6

The Challenge of Financing Infrastructure in Developing Countries

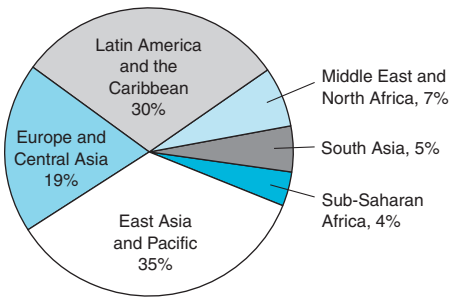
ESTABLISHING A SOUND FINANCING framework to meet developing countries' growing infrastructure needs remains a key challenge for policymakers. Efficient transport, reliable energy, safe drinking water, and modern telecommunication systems are critical to attracting foreign direct investment, expanding international trade, and achieving long-term investment and growth. Worldwide, most future infrastructure demand is likely to come from the developing world (home to 85 percent of the world's population), where access to infrastructure services falls well behind the levels in the developed world (box 6.1).[1] Estimates by several international organizations and researchers point to the substantial investment required in developing countries, including an annual amount of $120 billion in the electricity sector from 2001 to 2010 (International Energy Agency 2003) and $49 billion for water and sanitation from 2001 to 2015 (Camdessus 2003). China's infrastructure investment needs remain massive, estimated at about $2 trillion during the 2001–10 period (Asian Development Bank 2002). The rebuilding of Iraq's civilian infrastructure likewise will require considerable capital.

Global capital markets have the depth, maturity, size, and sophistication *potentially* to fund all viable investments and projects in developing countries' infrastructure. That they have failed to do so, and that the flow of private finance to infrastructure has declined so dramatically in recent years, is a reflection of several factors—chief among them the impact of recent macroeconomic shocks, ongoing transformations in the global electricity and telecommunications industries, the weakness of local capital markets in most developing countries, and unfinished reforms needed in many developing countries to place their infrastructure industries on a commercial footing.

From 1992 to 2003, total international investment in developing countries' infrastructure is estimated to have been $622 billion—an average of $52 billion a year and 3.8 percent of total gross domestic investment in the developing world (box 6.2). The investment was unevenly distributed. Countries in East Asia and Latin America accounted for almost two-thirds of the total (figure 6.1). Complementing the volume of cross-border flows have been resources that countries have mobilized domestically, predominantly from public sources.[2]

Policy responses to the imbalance of supply and demand in developing-country infrastructure have gathered momentum in the past two years. On the official side, the need to scale up multilateral assistance as a way of leveraging private capital, advancing reforms, and disseminating knowledge

Figure 6.1 Regional composition of international investment in infrastructure, 1992–2003



Sources: Dealogic Bondware and Loanware and World Bank staff estimates.

Box 6.1 Growing demand for infrastructure services in developing countries

Demand for infrastructure services is likely to grow more quickly in developing countries than in the developed economies for the foreseeable future. Infrastructure stocks and service access are relatively low in the developing world (see table). Currently, per capita electricity consumption is 1,054 kilowatt hours in developing countries, compared with 8,876 kilowatt hours in developed countries. Telecommunication links are five times less dense than in the developed world. Demand for infrastructure increases with per capita income, and growth is faster at lower income levels. A long-standing literature has established a close relationship between infrastructure and economic growth (World Bank 1994; Philippe, Aghion, and Schankerman 1999; Nadiri and Mamuneas 1996).

Stock of infrastructure in developing countries

	Installed capacity per 1,000 persons (kW) 2001	Electricity consumption per capita (kWh) 2001	Average telephone mainlines per 1,000 persons 2001	Road density (km/sq. km of land) 2000[a]	Access to improved water source (% of population) 2000
Developing countries	272	1,054	95	0.15	78
East Asia	223	921	59	0.15	71
Europe and Central Asia	992	3,425	217	0.11	88
Latin America and the Caribbean	431	1,709	150	0.15	88
Middle East and North Africa	338	1,411	86	0.08	84
South Asia	99	426	31	0.94	76
Sub-Saharan Africa	105	394	29	0.08	62
Developed Countries	2,044	8,876	501	0.58	99

a. Data are for the latest year available during the period 1996–2000.
Sources: Electricity—U.S. Energy Information Administration 2003; Telephone mainlines—World Bank, *World Development Indicators 2003;* Roads—International Road Federation 2002.

and best practice is now well recognized. That recognition culminated in the launching of the World Bank's Infrastructure Action Plan in 2003 (see www.worldbank.org/infrastructure). On the private side, too, there is a recognition of the need for a more balanced public-private approach to financing and for innovative risk-sharing mechanisms.

This chapter focuses on the financing of developing-country infrastructure. Finance matters for infrastructure development not only for the usual reason of allocative efficiency, but also because of certain distinctive economic characteristics of infrastructure—a high capital intensity, elements of natural monopoly, and location-specific investments—all of which affect private sector incentives to commit long-term capital. We adopt an eclectic approach, because of the vast scope of the subject matter and its multisectoral nature, and highlight the interface between government policy and investor behavior, on the one hand, and the intricate structure of developing-country infrastructure financing, on the other. The key messages are:

- The bottlenecks in ensuring a healthy flow of capital from international markets to developing-country infrastructure are related to policies, institutions, and regulation. Multilaterals can play a crucial role in providing risk-mitigation instruments (including guarantees and political risk insurance) and promoting the development of local capital markets. However, no single solution will fit all sectors and all countries.
- Emerging modes of infrastructure financing, based on private finance and ownership, have not proven resilient in the face of recent domestic macroeconomic shocks and international financial crises. Indeed, such shocks have had a more enduring impact on investors' confidence than did the downward movement in the global telecommunications

Box 6.2 Measuring capital flows to developing countries' infrastructure

The analysis in this chapter draws on three measures of capital flows to developing-country infrastructure:

- *International investment in developing-country infrastructure* is defined as the total volume of capital raised internationally through bank loans, bonds, and equity offerings for the core economic infrastructure sectors of telecommunications (all types of communication infrastructure and services), transport (all modes of transport infrastructure and services, as well as transport companies, such as airline and railway operators), power (including electricity generation and electric and gas utilities), and water and sanitation (all activities regarding water supply and treatment and waste management infrastructure and services) in developing countries. Data on debt volumes cover transactions on international loan syndications and bond issues reported by capital-market sources, including Dealogic Bondware and Loanware. Information on equity flows is based on World Bank staff estimates, using estimated debt-equity ratios that range from 42/58 for mobile telecommunications to 78/22 for road transportation, with those ratios being based on a study by Foreign Investment Advisory Services (Sader 2000).
- *Private participation in infrastructure (PPI)* comes directly from the World Bank PPI Project Database, which tracks information on total infrastructure investment with private involvement in developing countries. The database covers projects in the energy, telecommunications, transport, and water sectors that are owned or managed by private companies in developing countries and that directly or indirectly serve the public. Only projects that have reached financial closure are included. In general, investments are recorded on a commitments basis in the year of financial closure; actual disbursements are not tracked.
- *Project finance for infrastructure* refers to transactions for nonrecourse and limited recourse project finance through international capital markets, but excludes export credit agency facility financing, which is considered trade finance. Such information is compiled from deals reported in Dealogic's Projectware database.

and electricity industries. This poor resiliency underscores the importance of macroeconomic stability and measures to prevent future financial crises.

- Public entities, such as municipal utilities and parastatal corporations, will remain major players in the financing, development, and delivery of infrastructure services in many developing countries. Fundamental improvements in their creditworthiness will be essential to facilitate their access to global and domestic capital markets, as well as to bring in private equity investments to a range of public-private partnerships. Corporate-level and sector-specific reforms will have to be pursued. At the corporate level, investment planning, financial reporting, and corporate governance will have to meet commercial standards. At the sector level, reforms in the complementary regulatory environment will be essential to minimize regulatory risk.
- Substantial investments in developing-country infrastructure are unlikely to materialize unless there is a strong institutional framework for protecting creditors' rights, effective covenants, and reliable avenues of legal enforcement and remedy. Bond investors respond to a strong institutional framework by lowering the cost of capital.

