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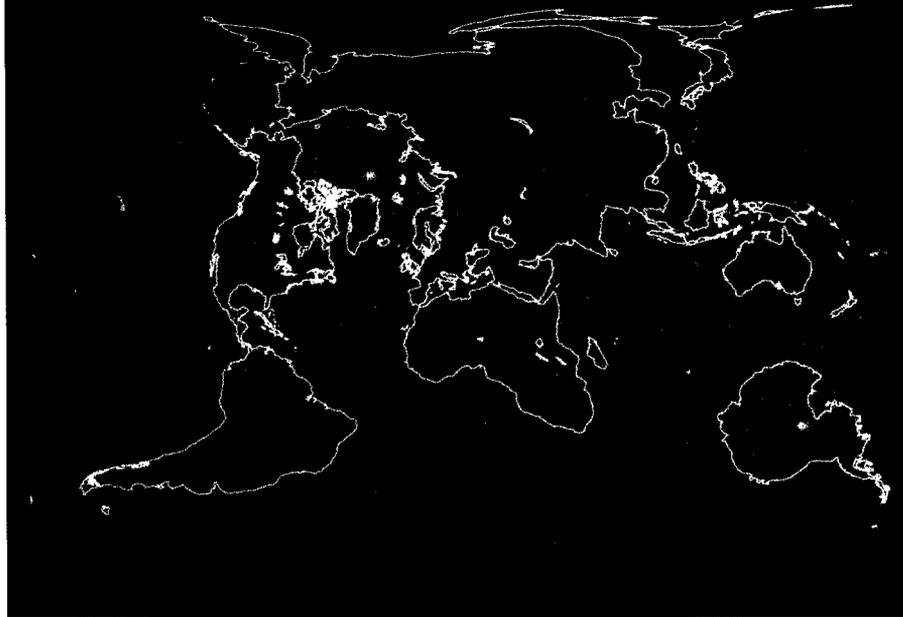
INFRASTRUCTURE FOR DEVELOPMENT

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EXECUTIVE SUMMARY



World Development Report 1994
Infrastructure for Development

Executive Summary

The World Bank
Washington, D.C.

6 Setting priorities and implementing reform



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Overview

Developing countries invest \$200 billion a year in new infrastructure—4 percent of their national output and a fifth of their total investment. The result has been a dramatic increase in infrastructure services—for transport, power, water, sanitation, telecommunications, and irrigation. During the past fifteen years, the share of households with access to clean water has increased by half, and power production and telephone lines per capita have doubled. Such increases do much to raise productivity and improve living standards.

These accomplishments are no reason for complacency, however. One billion people in the developing world still lack access to clean water—and nearly 2 billion lack adequate sanitation. In rural areas especially, women and children often spend long hours fetching water. Already-inadequate transport networks are deteriorating rapidly in many countries. Electric power has yet to reach 2 billion people, and in many countries unreliable power constrains output. The demands for telecommunications to modernize production and enhance international competitiveness far outstrip existing capacity. On top of all this, population growth and urbanization are increasing the demand for infrastructure.

Coping with infrastructure's future challenges involves much more than a simple numbers game of drawing up inventories of infrastructure stocks and plotting needed investments on the basis of past patterns. It involves tackling inefficiency and waste—both in investment and in delivering services—and responding more effectively to user demand. On average, 40 percent of the power-generating capacity in developing countries is unavailable for production, twice the rate in the best-

performing power sectors in low-, middle-, and high-income countries. Half the labor in African and Latin American railways is estimated to be redundant. And in Africa and elsewhere, costly investments in road construction have been wasted for lack of maintenance.

This poor performance provides strong reasons for doing things differently—in more effective, less wasteful ways. In short, the concern needs to broaden from increasing the *quantity* of infrastructure stocks to improving the *quality* of infrastructure services. Fortunately, the time is ripe for change. In recent years there has been a revolution in thinking about who should be responsible for providing infrastructure stocks and services, and how these services should be delivered to the user.

Against this background, *World Development Report 1994* considers new ways of meeting public needs for services from infrastructure (as defined in Box 1)—ways that are more efficient, more user-responsive, more environment-friendly, and more resourceful in using both the public and private sectors. The report reaches two broad conclusions:

- Because past investments in infrastructure have not had the development impact expected, it is essential to improve the effectiveness of investments and the efficiency of service provision.

- Innovations in the means of delivering infrastructure services—along with new technologies—point to solutions that can improve performance.

This Report marshals evidence in support of these conclusions—identifying causes of failure and examining alternative approaches. The main messages and policy options are summarized in Box 2.

Box 1 What is infrastructure?

This Report focuses on *economic infrastructure* and includes services from:

- Public utilities—power, telecommunications, piped water supply, sanitation and sewerage, solid waste collection and disposal, and piped gas.
- Public works—roads and major dam and canal works for irrigation and drainage.
- Other transport sectors—urban and interurban railways, urban transport, ports and waterways, and airports.

Infrastructure is an umbrella term for many activities referred to as “social overhead capital” by such development economists as Paul Rosenstein-Rodan, Ragnar Nurkse, and Albert Hirschman. Neither term is precisely defined, but both encompass activities that share technical features (such as economies of scale) and economic features (such as spillovers from users to nonusers).

Infrastructure’s role and record

The adequacy of infrastructure helps determine one country’s success and another’s failure—in diversifying production, expanding trade, coping with population growth, reducing poverty, or improving environmental conditions. Good infrastructure raises productivity and lowers production costs, but it has to expand fast enough to accommodate growth. The precise linkages between infrastructure and development are still open to debate. However, infrastructure capacity grows step for step with economic output—a 1 percent increase in the stock of infrastructure is associated with a 1 percent increase in gross domestic product (GDP) across all countries (Figure 1). And as countries develop, infrastructure must adapt to support changing patterns of demand, as the shares of power, roads, and telecommunications in the total stock of infrastructure in-

Box 2 Main messages of World Development Report 1994

Infrastructure can deliver major benefits in economic growth, poverty alleviation, and environmental sustainability—but only when it provides services that respond to user demand and does so efficiently. Service is the goal and the measure of development in infrastructure. Major investments have been made in infrastructure stocks, but in too many developing countries these assets are not generating the quantity or the quality of services demanded. The costs of this waste—in forgone economic growth and lost opportunities for poverty reduction and environmental improvement—are high and unacceptable.

The causes of past poor performance, and the source of improved performance, lie in the incentives facing providers. To ensure efficient, responsive delivery of infrastructure services, incentives need to be changed through the application of three instruments—commercial management, competition, and stakeholder involvement. The roles of government and the private sector must be transformed as well. Technological innovation and experiments with alternative ways of providing infrastructure indicate the following principles for reform:

- *Manage infrastructure like a business, not a bureaucracy.* The provision of infrastructure needs to be conceived and run as a service industry that responds to customer demand. Poor performers typically have a confusion of objectives, little financial autonomy or financial discipline, and no “bottom line” measured by customer satisfaction. The high willingness to pay for most infrastructure services, even by the poor, provides greater opportunity for user charges. Private sector involvement in management, financing, or ownership will in most cases be needed to ensure a commercial orientation in infrastructure.

- *Introduce competition—directly if feasible, indirectly if not.* Competition gives consumers choices for better

meeting their demands and puts pressure on suppliers to be efficient and accountable to users. Competition can be introduced directly, by liberalizing entry into activities that have no technological barriers, and indirectly, through competitive bidding for the right to provide exclusive service where natural monopoly conditions exist and by liberalizing the supply of service substitutes.

- *Give users and other stakeholders a strong voice and real responsibility.* Where infrastructure activities involve important external effects, for good or bad, or where market discipline is insufficient to ensure accountability to users and other affected groups, governments need to address their concerns through other means. Users and other stakeholders should be represented in the planning and regulation of infrastructure services, and in some cases they should take major initiatives in design, operation, and financing.

Public-private partnerships in financing have promise. Private sector involvement in the financing of new capacity is growing. The lessons of this experience are that governments should start with simpler projects and gain experience, investors’ returns should be linked to project performance, and any government guarantees needed should be carefully scrutinized.

