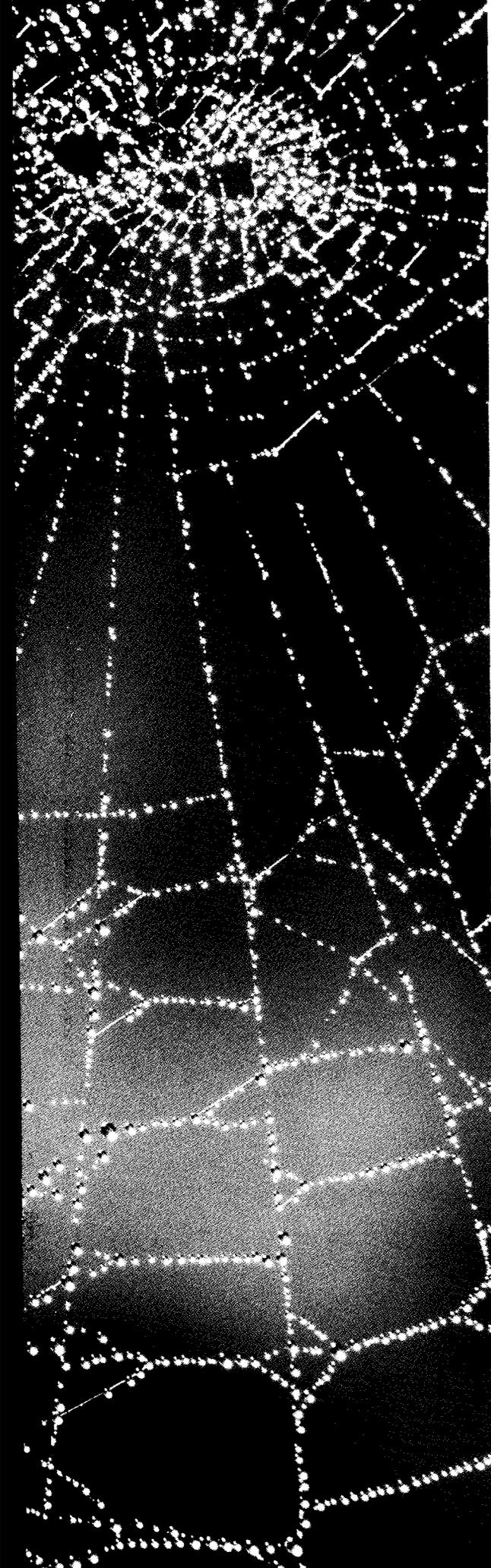
# FILE COPY



*Private Sector* is an open forum intended to encourage dissemination of and debate on ideas, innovations, and best practices for expanding the private sector. The views published are those of the authors and should not be attributed to the World Bank or any of its affiliated organizations. Nor do any of the conclusions represent official policy of the World Bank or of its Executive Directors or the countries they represent.

*Private Sector* is a quarterly publication distributed free of charge. To subscribe, please send your name, mailing address, telephone number, and fax number to the editor (Suzanne Smith, The World Bank, 1818 H Street, NW, Washington, D.C. 20433, email: [ssmith7@worldbank.org](mailto:ssmith7@worldbank.org), fax: 202 522 2961, telephone: 202 458 1111).

Most Notes from *Private Sector* are also available on-line. There is full text in HTML format for on-screen viewing or a downloadable file in Adobe's PDF format (<http://www.worldbank.org/html/fpd/notes/notelist.html>).



### In this issue

The financial crisis that erupted in East Asia in mid-1997 has led to sharp drops in currencies, stock markets, and other asset prices. One year on, the crisis is starting to have a dramatic effect on the **IPP industry in Asia**, which has dominated the global market for private power projects. In this issue we review the implications for power sector reform.

We also review the trends in private participation in **water projects** in developing countries, with an update from the **World Bank's private infrastructure project database**. Future issues will review projects in other sectors: power, telecommunications, and transport.

Finally, we would like to update our subscriber database. Please **revalidate your subscription** by filling out the enclosed form. If we do not hear from you, we will drop your name from our mailing list.

Suzanne Smith  
Managing Editor



PUBLIC POLICY FOR THE  
**Private**sector

Quarterly No. 14, September 1998

**The East Asian Financial Crisis—Fallout for Private Power Projects 5**

**R. David Gray** and **John Schuster** discuss the impact of the East Asian financial crisis on the power sectors of four of the most severely affected economies—Indonesia, Malaysia, the Philippines, and Thailand. For each country the authors examine the impact of the crisis on the cost of private power and the knock-on effects on retail tariffs. They also assess the sustainability of current private power programs, which hinges on the level of government risk exposure, the method used in awarding contracts, and the changed capacity needs in the wake of slowing or negative GDP growth.

**Contingent Liabilities for Infrastructure Projects—Implementing a Risk Management Framework for Governments 13**

To manage their exposure arising from guarantees to infrastructure projects, governments need to adopt modern risk management techniques. **Christopher Lewis** and **Ashoka Mody** introduce an integrated risk management system that draws on recent advances in the private sector. Adapted for use in the public sector, the system enables governments to budget for expected losses and to set aside reserves against unexpected losses, thus avoiding the budgetary stress associated with redirecting scarce public resources to cover a sudden increase in costs.

**Risk Management Systems for Contingent Infrastructure Liabilities—Applications to Improve Contract Design and Monitoring 17**

Government guarantees for private infrastructure projects represent real liabilities, and their costs can average as much as a third of the amount guaranteed. **Christopher Lewis** and **Ashoka Mody** show how governments can use a risk valuation process to analyze the distribution of risks, decide which risks they should bear and which should be borne by the private sector, and reduce the frequency and size of calls on guarantees.

**Financing Water and Sanitation Projects—The Unique Risks 21**

A project finance structure allows water projects with attractive cash flows and risk profiles to secure long-term private capital. But even in industrial countries the credit strength of off-taking municipal governments and the sector's traditional monopoly structure expose lenders to potentially significant credit, regulatory, and political risks. These risks, combined with the sunk, highly specific, and non-redeployable nature of water infrastructure investments, mean that lenders and investors are vulnerable to opportunistic contracting problems and expropriation. Reviewing some recent innovative water and sanitation projects, **David Haarmeyer** and **Ashoka Mody** show that private capital participation on a limited recourse or nonrecourse basis has required support by third parties—such as multilaterals and federal government agencies—to absorb noncommercial risks.

**Pooling Water Projects to Move beyond Project Finance 25**

To date most private sector water projects have been financed on a limited recourse basis, that is, with project cash flows and assets as the main security for lenders. The move from project to corporate (balance sheet) financing is occurring in stages. Financing project debt from the sponsor company's balance sheet exposes that company to significant risk and thus requires a strong and large balance sheet. Designed in part to shield a company's balance

sheet, innovative financing structures and instruments are emerging. Ultimately, the goal is for water utilities to raise debt and equity from capital markets on the basis of their own balance sheets, strengthened by a diversified and stable rate-paying customer base. **David Haarmeyer** and **Ashoka Mody** review the new trends.

### **International Gas Trade—The Bolivia-Brazil Gas Pipeline 29**

The Bolivia-Brazil natural gas pipeline, which will transport natural gas more than 3,000 kilometers, will cost US\$2.1 billion to construct. Despite the substantial benefits for both Bolivia and Brazil and the involvement of reputable private partners, the perceived risks and complexities of this large project made financing it a major challenge. **Peter Law** and **Nelson de Franco** explain the historical factors that shaped the project, how the financing package came together, and the role the pipeline will play in liberalizing the Brazilian hydrocarbon sector.

### **Promoting Regional Power Trade—The Southern African Power Pool 33**

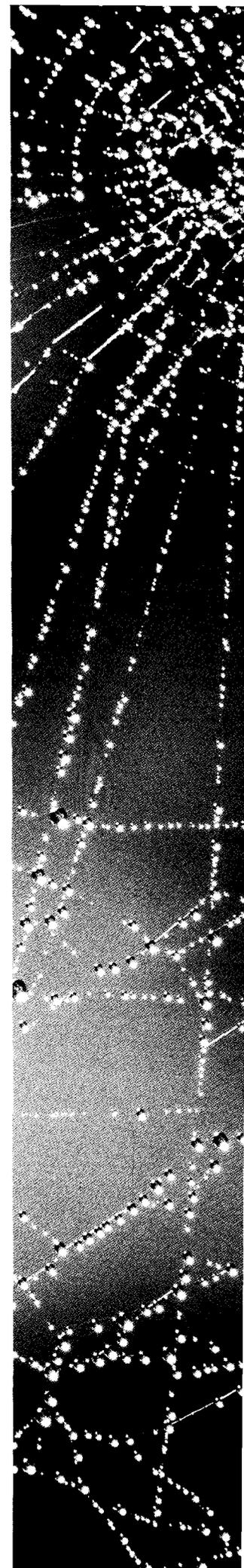
The Southern African Power Pool (SAPP), the first formal international pool to be set up outside North America and Western Europe, was inaugurated in 1995. While the utilities of southern Africa have been importing and exporting electricity for four decades, these trades occurred through bilateral contracts that were complex and often difficult to administer. The objective of shifting to the pool is to create a more efficient regional market. Although physically the pool is still embryonic and trade volumes average roughly 3 percent of production, confidence in the market and mutual trust between the members are being strengthened and sector coordination is dramatically improved. **Donal O'Leary**, **Jean-Pierre Charpentier**, and **Diane Minogue** review the factors that have eased the way for the pool agreements and the challenges that remain in getting the multilateral trading operation under way.

### **Why Performance Contracts for State-Owned Enterprises Haven't Worked 37**

When privatization is not feasible or palatable, developing country governments seeking to improve the performance of state enterprises are often negotiating performance contracts with their managers. Many of these contracts have been put in place with World Bank assistance. Research shows that they rarely work. **Mary Shirley** summarizes the rationale for performance contracts and the evidence against them and explores the reasons why they haven't worked. She concludes that since a well-designed and carefully enforced performance contract can be as politically costly as a well-designed privatization, performance contracts are not likely to be successful in countries that lack the political will to privatize.

### **Private Participation in the Water and Sewerage Sector—Recent Trends 41**

Analysis of the World Bank's private participation in infrastructure database shows that by the end of 1997 private companies operating in developing countries had reached financial closure on US\$25 billion of investment in water and sewerage projects and had taken on the management, operations, rehabilitation, or construction risk of ninety-seven projects in thirty-five developing countries. The database shows an overwhelming dominance of concession contracts compared with divestitures, greenfield projects, and management contracts, and that there are still only a few international companies sponsoring and operating most contracts.



## THREE WAYS TO ORDER

For a free subscription to **Public Policy for the Private Sector**

- 1 Fill out and mail this card to Suzanne Smith, Managing Editor, The World Bank, 1818 H Street NW, Washington, D.C. 20433, or fax it to 202 522 2961

FIRST NAME	MI	LAST NAME
JOB TITLE		COMPANY
STREET ADDRESS		
STATE		POSTAL CODE
COUNTRY	EMAIL	
WORK PHONE	FAX	

## Topics of interest

- Banking and capital markets
- Privatization
- Competition and regulation
- Telecoms and technology
- Energy
- Transport
- Water
- All

- 2 Call 202 458 1111 to record this information
- 3 Email this information to [ssmith7@worldbank.org](mailto:ssmith7@worldbank.org)

Managing Editor:  
Suzanne Smith  
The World Bank  
1818 H Street, NW  
Washington, D.C. 20433

Telephone: 202 458 7281  
Fax: 202 522 2961  
Email: [ssmith7@worldbank.org](mailto:ssmith7@worldbank.org)

Cover illustration by  
Ruth Sofair Ketler.  
Photos on pages 1, 2,  
3, and 12 by FPG  
International.

The entire contents of  
Private Sector © 1998  
World Bank. You are  
authorized to  
reproduce, duplicate,  
and disseminate all or  
part of this publication  
so long as you include  
the name of the  
publication and the  
name of the respective  
author. You may not,  
however, modify, alter,  
or otherwise change  
any part of this  
publication or sell,  
transfer, or otherwise  
disseminate any part of  
the publication for  
profit.

♻️ Printed on recycled  
paper.

Netscape: The Restructuring and Privatization of the U.K. Electricity Supply—Was It Worth It?

Back Forward Home Reload Images Open Print Find Stop

124Newbe.pdf

Public Policy for the  
**Private Sector**

Issue No. 124 September 1997

**The Restructuring and Privatization of the U.K. Electricity Supply—Was It Worth It?**

David M. Newbery and Michael G. Pollitt

The electricity supply industry in England and Wales was under public ownership from 1948 to 1990. For most of this period, a single company, the Central Electricity Generating Board (CEGB), operated all generation and transmission.

Significant changes followed. In the first six years after restructuring, labor productivity in the sector's companies more than doubled. There was a marked shift away from coal and toward natural gas. At privatization, generation based on

Page 1 of 4 100% 8.5 x 11 in Document: Done

Most Notes are now available on-line in full-text HTML format or in downloadable Adobe PDF format (<http://www.worldbank.org/html/fpd/notes/notelist.html>).

# The East Asian Financial Crisis—Fallout for Private Power Projects

R. David Gray and John Schuster

Countries around the world have increasingly turned to the private sector to finance and build new power projects. This trend has been especially pronounced in Asia, which accounts for nearly 60 percent of all new private generation capacity financed in the developing world. But the East Asian financial crisis that began in mid-1997, triggering dramatic stock market and currency slides and stalling economic growth in the region, has already had a profound effect on investment in infrastructure. This Note discusses the impact of the crisis in the power sectors of four of the most severely affected economies—Indonesia, Malaysia, the Philippines, and Thailand. All have major private investments in power generation, but their power sectors are still dominated by vertically integrated public utilities that act as the

country's single buyer. The single buyer enters into long-term power purchase agreements (PPAs) in which the buyer agrees to take power at specified rates from private power producers for periods ranging from ten to thirty years.

While the full extent of the crisis and its fallout in these four countries is not yet known, information available to date shows that the effects vary widely among the countries. To varying degrees their private power programs have been affected by:

- Increased cost of power.
- Threats of contract defaults and renegotiations.
- Contraction of the market for private power.

As the following analysis will show, the divergences in the management and impact of the crisis suggest a number of important lessons for

**TABLE 1 CRISIS-RELATED FACTORS AFFECTING THE IMPACT OF IPP COSTS ON RETAIL TARIFFS**

Country	Dimensions of crisis	Fuel supply	Denomination of payments	Source of financing	Project vintage	Wholesale tariffs	Overall impact
Indonesia	●	○	●	●	●	●	●
Malaysia	◐	○	○	○	○	○	○
Philippines	◐	●	●	●	◐	◐	◐/●
Thailand	●	●	○	◐	◐	○	◐/○

○ Little impact    ◐ Some impact    ● Severe impact

power reform and the role of independent power producers (IPPs) in that process.

### Increased cost of power

A currency depreciation of the magnitude of those in East Asia increases the cost of most goods and services, including electric power. The extent of the rise in power costs attributable to private power has varied among the countries, depending on such factors as:

- The dimensions of the economic crisis.
- The origin of the fuel supply.
- The currency denomination of the wholesale tariffs.
- The extent of domestic financing for projects.
- The amount and timing of private power purchases.
- Wholesale and retail tariffs.

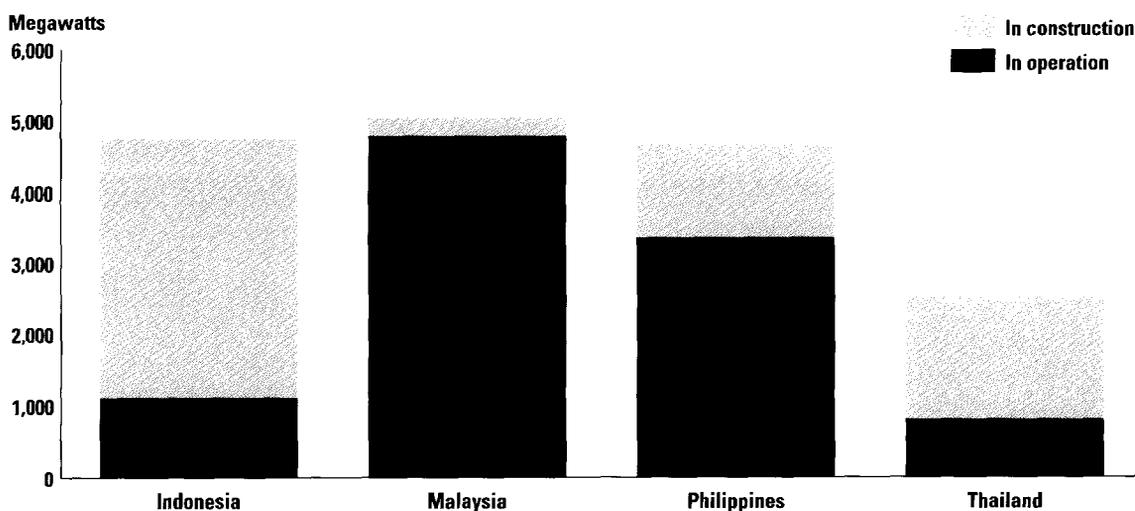
Each of these factors is examined below, and table 1 sums the aggregate implications for tariffs. This analysis suggests that the crisis will have the most severe impact in the Indonesian power sector, where retail tariffs may need to rise by up to 70 percent to pay for the increased cost of private power. In contrast, retail elec-

tricity rates will need to increase only slightly in Malaysia and Thailand to cover increased IPP costs—though rates may have to increase further for other reasons.

### Dimensions of the economic crisis

All four countries have suffered severe economic setbacks since mid-1997, and the International Monetary Fund has forecast a significant slowdown in economic growth in 1998.<sup>1</sup> By early June 1998 Malaysia, the Philippines, and Thailand had experienced currency depreciations of around 35 percent, and interest rates in Malaysia and the Philippines had risen 50 percent from a year earlier. Interest rates in Thailand are nearly twice the previous year's level. The drop in the value of currencies was accompanied by declines in regional stock markets. The Malaysian market index fell by more than 50 percent in local currency terms between early June 1997 and 1998, while the Philippines and Thailand suffered slides of 30 and 40 percent. Indonesia has been hit hardest—the rupiah has dropped 80 percent in value in the past year, increasing the local cost of imports by a factor of five. Interest rates are more than three times higher

FIGURE 1 PRIVATE POWER CAPACITY, MARCH 1998



Source: Hagler Bailly IIP Knowledge Base.

than before the crisis, the stock market has fallen by more than 40 percent, and growth is projected to turn sharply negative this year.