The changing balance between the public and private sectors

Participation by the private sector in infrastructure has a long history. The procurement of public infrastructure facilities can be traced to the "master contractor model" of Roman times. Project financing dates back to the Middle Ages, when, in 1299, the English Crown financed the development of a silver mine in Devon through an off-balance-sheet loan from a leading Italian merchant bank, assuming much of the operational and market risks. The concession structure dates back to sixteenth-century France, where the state granted a private company a concession to build

the Canal du Midi in 1514. In the United States, the need to finance railroads and canals in the nineteenth century helped foster the development of the national debt market.

Despite this long history, infrastructure has, relative to other capital-intensive industries, undergone sharp shifts in government policy, public attitude, and the intellectual environment. Twenty-five years ago, infrastructure services in virtually all developing countries, and in most developed ones, were controlled by the state, through ownership of vertically integrated utilities and other infrastructure entities. In the Philippines, for example, the government-owned National Power Corporation maintained a monopoly on the generation and wholesale distribution of electricity, as did Kazakhenergo in Kazakhstan and the Office National de l'Electricite in Morocco. In the telecommunications industry, government-owned monopolies were normally dominant, including Telefonos de Mexico SA de CV, Telecom Egypt, and Nitel in Nigeria. Similar examples abound.

In countries where infrastructure assets were privately owned, as in the United States, the dominant institutional structure was that of the "vertically regulated monopoly utility," under which utilities enjoyed local franchise monopolies in return for allowing their rates to be regulated and agreeing to serve the interests of the public.[3]

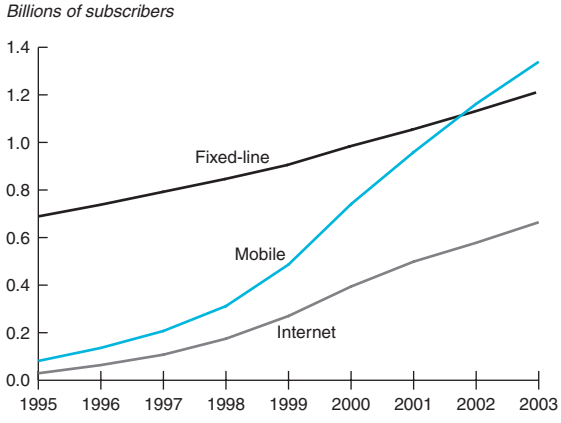
Financing for infrastructure reflected the stability of both the public ownership model and the reliance on regulated utilities. Under the first model, investors and creditors could count on the explicit backing of governments. State-owned utilities were dependent upon the fiscal budget for new investments and often for meeting shortfalls in operating revenues. In the latter model, that of the vertically regulated monopoly, stability came from the utilities' income stream—which was predictable because charges were regulated.

Charges were based on a transparent calculation of return on fixed assets or price-cap regulation with the incentive for enhanced return through cost savings. The main burden was borne by tax- and ratepayers, who implicitly underwrote the investment risks and sometimes suffered from the inefficiency of state-owned utilities. Operating inefficiencies in developing-country infrastructure are estimated to have caused losses of $55 billion a year, equivalent to 1 percent of developing-country GDP (World Bank 1994).

Over the past three decades, the global infrastructure markets have undergone unprecedented change and institutional reorganization. Rapid technological advances, particularly in the telecommunications sector, and conscious changes in public policy brought deregulation and competition in mature markets and liberalization in the developing world.

The telecommunications industry, once reliant upon fixed-line voice service, now boasts a variety of new products and services, from videoconferencing to third-generation mobile telephones. Since 1995, worldwide mobile phone subscriptions have soared by 1,360 percent, compared to 76 percent for fixed-line services (figure 6.2). With 1.3 billion subscribers, mobile phones are now the main form of telecommunication. Internet connections ballooned from 4 million in 1995 to 665 million by 2003. With innovations such as broadband transmission and wireless technologies, telecommunications infrastructure is set to undergo further changes. Many developing countries, especially those in which geography is an impediment to fixed telecommunication infrastructure, are expected to skip the deployment of wired technology in favor of wireless. In the power sector, recent technological advances have led to reductions in the capital costs of power plants using new or renewable fuel sources. Technological change can encourage competition by lowering sunk costs and reducing the natural monopoly elements of infrastructure industries.

Figure 6.2 The growth of mobile telecommunications and the Internet, 1995–2003



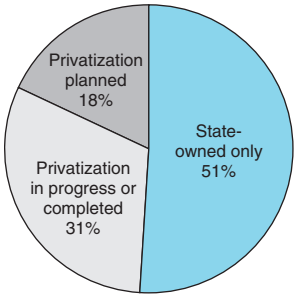
Source: International Telecommunication Union.

Various forces have driven conscious changes in public policy. In the United States, building on the success of earlier deregulation of the rail, airline, and gas industries, the regulatory reform process gained momentum in the 1990s with the passage of the Energy Policy Act of 1992 and the Telecommunications Act of 1996, both aimed at fostering competition to enhance efficiency, encourage technological innovation, and lower prices. In Europe, the desire to bring about a single market in gas, electricity, transport, and telecommunications has been a key driver of change. And in much of the developing world, the driving forces have been fiscal pressure, disenchantment with the performance of publicly owned utilities, and the need for new investments and modernization.

The shift to private sector involvement has taken different forms in the various sectors:

- *Telecommunications*. Considerable progress has been made in privatizing, restructuring, and introducing competition into segments of the telecommunications industry. Privatizations have occurred through the sale of assets to strategic investors (often major international companies) and through equity offerings in local and international markets. In most countries, the private sector is now dominant. In 1991, telecommunications in some 150 countries were state-owned, but by 2003 the number had fallen to 79. By contrast, the number of telecommunication regulators, usually an indication of the entry of private participants, rose from 12 to 123.
- *Power.* Worldwide reform in the electric power sector has been more uneven and contentious than in the telecommunications industry. In developing countries, progress has been made in privatizing and diversifying generating capacity, where international capital has contributed to the development of a private power market around competitive bidding on long-term power-purchase contracts. The thrust of restructuring has been on unbundling the ownership of vertically integrated utilities, separating the structurally competitive segments of generation and supply from the monopoly segments of transmission and distribution. In a survey of 52 developing countries having a generating capacity of between 29 megawatts (The Gambia) and 318 gigawatts (China),[4] 31 percent had completed, or were near completing, the privatization of state-owned power utilities (figure 6.3). A further 18 percent had begun the privatization process, either by enacting reform legislation or by partially divesting state ownership. In 67 percent of the countries reviewed, independent power providers (IPPs) had been established, with another 21 percent planning to open electricity markets to them.
- *Transport*. In transport, the movement to private ownership has been complicated by the economics of the industry, with private finance feasible only to the extent that users can be appropriately charged. Because infrastructure operators typically are able to charge only direct users, most private projects must be self-contained and have no close alternatives. Most privately financed schemes have been for bridges, tunnels, toll roads, and railways, as well as some major ports and airports. According to the World Bank's PPI Database, from 1990 to 2002, private participation in transport projects took place in 66 developing countries, encompassing 704 projects and absorbing $120 billion in capital.
- *Water and sanitation*. Before 1990, the sector relied almost entirely on government financing to meet operating costs and investment needs.[5] As late as the mid-1990s, 65–70 percent of water and sanitation projects were still financed by the public sector; 5 percent by the domestic public sector; 10–15 percent by international donors; and 10–15 percent by international private companies (Camdessus

Figure 6.3 Status of electrical power sector privatization in developing countries, 2001



Source: World Bank staff estimates using U.S. Electricity Information Administration 2003.

2003). The predominance of the public sector is expected to continue for the foreseeable future. However, with the introduction of various forms of public-private partnership in project design, development, finance, production, and service provision, private participation in water and sanitation has grown. Between 1990 and 2001, the private sector invested $40 billion in 203 water and sanitation projects in developing countries.

The transition to private participation in infrastructure has not yet settled; consequently, the financing environment for developing-country infrastructure is not clearly defined. In many developing countries, the agenda of market liberalization, regulatory reform, and the restructuring of state-owned monopoly utilities remains unfinished. Furthermore, given the characteristics of certain infrastructure industries, including the huge sunk costs involved, elements of natural monopoly, and their political saliency, there remains a strong rationale for state intervention, even in cases where privatization has been completed. Also, investors must factor in ongoing transformations of the global infrastructure industry, such as how to accurately price and gauge demand for new products resulting from rapid technological change.