Governments will have a continuing, if changed, role in infrastructure. In addition to taking steps to improve the performance of infrastructure provision under their direct control, governments are responsible for creating policy and regulatory frameworks that safeguard the interests of the poor, improve environmental conditions, and coordinate cross-sectoral interactions—whether services are produced by public or private providers. Governments also are responsible for developing legal and regulatory frameworks to support private involvement in the provision of infrastructure services.

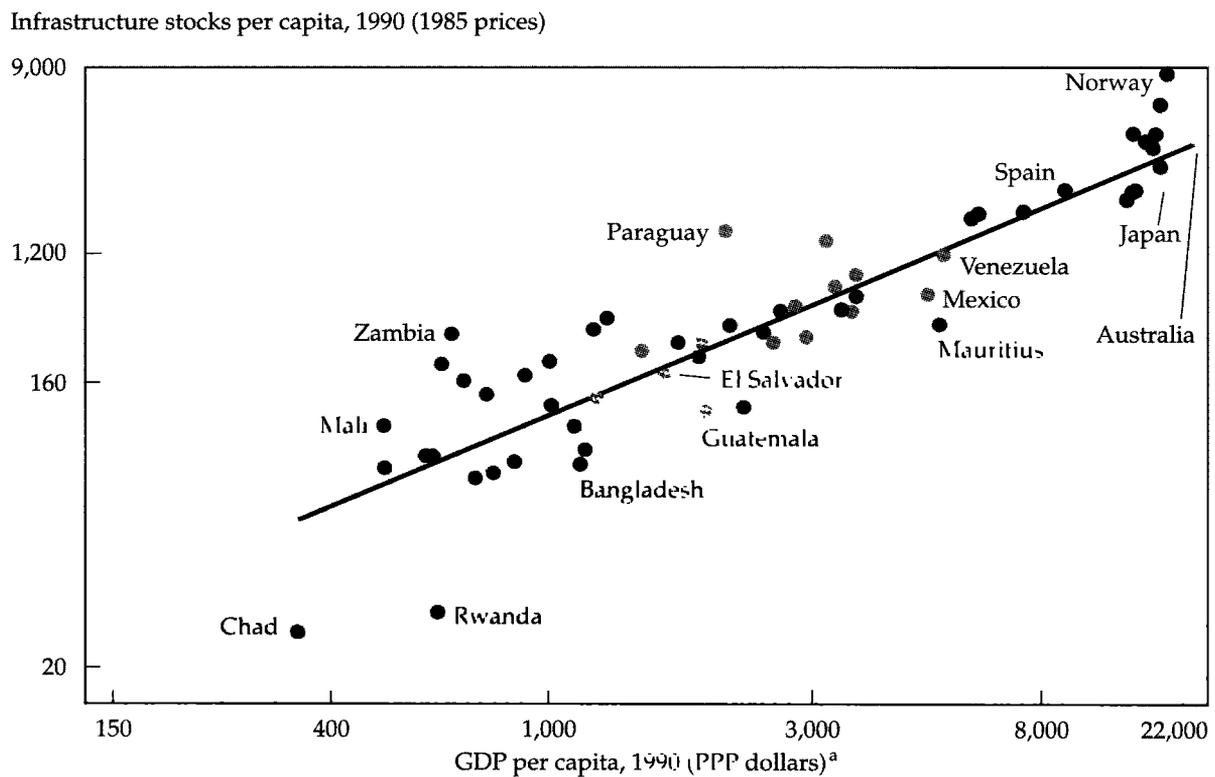
crease relative to those of such basic services as water and irrigation (Figure 2).

The kind of infrastructure put in place also determines whether growth does all that it can to reduce poverty. Most of the poor are in rural areas, and the growth of farm productivity and nonfarm rural employment is linked closely to infrastructure provision. An important ingredient in China's success with rural enterprise has been a minimum package of transport, telecommunications, and power at the village level. Rural enterprises in China now employ more than 100 million people (18 percent of the

labor force) and produce more than a third of national output.

Infrastructure services that help the poor also contribute to environmental sustainability. Clean water and sanitation, nonpolluting sources of power, safe disposal of solid waste, and better management of traffic in urban areas provide environmental benefits for all income groups. The urban poor often benefit most directly from good infrastructure services because the poor are concentrated in settlements subject to unsanitary conditions, hazardous emissions, and accident risks. And in many

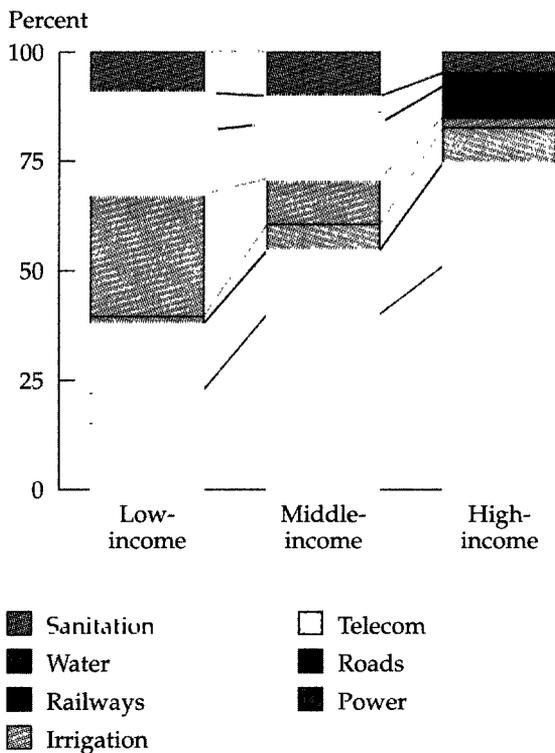
Figure 1 As a country's income grows, the amount of infrastructure increases.



- Middle East and North Africa
- Latin America and the Caribbean
- East Asia and Pacific
- Sub-Saharan Africa
- South Asia
- Europe and Central Asia

Note: Axes are logarithmic. Infrastructure includes roads, rail, power, irrigation, and telephones.
 a. Purchasing power parity (PPP) dollars are valued in Summers and Heston 1985 international prices.
 Source: Ingram and Fay, background paper; Summers and Heston 1991.

Figure 2 The composition of infrastructure changes with country income level.



Source: Ingram and Fay, background paper.

rapidly growing cities, infrastructure expansion is lagging behind population growth, causing local environments to deteriorate.

In developing countries, governments own, operate, and finance nearly all infrastructure, primarily because its production characteristics and the public interest involved were thought to require monopoly—and hence government—provision. The record of success and failure in infrastructure is largely a story of government's performance.

Infrastructure's past growth has in some respects been spectacular. The percentage of households and businesses served has increased dramatically, especially in telephones and power (Figure 3). The per capita provision of infrastructure services has increased in all regions; the greatest improvements have been in East Asia and the smallest in Sub-Saharan Africa, reflecting the strong association between economic growth and infrastructure.

In other important respects, however, the performance has been disappointing. Infrastructure in-