Many regional utilities have high levels of foreign debt, and the depreciation has led to heavy foreign exchange losses in servicing that debt, eroding their financial positions. The cost of capital for new projects is likely to rise sharply as investors assess additional premiums to compensate for higher perceived risk. The skyrocketing domestic interest rates also make financing new projects costlier.

### **Origin of fuel supply**

Fuel costs, a pass-through for power off-takers under most private power contracts in Asia and throughout the developing world, can represent about a third of the life-cycle cost of a coal project and about three-quarters of the life-cycle cost of oil and gas projects.<sup>2</sup> If fuel is imported, a depreciation of the size of those in East Asia significantly increases the local currency costs of both public and private power. In the Philippines and Thailand most private projects import fuel—at prices about 50 percent higher in 1998 than in 1997.

### **Currency of wholesale tariffs**

The currency denomination of payments for private power is one of the most important differentiating factors in the impact of the crisis on those payments. In Indonesia and the Philippines, where wholesale electricity tariffs for IPPs have been denominated in hard currencies, the local currency cost of utilities' off-take obligations has ballooned. In Malaysia, where power purchase payments are denominated in local currency and interest rates have risen comparatively less, the cost of private power has risen by less than 10 percent.

Thailand's national utility, the Electricity Generating Authority of Thailand (EGAT), has been partly insulated from currency exchange risks because, with the exception of purchases from a private power project in the Lao People's

Democratic Republic, payments to private power projects are denominated in baht. Nonetheless, the depreciation of the baht made planned projects unfinanceable under the existing power purchase agreements. EGAT reopened negotiations with sponsors to ensure the financial viability of projects needed to reduce the country's power shortages. The utility pegged part of the private power tariff to the U.S. dollar and assumed some currency risk by agreeing to pay IPPs at an exchange rate of 27 baht per dollar, close to the precrisis rate of about 25 baht per dollar. In early June the baht traded at 40 to 42 per dollar.

### **Extent of domestic financing for projects**

Projects attracting high levels of domestic finance are less susceptible to exchange rate volatility (although they may be vulnerable to interest rate hikes). Malaysia and Thailand both have high levels of local debt financing for IPPs (90 percent and 75 percent), which help to mitigate the impact of the currency depreciation. Domestic financing is negligible in the other two countries—14 percent in Indonesia and just 3 percent in the Philippines—leaving them more exposed to the mismatch between project revenues denominated in local currency, and hard currency obligations to project lenders.

### **Amount and timing of private power purchases**

Indonesia, Malaysia, and the Philippines are among the developing world's largest markets for private power with limited recourse financing.<sup>3</sup> Each has nearly 5 gigawatts (GW) of private power capacity in operation or under construction (figure 1). Private power now accounts for more than half of all generation in Malaysia and the Philippines. It has played a smaller role in Thailand. But once all the nearly 2 GW of private generating capacity now under construction in Thailand becomes commercialized, private power will account for about 10 to 15 percent of the country's electricity.

The four countries differ in the timing of their private purchases. Malaysia and the Philippines

began their private power programs early and now account for about 80 percent of the commercial private power capacity in operation in the four countries. The financial crisis is likely to have a large impact on electricity costs in the Philippines, which must make dollar payments to several operating IPPs. But in both Malaysia and the Philippines relatively little new private power is expected to be commercial by 2001. The fact that relatively little new private capacity is coming on line, along with the substantial payments for private power made before the crisis, will help mitigate the short-term impact of the crisis in these two countries. The longer-term impact of the crisis will depend on the cost and timing of development after 2001. Currently, the Philippines plans to commercialize substantial gas and hydroelectric capacity starting in about 2002.

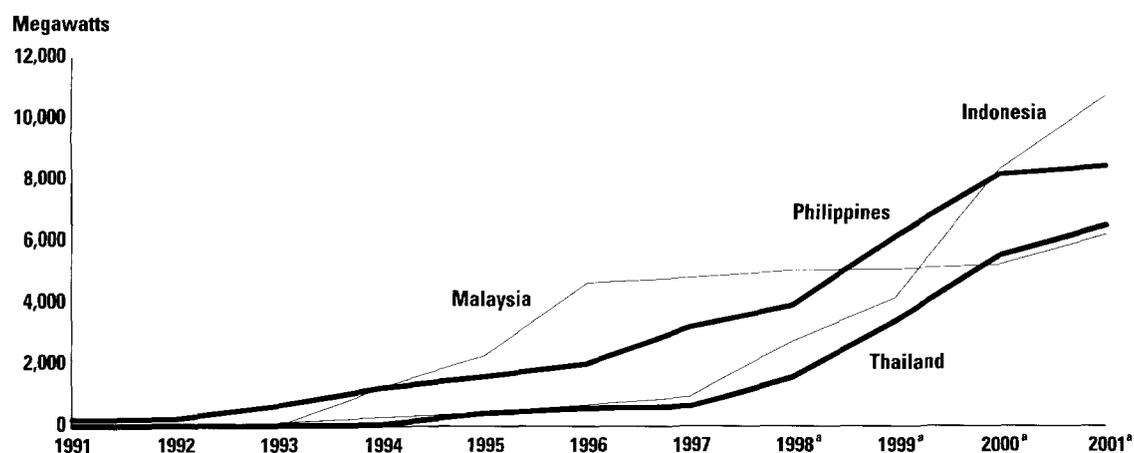
The crisis will have the largest impact in Indonesia, which accounts for nearly half the new IPP capacity due to begin operation in these countries in 1998–2001. In all, more than 9,000 megawatts (MW) of capacity is under construction or at an advanced stage of development in Indonesia (figure 2).

### Wholesale and retail tariffs

A rational system of wholesale IPP tariffs and retail consumer tariffs is a prerequisite for a successful private power program. Wholesale power costs should on average be about two-thirds of retail rates, which must also cover nongeneration costs (such as transmission, distribution, administration, and customer service). Wholesale IPP tariffs in Malaysia and Thailand range from 3¢ to 4¢ per kilowatt-hour (kWh), while retail tariffs are substantially greater, suggesting that utilities in these countries have adequate margins to pay nongeneration expenses.

The relationship between retail and wholesale power tariffs in Indonesia and the Philippines implies a less stable financial situation. Wholesale power tariffs in the Philippines are relatively high, and retail rates may not be sufficient to cover the cost of operations by the national power utility, Napocor. The increase in interest costs on foreign debt and in fuel and other costs in the wake of the crisis has further eroded Napocor's financial position. Rates should rise substantially as a result of automatic tariff ad-

**FIGURE 2 CUMULATIVE DEVELOPMENT OF PRIVATE POWER CAPACITY, 1991–2001**



a. Projected.

Source: Hagler Bailly IIP Knowledge Base.

justments and will need to rise even more if Napocor is to cover its costs.

In Indonesia Perusahaan Listrik Negara's (PLN) financial situation appears even more critical. Even before the crisis retail tariffs appeared inadequate relative to costs. While wholesale tariffs for private power ranged from 5.4¢ to 8.5¢ per kWh, retail tariffs were just over 7¢ per kWh, implying that margins were inadequate to pay for nongeneration expenses. When the rupiah fell from roughly 2,500 per U.S. dollar to more than 10,000, PLN's position deteriorated. Even with price hikes in March and May 1998 totaling more than 30 percent, retail tariffs remained below 3¢ per kWh.

Some of the region's utilities will need massive cash infusions from either government transfers or privatization to meet their debt obligations. As a result, their ratings by international credit agencies have been downgraded, and some are now considered technically bankrupt.

### Threats of contract defaults and renegotiations

The public utilities' worsening situation has increased pressures to renegotiate contracts. Several planned projects with signed PPAs have been reviewed or postponed. Governments have also sought to modify contracts for projects already in operation. Indonesia, the most heavily exposed country, has called on project sponsors to lower power prices and has tried to negotiate lower purchase obligations. In February 1998 PLN issued letters to three IPPs unilaterally setting an exchange rate for its payments to the private projects of 2,450 rupiah per dollar (the rupiah was then trading below 8,450), in violation of the existing PPAs. PLN later backed away from this position, promising eventual full payment in dollars. But international rating agencies have assessed an increased risk of default for several projects.

Renegotiating or defaulting on contracts can be costly to governments as well as to sponsors and investors. Countries that have breached contracts will deter investors. But all parties have

**TABLE 2** EFFECT OF THE CRISIS ON EXPECTED NEW GREENFIELD PROJECT DEVELOPMENT, 1998–2001  
Gigawatts

Country	Precrisis projections	Postcrisis projections	
		Low-growth scenario	High-growth scenario
Indonesia	7.3	3.8	4.0
Malaysia	1.4	0.1	0.5
Philippines	3.6	2.8	3.3
Thailand	3.8	0.2	2.0
Total	16.1	6.9	9.8

*Source: Hagler Bailly IPP Knowledge Base.*

an interest in reviewing agreements that may lead to an unsustainable situation. Many factors affect the sustainability of IPP programs, including (as outlined below) the appropriateness of government support for private projects, the use of competitive procurement procedures for projects, and the need for power. Analysis of such factors in the four countries predicts sustained government commitment to private projects in most countries. But it also points to a high risk of breach of contract by the government or public utilities in some cases.

### Government risk sharing

Governments have assumed some risk for private power projects in all four countries. Such support may take the form of government guarantees backstopping the obligations of the power purchasing utilities or financial participation in the projects. While direct support to projects can serve as an indicator of government commitment, excessive liabilities that are likely to come due when governments can least afford them (such as during a financial crisis) can undermine the sustainability of private investment programs, leading to default and renegotiation.

In Malaysia and Thailand the central governments have assumed some risk, but have granted no guarantees or other direct official forms of support. They have provided no special foreign exchange protections for private power projects beyond those granted to all foreign investors. Government fuel suppliers have provided similar levels of security to projects as would be provided under commercial fuel supply contracts. In many projects governments have assumed risks mainly by providing loans through government pension funds, state banks, or other public sources of funds, thus assuming similar commercial risk as other lenders.

In contrast, the government of the Philippines assumed fairly substantial risks through sovereign guarantees, including all fuel supply, inflation, and foreign exchange risks.<sup>4</sup> Its willingness to assume these risks was important to the successful financing of several early projects. Now that the market is fairly mature, the Philippines has recently reduced the guarantees offered to new projects, and some are being financed with no sovereign guarantees. The Indonesian government assumed fewer risks for projects, but it granted projects “let-

ters of comfort” in which it agreed to support the discharge of PLN’s responsibilities. These letters do not amount to a guarantee, however. Project sponsors assumed some fuel supply and other risks.

### Competitive bidding

Recent experiences such as Enron’s Dabhol project in India have shown that governments may face pressure to renegotiate projects that have not had to undergo the scrutiny of a formal competitive bidding process. Both Malaysia and Thailand procured new generation using competitive bidding—one reason for the lower wholesale tariffs in these two countries—while most IPP projects in Indonesia and many of the early projects in the Philippines were concluded through direct negotiation with project sponsors. The Philippines has since adopted international competitive bidding to increase transparency and lower costs.

### Need for power

The primary motivation in seeking private power was the dire need for more generation capacity. Widespread power shortages and blackouts

**TABLE 3 FACTORS AFFECTING THE SUSTAINABILITY OF CURRENT PRIVATE POWER PROGRAMS**

Country	Government risk sharing	Transparency of contract awards	Expected capacity needs (short term)	Overall sustainability
Indonesia				
Malaysia				
Philippines				
Thailand				

Low     
 Low to medium     
 Medium to high     
 High

are a costly drag on private investment and economic growth. As long as this need persists, it creates powerful incentives for governments to remain committed to private power projects.

There is a long-term need for power in all four countries. While there is currently excess capacity in the Philippines and Thailand, future demand growth should eliminate these surpluses and create a need for new projects. The future balance of supply and demand depends on the pace of new capacity additions. Excess capacity is expected to materialize in parts of the Indonesian power system as large plants now under construction become operational. Excessive surpluses could lead to pressures to break agreements on new projects. Thailand has taken steps to avoid surpluses by delaying power projects for two years.

### **A shrinking market for private power**

The economic slowdown and the higher prices for many basic goods have reduced demand for electricity, restricting future private power opportunities. It is estimated that total new private power development in the region could fall from around 16 GW to less than 7 over the period 1998–2001 (table 2). In Indonesia alone new private power development could decline by 3.5 GW, and near-term markets for new projects in Malaysia and Thailand could all but disappear. In the Philippines the crisis is expected to have a modest impact on new project commercialization through 2001.

The financial crisis has stalled many new construction projects, both public and private, as the construction costs have soared in local currency terms. PLN has canceled sixteen IPP projects, many of which had signed contracts. Plans for a 1,000-MW private power project in Malaysia have reportedly been shelved because the drop in the exchange rate increased the project's prospective costs by more than 1 billion ringgits (about US\$260 million). Depreciation poses a greater challenge to countries still in the early phases of IPP development, when construction risks are important, since

most equipment and construction costs are in hard currency.

### **Implications for private power policy**

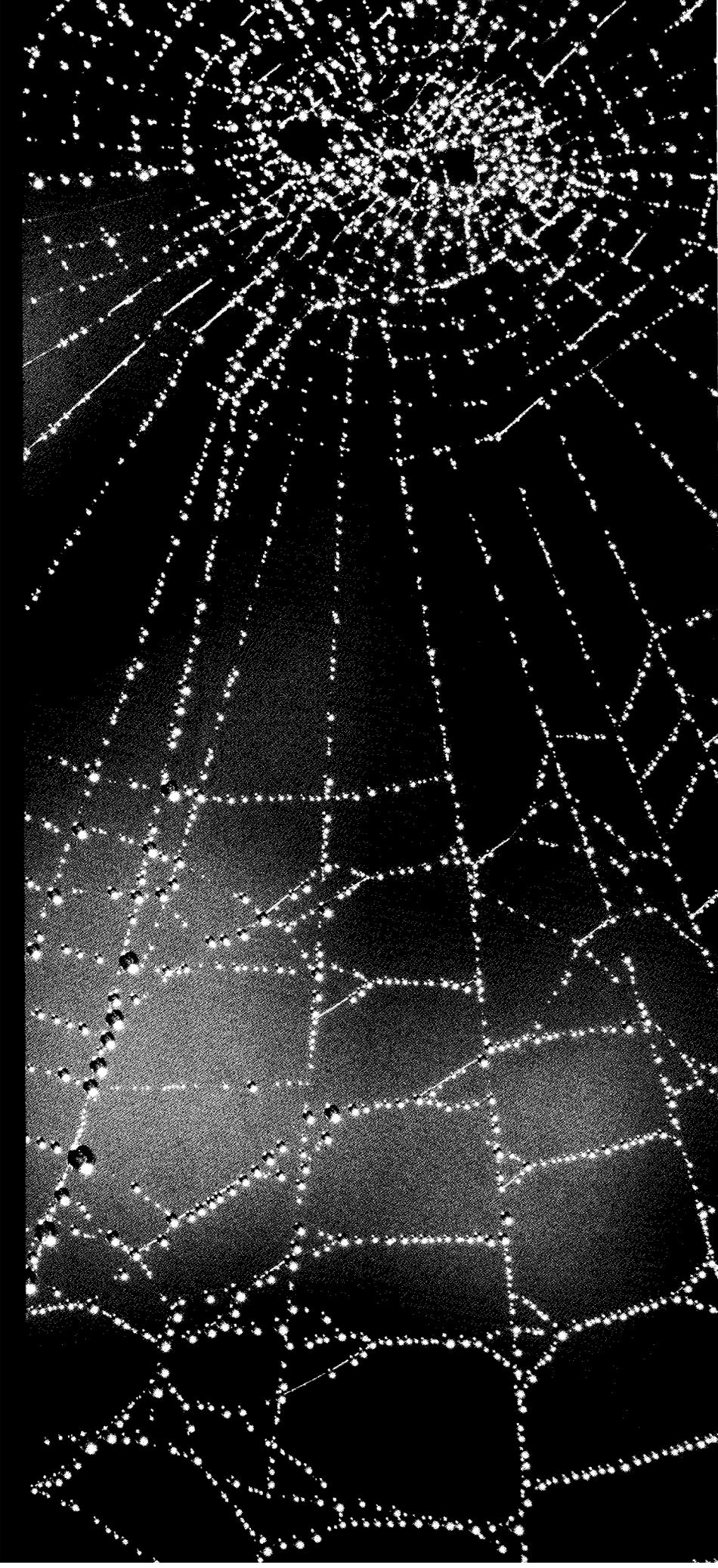
While no one could easily have predicted the dimensions of the crisis or have designed a power policy to protect projects from the economic shocks, analysis of the effects offers lessons for Asia and the rest of the developing world. Countries such as Malaysia and Thailand have adopted power policies that appear to have left them less exposed than other countries (table 3). Price reform, domestic financing, competitive bidding, and appropriate government support mechanisms mitigate the effects of the crisis on the cost of power and the sustainability of investment programs. The timing of project development also appears to be a major factor in the severity with which the crisis has affected regional power programs.

The Philippines and Thailand are pushing ahead with plans to privatize their national utility companies, despite the more difficult environment for privatization in the wake of the crisis. But unlike many countries in Latin America, no Asian countries have yet undertaken fundamental restructuring and privatization of their power sectors to reduce the burden of public sector liabilities and put the whole power industry on a more sustainable footing.

The market for private power in Asia appears both smaller and more fraught with uncertainty than before the crisis. In this new environment investors will scrutinize projects more closely, and governments will need to manage power programs judiciously to continue to attract investment. They need to strike a balance in providing support to the industry, shoring up private projects in the near term while avoiding burdensome, open-ended commitments that could hamper the longer-term prospects for reform.

This text was finalized in late June.

<sup>1</sup> International Monetary Fund, *World Economic Outlook* (Washington, D.C., May 1998).