Together with a series of recent financial crises, these developments have taken their toll, presenting a hierarchy of risks at the industry, country, and project levels. Those risks raise the cost of capital and make investors and creditors averse to long-term investments in developing-country infrastructure.

Recent developments in private external financing

The investment opportunities that came with the wave of privatization and liberalization in the early 1990s encouraged major international project operators and contractors facing poorer growth prospects in their home countries to invest in power plants, roads, and telecommunication facilities in the developing world. The entry of multinationals in the infrastructure sectors, which had traditionally been closed to international competitors and private participation, implied a process of learning, experimentation, and bargaining by firms and host governments. Firms had three comparative advantages in overcoming the barriers to entry in developing-country infrastructure. First, the utilization of modern technology, particularly in the telecommunications sector. Second, access to capital at a lower cost than that available to host countries' governments. And third, a capacity to operate at a global level, implying, among other things, an ability to draw on synergies involved in structuring business relationships in the form of joint ventures, consortia, and special-purpose vehicles.[6]

Expansion was initially fuelled by optimistic expectations about demand, the commitment of governments to contractual terms, the credit quality of project off-takers, consumers' ability to pay, and, above all, the stability of macroeconomic conditions. In the transport sector, for example, Standard and Poor's studied 32 toll roads worldwide, finding that traffic forecasts were too high in 28 cases—actual traffic volumes averaged only 73 percent of the forecast (Bain and Wilkins 2002). In the power sector, state-owned enterprises commonly entered into long-term power-purchase agreements on the understanding that those agreements would be guaranteed by a tariff indexed to hard currencies, such as the dollar, over the contract's entire life, backstopped by government guarantees. As those expectations proved overoptimistic, capital flows to developing-country infrastructure began to decline. Meanwhile, capital flows to infrastructure remain concentrated in a small number of countries.

Growth in the 1990s

The total volume of infrastructure finance raised internationally through commercial bank syndications, bond issuance, and equity participation rose from $23 billion in 1994 to $90 billion in 1997. Infrastructure investment with private participation in developing countries rose from $38 billion in 1994 to $114 billion in 1997, and the volume of project finance deals rose from $8 billion to $52 billion over the same period (figure 6.4). As a share of total gross domestic capital formation, international investment in developing-country infrastructure grew from 1.5 percent in 1992 to 6.2 percent in 1997 (table 6.1).

The financing of most forms of infrastructure involves a combination of project promoters, lenders, multilaterals, and export credit agencies, each with its own objectives but tied together

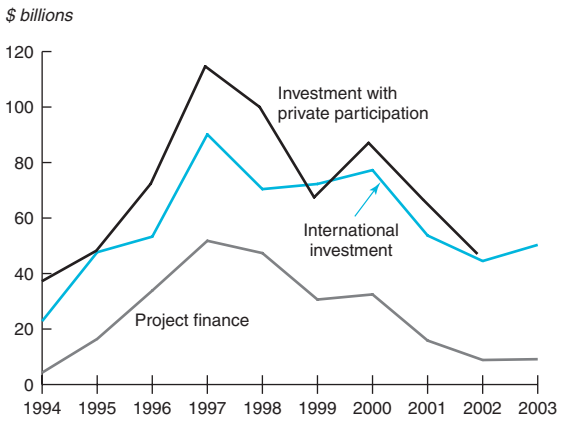
Table 6.1 International investment in developing countries' infrastructure as a share of total gross domestic capital formation, 1992–2003

Percent

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	1.5	2.5	2.1	3.8	3.8	6.2	5.1	5.6	5.4	3.7	2.9	3.4
East Asia & Pacific	2.8	5.1	3.5	4.7	4.6	4.7	5.1	3.1	4.4	1.7	3.1	4.2
Europe & Central Asia	0.6	0.8	1.3	4.3	3.2	5.9	7.0	8.3	8.1	4.3	4.9	5.5
Latin America & the Caribbean	1.3	1.4	1.2	2.7	4.2	8.1	5.9	5.9	7.5	7.8	2.8	1.7
Other regions	0.8	1.5	1.6	3.2	2.2	5.8	2.4	7.0	3.0	2.6	1.1	2.1

Note: Data for 2003 are from January through November.
Sources: Dealogic Bondware, Loanware, and Projectware, and World Bank staff estimates.

Figure 6.4 Private financial flows to developing countries' infrastructure, 1994–2003



Note: Data for 2003 are from January through November.
Sources: Dealogic Bondware, Loanware, and Projectware, and World Bank staff estimates.

through a nexus of contracts (box 6.3). Of these different players, the greatest source of finance traditionally has been commercial banks, often in connection with officially backed export credit agencies and multilateral organizations. The international syndicated loan market has accounted for 62 percent of international investment in developing-country infrastructure in the past decade. In the 1990s, the rise was led by banks domiciled in Japan, the United States, and Europe (primarily France, Germany, the Netherlands, and the United Kingdom), which together accounted for about three-quarters of all commercial bank infrastructure finance for developing countries in 1990–97, when such financing grew nearly nine-fold. Box 6.4 provides information on the key characteristics of syndicated bank lending to infrastructure.

Box 6.3 Phu My 3—An example of the multisource nature of infrastructure finance

Most infrastructure finance deals draw on an array of local and international funding sources, including syndicated commercial bank loans, bond issuances, equipment leasing, multilateral and export credit agency loans or guarantees, and equity commitments by project promoters and dedicated equity funds.

Vietnam's first international Build-Operate-Transfer power project, Phu My 3, with a generating capacity of 717 megawatts, reached financial closure in June 2003. Three-quarters of the funding took the form of debt, $40 million of which came from the Asian Development Bank; $99 million from the Japanese export credit agency, JBIC; and $170 million from a syndicate of international banks (Bank of Tokyo-Mitsubishi, Credit Agricole Indosuez, Credit Lyonnais, Fortis Bank, and Mizuho Corporate Bank). The equity component of $103 million was provided by the main sponsors (Electricite de France, Sumitomo Corporation, and Tokyo Electric Power Company), as shareholders' capital. The extended political risk insurance supporting the commercial tranche is provided by the Asian Development Bank, the Multilateral Investment Guarantee Agency, and Nippon Export and Investment Insurance.

The financing structure of Phu My 3, with several types of debt, equity, and credit enhancements, is not unique to Vietnam or the power sector. It satisfies two needs: to ensure access to international capital markets and to enhance efficiency by reducing overall financing costs, and extending debt maturity to match the project's underlying economics.

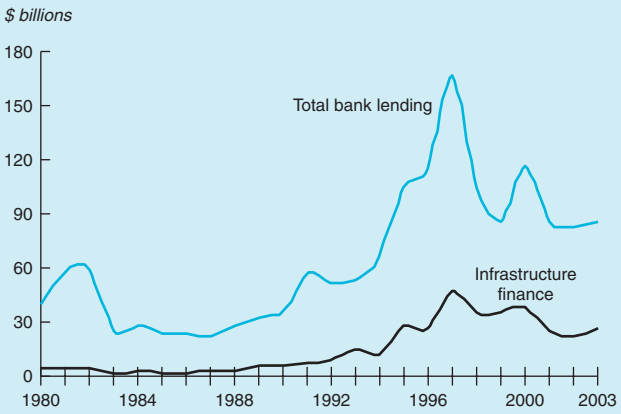
Box 6.4 Key characteristics of syndicated bank lending to infrastructure

Banks engage in syndicated lending to diversify their portfolio, both as a matter of commercial prudence and to comply with capital-adequacy requirements. Syndicated lending benefits the borrowers in several ways. First, it offers a wide range of maturities—from 364 days of revolving credit to 10-year project finance loans. Second, it provides necessary flexibility in loan drawdown during project construction. Third, bank loans can usually be repaid without penalty, creating flexibility for later refinancing.