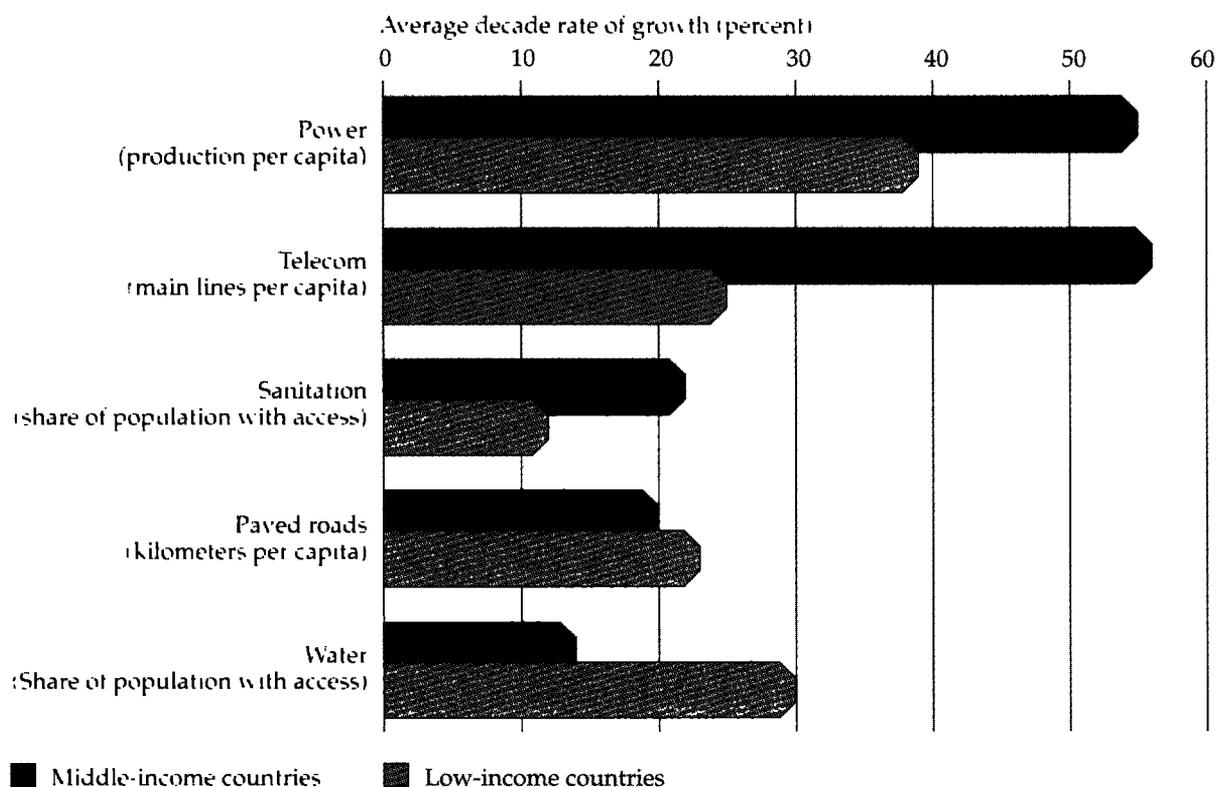
vestments have often been misallocated—too much to new investment, not enough to maintenance; too much to low-priority projects, not enough to essential services. The delivery of services has been hampered by technical inefficiency and outright waste. And too few investment and delivery decisions have been attentive to meeting the varied demands of different user groups, or to the consequences for the environment.

Inadequate maintenance has been an almost universal (and costly) failure of infrastructure providers in developing countries. For example, a well-maintained paved road surface should last for ten to fifteen years before needing resurfacing, but lack of maintenance can lead to severe deterioration in half that time. The rates of return from World Bank-assisted road maintenance projects are nearly twice those of road construction projects. Timely maintenance expenditures of \$12 billion would have saved road reconstruction costs of \$45 billion in Africa in the past decade. On average, inadequate maintenance means that power systems in developing countries have only 60 percent of their generating capacity available at a given time, whereas best practice would achieve levels over 80 percent. And it means that water supply systems deliver an average of 70 percent of their output to users, compared with best-practice delivery rates of 85 percent. Poor maintenance can also reduce service quality and increase the costs for users, some of whom install backup generators or water storage tanks and private wells.

Failings in maintenance are often compounded by ill-advised spending cuts. Curbing capital spending is justified during periods of budgetary austerity, but reducing maintenance spending is a false economy. Such cuts have to be compensated for later by much larger expenditures on rehabilitation or replacement. Because inadequate maintenance shortens the useful life of infrastructure facilities and reduces the capacity available to provide services, more has to be invested to produce those services. Donor objectives (such as seeking contracts for capital-goods supply or consultancy services) may also play a part in the preference for new investment over maintenance. In many low-income countries, donor financing underwrites nearly half of all public investment in infrastructure.

Project investments misallocated by many countries have created inappropriate infrastructure or provided services at the wrong standard. Demands of users for services of varying quality and affordability go unmet even when users are willing and able to pay for them. Low-income communities are not

Figure 3 Infrastructure has expanded tremendously in recent decades.



Note: Based on telecom, sanitation, and water data for 1975-90, and road and power data for 1960-90.
Source: Appendix tables A.1 and A.2

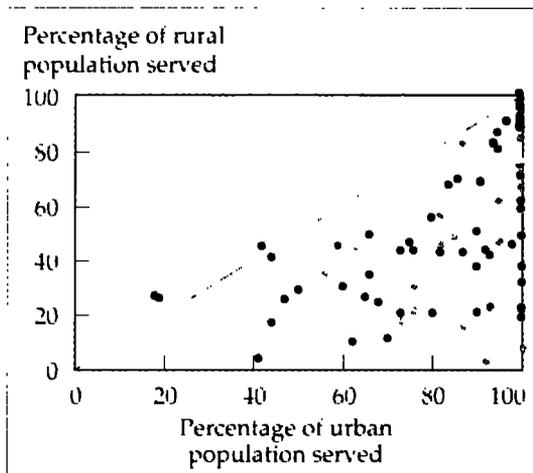
offered suitable transport and sanitation options that provide services they value and can afford. Premature investments in capacity—especially in water supply, railways, power, ports, and irrigation—have often absorbed resources that could otherwise have been devoted to maintenance, modernization, or improvements in service quality. Because many infrastructure investments are immobile and serve local markets, excess capacity cannot serve other markets—and it remains underused. In some cases, large public projects have been overambitious, placing a costly burden on the economy.

Waste and inefficiency claim a large share of resources that could be used for delivering infrastructure services. A review of power utilities in fifty-one developing countries showed that technical efficiency has actually declined over the past twenty years. Older power plants consume between 18 and 44 percent more fuel per kilowatt-hour than do plants in power systems operating at best-practice

levels—and have transmission and distribution losses two to four times greater. Port facilities in developing countries, on average, move cargo from ship to shore at only 40 percent the speed of the most efficient ports. Labor misallocations present another source of inefficiency. Overstaffing is far too common in many activities, especially railways, while others, such as road maintenance, warrant greater use of labor-based methods.

These failings in investment and operating efficiency are not compensated for by success in addressing poverty or environmental concerns—for here, too, the infrastructure record is weak. Badly designed and managed infrastructure is a major source of environmental degradation in both urban and rural areas. The poor often consume fewer infrastructure services and pay higher prices than do the nonpoor. For example, households obtaining water from vendors pay much more than those households connected to water systems. In most

Figure 4 Urban populations have better access to safe drinking water than rural populations.



- Middle East and North Africa
- Latin America and the Caribbean
- East Asia and Pacific
- Sub-Saharan Africa
- South Asia
- Europe and Central Asia

Source: Appendix table A.2.

countries, rural areas receive fewer infrastructure services than do urban areas (with the obvious exception of irrigation), even in such essential services as drinking water (Figure 4). But countries that have made concerted efforts to provide infrastructure in rural areas—for example, Indonesia and Malaysia—have succeeded in reducing poverty dramatically.

Given this mixed performance, improvements in investment and operation are required as a matter of urgency. In addition, the demands on infrastructure are growing. More competitive global trade requires more reliable and sophisticated transport, power, and telecommunications. Governments facing increased fiscal stringency can no longer sustain open-ended financing of infrastructure. And societies today hold infrastructure to higher environmental standards, as evidenced by sections of *Agenda 21*, the primary policy document agreed to by countries at the 1992 United Nations Conference on Environment and Development.

Diagnosing the causes of poor performance

The problems of insufficient maintenance, misallocated investment, unresponsiveness to users, and technical inefficiencies present daunting challenges for future reforms—challenges compounded by new demands and constrained resources. The solutions lie in the successes and failures of policy and in the lessons from recent policy experiments.

There is great variation both within and across countries in the efficiency of providing infrastructure services. Moreover, good performance by a country in one infrastructure sector is not necessarily associated with good performance in other sectors. Some developing countries—and not always the richer ones—perform at high levels. Côte d'Ivoire meets the 85 percent best-practice standard in water supply, while in Manila only about 50 percent of treated water is delivered to customers. In railways, the availability of locomotives is high where maintenance is good: at any given time, India has 90 percent of its locomotives available. Availability is low where maintenance is neglected: 50 percent in Romania and 35 percent in Colombia, compared with a developing country average of about 70 percent. For telephones, call completion rates are 99 percent in the best-performing countries, 70 percent in the average developing country, and far lower in some. These findings indicate that the performance of infrastructure derives not from general conditions of economic growth and development but from the institutional environment, which often varies across sectors within individual countries.