- 
- 
- <sup>2</sup> Power off-takers accept fuel risks in most projects with power purchase agreements. Banks generally believe that power off-takers are better able to take these risks than other project participants because of their ability to pass fuel price increases along to consumers. See Suman Babbar and John Schuster, "Power Project Finance: Experience in Developing Countries" (RMC Discussion Paper 119, World Bank, Resource Mobilization and Cofinancing Vice Presidency, Washington, D.C., 1998).
- <sup>3</sup> See Suman Babbar and John Schuster, "Power Project Finance: Experience in Developing Countries" (RMC Discussion Paper 119, World Bank, Resource Mobilization and Cofinancing Vice Presidency, Washington, D.C., 1998).
- <sup>4</sup> See David Baughman and Matthew Buresch, "Mobilizing Private Capital for the Power Sector: Experience in Asia and Latin America" (U.S. Agency for International Development and World Bank, Washington, D.C., 1994).

*R. David Gray (rgray@worldbank.org), consultant, Private Sector Development Department, and John Schuster (jschuste@haglerbailly.com), manager, Hagler Bailly Consulting*

# Contingent Liabilities for Infrastructure Projects

## Implementing a risk management framework for governments

*Christopher M. Lewis and Ashoka Mody*

**To manage their exposure arising from guarantees to infrastructure projects, governments need to adopt modern risk management techniques. Because guarantees come due only if particular events occur and involve no immediate cost to the government, they rarely appear in the government accounts or have funds budgeted to cover them. This Note introduces an integrated risk management system that draws on recent advances in the private sector. The system, adapted for use in the public sector, enables governments to budget for expected losses and to set aside reserves against unexpected losses, thus avoiding the budgetary stress associated with redirecting scarce public resources to cover a sudden increase in costs.**

Over the past several years many large multinational firms, including Bankers Trust, Chase Manhattan, and Microsoft, have implemented enterprisewide systems for risk management. For each risk identified as important, these firms determine the best approach for improving their management of exposure, whether by insuring, transferring, mitigating, or retaining the risk. The goal is not just to hedge a fixed set of risk exposures, but to determine the areas and lines of business in which a company is willing to retain risks in order to generate target returns.

Adapted to the public sector environment—and customized to reflect the government's budgetary and regulatory processes, the legislative and legal environments, and the risks being evaluated—this approach can be used to manage a government's exposure to risk, particularly contingent liability risk. The model involves six main steps:

- Identifying the government's risk exposures.
- Measuring or quantifying expected and unexpected exposures.
- Provisioning for expected costs in the budgetary process.

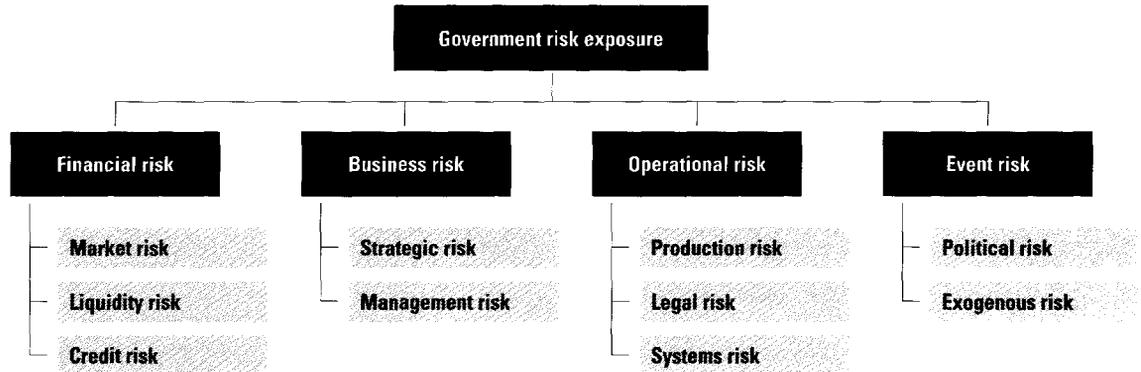
- Assessing the government's tolerance for bearing risk.
- Using the government's risk tolerance as a basis for establishing policies and procedures for structuring reserves against unexpected losses.
- Implementing risk mitigation and control mechanisms to prevent unintended losses on those risks and establishing systems to continually monitor and reassess the government's risk exposure over time (see page 17).

As in the private sector, these steps should be applied to four general categories of risk: financial, operational, business, and event risk.

### Measuring risk

A government's exposure to loss can arise from a wide variety of events, and attempting to account for every source of exposure is not feasible. A better approach, and that followed in the private sector model, is to first examine general categories of risk and then focus on the areas of highest risk (see figure 1 for a lattice of generic risks). The next step is to value the expected and unexpected losses (see box 1 for a

FIGURE 1 RISK IDENTIFICATION LATTICE



definition of expected and unexpected losses). The valuation techniques used will depend on the type of risk being analyzed and the data available. Actuarial and econometric models can be used to estimate exposures, but both techniques require substantial data on the performance of a program (or on a comparable program). For project finance, where deals are unique and data records often missing or of low quality, more advanced modeling approaches are required. The most powerful are those commonly used to value options in financial markets; these can be applied to value direct loans, loan guarantees, and insurance contracts granted to support infrastructure liabilities.

### Budgeting for expected costs—the accounting challenge

Armed with a measure of risk exposure for expected costs, a government can use the information as a budgetary control mechanism and work out how to improve the budgetary process to provide stronger incentives for risk management. The government could publish its risk exposure in the national budget, use it to establish exposure limits or credit limits, or use it to develop risk-adjusted performance measures. (Such measures could be applied to reward programs that deliver social benefits with the least risk to the public budget.)

The main impediment to implementing these options is the cash budget accounting system used by most governments. While private institutions compute virtually all investment decisions, expenditures, plans, and budget forecasts

on a present value basis, most government bodies account for credit and insurance products using a simple cash-based system of budgeting. Cash-based budgeting misrepresents and masks the aggregate exposure associated with loan guarantees and government insurance programs and creates perverse incentives for selecting one form of financing assistance over another.<sup>1</sup> By failing to align the budgetary impact of direct loans, loan guarantees, insurance, and grant programs with their true economic costs at the time commitments are made, a simple cash budget creates an intertemporal myopia, moral hazard, or both. Only by enforcing budgetary controls at the time the financial assistance is committed can the budgetary incentives be realigned to eliminate this effect.

Many governments face significant legal, regulatory, and political hurdles in moving from current budgetary practices to a full accounting of the risks of contingent liabilities. Often governments prefer incremental changes or interim steps to smooth the transition. Implementing risk-adjusted performance measures allows governments to manage their exposures to contingent liabilities even if an immediate change in national budgetary policy is not feasible. Nonbudgetary control mechanisms for contingent liabilities (publishing information, establishing credit quotas or exposure limits, and earmarking future funds to cover guarantee costs) also could be used during a transition to a new budgetary system. And they could be used on a permanent basis for liabilities grandfathered during a change in budgetary policy or as a permanent management solu-

**BOX 1 DEFINING EXPECTED AND UNEXPECTED LOSSES**

Consider a government loan guarantee program characterized by the following very simple probability distribution. While the expected costs of the program (the mean of the distribution) are US\$10, losses will exceed this expectation 35 percent of the time. That means that if the government sets reserves only to cover expected losses, it will have to request additional funds in 35 percent of all possible outcomes of the guarantee. For a portfolio of thirty similar programs and with five-year guarantees, the central government would have to go to the legislature twice a year for additional funds.

Probability (percent)	Exposure (millions of U.S. dollars)
5	0
5	2
15	5
15	8
25	10
15	12
5	14
5	16
5	18
2.5	20
2.5	30

tion if the government fails to enact a change in the budget law.

### Reserving for unexpected costs

In addition to budgeting for the full expected present value of costs, governments need to set aside reserves against unexpected losses. For a private firm with multiple lines of business, determining the appropriate level of capital or reserves is a complex procedure that takes into account both the variability of losses for each product line and the correlation between product returns and the opportunity cost of capital.

A private firm must also weigh the expectations of shareholders and stakeholders, rating agencies, and business partners in determining the optimal level of capital. The capital or reserves held by an enterprise reflect its relative risk aversion and its ability to withstand a specific level of unexpected losses. Thus a firm seeking a AAA rating will hold considerably more capital against unexpected losses (say, capital to cover a 99 percentile event over a one-year period) than a firm seeking an A rating (capital to cover a 90 percentile event).

Similar pressures come into play in assessing government tolerance for risk. But the assessment must also consider the unique question of

how often the executive wants to go to the legislature for funds. Once the proper valuation tools are in place, the government can set reserve policy based on an assessment of its aversion to making frequent funding requests. The government's leverage considerations will also be different from those in the private sector. Holding more funds in reserve increases the liquidity of the guarantees that the reserve supports, increasing their value and allowing the government to leverage more private funding in the guarantee program. But reserving funds in a separate account reduces the money available for other public sector projects and services. If the net benefits of additional public spending exceed the liquidity benefits of adding to the guarantee reserve, the government may want to direct additional funds toward public spending.<sup>2</sup>

### Setting reserves

Having assessed which risks and what level of loss it is willing to bear, the government can set its reserves against unexpected losses ("risk capital") in its credit and insurance programs. But first it needs to determine whether reserves will be set based on the additive unexpected loss exposure of each guarantee or on a portfolio value-at-risk approach to account for portfolio diversification, what the investment policy of the reserves will be, and where the reserves should reside.

Under an additive reserve standard the government calculates the unexpected loss exposure of each of its contingent liabilities independently (that is, examines the sensitivity of each guarantee valuation to changes in the underlying factors). Then, for a given confidence level and time interval, it determines the amount of unexpected loss it wishes to cover for each guarantee, taking into consideration the opportunity cost of capital. It then identifies the average cash reserve required to fund these unexpected losses. Finally, it aggregates the individual cash reserve balances to arrive at a total unexpected loss reserve.

The problem with the additive approach is that it fails to account for portfolio diversification—the fact that pooling imperfectly correlated risks will reduce the variance in the expected loss of a portfolio. As a result the risk of the overall portfolio will be overstated, and more protection against unexpected losses provided than originally sought by the government. The alternative is to calculate the aggregate loss distribution of the government's portfolio of risks, using a value-at-risk approach that incorporates cross-correlations between guarantee exposures, and then set reserves to cover unexpected losses based on the unexpected loss profile of the entire portfolio.

### Investing reserves

The objective in investing the reserve funds should be to maximize the value of the assets when the costs to the government increase—that is, to invest the reserve funds in assets that provide the best hedge against the government's cost for a given return. In doing this, the government may achieve better results by managing its assets and liabilities at the balance sheet level rather than on a program basis.

The government also needs to decide whether to hold its reserves offshore, in a foreign currency, or domestically, in the domestic currency. If the guarantees are denominated in dollars, the government should consider investing the reserve fund in dollar assets and possibly keep-

ing the reserve offshore to circumvent convertibility risk issues. This strategy would greatly enhance the market value of the guarantees and provide the government with greater leverage from the guarantee program. However, decisions on the location of the reserves must be made in the context of the government's broader foreign currency risk management program.

### Next step

This approach to risk management provides a mechanism for governments to critically assess the distribution of risks within a loan guarantee or insurance program and come up with better designed contracts and fewer and smaller calls on guarantees. And as risks change over time, the framework provides a basis for easy reestimation and quick adjustments to the budgetary and reserve system. A companion Note on page 17 shows how.

This Note is based on a longer paper by the authors in Timothy Irwin, Michael Klein, Guillermo E. Pery, and Mateen Thobani, eds., *Dealing with Public Risk in Private Infrastructure* (Latin American and Caribbean Studies, Washington, D.C.: World Bank, 1998).

- <sup>1</sup> To see how these incentives skew decisionmaking, consider the different ways in which a government could help finance a US\$100 loan to a private infrastructure provider. If the government provides a 10 percent loan subsidy, the cash budget cost would be US\$10 in year one. If it provides the loan directly, the cash budget cost in year one would be US\$100—the full face value of the loan. And if it agrees to guarantee a loan by a private bank, the budgetary cost would be zero (or negative if a guarantee fee is collected) in the first year. Thus while the economic and financial values of the three forms of financial assistance are equal, a legislative body would favor the guarantee option.
- <sup>2</sup> When a private company assesses the tradeoff between holding reserves and investing in other programs, it usually has a targeted economic return that helps guide its capital policy. For a government the comparable concept is social return. Calculating social return requires a complete asset-liability management program that goes beyond the valuation of infrastructure liabilities or other forms of direct loans, loan guarantees, and insurance. This Note focuses on reserving against contingent liabilities without considering a broader asset-liability management policy.

*Christopher M. Lewis, Ernst & Young, and Ashoka Mody (amody@worldbank.org), Project Finance and Guarantees Department*

# Risk Management Systems for Contingent Infrastructure Liabilities

Applications to improve contract design and monitoring

*Christopher M. Lewis and Ashoka Mody*

**Government guarantees for private infrastructure projects represent real liabilities, and their costs can average as much as a third of the amount guaranteed. Most governments do not know the full extent of these liabilities, because they have made no attempt to systematically estimate them. A companion Note proposes a new framework for identifying government exposures, valuing expected and unexpected risks, and budgeting for expected risks and reserving for unexpected ones. This Note shows how governments can use the valuation process to analyze the distribution of risks, decide which risks they should bear and which should be borne by the private sector, and reduce the frequency and size of calls on guarantees.**

In what may be the first time that a sophisticated contingent valuation method was applied to government infrastructure projects, the World Bank and the Colombian government collaborated to estimate the government's exposure in three infrastructure finance projects:

- The US\$20 million El Cortijo–El Vino toll road project, where the government guarantees construction costs and traffic volumes.
- A joint venture telecommunications project between Telecom S.A. and Siemens, where Siemens will supply switching equipment and cables for more than 80,000 new lines and the government guarantees annual minimum cash returns to Siemens in the period after construction.
- A US\$755 million privately sponsored power project to supply a government-owned distribution company, where the government provides guarantees for the power purchase agreement (box 1).

The valuation of the government's exposure in these three projects used a technique called stochastic simulation to identify the net expected loss. In keeping with the lattice of risks outlined in a companion Note (see page 14),

the government assessed a number of risk exposures: market risk (relating to market volumes and prices), construction risk (from cost and schedule overruns), counterparty risk (operations risk and risk of failure of participating companies), currency risk (relating to exchange rates and liquidity), force majeure, termination risk (risk of contract buyout, possibly including penalties), and regulatory risk (the risk of adverse regulatory changes).

The assessment for the El Cortijo–El Vino toll road project showed that the greatest exposures for the government are from the market risk associated with traffic volatility and the risk of construction cost overruns. The total expected loss to the government under these two guarantees was estimated at about US\$4.2 million (table 1). The assessment of the telecommunications project identified regulatory and market risk and construction risk as the largest risks. Regulatory and market risk exposure—stemming from Colombia's deregulation of telecommunications, which ended the monopoly held by Telecom S.A.—was estimated at US\$10 million. Construction risk was estimated at US\$9.8 million, but whether this risk is borne by Telecom

## BOX 1 CONTINGENT LIABILITIES FOR THREE COLOMBIAN PROJECTS

### *Toll roads*

The government provided a construction cost overrun guarantee and a traffic volume guarantee once road construction was finished. Under the terms of the cost overrun guarantee the government would cover 100 percent of the cost of overrun up to 30 percent of the original construction bid, 75 percent of the overrun between 30 and 50 percent of the bid, and none of the overrun above 50 percent of the bid. The traffic volume guarantee commits the government to reimbursing the concessionaire if traffic volume falls 10 percent below the projections agreed to in the project budget. If traffic volume exceeds projections by more than 10 percent, the additional revenues are placed in a reserve fund to cover future shortfalls in traffic volume or for road maintenance.

### *Telecommunications*

The telecommunications project, a joint venture between Telecom S.A. and Siemens, has a structure similar to a build-operate-lease arrangement under which Siemens will install the switching equipment and cables for more than 80,000 new lines. Under a risk sharing agreement Telecom bears 20 percent of the risk/return within a 10 percent band around the expected revenue of the project and 100 percent of the risk/return outside this 10 percent band. The contracts do not clearly specify the allocation of construction risks.

### *Power*

The government has provided several forms of support to the US\$755 million expansion of the 240-megawatt Barranquilla thermal power plant. The 750-megawatt plant will be constructed by TEBSA to provide power to CORELCA, an undercapitalized state-owned power distributor on Colombia's Atlantic coast that runs a narrow-margin energy distribution service. TEBSA is a special-purpose vehicle capitalized by the old Barranquilla thermal plant, now jointly owned by CORELCA and ABB Distral. The government support consists of a power purchase agreement between CORELCA and TEBSA, three guarantees, and a subordinated loan:

- Under the power purchase agreement CORELCA agrees to make capacity payments to TEBSA for the first twenty years of the plant's operation. As long as the plant is operational, CORELCA must pay a schedule of fees that start high and decline over time.
- The Ministry of Energy guarantees CORELCA's ability to make these payments to TEBSA, and the Colombian government guarantees the ministry's ability to honor this commitment.
- To prevent CORELCA from failing, the ministry has taken a subordinated debt position in the company to help ease any liquidity crisis.
- Ecopetrol, the supplier of gas to TEBSA and CORELCA, guarantees force majeure payments.

or Siemens is not clear from the contracts. In the energy project the government's exposure to CORELCA was estimated at US\$67 million. Most of the exposure relates to the risk that retail energy prices will be insufficient to support CORELCA's operations, causing the company to default.

The loss variances for each project were also analyzed, and scenario analyses were run to see how different conditions would affect the risks of each project. Scenario analysis is an extremely important tool for governments in reviewing their exposure to a project finance transaction in the context of general fiscal policies. In the toll road project, for example, such analysis can show how anti-inflationary fiscal policy would affect the government's exposure under traffic volume guarantees. Scenario analysis is also useful in analyzing alternative approaches to achieving the government's objective in an infrastructure project. For example, in addition to underwriting the power purchase agreement, the Colombian government provided a subordinated loan to CORELCA. As a result, the evaluation of any action designed to increase the value of the energy guarantee must take into account its impact on the value of the subordinated loan to CORELCA.