Almost by definition, such syndicated bank loans are priced at a floating rate, at a spread or margin (expressed in basis points) over a benchmark rate such as LIBOR or Euribor; nearly all are denominated in major currencies. In addition, they share three notable characteristics:

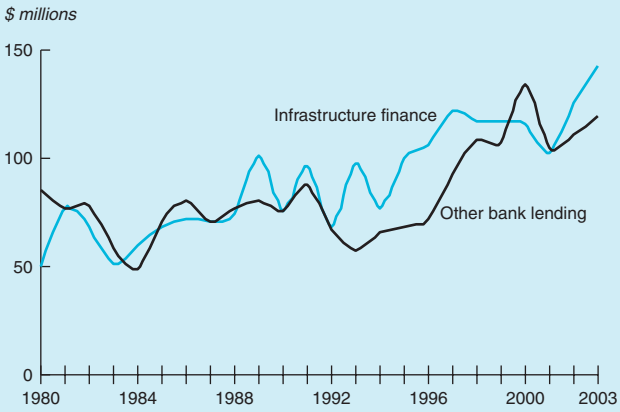
- Syndicated bank loans for infrastructure are closely linked with overall bank lending to developing countries (see figure below at left). As total new bank loans increased from close to $20 billion in the mid-1980s to almost $170 billion in 1997, infrastructure finance from commercial banks rose from about $3 billion to almost $50 billion. Since, it has dipped back to less than $30 billion.
- Infrastructure-related instruments have longer maturities than those for other activities (see figure at right). However, the average tenure for infrastructure finance declined from around 8.5 years in the 1980s to 7 years in the 1990s, decreasing further in 2000–03. The decline can be explained by the composition of borrowers. Average maturity was higher when East Asia dominated such financing, with maturities averaging eight years in East Asia between 1980 and 2003, compared with six in Latin America.
- Pricing has followed the overall structure for margins in bank lending (see lower right figure). Particularly noteworthy is the jump in pricing since 1998, as banks' risk aversion increased. The average margin on infrastructure finance increased from an average of 160 basis points in 1995–97 to 220 basis points in 2000–03, compared with an increase in the margin on general bank lending over the same period from 142 basis points to about 200 basis points.

Infrastructure financing and total bank lending, 1980–2003



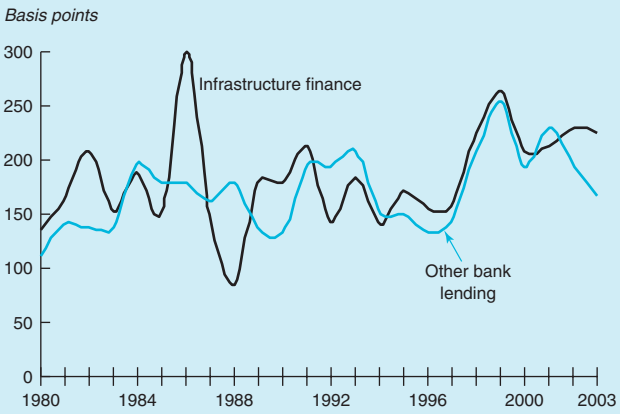
Sources: Dealogic Loanware and World Bank staff estimates.

Average size of transactions, 1980–2003



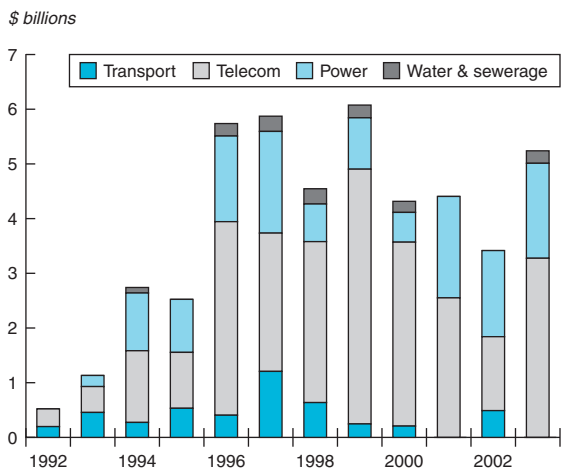
Sources: Dealogic Loanware and World Bank staff estimates.

Average margin over benchmark rates, 1980–2003



Sources: Dealogic Loanware and World Bank staff estimates.

Figure 6.5 Bond financing for developing-country infrastructure, 1992–2003



Note: Data for 2003 are from January through November.
Source: Dealogic Bondware.

A nascent bond market has also developed, driven by the economic reforms, market liberalization, and financial innovations of the early 1990s. New issuance amounted to about $4 billion in 2000–03, with most of the activity occurring in telecommunications (figure 6.5). The main issuing countries have been Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Malaysia, Mexico, the Philippines, Qatar, the República Bolivariana de Venezuela, and Thailand. As the market has gained maturity, it has delivered a series of high-profile transactions—among them the $1.2 billion bond issued by Qatar for the Laffan Liquified Natural Gas project, $1 billion issued by the República Bolivariana de Venezuela for the Petrozuarta oil project, and $125 million issued by the Philippines for the Quezon power project—and has encompassed a broad range of project types, issue sizes, and seniority.

Compared to the bank market, bond markets offer some advantages in terms of longer maturities, tradability, and back-weighted repayment structures that help to support equity returns. Infrastructure project bonds appeal in particular to institutional investors, such as insurance companies and pension funds, for which the long-term nature of investment projects is an advantage, as they can generate stable, long-term cash flows to match long-term liabilities.

During the mid-1990s, spreads on project bonds were 200–400 basis points, and maturities averaged more than 10 years (table 6.2). A sample of

Table 6.2 Infrastructure bond issuance, 1994–2003

	Number of bond issued	Maturity (*years*)	Amount (*$ billions*)	Launch spreads (*basis points*)
1994	16	7.9	2.8	246
1995	17	10.8	2.5	231
1996	31	10.9	5.8	313
1997	31	10.2	6.0	354
1998	22	8.5	4.5	418
1999	25	6.8	6.0	443
2000	17	5.9	4.3	409
2001	15	6.3	4.3	384
2002	21	7.7	3.4	670
2003	13	8.8	3.7	—

Note: — = not available. Data for 2003 are from January through November.
Source: Dealogic Bondware.

105 emerging-market project bonds issued between January 1993 and March 2002 found that, on average, project bonds were rated barely below investment grade—between BBB− and BBB according to Standard and Poor's rating classifications. The spread on project bonds typically was lower than on the sovereign bonds of the corresponding countries.

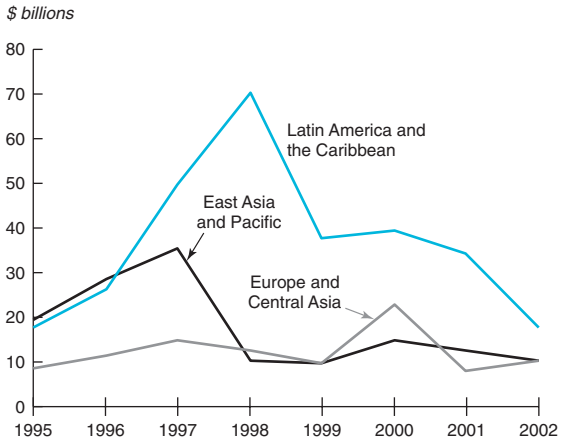
Infrastructure finance in the wake of macroeconomic and industry shocks

Since 1997, every important measure of infrastructure finance to developing countries—total external finance, project finance, and investment with private participation—has declined by at least 50 percent (see figure 6.4). The downturn was led by a series of crises affecting emerging-market economies, notably the East Asian countries, the Russian Federation, and Brazil. In recent years, the trend has been accentuated by a retrenchment by major commercial banks and a weakening of the global infrastructure industry.