Therefore, to understand what accounts for good performance—and bad—requires understanding the institutional arrangements for providing infrastructure services and the incentives governing their delivery. This Report identifies three reasons for poor performance.

First, the delivery of infrastructure services usually takes place in a market structure with one dominating characteristic: the absence of competition. Most infrastructure services in the developing world are provided by centrally managed monopolistic public enterprises or government departments. Almost all irrigation, water supply, sanitation, and transport infrastructure is provided in this manner. Until a few years ago, telephone services in most countries were the responsibility of a state-owned post, telephone, and telegraph enterprise. The bulk of power has also been provided by a public monopoly. As a result, the pressure that competition can exert on all parties to perform at maximum efficiency has been lacking.

Second, those charged with responsibility for delivering infrastructure services are rarely given the managerial and financial autonomy they need to do their work properly. Managers are often expected to meet objectives at variance with what should be their primary function—the efficient delivery of high-quality services. Public entities are required to serve as employer of last resort or to provide patronage. They are compelled to deliver services below cost—often by not being allowed to adjust prices for inflation. The other side of the coin is that public providers are rarely held accountable for their actions. Few countries set well-specified performance measures for public providers of infrastructure services, and inefficiency is all too often compensated for by budgetary transfers rather than met with disapproval.

Third, the users of infrastructure—both actual and potential—are not well positioned to make their demands felt. When prices reflect costs, the strength of consumer demand is a clear signal of what should be supplied. Through the price mechanism, consumers can influence investment and production decisions in line with their preferences. But prices of infrastructure services typically do not reflect costs, and this valuable source of information about consumer needs is lost. For example, power prices in developing countries have generally fallen, while costs have not. As a result, prices now cover only half the supply costs, on average. Water charges and rail passenger fares typically cover only a third of costs. Excess consumer demand based on below-cost prices is not a reliable indicator that services should be expanded, although often it is taken as such.

Users can express preferences in other ways, such as local participation in planning and implementing new infrastructure investments. But they seldom are asked, and investment decisions are all too often based on extrapolations of past consumption rather than on true assessments of effective demand and affordability.

Individually, each of these three points is important. Together, they go a long way toward explaining the disappointing past performance of much infrastructure. Rival suppliers and infrastructure users might have exerted pressure for better services, but they were prevented from doing so. Governments—by confusing their roles as owner, regulator, and operator—have failed to improve service delivery.

New opportunities and initiatives

Creating the institutional and organizational conditions that oblige suppliers of infrastructure services

to be more efficient and more responsive to the needs of users is clearly the challenge. But is it possible? Three converging forces are opening a window of opportunity for fundamental changes in the way business is done. First, important innovations have occurred in technology and in the regulatory management of markets. Second, a consensus is emerging on a larger role for the private sector in infrastructure provision, based in part on recent experience with new initiatives. Third, greater concern now exists for environmental sustainability and for poverty reduction.

New technology and changes in the regulatory management of markets create new scope for introducing competition into many infrastructure sectors. In telecommunications, satellite and microwave systems are replacing long distance cable networks, and cellular systems are an emerging alternative to local distribution networks. These changes erode the network-based monopoly in telecommunications and make competition possible. In power generation, too, combined-cycle gas turbine generators operate efficiently at lower output levels, while other innovations are reducing costs. New technology makes competition among suppliers technically feasible, and changes in regulations are making competition a reality by allowing competitive entry in activities such as cellular phone service or power generation. Technical and regulatory change in other infrastructure sectors—ranging from transportation to water supply and drainage and irrigation—also make them more open to new forms of ownership and provision.

Alongside such changes are new perceptions of the role of government in infrastructure. An awareness is growing in many countries that government provision has been inadequate. Brownouts and blackouts in power systems, intermittent water supplies from municipal systems, long waiting periods for telephone service connection, and increasing traffic congestion provoke strong reactions. Reforms in some industrial countries have increased the competition in telecommunications, in road freight and airline transport, and in power generation—proving that alternative approaches are possible. The poor performance of planned economies has also provoked a reassessment of the state's role in economic activity.

These developments have led governments to search for new ways to act in partnership with the private sector in providing infrastructure services. Most dramatic have been the privatizations of such enterprises as the telephone system in Mexico and the power system in Chile. Elsewhere, various forms of partnership between government and the

private sector have evolved. Port facilities have been leased to private operators—the Kelang container facility in Malaysia being among the first. Concessions have been granted to private firms, particularly in water supply; Côte d’Ivoire is one of the earliest examples. Contracting out services, as Kenya has done with road maintenance, is well under way in many countries. Private financing of new investment has grown rapidly through build-operate-transfer (BOT) arrangements under which private firms construct an infrastructure facility and then operate it under franchise for a period of years on behalf of a public sector client. This approach has been used to finance the construction of toll roads in Mexico and power-generating plants in China and the Philippines.

An increasing regard for the environmental sustainability of development strategies and a deepening concern for poverty reduction after a decade of stagnation in many regions of the world also give impetus to infrastructure reform. Creating pressures for change, environmental issues are coming to the fore in transport (traffic congestion and pollution), irrigation (increased waterlogging and salinity of agricultural land), water supply (depleted resources), sanitation (insufficient treatment), and power (growing emissions). At the same time, a decade of reduced economic growth—especially in Latin America and Sub-Saharan Africa—shows that poverty reduction is not automatic and that care must be taken to ensure that infrastructure both accommodates growth and protects the interests of the poor.

Options for the future

To reform the provision of infrastructure services, this Report advocates three measures: the wider application of commercial principles to service providers, the broader use of competition, and the increased involvement of users where commercial and competitive behavior is constrained.

Applying commercial principles of operation involves giving service providers focused and explicit performance objectives, well-defined budgets based on revenues from users, and managerial and financial autonomy—while also holding them accountable for their performance. It implies that governments should refrain from ad hoc interventions in management but should provide explicit transfers, where needed, to meet social objectives such as public service obligations.

Broadening competition means arranging for suppliers to compete for an entire market (e.g., firms

bidding for the exclusive right to operate a port for ten years), for customers within a market (telephone companies competing to serve users), and for contracts to provide inputs to a service provider (firms bidding to provide power to an electric utility).

Involving users more in project design and operation of infrastructure activities where commercial and competitive behavior is constrained provides the information needed to make suppliers more accountable to their customers. Users and other stakeholders can be involved in consultation during project planning, direct participation in operation or maintenance, and monitoring. Development programs are more successful when service users or the affected community has been involved in project formulation. User participation creates the appropriate incentives to ensure that maintenance is carried out in community-based projects.

These elements apply whether infrastructure services are provided by the public sector, the private sector, or a public-private partnership. To this extent, they are indifferent to ownership. However, numerous examples of past failures in public provision, combined with growing evidence of more efficient and user-responsive private provision, argue for a significant increase in private involvement in financing, operation, and—in many cases—ownership.

All countries will not be able to increase private involvement at the same rate. Much depends on the strength of the private sector, the administrative capacity of the government to regulate private suppliers, the performance of public sector providers, and the political consensus for private provision. With this in mind, the Report sets out a menu of four main options for ownership and provision:

- Option A. Public ownership and operation by enterprise or department
- Option B. Public ownership with operation contracted to the private sector
- Option C. Private ownership and operation, often with regulation
- Option D. Community and user provision.

Far from exhaustive, these four options merely illustrate possible points in a broader array of alternatives.

Option A: Public ownership and public operation. Public provision by a government department, public enterprise, or parastatal authority is the most common form of infrastructure ownership and operation. Successful public entities run on commer-

cial principles and give managers control over operations and freedom from political interference, but they also hold managers accountable, often through performance agreements or management contracts. And they follow sound business practices and are subject to the same regulatory, labor law, accounting, and compensation standards and practices as private firms. Tariffs are set to cover costs, and any subsidies to the enterprise are given for specific services and in fixed amounts. Water authorities in Botswana and Togo and national power companies in Barbados and Thailand perform well. The highway authorities in Ghana and Sierra Leone and the restructured road agency in Tanzania are promising examples of this approach. But few successful examples of Option A persist because they are vulnerable to changes in governmental support. Many public entities perform well for a time and then fall victim to political interference.