### **Risk sharing between the public and private sector**

The valuation process allows governments to critically assess the distribution of risks under a direct loan, a guarantee, or an insurance program and to design contracts that lead to fewer and smaller calls on guarantees. For example, in soliciting bids for the toll road project, the Colombian government asked prospective concessionaires to bid on the basis of a preliminary set of engineering designs. Recognizing that these designs provided too little detail, the government granted cost overrun guarantees that would compensate the concessionaire for cost variances within a wide band around the submitted bid. While the guarantees served the purpose of attracting qualified bidders, their structure allowed concessionaires

**TABLE 1**      **EXPECTED GOVERNMENT LOSSES IN COLOMBIAN INFRASTRUCTURE PROJECTS**  
 Millions of U.S. dollars

Type of risk	El Cortijo–El Vino toll road project	Telecom S.A.–Siemens joint venture	CORELCA energy guarantees
<b>Market</b>	3.1	2.5	52.0
<b>Construction</b>	1.1	9.8 <sup>a</sup>	0
<b>Counterparty</b>	0.3	0.1	5.0
<b>Currency</b>	0	-1.3	2.0
<b>Force majeure</b>	0.2	0.3	7.0
<b>Termination</b>	-0.2	0.2	1.0
<b>Regulatory</b>	0	10.1	0
<b>Total</b>	4.5	21.7	67.0

a. It is unclear from the contracts whether this risk is borne by Telecom or Siemens.

Source: Timothy Irwin, Michael Klein, Guillermo E. Perry, and Mateen Thobani, eds., *Dealing with Public Risk in Private Infrastructure* (Latin American and Caribbean Studies, Washington, D.C.: World Bank, 1998).

to extract a near-certain rent from the government of about 35 percent of the original bid.

After assessing the risk transfer associated with the toll road project and quantifying the risks in the project, the government changed its toll road guarantee program. It now commissions more detailed engineering studies before it solicits bids to limit the uncertainty in the bidding process, and provides a narrow guarantee. The new policy is less expensive than the old one but provides the same benefit to the concessionaires. The change made the Colombian toll road program more efficient—achieving a higher risk-adjusted rate of return by reducing the government's risk of delivering a fixed benefit.

The valuation process enables a government to assess how efficiently risks have been allocated and derive lessons from its findings. To do this the government must first assess which party (public or private) has the best access to the information needed to objectively and most accurately evaluate the underlying risks. It must then assess which party is in the best position to monitor, control, and service the risks once they are underwritten. If the government is in the best position to underwrite the risks directly, it should consider providing direct credit, targeting the credit to the area of concern. The government should then determine whether it also has the information and skills to most

effectively monitor and control the risks or whether a private servicer should be employed to service the loans. Where the government delegates servicing, it must have systems for monitoring the performance of the servicers.

Even if the government has the best access to information on a risk, it might choose to provide assistance through a guarantee targeted at a specific layer rather than through direct credit. The reason is that a contingent guarantee can be more narrowly focused on the market failure, as in the switch from providing a broad guarantee to funding engineering reports in the Colombian toll road concessions. Because guarantees and insurance can be narrowly targeted, they can be used to get the private sector to absorb as much risk as possible.

Where the private sector is better able to underwrite and service the underlying risks but some government assistance is needed, public-private risk sharing is often the best solution. In this case pro rata guarantees and insurance under which the private sector and the government share all losses on a risk equally are often the best form of assistance. Risk sharing gives the private entity an incentive to price the coverage appropriately, ensuring that it will not shift additional risks to the government. Other risk sharing mechanisms within and between classes of risk are also feasible. But they usually require

more government oversight and more government underwriting expertise.

### **Managing federal-state partnerships**

Risk management tools and techniques are also helpful in analyzing the structure of government programs that share responsibilities between the federal and state levels. Such programs can combine the national government's ability to redistribute resources across economically diverse regions with the ability of state and local governments to identify investment needs at the local level. The national government funds the program, while state and local governments provide the underwriting and administrative function. A potentially powerful combination, this type of federal-state partnership is analogous to a parent company's providing a guaranteed source of financing to a subsidiary established to perform a particular service.

Such federal-state partnerships are not without risks, however. If the federal government does not retain oversight of the underwriting function, the national budget remains at risk. But if it is overly prescriptive in setting regulations for the program, it reduces the flexibility of the state and local governments to identify needs in the local community. The goal is to reach the optimal tradeoff between delegation of project selection and federal oversight of state underwriting performance.

### **Minimizing the loss shifting**

Governments need to implement strong risk management programs to limit their contingent liability exposure to additional loss shifting by the guaranteed party. The valuation process provides a basis for determining the best strategy for limiting such exposure. Governments can require the guaranteed party to hold a certain amount of capital or collateral to serve as a first-loss protection barrier for the project, thereby aligning the guaranteed party's incentives to remain vested in the project with the government. They can place restrictions on the use and investment of reserves held by the guar-

anteed party, to ensure that their value is unimpaired during periods in which a loss event is likely. They can structure their support to promote pro rata risk sharing, where a private party shares risk equally with the government for some or all types of loss. Since the private party in this transaction would then bear the same risk per dollar of exposure as the government, the government can benefit from the private sector's pricing of risks. Finally, governments can levy risk-based guarantee fees that both reduce the budgetary cost of issuing guarantees and improve the alignment of incentives between the guaranteed party and the central government.

### **Conclusion**

Allocating risks efficiently and limiting the ability of private agents to shift additional losses to the government reduces the budgetary costs of issuing guarantees and improves the allocation of scarce budgetary resources. But techniques for assessing risk are only as good as the information on which the models are based, and over time institutions change, markets evolve, and new information on risk exposures emerges. A series of loss events can reveal risks that were previously unknown or unquantifiable, leading to radical changes in risk assessment. Using the risk management framework outlined in this and a companion Note, governments can quickly incorporate new information on risk exposures into their pricing of new contingent liabilities and reestimate the expected costs of previously issued liabilities.

This Note is based on a longer paper by the authors in Timothy Irwin, Michael Klein, Guillermo E. Perry, and Mateen Thobani, eds., *Dealing with Public Risk in Private Infrastructure* (Latin American and Caribbean Studies, Washington, D.C.: World Bank, 1998).

*Christopher M. Lewis, Ernst & Young, and  
Ashoka Mody (amody@worldbank.org), Project  
Finance and Guarantees Department*

# Financing Water and Sanitation Projects— The Unique Risks

*David Haarmeyer and Ashoka Mody*

**A project finance structure allows water projects with attractive cash flows and risk profiles to secure long-term private capital. This structure provides a direct link between a project's cash flow and its funding to give project sponsors, investors, and lenders strong incentives to ensure that projects are structured and operated to generate stable revenue streams. But even in industrial countries the credit strength of off-taking municipal governments and the sector's traditional monopoly structure expose lenders to potentially significant credit, regulatory, and political risks. These risks, combined with the sunk, highly specific, and non-redeployable nature of water investments, mean that lenders and investors are vulnerable to government opportunism and expropriation. Reviewing some recent innovative projects, this Note shows that private participation on a limited recourse or nonrecourse basis has required support from multilaterals and federal government agencies to absorb noncommercial risks.**

Private sector participation in water and sanitation has most often taken the form of special-purpose build-operate-transfer (BOT) projects following the project finance or limited recourse model. These are self-contained projects that address the need for more water and sanitation. Although these bulk suppliers can alleviate immediate shortages, they have virtually no effect on systemwide revenue problems (for example, leakage and tax collection) or labor cost problems. These long-term problems are sometimes tackled incrementally through leases and management contracts. An increasing number of countries have gone further by awarding operating concessions for entire systems, which require investment commitments from the concessionaire. Beyond such concessions lies full privatization of assets, which facilitates financing by creating collateral.

The promise of steady—if not growing—long-term future cash flows is the basis of the private sector's interest in financing these ven-

tures. As one of the last monopoly utility sectors, water and sanitation can be especially attractive to long-term private investors. But financing water and sanitation projects has been a special challenge because of their unique risks:

- Expensive to transport but cheap to store, water is essentially a local service and subject to control by local government, which can be more politicized and have weaker credit than state or federal government.
- With most of the assets underground, their condition is hard to assess. That makes investment planning difficult, posing risks for contract renegotiations.
- Inadequate provision is associated with health and environmental risks, so government has a strong interest in extending access to service, regardless of ability to pay.
- Significant currency risk arises because customers pay in domestic currency that does not match the currency of international debt and equity financing.

- There has so far been little scope to introduce direct competition in treatment, transmission, and distribution.

The risk profile of a project is also influenced by its type and by its stage of development. Greenfield projects with a build-operate-transfer or build-own-operate (BOO) structure, because they involve a period of construction before revenues are generated, generally expose lenders to greater credit, political, and regulatory risks than concessions for infrastructure services that are up and running. Similarly, older and more efficiently run systems with longer operating histories tend to have more secure and predictable cash flows and mature investment profiles, and thus expose lenders and investors to fewer risks.

The water and sanitation sector's exposure to risks that are often difficult and costly to cover has two important ramifications:

- Fewer projects have been successfully financed with private capital than in other infrastructure sectors, such as power and telecommunications.
- Projects financed with private capital have tended to involve direct financial or credit support from government or third parties such as bilateral, multilateral, and export credit agencies.

### Case studies in finance

The experience of six water and sanitation projects and one set of utilities in accessing and structuring private finance illustrates the level of government or third-party support (table 1). All the projects follow the standard project finance structure except for the more mature English and Welsh water companies, which rely on corporate finance.

Only the BOT project in Johor, Malaysia, was financed on a nonrecourse basis with no sponsor or third-party support to cover risk of nonpayment. All other projects were financed on a limited recourse basis. The recourse was generally provided by payment guarantees to the parties off-taking the service (buying bulk water or wastewater services), such as a local government

entity in a BOT or BOO project. For the BOT in Chihuahua, Mexico, for example, Banobras, the domestic development bank, provided credit support to the local government entity. In Izmit the Turkish government stands behind the local government's water purchase agreement. In Sydney the state government guarantees the payment of the city water utility (Sydney Water Corp.) to the private project company even though the utility's debt is rated AAA by Standard & Poor's. In Buenos Aires the Argentine government's guarantee to pay compensation if the concession is terminated early provides the chief form of security for lenders.

### Sources of debt

In countries with weak sovereign credit ratings financing has been provided by multilateral and export credit agencies. These agencies are generally in the best position to shoulder political and regulatory risk and thus provide long-term finance at reasonable rates. The US\$9 million Chase Manhattan Bank loan to the Chihuahua BOT project, which received no multilateral or bilateral funding but did receive grant and credit support from Banobras, is a rare case of commercial bank participation. In a similar BOT project in Puerto Vallarta, Mexico, the International Finance Corporation provided debt finance backed by a revolving and irrevocable letter of credit from Banobras.

In countries with high sovereign credit ratings projects have been financed by domestic commercial bank loans. The BOT project in Johor, Malaysia, and the BOO project in Sydney, Australia, were financed by commercial debt. As a result of the project structure (existing cash flows) and Malaysia's highly developed capital market and relatively low interest rates, the Johor project was financed entirely with local debt. The Sydney project had both local and offshore financing.

The limited capital market financing of water and sanitation indicates that individual investors are not in a position to accurately evaluate and mitigate the risks. But as the experience of the English and Welsh water companies shows,

**TABLE 1 FUNDING FOR SELECTED WATER AND SANITATION PROJECTS**

Project site, type, and date	Project cost	Debt/ equity	Country rating	Source and maturity of debt
Malaysia Concession (1993)	US\$2.4 billion (about US\$500 million in first 2 years)	75/25	A+	Government soft loans due to severe tariff collection problems
Buenos Aires, Argentina Concession (1993)	US\$4 billion (US\$300 million in first 2 years)	60/40	BB-	10-year IFC A-loan, 12-year IFC B-loan (recourse to Argentine government in event of early termination)
Izmit, Turkey BOT (1995)	US\$800 million	85/15	B	13-year export credit agency loans, 7-year MITI <sup>a</sup> loan, 7-year commercial bank loan (recourse to Turkish government)
Chihuahua, Mexico BOT (1994)	US\$17 million	53/15/32 <sup>b</sup>	BB	8.5-year commercial bank loan with limited recourse to Banobras
Johor, Malaysia BOT (1992)	US\$284 million	50/50	A+	10-year project finance loan from Public Bank Bhd (nonrecourse)
Sydney, Australia BOO (1993)	A\$230 million	80/20	AAA	15-year commercial loans (State government stands behind Sydney Water Corp. payment.)
England and Wales Full privatization (1989)	US\$5.24 billion	25/75	AAA	Capital markets, corporate finance, European Investment Bank, and other sources

a. Ministry of International Trade and Industry of Japan.

b. Debt/equity/grant.

Source: Haarmeyer and Mody 1998.

projects can be expected to access capital markets as their cash flows to support debt service become more stable and certain and independent regulatory agencies are established.

The English and Welsh companies have drawn on a variety of financing sources, including the bond markets. Anglian Water, one of the ten privatized water companies, reflects the low risk profile of more mature water utilities. In 1990 the company floated a twenty-four-year bond

issue priced at just fifty-three basis points over U.K. Treasury gilts due November 2006. Standard & Poor's based its AA rating of the £150 million Eurobond on Anglian's "robust financial profile and stable operating environment," which "should provide the company with a fair degree of insulation from the impact of key regulatory and political risks going forward." The English and Welsh companies have also taken advantage of low-cost loans from the quasi-governmental European Investment Bank.

### Equity financing

Although debt is generally cheaper than equity, a long-term equity stake by the sponsor (which is sometimes also the operator) ensures that management has a long-term interest in the project and that cash flow growth leads to capital appreciation. Equity also reduces the debt service burden on the cash flow, which can be especially important in a project's early development phase.

Equity has been provided largely by sponsors. For large projects especially, equity, like debt, is often sourced from multiple consortium members, both international developers and local investors. The Buenos Aires concession, for example, has four international shareholders and four local shareholders (including the utility's employees).

Lenders like to see sponsors achieve a reasonable return on their investment, to ensure that sponsors have adequate incentive to maintain support for the project, at least through the life of the loans. Equity holders partially shield lenders, because the lower priority of their claims on a project's revenues means that they will absorb unexpected shortfalls in revenue. In full concessions and privately owned utility companies internal cash generation can provide an important source of equity for financing investment.

Although information on the return on equity for project sponsors is not widely available, the return can be expected to vary with project risk and cash flow profiles. In two of the cases discussed here returns to investors are regulated:

- The Malaysian government has guaranteed returns of 14 to 18 percent on investment in the national sewerage project; actual returns are currently at 12 percent because the concessionaire failed to achieve a 90 percent tariff collection rate.
- For the English and Welsh water companies the returns on regulatory capital (the assets of the core business) were 11.5 percent in 1995–96 and 12 percent in 1994–95. According to Ofwat, the U.K. water company regu-

lator, these returns are expected to fall as the water companies become more established and capital expenditures decline.

To compensate for the greater country and political risks, required returns in most developing country projects are likely to be significantly higher and closer to those in other infrastructure sectors. For a sample of power projects in Asia and Latin America Baughman and Buresch (1994) estimated the equity return at between 18 and 25 percent. And for privately financed toll roads Fishbein and Babbar (1996) found that investors expect annual returns to range between 15 and 30 percent.

### Conclusion

The challenge for the future is in mitigating the noncommercial risks that characterize the sector and moving beyond the limited capacity of third parties. Part of the solution lies in generating better information about these risks so that they are more transparent and their costs are more fully recognized by parties that can mitigate them. Two tracks to achieve this end are independent regulatory agencies and competition—for the market and for rights to supply individual customers, as in England and Wales.

### References

- Baughman, David, and Matthew Buresch. 1994. "Mobilizing Private Capital for the Power Sector: Experience in Asia and Latin America." U.S. Agency for International Development and World Bank, Washington, D.C.
- Fishbein, Gregory, and Suman Babbar. 1996. "Private Financing of Toll Roads." RMC Discussion Paper 117. World Bank, Resource Mobilization and Cofinancing Vice Presidency, Washington, D.C.
- Haarmeyer, David, and Ashoka Mody. 1998. "Tapping the Private Sector: Approaches to Managing Risk in Water and Sanitation." RMC Discussion Paper 122. World Bank, Resource Mobilization and Cofinancing Vice Presidency, Washington, D.C.

*David Haarmeyer (david.baarmeyer@stoneweb.com), Stone & Webster Consultants, Boston, and Ashoka Mody (amody@worldbank.org), Project Finance and Guarantees Department*

# Pooling Water Projects to Move beyond Project Finance

*David Haarmeyer and Ashoka Mody*

**Many commercial banks have had little interest in water and sanitation projects not only because of noncommercial political and regulatory risks, but also the small size, weak local government credit, and high transactions costs (the legal, consulting, and financial costs of structuring). Most projects have been financed on a limited recourse basis, that is, with project cash flows and assets as the main security for lenders. The move from project to corporate (balance sheet) financing is occurring in stages. Financing project debt from the sponsor company's balance sheet exposes that company to significant risk and thus requires a strong and large balance sheet. Designed in part to shield a company's balance sheet, innovative structures and financial instruments are emerging. Ultimately, the goal is for water utilities to raise debt and equity from capital markets on the basis of their own balance sheets, strengthened by a diversified and stable rate-paying customer base. This Note reviews the new trends.**

In the transition from government to private financing, projects in the water and sanitation sector require a heavy focus on risk allocation and mitigation, which has often implied drawn-out negotiations before and sometimes after financial closure. To address noncommercial risk, many projects have required some form of ongoing government or third-party support (see page 21). To transform themselves into economically viable enterprises, projects must mitigate commercial risks and gain credit strength (significant cash for investments and the ability to raise funds from capital markets). Risk pooling structures and asset aggregating instruments may be one way to achieve the funding objectives:

- Financing of project debt on the basis of the sponsor's balance sheet, or corporate finance (pooling risks with the corporation's other activities).
- Equity funds to leverage sponsors' equity and attract a larger group of investors.
- Bundling of water and sanitation projects to form economically viable entities that can be attractive to lenders.

- Integration of water and sanitation utilities with other utilities (such as natural gas distribution or power generation and distribution entities) to form holding companies with stronger balance sheets.

## **Corporate finance and capital markets**

Corporate finance can simplify the transition to capital market financing because the risk of a project's debt is absorbed in part by other corporate activities. As in other sectors, projects in water and sanitation have been financed with some ("limited") recourse to a sponsor's balance sheet. For example, the Buenos Aires project protects the balance sheets of its corporate sponsors (see page 23).