Two factors suggest that the initial downturn was most influenced by an increase in host-country-related risks (country and project risks) rather than global industry-specific risk:

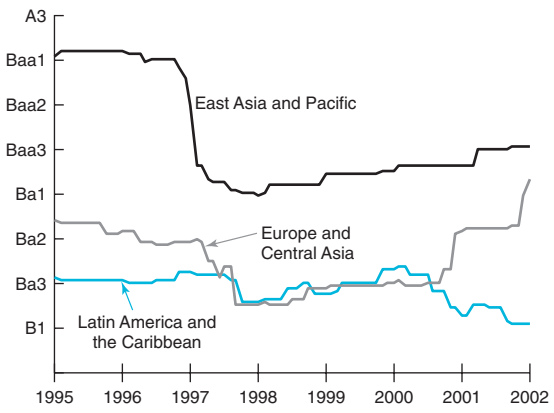
- The significant drop in investments with private participation between 1997 and 2000 was highly correlated with the increase in sensitivity to country risks due to financial crises. In 1997–98, investments in East Asia and in Europe and Central Asia dipped dramatically (figure 6.6), coinciding with a sharp fall in sovereign credit ratings in those regions (figure 6.7). Investments and credit ratings in Latin America followed a year later.[7]

Figure 6.6 Investment in developing-country infrastructure with private participation, 1995–2002



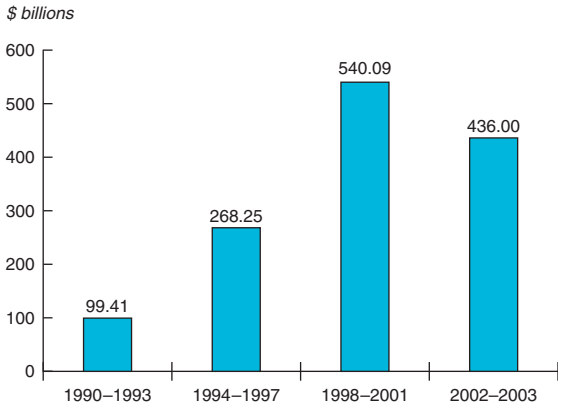
Source: PPI Project Database.

Figure 6.7 Average regional credit quality, 1995–2002



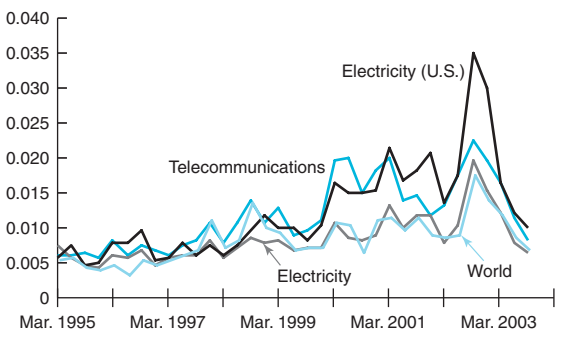
Sources: Moody's Investor Service and World Bank staff estimates.

Figure 6.8 Global annual average of debt financing for infrastructure, 1990–2003



Source: Dealogic Bondware.

Figure 6.9 Risk of investing in telecommunications and electricity, 1995–2003



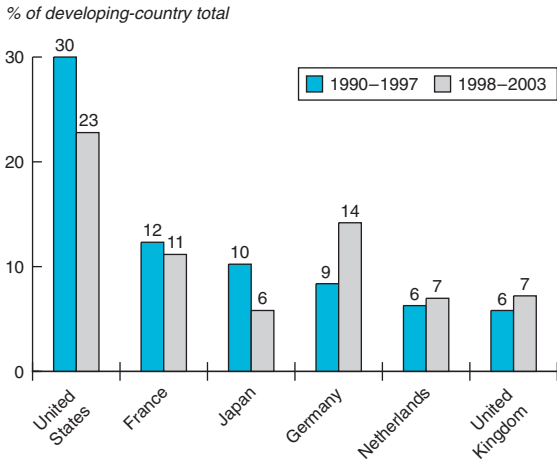
Note: The volatility of the telecommunications and electricity sectors is defined as the standard deviation of the stock price returns measured over the preceding quarter.
Sources: Morgan Stanley and World Bank staff estimates.

- From 1997 to 2000, as capital flows to developing countries declined, the global infrastructure industry remained robust (figure 6.8). Industry risk indicators, as measured by the volatility of their stock market prices relative to world stock market prices, remained stable (figure 6.9).[8] During this period, it appears that investors shifted from investments in developing countries' infrastructure to investments in countries that had opened their infrastructure sectors to new public-private partnership models—notably developed countries in Western Europe.

The susceptibility of infrastructure finance to perceived host-country risks suggests the importance of measures to prevent financial crises and to ensure macroeconomic stability in developing countries, including the pursuit of sound monetary and fiscal policies.

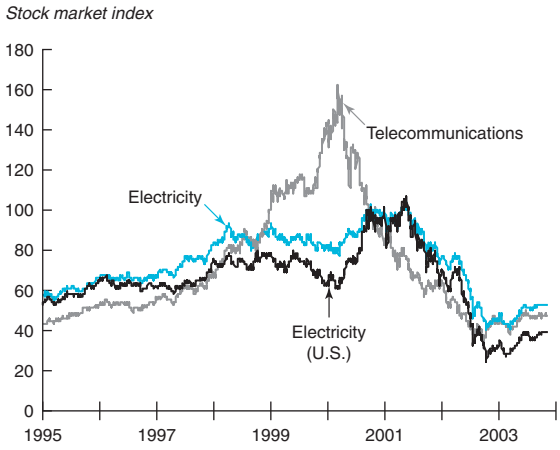
The commercial bank retrenchment from infrastructure finance was part of a more general

Figure 6.10 Share in infrastructure-related bank lending



Sources: Dealogic Loanware and World Bank staff estimates.

Figure 6.11 Stock market behavior of global telecommunications and electricity industries, 1995–2003



Sources: Morgan Stanley and World Bank staff estimates.

retrenchment of banks, particularly U.S. and Japanese banks (figure 6.10), from lending to developing countries, due to increased sensitivity to country risk (see chapter 2).

The decline in infrastructure financing in recent years has been accentuated by weakness in the telecommunications and power sectors. Telecommunications and power both have experienced financial strain, as indicated by a steep decline in share prices (figure 6.11). In power, the companies that drove the 1990s boom in the sector (mainly those in the United States) experienced, on average, an 88 percent fall in stock prices between June 2001 and October 2002, the most seriously affected being AES, Calpine, CMS, El Paso Energy, Enron, Mirant, and Reliant. In telecommunications, share prices of major firms have fallen by some 70 percent since January 2000. Furthermore, the decline in infrastructure financing coincided with a sharp increase in risk measures associated with investments in these sectors, as reflected by the substantial increase in the volatility of stock market price indices (see figure 6.9), and the significant increase in the sensitivity of sector returns to global returns (box 6.5).

Part of the reason for the weakness of the sectors was the revelation of accounting irregularities, with Adephia Communications, Enron, Qwest, and WorldCom now under criminal investigation in the United States. But in telecommunications, technological change also played a part in the decline. While creating new opportunities for large transnational players, rapid change has created new difficulties, particularly in accurately gauging demand and pricing new products. The balance sheets of telecommunications companies were severely hit by two investments—the 100-fold increase in the fiber-optic transmission capacity since 1998 (demand grew four-fold), and the high bids (up to $125 billion) for third-generation mobile licenses in European markets, which have not yet generated significant returns.

Since the middle of 2003, there has been evidence of a recovery in the financial health of the global telecommunications and electricity industries. Stock prices in both sectors have increased slowly, volatility has fallen (dramatically in the third quarter of 2003), balance-sheet consolidation has progressed, and growth has resumed. The telecommunications industry is expected to show growth of 10.1 percent in 2003, reversing declines in 2001 and 2002 (Telecommunications Industry Association 2003). Many electricity firms are seeking a better position in the market through domestic and cross-border mergers and acquisitions.

Regional differences in infrastructure flows

International investment in developing countries' infrastructure is spread unevenly across regions. Over the past decade, most external financing went to East Asia and Latin America. East Asia alone

Box 6.5 Systemic risk associated with investing in telecommunications and electricity

It is possible to test whether systemic risk, referred to as beta risk in the Capital Asset Pricing Model, increased in the telecommunications and electricity sectors during the period of the global downturn, by deploying the following regression model:

Return on a particular sector index
$= a + b^*$return on world index $+ c^*$dummy
$+ d^*$(dummy)*(return on world index)
+ error term.

The model was estimated using daily observations from January 1, 1995, to November 11, 2003. The dummy equals 1 in the period March 1, 2000, to March 1, 2003, and zero otherwise; *b* reflects the beta for each sector between January 1, 1995, and March 1, 2000 (the boom period in global infrastructure finance); and *d* measures the change in beta during the decline. A positive and statistically significant value of *d* indicates an increase in systemic risk during the downturn. The results are summarized in the box table and indicate that the beta significantly increased in both sectors, with the increase in risk in the electricity sector almost entirely driven by U.S.-based companies.