Option B: Public ownership with private operation. This option is typically implemented through lease contracts for full operation and maintenance of publicly owned infrastructure facilities, or through concessions, which include responsibility for construction and financing of new capacity. Arrangements between the owner (government) and the operator (firm) are set out in a contract that includes any regulatory provisions. The private operator typically assumes all commercial risk of operation and shares in investment risk under concessions. Leases and concessions are working well for railways in Argentina; for water supply in Buenos Aires and Guinea; and for port facilities in Colombia, Ghana, and the Philippines. Concessions also include contracts to build and operate new facilities under the BOT arrangement and its variants. Proliferating in recent years, concessions to build and operate facilities include toll roads in China, Malaysia, and South Africa; power plants in Colombia, Guatemala, and Sri Lanka; water and sanitation facilities in Malaysia and Mexico; and telephone facilities in Indonesia, Sri Lanka, and Thailand. Each has brought private financing to support new investments.

Option C: Private ownership and private operation. The private ownership and operation of infrastructure facilities is increasing—both through new entry by private firms in infrastructure markets and through divestiture of public ownership of entire systems. Private ownership is straightforward when services can be provided competitively, and, in many infrastructure sectors, it is possible to identify such activities and to allow private provision. For example, twenty-seven developing countries allow cellular telephone service to be competitively pro-

vided, and many others allow private firms to construct electricity-generating plants and sell power to the national power grid. Where competition among suppliers is possible, private ownership and operation require little or no economic regulation beyond that applied to all private firms. The necessary competition can also occur across sectors—between road and rail, or between electricity and gas. For example, because it competes with suppliers of other energy sources, the private gas company in Hong Kong has no special economic regulation.

Where systems are being fully or partly privatized and there is no cross-sectoral competition, regulation of both private and public providers may be required to prevent the abuse of monopoly power. Experience with regulation and with systemwide privatization in developing countries is still very new. The Chilean form of regulation, which involves regular, automatic price adjustments and a well-specified arbitration system, appears to be working well. And systems that have been privatized have been very successful at expanding service. Venezuela's telephone company expanded its network by 35 percent in the first two years after its privatization; Chile's by 25 percent a year, Argentina's by 13 percent a year, and Mexico's by 12 percent a year.

Option D: Community and user provision. Community and user provision is most common for local, small-scale infrastructure—such as rural feeder roads, community water supply and sanitation, distribution canals for irrigation, and maintenance of local drainage systems—and it often complements central or provincial services. Successful community provision requires user involvement in decision-making, especially to set priorities for expenditures and to ensure an equitable and agreed sharing of the benefits and costs of service provision. Technical assistance, training, and compensation of service operators are also very important. When these elements are present, community self-help programs can succeed over long periods. A community organization in Ethiopia devoted mainly to maintaining roads (the Gurage Roads Construction Organization) has worked well since 1962 because it sets its own priorities and allocates its own financial and in-kind resources.

Financing: essential for all options. Implementing the foregoing institutional options and mobilizing funds to expand and improve services require carefully designed financing strategies. Foreign and domestic sources of finance will need to be tapped, but there are limits to the capacity of any economy to obtain funds from abroad, especially debt finance. Balance of payments constraints, and the limited

tradability of infrastructure services, mean that for most countries an ongoing infrastructure program has to be sustained by a strategy for mobilizing domestic funds.

Private financing in one form or another at present accounts for about 7 percent of total infrastructure financing in developing countries (the share may double by the year 2000), while bilateral and multilateral foreign aid accounts for around another 12 percent. Although an increasing share of the domestic savings needed to finance infrastructure provision can come from private sources, governments will continue to be a major source of funds for infrastructure, as well as a conduit for resources from the donor community. As transitional measures to provide long-term financing where sufficient private support is not likely to be forthcoming, governments are revitalizing existing lending institutions for infrastructure and creating specialized infrastructure funds.

In the future, governments will often need to be partners with private entrepreneurs. The task for both the public and private sectors is to find ways to route private savings directly to those private riskbearers that are making long-term investments in infrastructure projects—projects that have varying characteristics and for which no single financing vehicle is appropriate. Official sources of finance, such as multilateral lending institutions, can facilitate the process by supporting the policy and institutional reforms needed to mobilize private financing and use it more efficiently.

Implementing reform

Just as the differences across infrastructure sectors imply that no single option can be applied to all sectors, infrastructure provision must be tailored to country needs and circumstances, which vary widely. To see how, consider a middle-income country with a thriving private sector and well-developed institutional capability, and a low-income country with a small private sector and relatively undeveloped institutional capacity.

Middle-income countries with good capacity. The four major options can all work well in these countries. The broad reform instruments for such countries are clear: apply commercial principles, increase competition, and involve users. These actions lead to an increase in private involvement and finance, and to a reduction (or decentralization) of activities remaining with government. Some countries are following this path for a wide range of sectors, and many more for only a few sectors, especially telecommunications, power, and roads.

Activities that can be competitively provided should be separated and opened to private suppliers and contractors. Where possible, entire sectors—telecommunications, railways, power generation—can be privatized, but with regulatory oversight. Sectors that are unlikely to be privatized (such as roads) can be operated on commercial principles, using contracting for construction and periodic maintenance. Leasing or concessions can be used to operate facilities that may be difficult to privatize for strategic reasons, such as ports or airports. Moreover, technical and managerial capacity at the provincial and local level is likely to be sufficient to realize the benefits of decentralization. Responsibility for local services—such as urban transport, water supply, sanitation, and local roads—can be turned over to local governments.

Low-income countries with modest capacity. In these countries, commercial principles of operation can form the basis for reform in several sectors. Commercial approaches can be supplemented with reforms in procurement and contracting practices that foster competition and develop the domestic construction industry. Many activities (such as road maintenance and the collection of solid waste) can be contracted out to the private sector. Contracting can have a salutary effect on all infrastructure because, as experience shows, public providers become more efficient when they are exposed to competition from private contractors.

Concessions or leasing arrangements are proven ways for a low-income country to draw on foreign expertise, as are the various BOT options that can be used to increase the capacity of systems. Concessions and leases have been widely used in water supply, ports, and transport sectors. BOT schemes have been extensively used in middle-income countries, and their application is now spreading to low-income countries. These arrangements help develop local expertise and foster the transfer of new technology, but they do not require the establishment of independent regulatory bodies because regulatory procedures are specified in the underlying contract.

Community approaches, with technical and financial support, can be efficient and sustainable in supplying services using intermediate technologies in rural areas and in the low-income settlements that often develop outside existing urban service areas. Competition is possible in many activities but may be impeded by unnecessary regulations. Trucking and many types of urban passenger transport can be provided privately, under regulations that deal only with safety and service standards.

Some countries may benefit from arrangements that increase the effectiveness of aid by coordinating

the efforts of donors to focus on common objectives. For example, the Sub-Saharan Africa Transport Policy Program coordinates donor assistance for road maintenance and in several countries has supported the establishment of road boards that oversee execution of road maintenance. More generally, external assistance should aim to build institutional capacity in those countries where it poses a serious constraint. Well-designed programs of training and technical cooperation, as well as efforts to collect and disseminate information on policy options and performance across countries, can supplement donors' advice and financial assistance in creating an appropriate enabling environment for successful reform and development of infrastructure.