Increasing balance sheet financing may require significant industry restructuring, such as consolidating the ownership and operation of water utilities in a region or encouraging the integration of different utility sectors (box 1). Such restructuring is already happening. Malaysia has

bundled its entire sewerage system under one concession, a case of project pooling. While this project has forgone the benefits of comparative competition achieved when systems operate side by side, it creates the potential for securing revenue streams to finance a large number of small investments that would not be commercially viable on their own.

In the long term, however, achieving financial and operational sustainability will require a utility to finance investments from internal cash and long-term bond issues. As the English and Welsh water companies demonstrate, water projects have the potential to do this. Once established, they can produce stable revenues that not only permit internal financing but also allow access to a much broader class of investors through bond issues. Among developing country projects, only Aguas Argentinas has moved significantly in this direction: internal cash generation accounted for 9 percent of financing in the first three years and was expected to rise to 30 percent in the next three.

#### BOX 1 PROJECT FRAGMENTATION

**New investments in the water and wastewater sector tend to be much smaller than those in other infrastructure sectors because of the market's fragmentation. Municipalities are in charge of water and sanitation, so investments in facilities reflect demand only within their jurisdictions. The Mexican wastewater program, for example, will build many small wastewater plants, with an average cost of about US\$25 million to US\$30 million. Even where large investments are expected, they are spread over time, keeping pace with growth in demand. The massive Buenos Aires concession is expected to make investments worth a few billion dollars over its lifetime, but the initial financing was for less than US\$200 million. Similarly, the Manila concessions are expected to invest about US\$5 billion over thirty years, but the initial round of financing probably will not exceed US\$350 million. This pattern of small, incremental investments contrasts with that of power and transportation projects, which typically require large investments over a short period and gain the attention, and often the support, of national governments.**

The use of bond financing by privately financed water projects and utilities is relatively new. Leading the way, the English and Welsh utilities have used bond financing based on their balance sheets. In most developing countries, however, the development both of bond markets and of economically viable water utilities is at an incipient stage. The United States has the most mature bond market for municipal infrastructure; its development has been aided by tax exemptions and credit enhancements (see the discussion below on state revolving funds). Although the funds are used primarily by utilities owned by local governments, this "municipal" bond market taps private financing.

#### Equity funds

Over the past few years infrastructure equity funds have provided a means by which developers can raise financing for infrastructure projects and investors can participate in this emerging market. Such funds can be particularly attractive to infrastructure developers because they allow them to leverage their contributions with those of other investors and thus to spread their capital. For investors, equity funds mitigate project and country risk by creating a portfolio of projects under one company.

The French water and sanitation company Lyonnaise des Eaux, for example, introduced an infrastructure equity fund in Asia in 1995, a US\$300 million water fund. Besides Lyonnaise, contributors to the fund include Allstate Insurance Company, the Employees Provident Fund Board of Malaysia, and the Lend Lease Corporation of Australia. Investors are expected to benefit from the water company's significant market position and deal flow in the region. The fund refinances the equity of the original sponsors. Thus it conserves sponsor equity for the riskier development phase; sponsors apply their expertise in the early phase to get projects started and can then move on to other projects. Investors in the fund expect to receive steady, utility-like returns and potentially stand to gain significantly if the fund or a portion of it is publicly listed.

Houston-based Enron Corporation used a similar strategy, though the fund took the form of a publicly listed company. In 1994 Enron packaged its emerging market power plants and natural gas pipelines in a new company that it floated on the New York Stock Exchange. Capitalized at about US\$165 million, Global Power and Pipelines (GPP) included the assets of two power plants in the Philippines, a power plant in Guatemala, and a natural gas pipeline system in Argentina. Enron retained a 50 percent share of the company and sold the rest to investors. GPP has the right to buy into projects developed by Enron at favorable prices, providing Enron an ensured exit mechanism to free up capital for high-risk, high-return development opportunities.

### **EBRD's private multiproject financing facility**

To mobilize private investment in Eastern Europe, the European Bank for Reconstruction and Development (EBRD) has developed a multiproject financing facility (MPF) that provides a framework for financing a series of projects that may be too small to be considered individually. The MPF is made available to a private company, which uses the facility to make equity investments in and loans to private water and sanitation projects. Under this arrangement the company largely takes on the task of due diligence, which helps to reduce the transactions costs for each project financed.

EBRD signed its first MPF in July 1995—a US\$90 million equity and loan facility with Lyonnaise des Eaux. The company was recently awarded a project that could be the first to access the facility, a US\$41 million, twenty-five-year BOT (build-operate-transfer) wastewater treatment project in Maribor, Slovenia (population 150,000). In 1996 the second MPF was signed, with three Austrian companies. The agreement involves a S 700 million (approximately US\$140 million) equity and loan facility to support an investment program of S 2 billion. The Austrian companies will also receive financial support in the form of a guarantee from the East-West Fund of the Austrian Finanzierungsgarantie GmbH.

### **State revolving funds**

In the United States the federal government has supported state and local governments in financing the construction of wastewater treatment plants since the 1950s. In 1987, in an effort to delegate more responsibility to state and local governments, the U.S. Congress replaced the existing grant funding with a program to capitalize state revolving funds (SRFs). States are required to contribute an amount equal to at least 20 percent of the federal capitalization funding. The program is aimed at leveraging federal resources and creating a renewable and perpetual source of financial assistance for wastewater infrastructure. Unlike with grant funding, the need to repay SRF loans introduces an important element of accountability, as well as a basis for new loans.

The structure of each state's revolving fund program depends primarily on the state's needs and circumstances (such as its borrowing limit and ability to repay loans). Some states use program funds to provide direct loans to local governments of up to 100 percent of a project's cost at below-market rates. Others provide excess reserves or excess debt payment coverage that helps secure bonds backed by the revenues of a wastewater facility. Program funds may be used as collateral to borrow new resources; because several jurisdictions borrow on the basis of the same collateral, spreading the risks, the overall costs of borrowing are lowered.

The large, diversified pools of municipal borrowers created under SRF programs are attractive to lenders because they spread the risks of debt payment interruption or default. Pooling projects for financing on a statewide basis also makes it more economical for credit rating agencies to evaluate credit risks. While a single project might not be large enough to justify a credit assessment, a large group of projects will be attractive. Credit rating agencies provide important information to prospective lenders about the creditworthiness of SRF programs by, for example, assessing and monitoring reserve fund and debt coverage levels and

evaluating the size and composition of the borrower pool. Size and diversity matter. Rating agencies have found that smaller pools (20–100 borrowers) generally face more stringent credit requirements from lenders than larger pools because the behavior of individual borrowers has an amplified effect. For pools with fewer than twenty borrowers the weakest borrower tends to determine the credit rating.

The revolving nature of the funds has had a significant effect on purchasing power. According to the U.S. Environmental Protection Agency, funds invested in the SRFs provide about four times the purchasing power over twenty years than funds used to make grants. Even so, the funds represent only a fraction of the investment needed to upgrade municipal plants. In 1997 states were expected to make SRF loans of US\$3 billion, compared with US\$11 billion in total capital investment in wastewater infrastructure from all sources (federal, state, and local).

### Multiutilities

Deregulation and increasing competition in industrial countries are creating pressures for different utility sectors to combine. By combining, utilities hope to achieve not only economies of scope but also larger balance sheets and increased credit strength (through diversity) to attract long-term private financing. The trend has been most pronounced in the United Kingdom but is growing elsewhere. United Utilities and ScottishPower, two of the three U.K. multiutilities, provide utility services that run the gamut—principally electricity generation and distribution and water and sanitation, but also gas distribution and telecommunications services.

Multiutilities in developing countries may soon play a growing role. Argentina and Slovenia have combined gas and water utilities. In Côte d'Ivoire the project company developing the water supply concession went on to develop the electricity distribution system and a power generation project. This multiutility approach is being adopted in the concessions recently

awarded in Casablanca and Gabon and is being considered for water and power projects in the Republic of Congo. However, the implications for the concentration of monopoly power are a concern. Chile recently passed a law prohibiting owners of water utilities from simultaneously owning power distribution or telephone service in the same area.

### Conclusion

As a utility matures and its revenues become increasingly predictable and secure, its financing structure can be expected to shift to corporate finance or greater balance sheet support. Internally generated revenues are an important source of funding for water projects that have achieved a stable and diversified customer base. And strong balance sheets permit utilities to obtain external financing by issuing long-term debt to a broader class of investors. As a result of high political risk and shallow or nonexistent capital markets, in developing countries the work of building stronger balance sheets and tapping capital markets generally takes time, however.

New financing techniques in other sectors and their early applications in water and sanitation suggest that pooling projects may be a way to move beyond project finance, particularly for the many small projects that need financing. Multiutilities, entities that deliver multiple infrastructure services such as water and electricity, offer another approach to attracting private capital. These multiutilities can gain credit strength through a diversified revenue base that enhances the prospects for corporate finance.

The Note is based on a longer paper by the authors, "Tapping the Private Sector: Approaches to Managing Risk in Water and Sanitation" (RMC Discussion Paper 122, World Bank, Resource Mobilization and Cofinancing Vice Presidency, Washington, D.C., 1998).

*David Haarmeyer (david.haarmeyer@stoneweb.com), Stone & Webster Consultants, Boston, and Ashoka Mody (amody@worldbank.org), Project Finance and Guarantees Department*

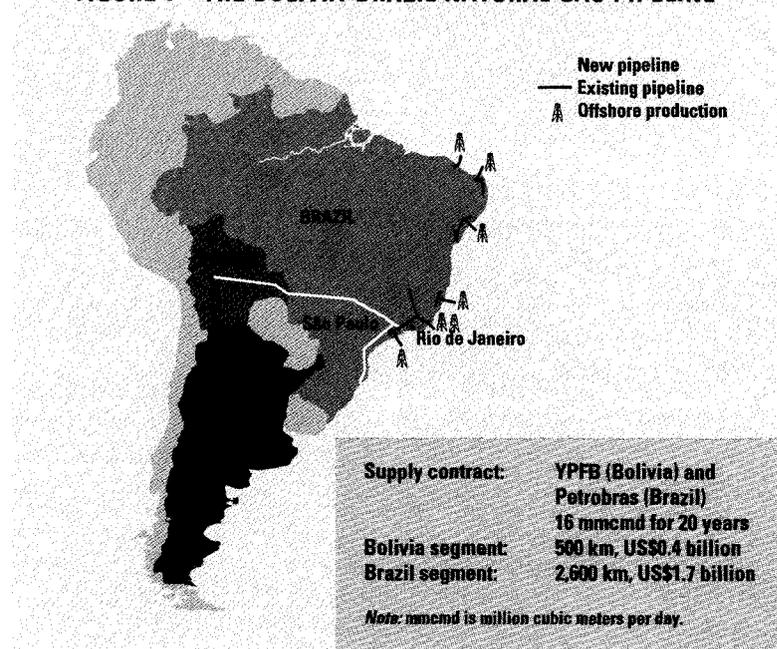
# International Gas Trade—The Bolivia-Brazil Gas Pipeline

*Peter L. Law and Nelson de Franco*

The Bolivia-Brazil natural gas pipeline, which will transport natural gas more than 3,000 kilometers, will cost US\$2.1 billion to construct. Despite the substantial benefits for both Bolivia and Brazil and the involvement of reputable private partners, the perceived risks and complexities of this large project made financing it a major challenge. The pipeline will link supply in one country to a potential market in another. Neither of these countries has a tradition of independent regulation or economic pricing of fuels. And the pipeline will be the first major gas infrastructure project involving the private sector in Brazil, where the natural gas market is underdeveloped and the gas distribution infrastructure still very limited. This Note explains the historical factors that shaped the project, how the financing package came together, and the role the pipeline will play in liberalizing the Brazilian hydrocarbon sector.

When the pipeline project started to get off the ground in the early 1990s, the Brazilian hydrocarbon sector was dominated by government-owned entities and prices were heavily regulated. At the federal level the oil and gas company Petrobras, the main player in the project, still had a monopoly on exploration, exploitation, refining, and maritime and pipeline transportation. Natural gas distribution was reserved for state-owned distribution companies, although petroleum distribution was open to foreign investors. Prices were equalized across regions, and the prices of liquefied petroleum gas (LPG) and fuel oil were subsidized. For Petrobras, exploiting Brazil's modest natural gas reserves had been secondary to producing oil, and the share of natural gas in the energy market in the early 1990s was a mere 2 percent. Petrobras had introduced natural gas only in 1988, supplying small quantities to the existing São Paulo distribution network as associated gas from local oil fields.<sup>1</sup> But with Brazil forecasting strong growth in energy

**FIGURE 1 THE BOLIVIA-BRAZIL NATURAL GAS PIPELINE**



demand, natural gas gained appeal as a means to offset increasing dependence on more expensive fuels. Meanwhile, Bolivia needed to find a new market for gas exports. The country had been exporting gas by pipeline to Argentina since the 1970s, with these export sales representing some 80 percent of Bolivia's total gas production, but new discoveries in Argentina gave notice that this was no longer tenable. The idea of natural gas trade between Bolivia and Brazil had been around since the 1930s, and in 1990 the two governments decided to give a gas export pipeline another serious look. After a preliminary feasibility study the two state monopolies, Petrobras in Brazil and Yacimientos Petroliferos Fiscales Bolivianos (YPFB) in Bolivia, signed a gas sales contract in 1993.

### **Private investors emerge**

Neither government was in a position to fund the pipeline project. As a first step to raise private finance, Petrobras embarked on a series of road shows in 1994 to choose private equity partners for a new pipeline company on the Brazilian side. Petrobras ultimately selected the BTB consortium, comprising British Gas, Tenneco (now El Paso Energy), and Broken Hill Proprietary, to form the Brazilian transport company (Transportadora Brasileira Gasoduto Bolívia-Brasil, S.A. [TBG]). This company, with an initial 51 percent ownership by Petrobras, would own the Brazilian part of the pipeline. However, the private partners began to signal to the government that fair access to downstream markets and market-based pricing policies would be important for the realization of the project—policies in line with those recommended earlier by the World Bank to the Brazilian government as key for the development of the hydrocarbon sector. In late 1995 an amendment to the Brazilian constitution removed the Petrobras monopoly, subject to an implementation law that was approved by Brazil's Congress in August 1997.

On the Bolivian side an agreement of association was reached between Enron and YPFB that included the development of the Bolivian sec-

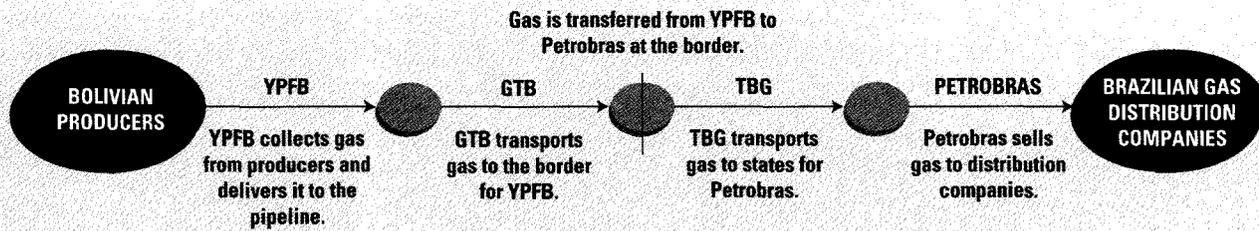
tion of the pipeline. YPFB was being prepared for capitalization and sale by international tender. A hydrocarbon law passed in 1996 committed Bolivian reserves to the export project and defined a diminished (but still critical) role for YPFB as the aggregator and shipper of future gas exports to Brazil. The capitalization of YPFB followed shortly after, and two private exploration and production companies and one oil and gas transportation company eventually won the international competitive tender. The Bolivian transportation company, Gas Transboliviano S.A. (GTB), was formed for the gas export project as a private joint venture among Enron, Shell, and Bolivian pension funds.

The project structure allowed a degree of cross-border ownership by each sponsor group, and special committees were formed with representation from all sponsors to resolve technical and financial issues and ensure cross-border harmonization of the project. These committees proved effective in helping to speed up project development.

### **A financing plan takes shape**

In 1997 the project still lacked a firm financing plan. The project required a large, bulky, upfront investment with a gradual buildup of tariff revenues, and a final gas price that would provide incentives for a speedy uptake of gas by potential customers—industrial users and power plants. Market soundings had indicated a lack of capacity for long-term commercial funding. Commercial debt would be high cost with short maturities (eight to ten years) because of perceived Brazilian country risk, regulatory risk, and supply risks, resulting in debt service difficulties and a final gas price that could severely limit market penetration during the critical initial years. (Commercial lenders perceived some supply risks because known Bolivian reserves were only sufficient to meet 80 percent of the gas sales contract. But in the World Bank's view the risks were likely to be small because the capitalization of YPFB had attracted some US\$1 billion of private capital for further exploration and development.)

**FIGURE 2 THE BOLIVIA-BRAZIL PIPELINE—TAKE (AND SHIP) OR PAY FRAMEWORK**



In 1997 the World Bank and its multilateral counterparts, convinced that both countries were serious about opening their hydrocarbon sectors to competition and private participation, decided to appraise the project on the understanding that transmission tariffs (and private investor rates of return) would be regulated to ensure that any benefits of extended maturities resulting from their loans and guarantees would be passed on to final consumers. A World Bank analysis showed the project to be economically viable and the best of several alternatives, including using different pipeline routes from Bolivia, constructing a pipeline from Argentina to Brazil, and constructing large gas-fired power plants in Bolivia and transporting the power to Brazil using high-voltage transmission lines. (The final pipeline route was selected to minimize environmental impact, and the project includes full measures to protect the interests of indigenous people living near the pipeline.) On the Brazilian side multilateral lending and partial credit guarantees offered the prospect of longer loan maturities and a gas price just right to penetrate the market. Thus the World Bank agreed in December 1997 to provide a direct loan of US\$130 million and to continue preparing a partial credit guarantee of US\$180 million to TBG. Other multilaterals, including the Inter-American Development Bank, provided financing totaling US\$380 million. The multilateral financing covered 40 percent of the financing requirements as senior debt, Petrobras provided another 40 percent sourced from bilateral agencies, and the equity sponsors provided the rest.