Regression results: Increase in systemic risk during the downturn

		Return telecom index	Return electricity U.S. index	Return electricity index
Constant	a	0.00	0.00	0.00
		(1.40)	(0.19)	(0.09)
Return world index	b	0.94*	0.37*	0.50*
		(34.68)	(8.78)	(20.76)
Dummy	c	0.00*	0.00	0.00
		(−3.11)	(−0.96)	(−1.25)
(Dummy)*(return world index)	d	0.23*	0.35*	0.08*
		(6.21)	(5.96)	(2.29)
R-squared		0.59	0.15	0.32
Number of observations		2,312	2,312	2,312

Note: Figures in parentheses indicate *t*-statistics; * indicates significance at the 5-percent level. Model is estimated using ordinary least squares methodology.
Sources: Morgan Stanley and World Bank staff estimates.

captured about 44 percent of total developing-country infrastructure finance in 1990–96, led by China, Malaysia, and, to a lesser extent, Indonesia, the Philippines, and Thailand. But the region's share was cut in half in 1997–2001 in the wake of the East Asian crisis. Despite a slight recovery in 2002–03, memories of failed projects still block a rapid resumption of foreign investment.

After the East Asian crisis, Latin America became a relatively more important borrower of external infrastructure funds, led by Argentina, Brazil, Chile, and Mexico. The region's share of developing-country infrastructure finance more than doubled, from an average of 24 percent in the early 1990s to 33 percent during 1997–2001. Much of the rise can be ascribed to a sharp increase in privatization-related financing (especially in the telecommunication and electricity sectors) and bank lending. Between 2002 and 2003, however, as new commercial bank deals to infrastructure projects in Latin America plummeted to $3 billion from $11 billion in 2001, the region's share in total infrastructure financing dropped correspondingly. Short-term liquidity became a concern in Chile, while utilities in Brazil struggled with the effects of a 2001 drought that required unprecedented energy conservation measures. In Argentina, many public-service providers of infrastructure services defaulted on their obligations, openly questioning the commercial viability of their enterprises under prevailing political conditions. República Bolivariana de Venezuela suffered the aftershocks of general strikes in late 2002 and 2003, during which capital controls were imposed and demand for electricity fell.

External financing for infrastructure in the Middle East and North Africa, South Asia, and Sub-Saharan Africa was small throughout the 1990s, with most externally financed projects concentrated in just a few countries. However, in the Middle East, the ability of national and regional banks to provide medium- to long-term local funding (including through Islamic financing instruments) has been instrumental in financing an array of desalination and independent water and power projects. These include the Barha project in Oman and the $1.8 billion Umm Al-Nar project in Abu Dhabi.

After 1994, Europe and Central Asia attracted substantial amounts of infrastructure financing, as candidate countries prepared their infrastructure markets for accession to the European Union. In 1997–2003, infrastructure finance to the region more than tripled to an annual average of $10 billion (from $3 billion during 1990–96), reflecting vigorous efforts by the region's governments. The share of the region in total developing-country infrastructure finance increased from 9 percent to 19 percent during the period.

Unlocking the potential of the global capital markets

Viewed from the perspective of their size, depth, sophistication, and range of instruments, global capital markets have the potential to fund all economically viable infrastructure projects in developing countries. In 2003, international lending in medium- and long-term bonds and bank loans amounted to $3.1 trillion (table 6.3). Yet on a global scale, infrastructure on average has attracted only 15 percent of these flows. Flows to developing-country infrastructure are even lower—at their peak in 1997, total private capital flows to developing countries' infrastructure were just 3.6 percent of the global total of new international bond, loan, and equity issuance.

In the current environment, in which developing countries' capital markets are not fully integrated with the global financial system, and where considerable administrative restrictions remain on capital flows, tapping the international capital markets to meet the high demand for infrastructure in developing countries will require solutions on five fronts. First, establishing transparent rules of the game, upon which investors can form expectations of future returns, assess risks, and have the assurance that contracts will be enforced—with legal remedies in the case of default. Second, strengthening the capacity of local capital markets, both as a source of long-term local currency finance and as a hedging instrument against currency risk. Third, developing viable public-private risk-mitigation and financing instruments capable of addressing a host of political, currency, credit, contractual, and regulatory risks. Fourth, facilitating the access of subsovereign public utilities, such as municipal utilities, to these capital markets. And, fifth, supporting public providers of infrastructure services in achieving commercial standards of creditworthiness to access capital markets on a sustainable basis over the long term. All these efforts involve a strategic role for multilaterals, particularly the last three. Seen against the backdrop of an acceleration of domestic growth, past macroeconomic adjustment, and improving creditworthiness in developing countries (see chapters 1 and 2), the time is favorable for scaling up efforts to meet the challenge of financing infrastructure in developing countries.

The importance of investor protection

Typically, private sector participation in infrastructure is governed by sector-specific regulations or long-term concession contracts. Governments often enter into such concessions under national laws (such as concession laws in Argentina and the build-operate-transfer laws in the Republic of Korea and the Philippines) that authorize the government to award concessions to private operators—through competitive public bidding and solicited tenders—to build, finance, and manage infrastructure assets, and to collect tolls and tariffs. Such contracts differ from "private-to-private" contracts in several respects. Acting in its sovereign capacity, governments may abrogate—or derogate from—contractual arrangements by legislative

Table 6.3 Total global international bank lending and bond issuance, 1990–2003

$ billions

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total bank lending	422	403	433	548	812	1,154	1,325	1,601	1,336	1,507	1,910	1,574	1,554	1,489
of which to infrastructure	76	54	68	89	129	221	261	335	277	377	553	385	347	296
Total bond issuance	236	312	352	499	457	496	713	757	912	1,379	1,469	1,716	1,500	1,912
of which to infrastructure	21	28	33	40	29	28	39	41	65	150	157	201	103	128

Note: Data for 2003 are from January through November.
Sources: Dealogic Bondware and Loanware and World Bank staff estimates.

means. Governments also have legitimate public-policy goals and concerns, such as affordability, universal access, and the regulation of monopoly practices. These differences expose the vulnerability of privately financed infrastructure projects to a host of contractual, political, and regulatory risks. Sustainable private financing of infrastructure requires enhancing the credibility of governments' reform and regulatory commitments. This can occur by institutional and legal development, as well as by more transparent procedures for project selection, appraisal, and the awarding of concessions.[9]

The legal documents governing virtually all infrastructure finance projects include provisions requiring the host country to submit to international commercial arbitration—the International Court of Arbitration of the International Chamber of Commerce, the London Court of International Arbitration, or the Arbitration Institute of the Stockholm Chamber of Commerce—as a mechanism of dispute resolution and enforcement. Arbitration is a binding, nonjudicial means of dispute resolution and—because a majority of countries have ratified the New York Convention on the Recognition and Enforcement of Foreign Arbititral Awards of 1958—widely enforceable around the world, in contrast to litigation, which is enforceable only under bilateral treaties (Mattli 2001; Thompson Financial 2004).

For creditors, covenants to mitigate risk and provide contractual protection have gained importance as a mechanism to increase investor interest in developing-country infrastructure. Because debtholders are exposed to the usual problems of agency, moral hazard, and adverse incentives inherent in all debt transactions, well-crafted and enforceable debt covenants are crucial for tapping external markets for financing. They can protect the safety and seniority of debtholders' claims, ensure repayment of principal, and provide legal remedies in the event of default. Covenant provisions are enforced by making their violation an event of default. The specific covenants included in a particular debt agreement, and the extent to which they protect the interests of creditors, will depend on other attributes, such as collateral, the governing law, and the legal and institutional frameworks underpinning contract formation and enforcement. Given that the writing, negotiation, and monitoring of specific provisions are costly, two sets of considerations become relevant—the ease with which the stipulated covenants can be monitored and the scope for potential opportunistic behavior that could lead to a transfer of wealth from bondholders to shareholders. While most infrastructure loans and bonds issued internationally are governed by contracts and covenants based on United States (New York) or United Kingdom (English) law, enforcement of debt terms depends on the legal system of host countries (Esty and Megginson 2000).