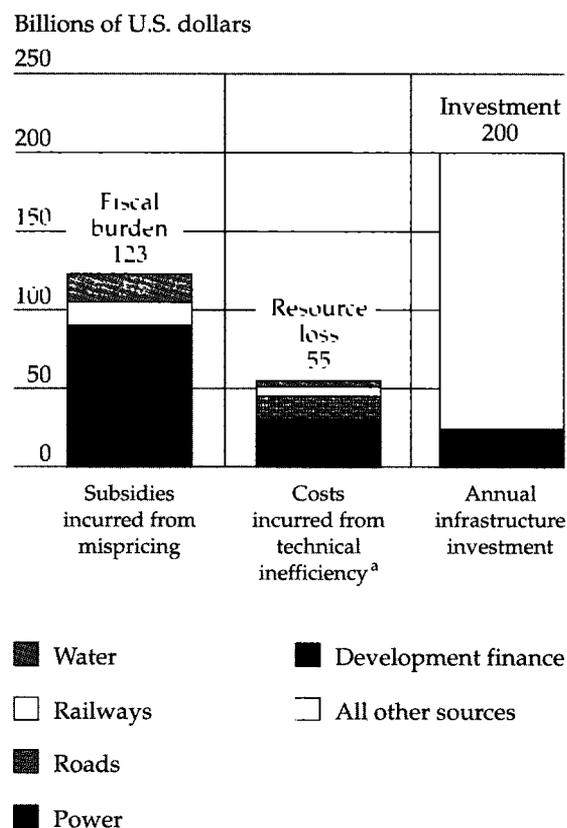
Potential payoffs from reform

Because of the great variation in performance, the payoffs from increasing the efficiency of infrastructure provision will differ from country to country and from sector to sector. But the rewards are potentially large across the spectrum, making the commitment to reform imperative and worthwhile.

Reform will produce three types of gains: reduction in subsidies, technical gains to suppliers, and gains to users. It is possible to make rough estimates of the first two types of gains. The first source of gains is the reduction in the fiscal burden of service provision—costs not recovered from users. Although a conservative estimate can be made for only three sectors (power, water, and railways), the total savings are nearly \$123 billion annually—nearly 10 percent of total government revenues in developing countries, 60 percent of annual infrastructure investment, and approximately five times annual development finance for infrastructure (Figure 5). Eliminating underpricing would not produce a net resource savings to the economy (as the costs would be covered by users), but the fiscal relief would be substantial.

The second source of gains is the annual savings to service providers from improved technical efficiency. The savings possible from raising operating efficiency from today's levels to best-practice levels are estimated at around \$55 billion a year—pure savings equivalent to 1 percent of all developing countries' GDP, a quarter of annual infrastructure investment, and twice annual development finance for infrastructure. Looked at another way, if the annual technical losses of \$55 billion could be redirected for three years—at current costs of roughly \$150 per person for water systems—the 1 billion people without safe water could be served.

Figure 5 Annual gains from eliminating mispricing and inefficiency are large relative to investment.



a. Costs for the water sector are due to leakages; for railways—fuel inefficiency, overstaffing, and locomotive unavailability; for roads—added investment caused by poor maintenance; for power—transmission, distribution, and generation losses.
Source: Ingram and Fay, background paper; Appendix table A.4.

The payoffs from better infrastructure services go beyond reducing technical inefficiency and financial losses. Improvements in productivity and pricing would permit more effective delivery of service in response to demand. They would also enhance the growth and competitiveness of the economy. And they would allow vastly greater mobilization of resources for needed new investments—by generating higher revenues and by creating a policy environment conducive to the inflow of new investment resources.

This Report's agenda for reforming the incentives and institutional frameworks in infrastructure poses major challenges—but promises major bene-

fits. The way ahead is one of continuing innovation and experimentation, and both industrial and developing countries will learn from each other. In some countries, the challenge is to keep pace with rapid economic growth and urbanization. In others, it is to restore growth in ways that also provide greater opportunities to the poor. Everywhere, the

emphasis needs to be on improving environmental conditions. Increasingly, infrastructure needs to match new demands as developing countries become more closely integrated into the global economy. Infrastructure is no longer the gray backdrop of economic life—underground and out of mind. It is front and center in development.



*Highlights of
World Development
Report 1994*

Investment in infrastructure has a high potential payoff in terms of economic growth. But, as discussed in the box, making infrastructure available is not enough to guarantee high returns; services must be delivered efficiently and in response to demand.

Good performance in infrastructure sectors comes from having good sectoral policies, not necessarily high per capita incomes (see the figure on the facing page).

Box 1.1 Returns on infrastructure investment—too good to be true?

Recent studies in the United States suggest that the impact of infrastructure investments on economic growth represents startlingly high rates of return (up to 60 percent). Too good to be true? Possibly. The results presented in Box table 1.1 may overestimate the productivity of infrastructure for two reasons. First, there may be a common factor that causes growth in both output and infrastructure that is not included in the study. Second, it may be that growth leads to infrastructure investment, and not that investment produces growth. A number of studies have found that causation runs in both directions. Yet more sophisticated estimates that address these issues either have concluded that the positive results were not much affected by different econometric methods or have found no noticeable impact of infrastructure on growth. Neither finding—of an extremely high impact or of a negligible impact—is entirely credible, and research efforts continue in an attempt to refine the methodology.

An alternative approach estimates the impact of in-

frastructure on production costs. Studies (summarized in Aschauer 1993) found that infrastructure significantly reduces production costs in manufacturing in Germany, Japan, Mexico, Sweden, the United Kingdom, and the United States. One estimate suggests that three-quarters of U.S. federal investment in highways in the 1950s and 1960s can be justified on the basis of reductions in trucking costs alone.

While there is still no consensus on the magnitude or on the exact nature of the impact of infrastructure on growth, many studies on the topic have concluded that the role of infrastructure in growth is substantial, significant, and frequently greater than that of investment in other forms of capital. Although the indications to date are suggestive, there is still a need to explain why the findings vary so much from study to study. Until this problem is resolved, results are neither specific nor solid enough to serve as the basis for designing policies for infrastructure investment.

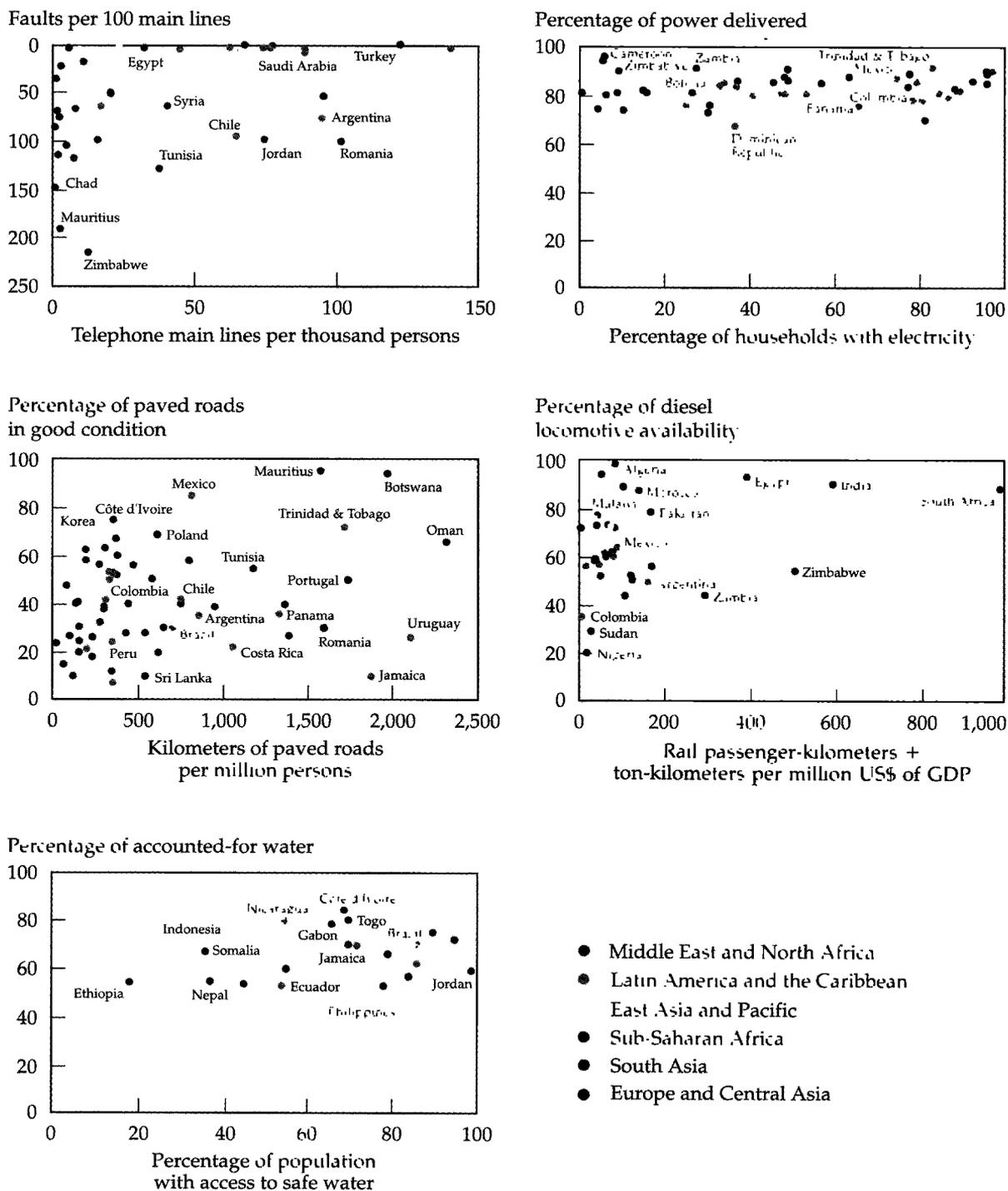
Box table 1.1 Results from studies of infrastructure productivity