On the Bolivian side only 20 percent of financing was available from shareholder equity. With the Bolivian government unprepared to provide sovereign guarantees, little progress was being made to close the financing gap. The Brazilian

government, realizing that this threatened to delay the project until a new government was elected, urged Petrobras to quickly seek a solution. Petrobras responded through two mechanisms. First, it agreed to finance a fixed price turnkey construction contract for the Bolivian section of the pipeline, with repayment to be made through the waiver of future transportation fees. Second, it agreed to prepurchase part of the uncommitted upside capacity of the pipeline on both sides of the border, an arrangement that became known as the transport capacity option.

### Who takes the risks?

Petrobras bears most of the project risk on both sides of the border. YPFB will collect gas from the producers, and the gas will be transported to the border under a ship-or-pay contract with GTB (figure 2). Here, Petrobras will take ownership of the gas for delivery to the five Brazilian state gas distribution companies under similar transportation arrangements with TBG.

The supply risk on the Bolivian side falls on YPFB. But this risk is small because of additional supply likely to become available from new discoveries in southern Bolivia and possibly northern Argentina. The biggest risk lies in the market in Brazil. Four of the five distribution companies are paper companies with as yet no pipes in the ground, and gas will have to penetrate a market dominated by high-sulfur fuel oil. (Petrobras has an equity stake of about one-third in several of the distribution companies.)<sup>2</sup> Although the ultimate market risk lies with the distribution companies, it is Petrobras that is contractually obligated to pay YPFB for the gas and the transportation companies for their transportation services.

Moreover, through its turnkey construction contract, Petrobras takes the construction risk on the Bolivian side. And if the pipeline in Brazil is not built on time, it is Petrobras that will incur financial penalties payable to YPF and the distribution companies.

### Toward sector liberalization

The size and scope of the pipeline give it the leverage to play a key role in opening the Brazilian hydrocarbon sector to competition and private participation. The project and accompanying policy reforms will establish the principles of unbundling and transparent pricing in transactions between gas supply, transportation, and distribution. The pipeline will help promote interfuel competition in Brazil by allowing a large increase in gas supply, and increase the number of players in the market by making the upside capacity of the pipeline available to shippers other than Petrobras.

During the project preparation stage it was still unclear to what extent Brazil's hydrocarbon sector would be opened to competition, as the hydrocarbon law was not passed until later. The World Bank therefore sought to include good practice policy principles relating to open access, ownership, and pricing in the authorization agreement between the government of Brazil and TBG that sets out the parameters under which the pipeline will eventually operate. These policies include nondiscriminatory third-party access, the adoption of distance-related transmission tariffs for the uncommitted upside capacity of the pipeline, and the requirement that TBG would act only as a gas transporter and not engage in gas trading or upstream or downstream cross-ownership. Although Petrobras will be the dominant shareholder of the Brazilian transportation company for a transition period, the Brazilian government has agreed with the World Bank to eventually maximize private participation in the project. To initiate this too quickly would risk unraveling the many complex project agreements already reached and fail to maximize the value of the Petrobras shares. The government will there-

fore submit a plan for eventual reduction of Petrobras's shareholding in a way that will ensure the best chances for commercial success.

As part of the agreements reached with the World Bank, the Brazilian government has developed a plan to phase out fuel price subsidies and deregulate petroleum product prices within a three-year transition period (from August 1997). The concept of distance-based transport tariffs, a departure from the traditional pricing mechanisms, will encourage use of the best fuel supply option in each area of Brazil. Open access to transmission systems, combined with increased private participation in upstream development, will be a major force in controlling extraction costs and increasing supplies of domestic gas in Brazil. It will ultimately lead to wider choices for consumers, allowing large consumers to negotiate directly with producers and importers for the best commercial terms.

### Conclusion

Many prospective international gas pipeline projects are under consideration—projects in Central and South Asia and projects proposing pipelines from Russia to China and from Turkey to Eastern Europe. Given the large investments required, the main challenge is to design financing schemes that work. There are few blueprints to draw on. The World Bank can play a key transitional role in such projects. But there needs to be demonstrable commitment to opening the natural gas industry to competition and private investment and establishing sound regulatory and pricing policies.

<sup>1</sup> The São Paulo distribution network was originally constructed to distribute manufactured gas.

<sup>2</sup> To counter Petrobras's bargaining power, the distribution companies used collective negotiations to achieve acceptable price and take-or-pay conditions, an approach that proved highly effective.

*Peter L. Law (plaw@worldbank.org),  
Energy Specialist, Oil and Gas Division, and  
Nelson de Franco (ndefranco@worldbank.org),  
Principal Power Engineer, Latin America and  
the Caribbean Regional Office*

# Promoting Regional Power Trade— The Southern African Power Pool

*Donal T. O'Leary, Jean-Pierre Charpentier, and Diane Minogue*

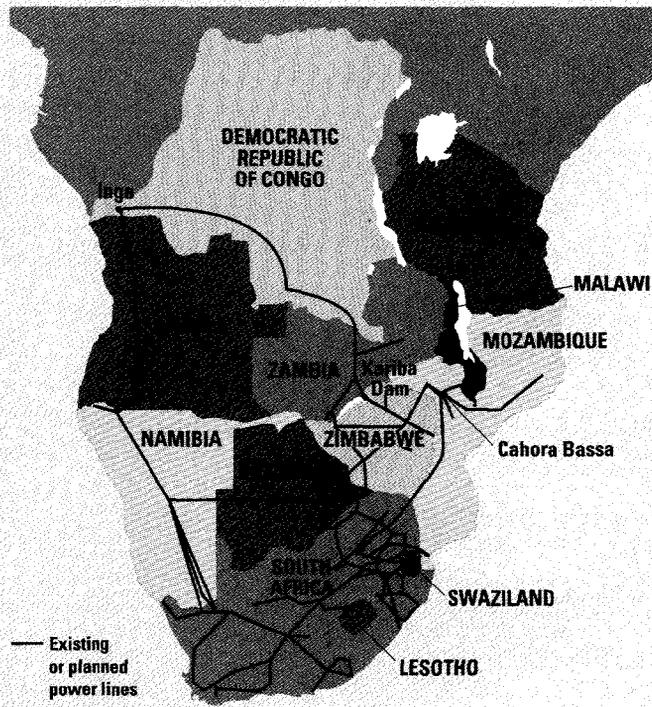
**The Southern African Power Pool (SAPP), the first formal international pool to be set up outside North America and Western Europe, was inaugurated in 1995. While the utilities of southern Africa have been importing and exporting electricity for four decades, these trades occurred through bilateral contracts that were complex and often difficult to administer. The objective of shifting to the pool is to create a more efficient regional market. Although physically the pool is still embryonic and trade volumes average roughly 3 percent of production, confidence in the market and mutual trust between the members are being strengthened and sector coordination is dramatically improved. This Note reviews the factors that have eased the way for the pool agreements and the challenges that remain in getting the multilateral trading operation under way.**

Power exchange first arose because of the distribution of power sources in the region: a large reserve of low-cost hydroelectricity in the northern part (especially the Inga Reservoir in the Democratic Republic of Congo and the Cahora Bassa Reservoir in Mozambique), large reserves of cheap coal in South Africa, and the Kariba Dam (on the border between Zambia and Zimbabwe), which, being in the middle of the regional system, can play the “buffer” role (figure 1). As the network has been reinforced and extended, many arrangements have arisen for the sale and wheeling of electrical power between countries in the region.

The new pool agreements cover about 9 million square kilometers and 200 million people. The number of customers of the interconnected national systems has been estimated at more than 4.1 million, though this figure understates the total number of retail customers because some of the customers are distribution companies.

The SAPP members agreed to develop their pooling operations as a “loose pool” along the lines of NORDEL/NordPool (Scandinavia), UCPTA (Western Europe), and such U.S. pools

**FIGURE 1 SOUTHERN AFRICAN POWER POOL**



**SAPP members and their utilities****Angola**

Empresa  
Nacional de  
Electricidade (ENE)

**Botswana**

Botswana Power  
Corporation (BPC)

**Democratic****Republic of Congo**

Société Nationale  
d'Electricité (SNEL)

**Lesotho**

Lesotho Electricity  
Commission (LEC)

**Malawi**

Malawi Electricity  
Supply Commission  
(ESCOM)

**Mozambique**

Electricidade de  
Mozambique (EDM)

**Namibia**

Namibia Power  
(NAMPOWER)

**South Africa**

Electricity Supply  
Commission (ESKOM)

**Swaziland**

Swaziland Electricity  
(SEB)

**Tanzania**

Tanzania Electricity  
Supply Company  
(TANESCO)

**Zambia**

Zambian Electricity  
Supply Corporation  
(ZESCO)

**Zimbabwe**

Zimbabwe Electricity  
Supply Authority  
(ZESA)

as the Midcontinent Area Power Pool before the 1996 restructuring of the U.S. electricity market. Loose pools emphasize the constant exchange of information in order to maximize both the economic and reliability benefits from trading and system autonomy. These pools do not use central dispatch of power plants, often relying instead on long-term bilateral contracts for electricity supply between generators and customers. These contracts are supplemented with short-term contracts and other deals under the overall agreement. Loose pools may provide central services, however, including producing continuous, real-time data to match generation and demand, developing indicative expansion plans, and implementing emergency procedures. Loose pools also establish detailed common design and operational standards to ensure system security and reliability and to facilitate trades.

In the SAPP full membership is limited to the national utilities. Most are still vertically integrated, with a primary mandate of ensuring the autonomy and self-sufficiency of the domestic system. The benefits of the pool include reductions or postponements in new requirements for generating capacity and reserves, reductions in fuel costs, and more efficient use of hydroelectricity. To estimate the potential gains, a Southern African Development Community (SADC) electric power study conducted in 1990–92 compared the costs of integrated regional development with those of independent development, in which each country follows a strategy of self-sufficiency. The study showed savings of US\$785 million (1992 prices), or 20 percent, over 1995–2010. Because the Democratic Republic of Congo and South Africa were not members of the SADC at the time of the study, the comparison did not include their system expansion plans, though it did account for energy trade opportunities. Including these two countries boosts the benefits significantly.

**The agreements**

The Southern African Power Pool is based on agreements rather than on law. The pool was inaugurated after the Inter-Governmental Memorandum of Understanding was signed by

a majority of the SADC members. The memorandum of understanding and its subsidiary agreements—the Inter-Utility Memorandum of Understanding, the Agreement between Operating Members, and the Operating Guidelines—have now been signed by all the SADC members and their national power utilities.

The SAPP agreements state that the purpose of the pool is to allow its members to coordinate the planning and operation of their systems while maintaining reliability, autonomy, and self-sufficiency, and to share in the benefits of operating the pool. The agreements incorporate the SADC treaty, the SADC Dispute Resolution Tribunal, the SADC energy ministers, and the Technical and Administrative Unit. The Inter-Governmental Memorandum of Understanding establishes that the SAPP agreements must be interpreted in a manner consistent with the SADC treaty and that the final and binding dispute resolution forum is the SADC Dispute Resolution Tribunal. The energy ministers are responsible for resolving major policy issues in the SAPP and for admitting new members to the pool. The Technical and Administrative Unit provides secretariat and other services to the SAPP executive committee, acts as liaison to the SADC, and seeks funding according to the recommendations of the executive committee.

The SAPP is organized under the executive committee, which acts as the board of directors of the pool, and a management committee, which oversees the administration of the pool. Three subcommittees serve under the direction of the management committee: the planning subcommittee (which focuses on reviewing wheeling rates annually and developing an indicative SAPP expansion plan every two years), the operating subcommittee and its associated coordination center, and the environmental subcommittee. The coordination center, which is still being set up, will be responsible for such tasks as undertaking most pool monitoring activities, carrying out operating and planning studies, determining transfer limits on tie-lines, administering a regional database, disseminating maintenance sched-

ules, providing technical advice, and seeking funding for its needs.

Each member must meet its Accredited Capacity Obligation, a requirement that each utility have sufficient capacity to cover the forecast monthly peak. Each member is also obligated to supply emergency energy for up to six hours, to provide automatic generation control and other facilities in its control area, to allow wheeling through its system where technically and economically feasible, to submit maintenance schedules, to disclose information and costs related to thermal generating facilities, and to contribute toward the center's costs.

A key element in the operation of the pool is the SAPP pricing arrangement, set out in thirteen detailed schedules in the operating agreement. These schedules cover four broad types of transaction: firm power contracts of varying duration; nonfirm power contracts of varying duration; mutual support contracts such as operating reserve, emergency energy, and control area services; and scheduled outage energy, energy banking, and wheeling.

## Implementation

Three major factors played a key part in the development of the regional pool agreements: the availability of complementary power sources, an active regional organization for economic cooperation, and the political will to support increased regional energy trade. The Southern African Development Community and its predecessor, the Southern African Development Co-ordination Conference, served as a focal point for the promotion of regional integration, facilitating investment in projects (such as interconnection projects) that allowed increased regional power trade. The momentum for regional integration, including increased power trade, was further strengthened by the emergence of more democratic governments in several countries and the cessation of hostilities in others. Also helpful has been having at least one country or partner (South Africa) act as a driver, encouraging more passive parties.

The experience of the SAPP shows that in moving from pool agreements to implementation, it is possible for some participants to move in smaller, incremental steps toward the overall goals set by the agreements. While all participants must take consistent steps, they do not need to move at the same pace. And while all participants have agreed to an international pool, it is reasonable to expect that self-sufficiency and autonomy will remain the priority for some members, at least through the first phase of operations. The pool agreements include provisions that recognize these concerns while also encouraging greater integration, for example, by permitting members to meet their Accredited Capacity Obligation through a contract with another member. Not all countries prefer such a gradualist approach, however: Botswana, Mozambique, and Namibia have opted to rely more on importing power than on building new capacity. Regardless of the preferred path, it is essential to set pool governance rules so that all members, large and small, perceive that they have a voice.

As national regulatory agencies develop and begin to assert their authority, there is a risk that they might not be sufficiently attuned to the needs of the regional market. Experience in other countries shows that although a pool can operate where regulatory regimes differ, as they do among SAPP countries, possibilities for gaming or unfair advantage created by differences in regulatory systems can undermine members' willingness to participate. Thus national-level regulatory statutes should be carefully drafted so that the agency jurisdictions are properly defined, directed, and restrained in order to avoid regulatory obstacles to trade. There should also be periodic reviews of regulatory compatibility as the SAPP develops. In addition, the need for a consistent approach to transmission access is becoming apparent as more independent power producers (IPPs) and independent transmission projects (ITPs) express interest in investing in the region. So far only Zambia has required its regulator to take into account SAPP interests.

A review of the SAPP's first year of operation shows that several important practical issues need

to be addressed to support the development of the pool. First, the power utilities in each country need to be put on a more viable financial footing to ensure that they are creditworthy and able to respond to commercial incentives for trading power, including the ability to generate foreign exchange. Toward this end, commercialization programs are under way or under consideration at half the utilities (EDM, ENE, ESCOM, ESKOM, ZESA, and ZESCO). Most advanced in power system reform are South Africa and Zambia.

Second, the SAPP members need to reach agreement on the design and staffing of the coordination center, a politically challenging task, so that the center can become operational. The key steps are deciding on a neutral location; selecting a neutral manager with sufficient autonomy; establishing a legal status; defining clear governance rules; setting guidelines for the interface between the center, SAPP members, and the SADC; identifying equipment needs, especially computer hardware and software; training operators; twinning with a mature pool to develop skills; and developing a realistic budget. By the end of the first year SAPP members had made progress on only a few of these issues. They had agreed to establish the center in Harare, Zimbabwe, separate from ZESA, and had advertised for a manager. The operating subcommittee had drafted a constitution that was being finalized. And training programs for operators had been offered, with more under preparation.

Third, the pool would benefit from broadening its membership to include existing institutions that control or influence significant generation or transmission, such as Hidroelectrica de Cahora Bassa, the Copperbelt Energy Consortium, the new private owner of the Power Division of the Zambia Consolidated Copper Mining Company, and the Zambezi River Authority. But this will mean developing procedures (voting rules) to give voice to and account for the interests of these players as well as other new entrants, such as IPPs and ITPs.

Fourth, to allow efficient operation of the pool and encourage an IPP presence, all the SAPP

utilities should unbundle their domestic transmission pricing and ensure that members adopt identical rules to set transmission costs. In addition, a study is needed to assess the effects on pool development of transmission pricing under the SAPP and current national pricing policies.

Fifth, SAPP members need to estimate and meet financing requirements for operations and new generation and transmission projects. In identifying potential new projects, they should use compatible generation and transmission planning software that explicitly allows for risk analysis and for dealing with hydrological uncertainty.

Sixth, SAPP members need to harmonize ESKOM's internal competitive generators pool with the SAPP cooperative pool. The internal pool, set up in 1996, is based on the England and Wales model and currently does not provide for access to third-party operators. SAPP members also need to address the risk that the different triggers for capacity addition (price signals for the internal pool and a planned approach for the other SAPP members) could lead to suboptimal investment.

Finally, because the SAPP establishes a largely self-governing regime at the operating level, and as experience in Argentina, Europe, and North America shows, members will need to quickly set up an effective dispute resolution process. Clear resolution procedures combined with realistic enforcement could also help in attracting new generation and minimizing national self-sufficiency concerns.

This Note draws heavily from a longer work by the authors, *Supporting the Implementation of the Southern African Power Pool*, forthcoming as a World Bank Technical Paper (Washington, D.C.).

*Donal T. O'Leary (currently working with Siemens AG under the World Bank Staff Exchange Program), Jean-Pierre Charpentier, and Diane Minogue, Energy, Mining, and Telecommunications Department*

# Why Performance Contracts for State-Owned Enterprises Haven't Worked

Mary Shirley

**When privatization is not feasible or palatable, some developing country governments seek to improve the performance of state enterprises by negotiating performance contracts with their managers. Many of these contracts have been put in place with World Bank assistance. Research shows that they rarely work. This Note summarizes the rationale for performance contracts and explores the reasons why they haven't worked. It concludes that since a well-designed and -enforced performance contract can be as politically costly as a well-designed privatization, performance contracts are not likely to be successful in countries that lack the political will to privatize.**

Written contracts between governments and state enterprises have been widely used in World Bank projects since the first Bank operation supporting performance contracts, a 1975 operation in Senegal. A Bank survey of developing countries found 565 such contracts in thirty-two countries, and another 103,000 in China as of June 1994 (World Bank 1995). Although these performance contracts go by different names—*contrat-plan*, memorandum of understanding, signaling system—they share common features. All are negotiated, written agreements between governments and the managers of state enterprises that specify targets that management pledges to achieve in a given time frame and define how performance will be measured at the end of a specified period.