For project bondholders, covenants typically offer security that is less stringent than that attached to bank loans but greater than that of corporate bonds. A sample of 27 project bonds for which detailed covenant information was available indicates that project-bond indentures contain provisions, usual in corporate bonds, aimed at mitigating common shareholder-bondholder conflicts.[10] Covenant provisions typically take the form of restrictions on dividends, mergers and acquisition transactions, asset disposals, limitations on indebtedness, requirements of third-party guarantees, maintenance of good regulatory standing, and, in some circumstances, the establishment of offshore and debt-service reserve accounts. In addition, they contain two further categories of clauses that arise from the very specific nature of project finance:

- Incentive provisions for contractors, operators, and sponsors, such as performance targets, mandatory penalties, and equity participation in the project. For instance, if a project operator fails to meet certain performance targets, then the equity holders would have to inject additional funds.
- Institutional environment provisions that, in case of changes in the ambient regulatory, legal, or tax environment, would trigger changes in project control or mandatory redemption of debt. For instance, a material change in the terms of agreement for concessions would trigger early repayment of the project bond.

Increasing local-currency financing

Currency risk, traditionally, has been a critical feature of infrastructure project investment. With the exception of international airports and seaports, most transport infrastructure is domestically oriented, with project revenues generated in local currencies. But servicing foreign debt and equity involves payment in foreign currency. So when

foreign financing flows to projects with only a limited ability to generate such funds, currency risks arise. Hedging can occur, but contracts are usually limited to the short term. Investors are exposed not only to fluctuations in the exchange rate, but also to changes in capital controls, which may affect currency convertibility and profit repatriation.

Recently, however, prospects for currency convertibility and transferability have improved in many developing countries, with the liberalization of capital accounts and the move to more flexible exchange-rate regimes. At the same time, local-currency fixed-income markets have witnessed considerable growth and modernization, particularly in Brazil, Chile, Hungry, India, the Republic of Korea, Malaysia, Mexico, Poland, South Africa, and Turkey. Notably, in countries with a large local institutional investor base (such as Chile, the Republic of Korea, and Malaysia), local debt markets have significantly expanded the domestic capacity to meet needs for long-term infrastructure investment.

A strategic role for multilaterals

As they incorporate the Millennium Development Goals into their targets and strategic vision, multilaterals have come increasingly to view infrastructure financing within the broader context of finance for development. Their strategy is predicated on three points of consensus—the pivotal role of infrastructure in development; its direct and indirect contribution to achieving the Millennium Development Goals[11]; and the recognition that public sector support, including well-targeted government subsidies, will remain crucial in attracting private capital, particularly in sectors such as water and road transport.

At the same time, the unique role of multilaterals in promoting infrastructure finance, including their years of experience, their capacity to provide long-term loans, and their focus on poverty alleviation, is well recognized (Goldin, Dailami, and Wallich 2003). However, lending from multilaterals, particularly the World Bank, fell during the 1990s—decreasing by 47 percent between fiscal year 1993 and fiscal year 2002. Trends in multilateral development bank spending from 1995 are shown in box 6.6.[12]

The strategic agenda to promote infrastructure financing must focus on three elements. First, multilaterals need to expand their current offering of loans and guarantee instruments to facilitate access to global and local capital markets by both private and public providers of infrastructure services. Political, contractual, regulatory, and foreign-exchange risks will have to be dealt with. Political risk mitigation has advanced in recent years and now includes a private political-risk insurance market and new programs by export credit agencies. But instruments to mitigate the other risks remain less developed. The challenge is to achieve an appropriate allocation of risks between the private and public sector, without inducing moral hazard—which implies not having the government or public sector shouldering excessive risk. Apart from infrastructure loans to public and private providers, most multilaterals are able to provide partial credit guarantees, political risk insurance, and partial risk guarantees. Instruments that require further evaluation and development are those relating to local-currency lending and guarantees, and liquidity backstopping to mitigate exchange-devaluation risk.

The second item on the agenda for promoting infrastructure finance is to apply the new financing and risk-mitigation instruments to subsovereign providers of infrastructure services, such as municipal utilities. Facilitating the access of subsovereign entities to capital markets complements the wider economic reform agenda of fiscal decentralization, wherein local entities assume responsibility for providing infrastructure services. However, carefully structured incentives will be required to encourage fiscally responsible behavior by these subsovereign infrastructure providers. Some multilaterals, such as the European Bank for Reconstruction and Development and the Inter-American Development Bank, have been able to engage at the subsovereign level without a government counter-guarantee. The World Bank, including the International Finance Corporation, is working on similar facilities.

The third element is to work with public providers of infrastructure services to fundamentally improve their creditworthiness. Corporate-level reforms in investment planning, financial reporting, and corporate governance will have to be pursued, in addition to enhancing investor protection (as discussed above). Although the focus on improving the creditworthiness of public enterprises is not entirely new, there is a need to renew capabilities to deliver advisory and implementation support to achieve this transformation. Ultimately, the infrastructure financing requirements of most developing

Box 6.6 Multilateral development bank spending on infrastructure in recent years

Throughout the mid- to late 1990s, multilateral spending on infrastructure declined, reaching a trough of $13.8 billion in 1999—mainly because of a reduction in IBRD/IDA lending (boxed table). The major decline in multilateral infrastructure spending was to the energy sector (boxed figure), as the private sector became an increasingly important player, and as multilateral lenders focused on developing an enabling environment for private participants (World Bank 2003). However, over the past few years, there has been a slight recovery in infrastructure spending, with commitments standing at $16.6 billion in 2002.

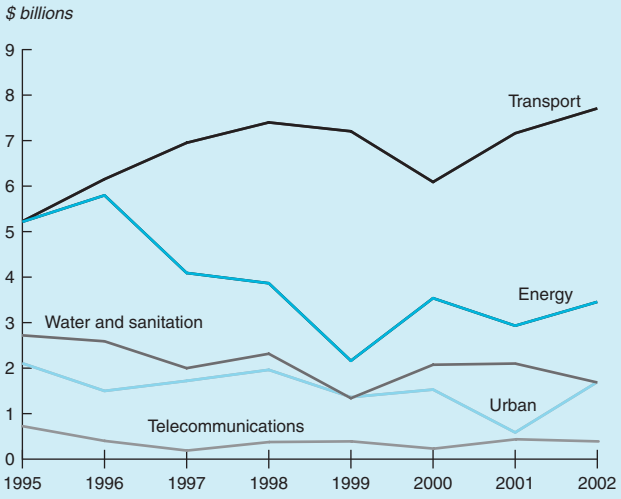
Multilateral development bank commitments to infrastructure sectors, 1995–2002

$ billions

	1995	1996	1997	1998	1999	2000	2001	2002
Total	17.770	18.266	16.612	17.687	13.842	14.957	14.684	16.591
As percentage of total commitments	33.984	24.708	36.130	40.998	31.205	34.147	34.171	38.973
ADB	3.424	2.849	1.903	2.337	1.752	2.655	2.261	2.879
AfDB	0.176	0.087	0.210	0.372	0.277	0.135	0.375	0.463
EBRD	1.404	1.631	1.077	0.874	0.916	0.792	1.164	1.458
EIB	2.465	2.425	3.067	3.483	2.993	3.735	3.552	4.401
IBRD/IDA	7.384	7.954	6.616	6.674	5.278	4.248	4.980	4.599
IDB	2.221	2.666	2.805	3.117	1.782	1.702	0.988	0.998
IFC	0.335	0.358	0.496	0.394	0.289	0.472	0.321	0.486
IsDB	0.219	0.148	0.295	0.260	0.351	0.468	0.475	0.445
MIGA[a]	0.142	0.148	0.143	0.176	0.204	0.749	0.568	0.862

Note: Infrastructure sectors considered are energy (excluding extractive industries), water supply and sanitation (excluding water resource management and irrigation), transport, urban development, and telecommunications (information and communications technologies).
ADB (Asian Development Bank), AfDB (African Development Bank), EBRD (European Bank for Reconstruction and Development), EIB (European Investment Bank), IBRD/IDA (International Bank for Reconstruction and Development/International Development Agency), IDB (Inter-American Development Bank), IFC (International Finance Corporation), IsDB (Islamic Development Bank), MIGA (Multilateral Investment Guarantee Agency).
a. Political risk insurance coverage.
Source: Refer to endnote 12.