Sample	Elasticity ^a	Implied rate of return ^b	Author/year	Infrastructure measure
United States	0.39	60	Aschauer 1989	Nonmilitary public capital
United States	0.34	60	Munnell 1990	Nonmilitary public capital
48 states, United States	0	0	Holtz-Eakin 1992	Public capital
5 metro areas, United States	0.08	—	Duffy-Deno and Eberts 1991	Public capital
Regions, Japan	0.20	96	Mera 1973	Industrial infrastructure
Regions, France	0.08	12	Prud'homme 1993	Public capital
Taiwan, China	0.24	77	Uchimura and Gao 1993	Transportation, water, and communication
Korea	0.19	51	Uchimura and Gao 1993	Transportation, water, and communication
Israel	0.31–0.44	54–70	Bregman and Marom 1993	Transportation, power, water, and sanitation
Mexico	0.05	5–7	Shah 1988, 1992	Power, communication, and transportation
Multicountry, OECD	0.07	19	Canning and Fay 1993	Transportation
Multicountry, developing	0.07	95	Canning and Fay 1993	Transportation
Multicountry, OECD and developing	0.01–0.16	—	Baffes and Shah 1993	Infrastructure capital stocks
Multicountry, developing	0.16	63	Easterly and Rebelo 1993	Transportation and communication

a. Percentage changes in output with respect to a 1 percent change in the level of infrastructure.

b. Ratio of discounted value of increase in dependent variable to discounted value of investment in infrastructure.

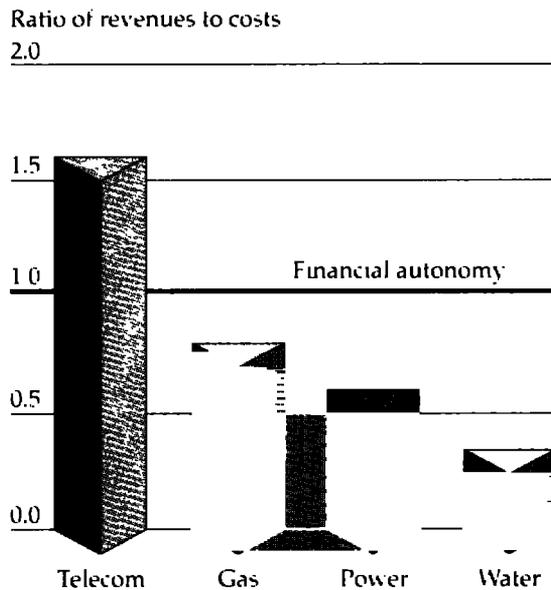
Figure 1.5 Efficient and effective delivery of infrastructure services does not always accompany increased availability.



Source: WDI table 32.

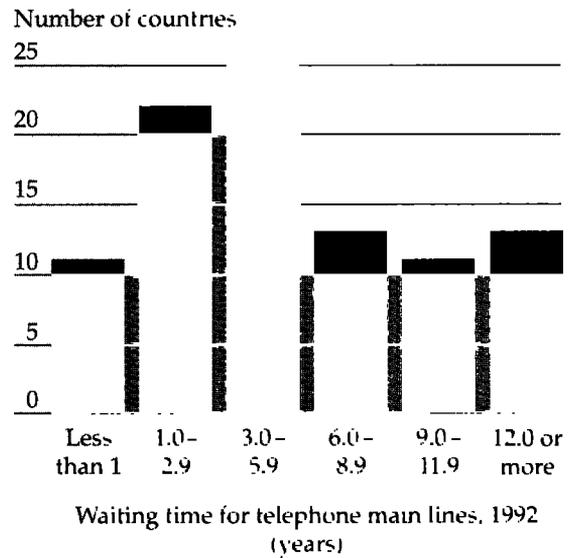
Inefficient operation and poor pricing policies often lead to unreliable services and greater inequities. As illustrated on the facing page, public-private sector partnerships can improve infrastructure performance as well as contribute to higher flows—and better use—of financial resources for these sectors.

Figure 2.2 Costs are seldom fully recovered in infrastructure.



Source: Telecom, ITU 1994; gas, World Bank data, power, Besant-Jones 1993; water, Bhatta and Falckmark 1993

Figure 1.6 There is very high unmet demand for telephone connection.



Sample: 95 developing countries
Source: ITU 1994

Box 1.5 Households' responses to unreliability of water supply

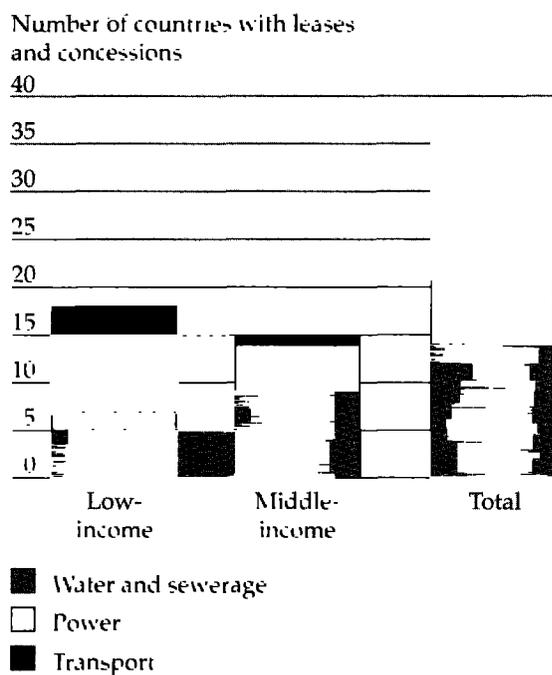
In 1991, micro-level research on household responses to deficient water supply by public utilities was undertaken in Faisalabad (Pakistan), Istanbul (Turkey), and Jamshedpur (India). These surveys revealed that nearly all households in the three cities are dependent on multiple sources of water, including house taps, wells, tubewells, public taps, rivers, and street vendors. Not all alternatives are available to all households. Because access to a source increases with income, poorer households bear a disproportionate share of the burden of deficient infrastructure. The private expenditures incurred for water supply indicate consumers' willingness to pay for reliable water.

In Istanbul, the poorest households surveyed spend a larger share of their income (about 5 percent) to supplement inadequate water supply than do wealthier ones (which spend about 1 percent). These expenditures on informal sources of water, including self-provision from wells or storage facilities, are in addition to the user charges for publicly supplied water, which amount to 1 to 2 percent of annual income.

In Jamshedpur, the connection charges for piped water vary between \$1.66 and \$16.66. The residents of the periurban areas, served by the local municipal authorities, incur capital costs of \$50 to \$65 in installing tubewells and \$150 to \$300 in digging wells to avoid dependence on the (unreliable) public water supply. Despite the existence of a piped water system, at least 17 percent of the population meets 90 percent of its water needs from wells and handpumps. Over and above the monetary costs that consumers bear, households in Jamshedpur spend, on average, two hours a day fetching and storing water. The burden of these activities falls in nearly all cases on women.