## The case for performance contracts

Despite a global wave of privatizations, state enterprises still account for about 10 percent of gross domestic product (GDP) in developing countries. These enterprises are often the largest and most valuable or problematic firms, with monopolies in mining, petroleum, infrastructure, and heavy industry. For these firms performance contracts have often seemed to make good sense. Before the contracts were

put in place most governments were trying to run their state enterprises without any form of performance evaluation. As one architect of performance contracts noted, this was like playing football without rules, scoreboards, or referees. Performance contracts seemed a logical solution to this problem, since similar contracts had been successful in the private sector.

No one, including the proponents of performance contracts, minimized the problems governments would face in designing such contracts, however. Much has been written about the problems that principals (in this case, governments) face because they cannot accurately measure the effort expended by their agents (managers) or sort it out from other factors affecting performance. These agency problems are compounded in the public sector, where politicians have many points of view and bureaucrats have many different agendas. Under such circumstances it is hard to judge performance and to motivate managers and hold them accountable for results. Moreover, unlike private owners, politicians may not benefit from better performance, and so may try to make managers serve objectives that conflict with efficiency, such as rewarding political supporters with jobs or subsidies.

Proponents of performance contracts argue that they can be written in ways that clarify multiple objectives and make it easier to judge performance. For example, a contract could apply weights to the multiple objectives, spell out the obligations for which managers will be held accountable, and specify rewards (such as bonuses) and penalties (such as demotion or firing). Even where a government seeks to maximize social or political objectives, a performance contract can improve efficiency by setting appropriate targets. For example, a state enterprise required to retain redundant workers could still achieve contractual targets aimed at improving quality. And an overstaffed firm could still improve labor productivity by making better use of plant and equipment. The fact that managers operate under such constraints could be taken into account by judging performance against past trends.

### The contrary evidence

The logic of performance contracts is persuasive, but the reality has been disappointing. Two empirical studies—one analyzing the effect of such contracts on profitability and productivity in twelve companies in six countries and the other examining statistically the correlation be-

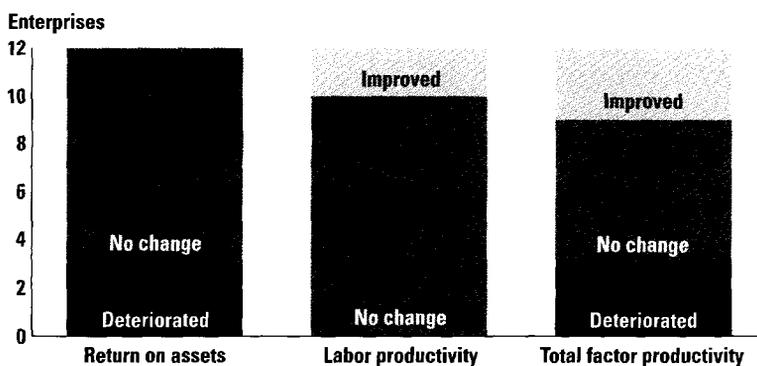
tween performance contracts and productivity in hundreds of state enterprises in China—found no evidence that performance contracts had improved efficiency. The first study analyzed the effects of contracts in monopoly enterprises (in water, electricity, telecommunications, and oil and gas) in Ghana, India, the Republic of Korea, Mexico, the Philippines, and Senegal. It found no pattern of improvement associated with the performance contracts in productivity or profitability trends (figure 1).

The second study used a much larger sample in manufacturing but in only one country, China. The results showed that the increasing use of performance contracts in China could not stem the fall in productivity among state enterprises (figure 2). More important, the study found no robust, positive association between performance contracts and productivity. And a comparison of a sample of state enterprises that had signed performance contracts with a sample of firms that had not found no significant difference between the two groups.

Is it possible that performance contracts failed to improve productivity because managers were told to maximize social benefits, such as increasing employment or developing backward regions? Although the studies did not measure social benefits, the weights that contracts assigned to productivity targets (two-thirds on average) and the stated goals of the parties to the contracts suggest that improving operating efficiency was the prime objective. Moreover, most social and political goals imposed constant costs on state enterprises during the period and so should not have affected the trends being measured.

Why not simply judge performance contracts on whether the firms met the targets specified in the contract? All the firms in the first study did achieve at least satisfactory ratings where some sort of score was assigned, and all the contracts assign a high weight to economic goals. The problem is that many of the targets are soft or flawed measures of economic performance. For example, 30 percent of the score for one of the electricity

**FIGURE 1 PERFORMANCE CHANGES IN STATE ENTERPRISES AFTER SIGNING PERFORMANCE CONTRACTS**



*Note:* The data cover twelve state enterprises in Ghana, India, the Republic of Korea, Mexico, the Philippines, and Senegal.

*Source:* Company data and World Bank estimates.

companies (India's National Thermal Power Corporation) depended on the volume of electricity it generated. The company achieved its target and received a score of excellent, yet its total factor productivity actually fell below precontract levels. Output went up, but inputs rose three times faster. The target was flawed because it could be met by increasing inputs, even if efficiency declined. The contracts have many such flaws, for reasons explored below.

### What is the problem?

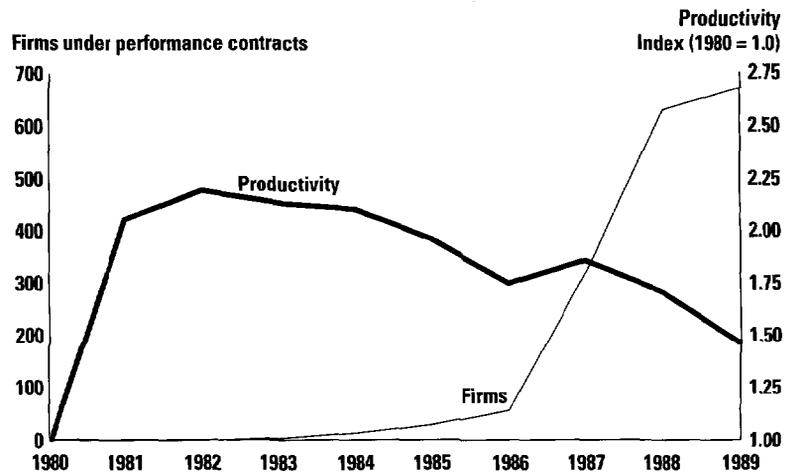
The theory of contracting suggests that to improve performance, performance contracts must:

- Reduce the information advantage that managers enjoy over owners.
- Motivate managers through rewards or penalties to achieve the contract's targets.
- Convince managers that the government promises in the contract (such as to pay bonuses or impose penalties) are credible.

The performance contracts in the two studies failed on all three counts. First, managers were able to use their information advantage to negotiate targets that were either hard for outsiders to evaluate or easy for the firm to achieve. Performance is hard to evaluate, for example, when there are many targets (the contract for Korea's telecommunications company had forty) or when targets change frequently (a third of the targets for Ghana's water company changed every year). Targets can also simply be soft; in India, for example, negotiations dragged on so long that targets were set equal to ex post performance. The managers' information advantage was compounded by governments' failure to give the bureaucrats responsible for negotiating the contracts and evaluating results the power, resources, and status they needed to face enterprise managers on a level playing field. Managers were thus able to negotiate targets that they could achieve without making additional efforts to improve productivity.

Second, the incentives provided under the contracts failed to motivate managers. The first study found that only two of the twelve contracts paid

**FIGURE 2 CHINESE STATE ENTERPRISES UNDER PERFORMANCE CONTRACTS AND THEIR PRODUCTIVITY, 1980–89**



*Note:* The data for productivity refer to the state enterprises with performance contracts each year.  
*Source:* Shirley and Xu 1997a.

a bonus or punished underachievement. And the second study, in China, found that the incentive (wage increases linked to profits) was set too low to motivate improvements in most of the firms and was aimed only at workers.

Finally, governments' commitment to enforcing the contracts and keeping their promises was not credible. All the contracts lacked neutral, third-party enforcement mechanisms (the state enterprises could not take the government to court, for example), and governments often reneged on their promises. In Ghana, India, and Senegal, for example, the government did not force public entities to pay their bills to the electricity companies.

There is evidence that a performance contract that overcomes the three contracting problems can improve efficiency. The study of China simulated what would have happened with a "good" performance contract—one that addressed the information, incentive, and commitment problems—and found that it would have had a statistically significant and large positive effect, boosting productivity growth rates by 10 percent. But only 2.2 percent of the firms in the sample had "good" performance contracts. All the other performance contracts had either insignificant or negative effects on productivity.

Why did so few performance contracts contain the provisions necessary for success?

Performance contracting assumes that government objectives can be maximized and performance improved by setting targets that take into account the constraints placed on managers. For this to occur, politicians and bureaucrats must state their objectives explicitly and agree to weights that reflect their priorities, empower a supervisory body to translate these objectives into monitorable targets negotiated with managers, punish and reward managers on the basis of their performance, and keep any promises made in the contract. Few of these actions occurred for the contracts studied.

Why would governments sign performance contracts and then not try to make them work? Some governments may have been motivated to pledge actions that were politically unrealistic because it enabled them to meet conditions of a World Bank loan. Some governments may have underestimated the political costs of adhering to a performance contract, such as firing politically loyal but underperforming managers, paying incentives that might raise a manager's salary well above a minister's, shifting funds from other purposes to pay electricity bills, or allowing overstuffed state enterprises to lay off workers. All governments seem to have underestimated the extent of their information disadvantage relative to managers.

### Improving enterprise performance

Chile's successful experience in reforming its state enterprises points to actions that are key to improving efficiency: Chile increased competition by ending any legally mandated state monopolies and barriers to entry, reducing import tariffs to 10 percent across the board, breaking up monopolies in such sectors as electricity, and pushing state enterprises to contract out competitive activities under strict rules of competitive bidding. It placed state enterprises under private commercial law, and members of the boards of directors became liable for their decisions. Private parties were named to boards, and boards were kept small (five people) to reduce the political value of keeping companies public. The government elimi-

nated all subsidies, transfers, and government guarantees for debts of state enterprises and instructed banks to lend to them under the same criteria as for private enterprises. State enterprises were required to pay a 10 percent return on assets as a dividend, and money losers were required to sell assets to pay their dividend. The government privatized almost all commercial and financial firms and most utilities, allowing it to concentrate its supervision on relatively few firms (such as the water and sewerage companies).

Do these findings mean that World Bank operations should not support or encourage performance contracts? Although the studies found few successful contracts, they did show that in those rare cases where a performance contract is properly written, it can improve efficiency. But they also found that performance contracts can do harm. If targets are set too low, managers might reduce their efforts to improve performance. And flawed targets can have perverse effects, as in the case of India's electricity company. Since a well-designed and carefully enforced performance contract can be as politically costly as a well-designed privatization, performance contracts are not likely to be successful in countries that lack the political will to privatize, where they may be viewed as a soft alternative to privatization. The findings suggest that performance contracts should be used only where governments are politically prepared to make tough decisions and the contract is part of a broader package of state enterprise reforms.

### References

- Shirley, Mary, and Lixin Colin Xu. 1997a. "Empirical Effects of Performance Contracts: Evidence from China." World Bank, Development Research Group, Washington, D.C.
- . 1997b. "Information, Incentives, and Commitment: An Empirical Analysis of Contracts between Government and State Enterprises." Policy Research Working Paper 1769. World Bank, Development Research Group, Washington, D.C.
- World Bank. 1995. *Bureaucrats in Business: The Economics and Politics of Government Ownership*. New York: Oxford University Press.

Mary Shirley, Research Manager, Development Research Group

# Private Participation in the Water and Sewerage Sector—Recent Trends

*Gisele Silva, Nicola Tynan, and Yesim Yilmaz*

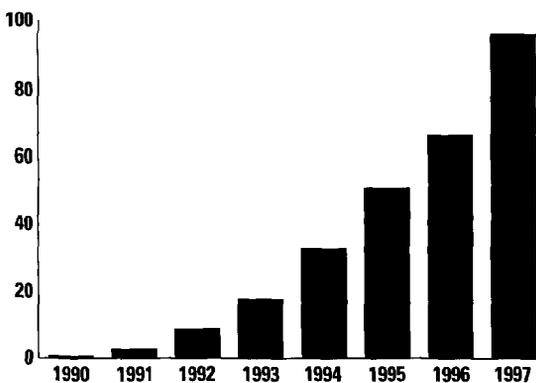
In developing countries private sector participation in water and sewerage is a relatively recent phenomenon. Before 1990 almost all developing countries relied on government provision of water supply and sewerage services; private participation in the sector was rare. The potential for gains from private sector involvement, through greater efficiency and improved access to finance for new investments, was as great in water and sewerage as in other infrastructure sectors. But governments' willingness to take the steps to secure private participation was relatively limited. In many countries water continued to be treated as a social rather than an economic commodity. There was considerable political resistance to raising tariffs to cost recovery levels, increasing the risk of long-term investment in water and sewerage assets. In addition, many national governments

in recent years decentralized responsibility for water and sewerage services to municipal or provincial governments, which often had little experience with private sector contracting and regulation and were thus relatively unlikely to initiate private transactions.

Between 1984 and 1990 developing countries awarded contracts for only eight water and sewerage projects to private companies. The private capital investment in these projects was US\$297 million.<sup>1</sup> Since 1990 private participation in the water sector in developing countries has accelerated (figures 1 and 2). The number of private water projects reaching financial closure increased more than tenfold between 1990 and 1997, though private involvement is still small relative to public provision in the water sector and to private participation in other

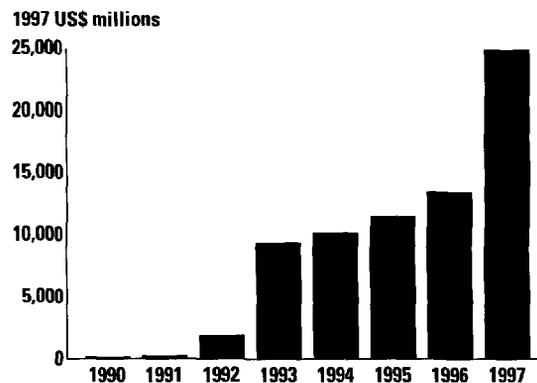
The PPI Project Database covers private participation in infrastructure in developing countries. The database records details of all projects owned or managed by private companies in 1984–97 in the water, energy, transport, and telecommunications sectors. This Note focuses on private water and sewerage projects that reached financial closure between 1990 and 1997 and surveys regional trends, type of private participation, project size, and top sponsors and operators. See box 1 for an explanation of the PPI project criteria and database terminology.

**FIGURE 1 CUMULATIVE WATER AND SEWERAGE PROJECTS WITH PRIVATE PARTICIPATION IN DEVELOPING COUNTRIES, 1990–97**



Source: PPI Project Database.

**FIGURE 2 CUMULATIVE NEW CAPITAL EXPENDITURE IN PRIVATE WATER AND SEWERAGE PROJECTS IN DEVELOPING COUNTRIES, 1990–97**



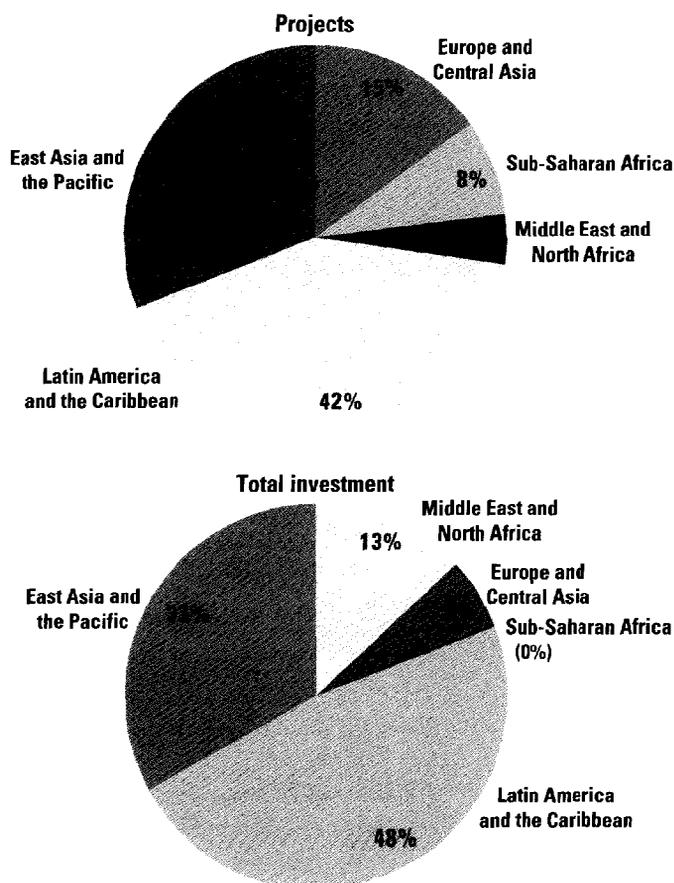
Source: PPI Project Database.

**TABLE 1 PRIVATE WATER AND SEWERAGE PROJECTS IN DEVELOPING COUNTRIES, BY REGION, 1990–97**

Region	Projects	Total investment in projects with private participation (1997 US\$ millions)
East Asia and the Pacific	30	11,913
Europe and Central Asia	15	1,499
Latin America and the Caribbean	40	8,225
Middle East and North Africa	4	3,275
Sub-Saharan Africa	8	37
<b>Total</b>	<b>97</b>	<b>24,950</b>

*Note:* Data may not sum to total because of rounding.  
*Source:* PPI Project Database.

**FIGURE 3 PRIVATE PARTICIPATION IN WATER AND SEWERAGE IN DEVELOPING COUNTRIES, BY REGION, 1990–97**



*Source:* PPI Project Database.

infrastructure sectors (particularly energy; see the next issue for data on private participation in the energy sector).

By the end of 1997 private companies operating in developing countries had reached financial closure on US\$25 billion of investment in water and sewerage projects. In total, ninety-seven projects had been implemented in thirty-five developing countries, ranging from management contracts to leases, concessions, divestitures, and greenfield build-operate-own (BOO) or build-operate-transfer (BOT) arrangements. This Note provides an overview of patterns and trends in these projects.