Multilateral development bank commitments by sector, 1995–2002



Note: Refer to table above.
Source: Refer to endnote 12.

countries cannot be met without reaching commercially defensible standards of creditworthiness.

Over the longer term, enhancing the access of developing-country infrastructure to the international capital markets will also require developing an international mechanism to deal with cross-border investment regulation, competition rules, and consistency between national regulatory regimes. As technology increasingly interacts with economic pressures to globalize infrastructure industries and open them to international competition, consistency and compatibility of national competition laws and policies will become more important for achieving gains. Where elements of competition and natural monopoly co-exist and are complementary, the regulation of third-party access to essential facilities is vital. In recent years, the issue has generated a considerable amount of academic interest and research.[13] It has found its most immediate practical expression, as well as the most substantial challenges, in the European Union. In the context of implementing the single market, common rules have been prescribed for the progressive liberalization of networked industries in telecommunications and other sectors (Newbery 2001). At the global level, in the telecommunications industry, the World Trade Organization's Agreement on Trade in Telecommunications, reached in 1998, committed 78 nations, representing 90 percent of the global market, to liberalization and open-market policies, providing a necessary international framework. In other sectors, arrangements are less formal,[14] but steady movement toward common regulatory schemes can be detected and is likely to gain speed as globalization proceeds.

Notes

1. Some 1.1 billion people lack access to safe drinking water, 2.4 billion are affected by inadequate sanitation, and 1.4 billion have no power.

2. In the 1990s, an estimated 70 percent of infrastructure investment in developing countries came from governments or public utilities, 22 percent from the private sector, and 8 percent from official development assistance (World Bank staff estimates). Country data on infrastructure investment are scarce and fragmented, but available information reveals considerable variation across countries as well as regions. Infrastructure investment in Mexico in the late 1990s was 1 percent of GDP, for example; in Columbia, 7 percent (Serven and Easterly 2003). In India, it was 4.5 percent in 2000–01 (Reserve Bank of India 2003).

3. In the U.S. electricity sector, this organizational structure came to be known as the "utility consensus" (Hirsch 1999), which prevailed from the 1920s to the 1970s.

4. Data were obtained by analyzing the U.S. Electricity Information Administration's Country Analysis Briefs for 2003 of 54 developing countries in East Asia, Europe and Central Asia, Middle East and North Africa, South Asia, and Latin America and the Caribbean.

5. Between 1984–90 developing countries awarded only eight water and sewerage projects to private companies for a total capital investment of $297 million.

6. The project company, as a separate legal entity, is incorporated under host country company law. The project company has ownership rights over project assets and future cash flows and, typically, is structured as a "bankruptcy remote" special-purpose vehicle. This allows it to enter into a contract with other stakeholders, as well as to raise debt capital in the international and local financial markets.

7. The average regional credit quality is based on Moody's long-term foreign currency credit rating of the countries in the region. The credit qualities of each month are calculated as weighted averages of the credit ratings, with the weight of each country equal to its outstanding foreign-currency debt (composed of long-term, short-term, and IMF credit) relative to the total outstanding foreign-currency debt of the region.

8. The volatility of the telecom and electricity sector is defined as the standard deviation of the stock price returns measured over the preceding quarter. For the telecom sector, the returns of the Morgan Stanley Capital International Inc. (MSCI) sector index are used. For the power sector, because a similar index with a long enough history does not exist, the volatility measure is based on returns to the average stock price of the main global companies in this sector. As private investment in the power sector is concentrated in U.S.-based companies, a separate index has been created for these companies. The following companies are included: the U.S.-based companies American Electric Power, Texas Utility Company, Dynegy, El Paso Energy, AES, Reliant, Williams, Calpine, Enron, Duke Energy, Entergy, Mirant, Allegheny Energy, CMS Energy; and the non-U.S.–based companies British Energy, Scottish & Southern, Scottish Power, EDF, E.ON, RWE, Endesa, Iberdrola, Union FENOSA, Enel, Edison, Electrabel, Electricidade de Portugal, Empresa Nacional de Chile.

9. See Daniels (2003) for a more in-depth discussion of the role of legal instruments in enhancing the stability of private participation in public infrastructure projects.

10. See Dailami and Hauswald (2003) for a more detailed analysis of project bond covenant provisions.

11. Directly, the provision of services such as clean drinking water, sanitation, electricity, and roads are either goals on their own (Goal 7, Ensuring Environmental Sustainability, calls for halving the proportion of people without access to safe drinking water) or have obvious effects on goals such as combating infectious diseases, reducing child mortality, and achieving universal primary education. For example, the distribution of vaccines requires an effective transportation infrastructure, with vaccines such as that against hepatitis A being very sensitive to temperature (World Health Organization 2003). Water-related diseases rank as one of the top killers of children, and roads in rural areas can increase the practicality of children attending

school. Indirectly, infrastructure affects the Millennium Development Goals by enhancing economic growth.

12. The data were collected from various sources.

—ADB: data from ADB annual reports, based on calendar year recording. Exclude private sector loans categorized in the ADB annual reports as "social infrastructure."

—AfDB: data from AfDB annual reports, based on calendar year recording. Conversion rates (1 unit of account [UA]: US$): 1995—1.48649, 1996—1.43796, 1997—1.34925, 1998—1.40803, 1999—1.37095, 2000—1.30291, 2001—1.25673, 2002—1.35952. Data do not include the African Development Fund (ADF) nor the Nigeria Trust Fund (NTF), the concessional and private windows of the AfDB Group. "Energy" includes oil and gas.

—EBRD: Data from EBRD annual reports, based on calendar year recording. Conversion rates (1 Euro/ECU: US$): 1995—1.307, 1996—1.277, 1997—1.164, 1998—1.1115, 1999—1.0845, 2000—0.94785, 2001—0.8937, 2002—0.9343. Figures under "urban" here correspond to EBRD category of "municipal and environmental infrastructure," which includes water supply and sanitation as well. "Energy" here corresponds to EBRD's categories of "energy efficiency" and "power and energy." Similarly, "telecommunications" here corresponds to "telecommunications, informatics, and media." Figures include acquisitions of and investments in private companies.

—EIB: Data from EIB annual reports, based on calendar year recording. The same conversion rate is used as for EBRD. Figures refer to commitments to "(pre)accession and partner countries" only. Figures recorded here under "transport" reflect the broader EIB category of "communications."

—IBRD/IDA: Data from IBRD/IDA central database system, based on fiscal year recording. Do not include IFC/MIGA commitments. "Energy" excludes extractive industries (oil, gas, and mining). "Water supply and sanitation" excludes water resource management and irrigation.

—IDB: Data from IDB annual reports, based on fiscal year recording. "Transport" reflects here the IDB category of "transport and communications," which covers both transport and telecommunications. Data include loans, technical cooperation operations ($1 million and above), and Multilateral Investment Fund operations (when applicable to infrastructure sectors).

—IFC: Data from institutional internal database.

—IsDB: Data from IsDB central database system, adjusted from the lunar calendar. Figures include operations by IsDB and Unit Investment Fund, an IsDB subsidiary. Figures do not include the Emerging Markets Partnership (EMP)–managed IsDB Infrastructure Fund nor the Islamic Bank's Portfolio (IBP), another IsDB subsidiary, which provides both short- and long-term finance. Similarly, figures do not include operations approved by the Islamic Corporation for the Development of the Private Sector (ICD), the private sector arm of the IsDB Group.

13. For a comprehensive review of key issues see Yoo (2002) and Posner (1979); for telecommunications, see Valetti (2003) and Grout (2001); and for water see Hern (2001) and Aitman (2001).

14. In transport, the International Air Transport Association has served as the authority to set fares and terms of service in the international aviation industry (Richards 2001). In water and electricity, outside the European Union, international agreements have been limited to what can be described as "soft legal arrangements," in the terminology of international-relations scholars (Koremenons, Lipson, and Snidal 2001).

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