### Sector trends

The PPI Project Database reveals the following trends in private participation in water and sewerage:

- A regional and national concentration of private water projects, reflecting varied government efforts to create conditions for sustainable private involvement through pricing, regulatory, and institutional reforms, but also a ripple effect from growing government familiarity with private involvement in the sector.
- A dominance of concession contracts compared with divestitures, BOT contracts, leases, and management contracts.
- A few international companies sponsoring and operating most major projects. But the number of companies involved in private contracts is growing, and it remains too early to tell whether other new entrants will increase their international presence.

### Latin America and East Asia dominate

A regional breakdown of private sector involvement in the water and sewerage sector shows a concentration of projects in Latin America and the Caribbean and East Asia and the Pacific (table 1 and figure 3). This regional concentration is similar to that in energy and transport. The growth of the sector in these two regions coincides with the opening of markets and, particularly in Latin America, progress toward

**BOX 1 PPI PROJECT DATABASE: PROJECT CRITERIA AND DATABASE TERMINOLOGY**
***Database coverage***

- To be included, a project must have reached financial closure and directly or indirectly serve the general public.
- Sectors covered are energy, water, transport, and telecommunications.
- The water sector includes the following subsectors and segments: potable water treatment and distribution and sewage collection and treatment.
- Moveable assets, incinerators and stand-alone solid waste projects, and small projects such as windmills are excluded.
- The period covered is 1984–97.
- The countries covered are developing countries, as defined and classified by the World Bank, in East Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, the Middle East and North Africa, South Asia, and Sub-Saharan Africa.

***Definition of private participation.*** The private company must assume operating risk during the operating period or assume development and operating risk during the contract period. In addition, the operator must consist of one or more corporate entities, with significant private equity participation, that are separate from any government agency.

***Project types***

- **Operations and management contracts**—The private entity takes over the management of a publicly owned enterprise for a given period. This category includes management contracts and leases.
- **Operations and management contracts with major capital expenditure**—These are concession contracts for existing facilities under which the private entity also assumes

- significant investment risk. This category includes build-transfer-operate, build-lease-transfer, and build-rehabilitate-operate-transfer contracts as applied to existing facilities.
- **Greenfield projects**—A private entity or a public-private joint venture builds and operates a new facility. This category includes build-operate-transfer and build-operate-own contracts.
- **Divestitures**—The state sells an equity stake to private entities; this may or may not involve private management. This category includes full and partial divestitures.

***Definition of financial closure.*** For greenfield projects and for operations and maintenance contracts with major capital expenditure financial closure is defined as the existence of a legally binding commitment of equity holders or debt financiers to provide or mobilize funding for the project. The funding must account for a significant part of the project cost, securing the construction of the facility. For operations and management projects a lease agreement or a contract authorizing the commencement of management service must exist. For divestitures the equity holders must have a legally binding commitment to acquire the assets of the facility.

***Sources***

- The World Wide Web.
- Commercial databases.
- Developers and sponsors.
- Regulatory agencies.

***Contact.*** The database is maintained by the Private Participation in Infrastructure Group of the World Bank. For more information contact Mina Salehi at 202 473 7157 or msalehi@worldbank.org.

**TABLE 2 TOP FIVE DEVELOPING COUNTRIES BY TOTAL INVESTMENT IN PRIVATE WATER AND SEWERAGE PROJECTS, 1990–97**

Country	Total investment in projects with private participation (1997 US\$ millions)	Projects
Argentina	6,183	7
Philippines	5,820	3
Malaysia	5,030	6
Turkey	1,230	2
Mexico	597	12

Source: PPI Project Database.

**TABLE 3 TOP FIVE DEVELOPING COUNTRIES BY NUMBER OF PRIVATE WATER AND SEWERAGE PROJECTS, 1990–97**

Country	Total investment in projects with private participation (1997 US\$ millions)	Projects
China	503	13
Mexico	597	12
Brazil	583	8
Argentina	6,183	7
Malaysia	5,030	6 <sup>a</sup>

a. The Czech Republic also implemented six projects between 1990 and 1997, with total investment of US\$25 million.

Source: PPI Project Database.

the establishment of credible legal and regulatory institutions. Latin American countries have awarded forty private contracts, which have brought investment commitments of US\$8,225 million. East Asian countries have awarded thirty contracts, with investment commitments of US\$11,913 million.<sup>2</sup>

Europe and Central Asia and the Middle East and North Africa have small but growing private involvement in the water sector, and recent projects are likely to encourage imitation. For example, the Moroccan government awarded a thirty-year concession contract for a power-water-sewerage operation in the Rabat and Sale

regions, following a similar project implemented in Casablanca in 1997. Sub-Saharan Africa has almost no private investment, but has eight management and lease contracts. Despite an early start in the region, private participation in Africa is progressing slowly. In the absence of strong commitments on tariffs and credible regulatory provisions, private companies have been unwilling to take investment risk in the region. In some cases they have taken on a degree of commercial risk under lease contracts. In other cases private participation has been limited to short-term management contracts. No country in South Asia has yet awarded a water or sewerage contract to the private sector, but a number of proposals are being considered (for example, in Tiripur, India, and Karachi, Pakistan).

#### A few countries lead the way

Similar to the trend in power and transport, in each region a few countries have awarded the majority of the water and sewerage contracts (tables 2 and 3). In East Asia, for example, China has awarded thirteen contracts and Malaysia six, together representing 63 percent of the East Asian total of thirty projects. A similar picture emerges in Latin America, with Mexico awarding twelve contracts, Brazil eight, and Argentina seven. This pattern is largely explained by the relative ease of implementing further projects once an initial project is in place, given the development of local private participation models and a degree of local experience with private transaction processes. In Argentina, for example, the availability of model contracts and regulatory documents is assisting smaller cities and provinces in working with the private sector.

The relationship between total investment and the number of projects awarded is not strong. The total investment in any country depends on how and where the projects have been implemented. The top three countries in terms of number of projects—China, Mexico, and Brazil—have awarded small contracts, and they account for only 7 percent of investment in developing countries in the water and sewer-

age sector. The top three countries as ranked by investment in private projects have awarded fewer contracts but of larger scale. Argentina, the Philippines, and Malaysia have awarded 16 percent of private projects, but they account for 69 percent of all private investment in water and sewerage.

**Projects differ vastly in size**

Project sizes also differ within countries. In Argentina, for example, one project, Aguas Argentinas, accounts for US\$4,464 million (54 percent) of the planned private investment in Latin America, while the country as a whole accounts for US\$6,183 million. Similarly, in East Asia three Philippine projects account for half the total investment commitments.

**Concessions are the most popular**

One striking feature of the water and sewerage sector is the dominance of concessions compared with other forms of private participation.<sup>3</sup> Concessions are attractive to governments because they place full operational and investment responsibilities, and associated commercial and investment risk, with the private sector, maximizing potential benefits from efficiency gains and access to private sector financing. But they also require significant government commitment, and efforts to create a credible regulatory environment for private investment. Of ninety-seven contracts with the private sector, forty-eight are concession contracts, accounting for 49 percent of all water and sewerage projects and 80 percent of all private capital investment (table 4 and figure 4). By contrast, in the energy sector most private projects are greenfield projects or divestitures.

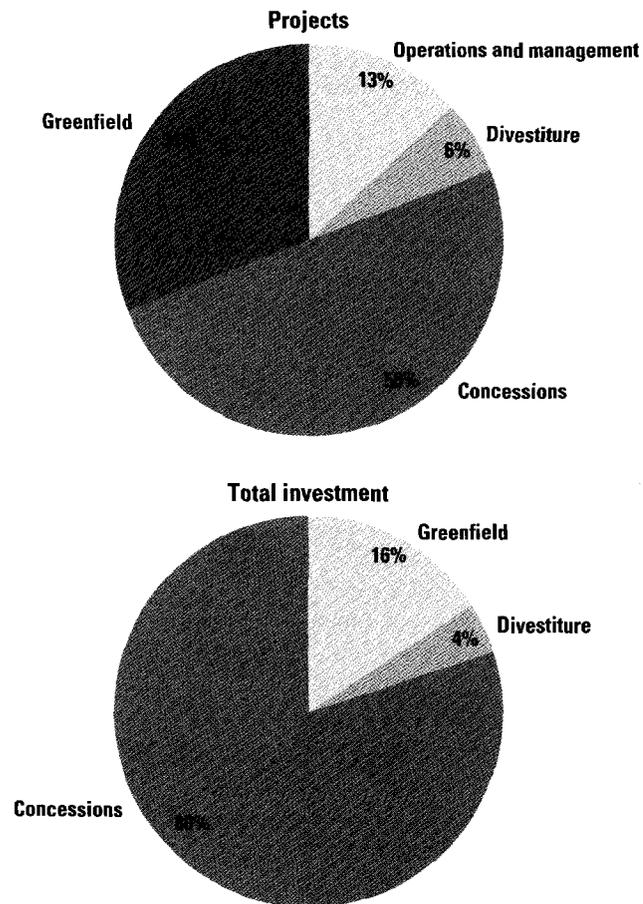
Differences in government objectives help explain differences in the contracts preferred in each sector. In the energy sector private involvement has been driven largely by an increasing demand for new capacity, requiring significant private sector investment. In the water sector most developing countries not only need to expand capacity and distribution networks, but

**TABLE 4 PRIVATE WATER AND SEWERAGE PROJECTS IN DEVELOPING COUNTRIES, BY TYPE, 1990-97**

Type	Projects	Total investment in projects with private participation (1997 US\$ millions)
Concession	48	19,909
Greenfield	30	4,037
Operations and management	13	n.a.
Divestiture	6	997
<b>Total</b>	<b>97</b>	<b>24,950</b>

n.a. Not applicable.  
 Note: Data may not sum to total because of rounding.  
 Source: PPI Project Database.

**FIGURE 4 PRIVATE PARTICIPATION IN WATER AND SEWERAGE IN DEVELOPING COUNTRIES, BY TYPE OF CONTRACT, 1990-97**



Source: PPI Project Database.

**TABLE 5 PRIVATE WATER AND SEWERAGE PROJECTS IN DEVELOPING COUNTRIES, BY SUBSECTOR, 1990–97**

Subsector	Projects	Total investment in projects with private participation (1997 US\$ millions)
Water treatment	25	4,249
Full water and sewerage service	19	11,935
Water treatment and distribution	16	1,177
Sewage treatment	12	673
Water and sewerage networks	7	496
Water distribution	5	218
Sewage collection and treatment	5	2,754
Other	8	3,536
<b>Total</b>	<b>97</b>	<b>24,950</b>

*Note:* Data may not sum to total because of rounding.

*Source:* PPI Project Database.

also face high levels of unaccounted-for water and inefficient services. The creation of new capacity detached from the management of distribution networks can exacerbate system inefficiencies. The construction of new water treatment plants, for example, increases the pressure of water going into the distribution network, increasing leaks. If, in addition, collections performance is poor, raising funds to meet take-or-pay commitments will be difficult. Greenfield contracts often do not give the private contractor an incentive to take these problems into account. By contrast, concessions can encourage improved management and maintenance of the whole network.

#### **Greenfield projects typically involve bulk water sales**

The thirty greenfield contracts account for 31 percent of all projects and US\$4,037 million of private investment. Almost all greenfield projects take the form of BOT contracts, with ownership reverting to the government after the initial contract period. In public-private joint ventures ownership of the assets often remains with the public partner during the contract term.

Some BOT contracts also give the private sponsor responsibility for management of the distribution network, making them more like concession contracts. There are only five projects in which the private company retains ownership of the facilities. All these build-operate-own schemes are in Latin America and the Caribbean.

Most of the greenfield projects in the sector (twenty-five of thirty, with one project covering both water and sewerage) are for the construction and operation of water treatment plants in countries with an increasing demand for piped water. In these cases companies typically have a take-or-pay agreement with the municipal government for bulk water sales. All six greenfield projects in China, for example, are for water treatment plants. In the relatively high-income countries of Latin America governments have awarded greenfield contracts to meet the growing demand for sewage treatment plants.

#### **Divestitures are rare**

Divestiture of public water and sewerage assets is comparatively rare; six projects, all partial divestitures, account for 6 percent of all water projects and only 4 percent of private investments. This small share highlights the sectoral difference between water and energy in asset ownership: most water and sewerage assets remain in the public sector, and governments are resistant to giving them up. The availability of concession contracts as an alternative to divestiture has allowed governments to maintain ownership of sector assets while delegating substantial responsibility and risk to the private sector.

#### **Management and lease contracts are less risky**

Management contracts and leases are intended to improve the performance of loss-making public utilities while leaving the public sector primarily responsible for new investments. Funding for this investment often comes from development bank loans, and all investment risk is borne by the government. These types of contracts have therefore proved attractive in countries where the private sector perceives investment

**TABLE 6 TOP FIVE PRIVATE SPONSORS BY NUMBER OF PROJECTS, 1990-97**

Sponsor	Projects	Total investment in projects with private participation (1997 US\$ millions)
Suez Lyonnaise des Eaux	28	16,153
Vivendi (formerly CGE)	13	5,275
Aguas de Barcelona	6	9,072
Thames Water	6	1,375
SAUR International	5	38

Source: PPI Project Database.

**TABLE 7 TOP FIVE PRIVATE SPONSORS, BY REGION, 1990-97**  
Number of projects

Sponsor	East Asia and Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	Sub-Saharan Africa	Total
Suez Lyonnaise des Eaux	11	7	6	2	2	28
Vivendi (formerly CGE)	4	3	3	0	3	13
Aguas de Barcelona	0	0	6	0	0	6
Thames Water	4	1	1	0	0	6
SAUR International	1	1	0	0	3	5

Source: PPI Project Database.

risk to be high. Management contracts attempt to improve efficiency through incentive payments based on measured performance and involve minimal transfer of risk to the private sector. Leases do transfer commercial risk to the private partner, thereby creating direct incentives to improve revenues and reduce costs. Together, management contracts and leases constitute 13 percent of all projects. Seven of the ten projects in Africa are management contracts or leases. Management and lease contracts account for all single-sector water projects in Africa; all three concessions for water services in Africa also involve electricity generation, transmission, and distribution.

#### Private participation is easier in water than in sewerage

A breakdown of private involvement by sub-sector (water treatment, water distribution, sewerage collection, sewage treatment) highlights the

greater prevalence of private sector involvement in water relative to sewerage (table 5). Government priorities have generally given greater emphasis to supplying water than to removing wastewater after use. Consumers are more willing to pay for water delivery service that yields immediate and direct benefits than for services such as sewage treatment, the benefits of which are more dispersed. In Asia contracts commonly focus solely on the water sector (the national concession for sewerage services in Malaysia is an exception, as are the Manila water and sewerage concessions in the Philippines). By contrast, concessions covering water treatment, water distribution, and sewerage services, as well as BOTs for sewage treatment, are relatively common in Latin American countries. In this region a well-developed water infrastructure is more often already in place, and increasing wealth allows

municipal governments to extend concessions to sewerage.

#### Few major players so far

A few major companies dominate private participation in the water and sewerage sector in developing countries (see table 6 for the top five sponsors by number of projects in which they are involved).<sup>4</sup> The top five sponsors are involved primarily in concessions and lease or management contracts, more rarely in divestitures and greenfield projects.

The small number of major players reveals the novelty of private contracts in the water sector compared with other sectors. Many contracts are awarded to consortia made up of local companies, often operating in other industries, and one or two experienced international companies. A breakdown of the major players by region highlights even more clearly how few major international players operate in developing countries (table 7). Only one of the top five sponsors operates in all five developing regions. There are signs, however, that the growth of the sector will bring an increase in the number of international players. Water and sewerage contracts increasingly are attracting bids from consortia of multisector utility and construction companies.

#### Conclusion

The water sector has a long history of tariffs below costs and political resistance to raising them. Considerable government commitment is required to raise tariffs to cover costs, and to build regulatory arrangements that give private companies confidence that they can make a fair rate of return on their investments. Even relatively low-risk contracts, such as management contracts and leases, still require governments to establish their credibility as good partners for the private sector. While many governments are currently contemplating reforms that will make private participation in water and sewerage possible, only thirty-five countries in the developing world have so far succeeded in implementing private transactions in the sector.

Private participation in the water sector is very new. The small number of projects and the dominance of a few major international players are characteristics of an industry in transition. Developing countries are opening their water and sewerage sectors to greater private participation and giving more private operators the opportunity to gain experience in the sector. As opportunities in developing countries increase, water sector projects are likely to attract companies with domestic experience, as well as new companies. (We have recently witnessed Enron's acquisition of a water company in England with the aim of expanding into the water sector overseas.) Companies already operating in developing countries are taking on additional projects as they acquire experience in the sector, but may face a constraint from managerial economies of scale. Expansion may therefore depend on new entrants to the sector.

<sup>1</sup> All dollar amounts are in 1997 U.S. dollars.

<sup>2</sup> Any impact of the East Asian financial crisis is likely to show in the next update of the water project database.

<sup>3</sup> For details on concession contracts see Pierre Guislain and Michel Kerf, "Concessions—The Way to Privatize Infrastructure Sector Monopolies" (*Public Policy for the Private Sector*, September 1995), Claude Crampes and Antonio Esache, "Regulating Water Concessions" (*Public Policy for the Private Sector*, September 1996), Penelope J. Brook Cowen, "The Private Sector in Water and Sanitation—How to Get Started" (*Public Policy for the Private Sector*, September 1997), and Helen Nankani, "Testing the Waters—A Phased Approach to a Water Concession in Trinidad and Tobago" (*Public Policy for the Private Sector*, December 1996).

<sup>4</sup> Sponsor companies that have a small stake in a few large projects have an inflated market share if market share is calculated according to the total investment in projects. At the other extreme, major sponsors that focus on management and lease contracts but undertake little or no capital investment are excluded from a calculation based on investment. Using the number of projects avoids this bias and highlights the major players in the sector better than the size of projects in which each company has a stake. The number of projects still is not a perfect measure, however, because it ignores the cross-ownership between some sponsor companies and therefore double counts when two affiliated companies have a stake in the same project.

*Gisele Silva, Nicola Tynan, and Yesim Yilmaz,  
George Mason University and Private Participation  
in Infrastructure Group*