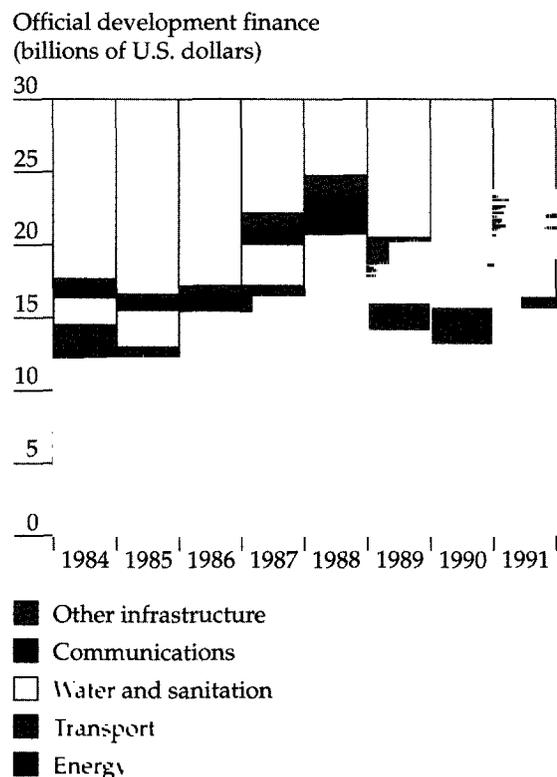
The pattern of private augmentation of the public water supply at substantial private costs to consumers is observed also in Faisalabad, Pakistan. Less than 20 percent of the households with piped water use this source exclusively; 70 percent have motor pumps and 14 percent have handpumps.

Figure 3.2 Leases and concessions in infrastructure sectors are common, even in low-income countries.



Source: Berg 1993

Figure 5.1 Large shares of official development finance for infrastructure go to energy and transport.



Source: Appendix table A.4

Box 3.4 Success of a lease contract—Guinea's water supply

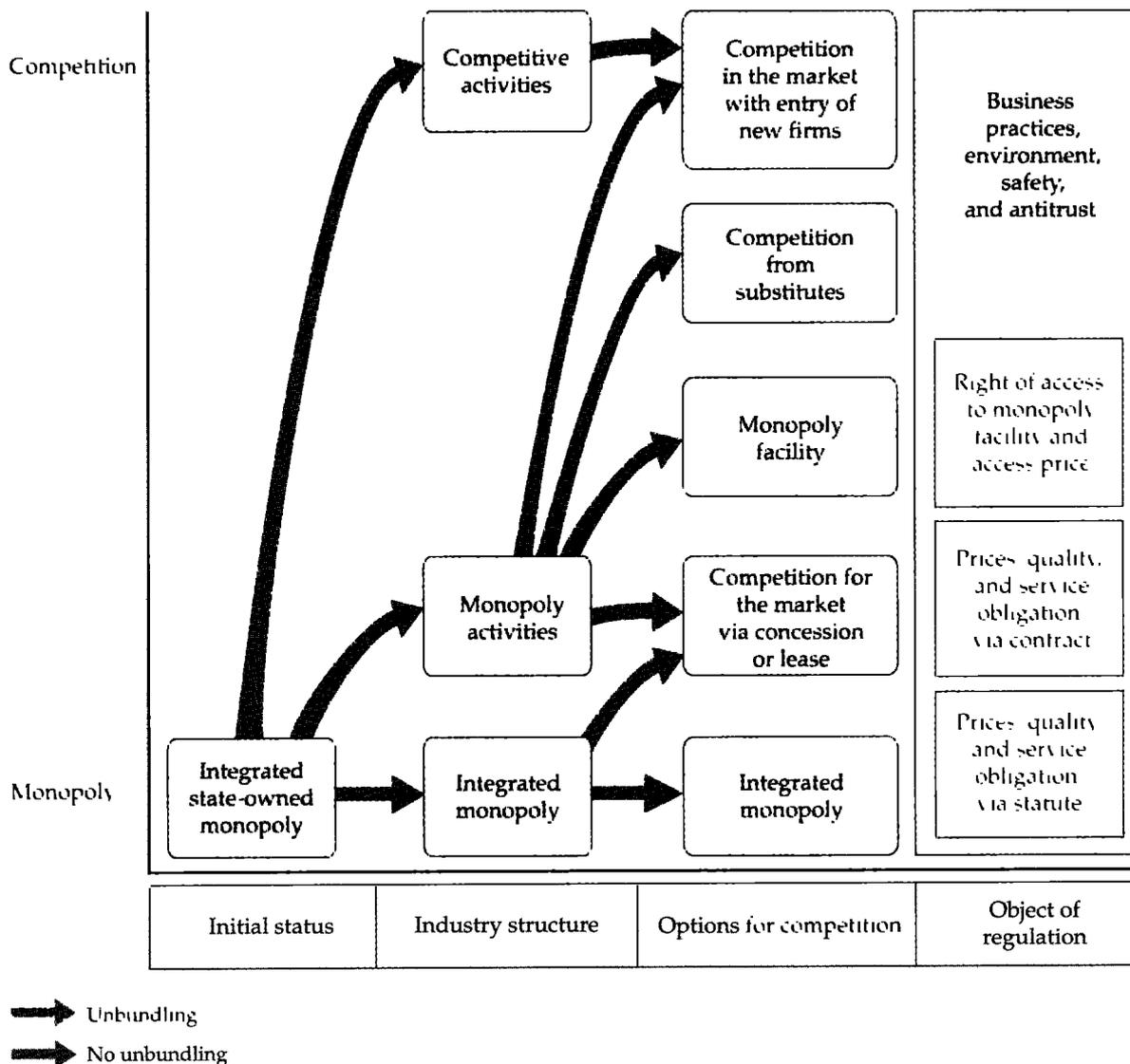
When the Republic of Guinea's water supply sector was restructured in 1989, it was one of the least developed in West Africa. At that time a new autonomous water authority, SONEG, took over ownership of the urban water supply infrastructure and assumed responsibility for sector planning and investment. SEEG, 49 percent government-owned and 51 percent owned by a foreign consortium, was created to operate and maintain the system's facilities.

Under the ten-year lease contract signed with SONEG, SEEG operates and maintains the system at its own commercial risk. Its remuneration is based on user charges actually collected and fees for new connections. SEEG also benefits from improvements it achieves in the collection ratio, from reduced operating costs, and from reductions in unaccounted-for water. Since SONEG has ultimate responsibility for capital financing, it has strong incentives to seek adequate tariffs and to make prudent investments based on realistic demand forecasts.

To make sure the necessary tariff increases would be affordable, the Guinean lease contract included an innovative cost-sharing arrangement. Under the agreement negotiated by the government, the two sector entities, and the external financier (the World Bank), the consumer tariff was to be adjusted gradually from the first to the tenth year of the contract. During this period the World Bank agreed to assume a declining share of the foreign exchange expenditures of operation, and the central government covered a declining share of the debt service. By the tenth year tariffs were expected to cover the full cost of water. Tariff increases have to date exceeded the planned schedule, rising from \$0.12 per cubic meter in 1989 to about \$0.75 in 1993. Despite higher tariffs, the collection ratio for private customers has increased dramatically—from less than 20 percent to more than 75 percent in 1993—and technical efficiency and service coverage have improved.

Natural monopoly only exists for certain activities within any infrastructure sector. Separating out (“unbundling”) these activities opens an array of alternatives for competition and private sector involvement to achieve greater efficiency and new investment. An existing enterprise can be converted to more market-based provision through one or more of the arrangements shown in the figure.

Figure 3.1 Unbundling activities increases the options for competition and private sector involvement.



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This executive summary reproduces the overview and several other elements of *World Development Report 1994*.

Economic infrastructure—including transport, electric power, telecommunications, water and sanitation, and waste disposal—produces services that are vital to development. The availability of infrastructure has increased significantly in developing countries over recent decades. Yet performance is often poor, inadequate maintenance leads to premature deterioration of facilities, and services frequently do not match users' needs and willingness to pay. The potential for infrastructure services to contribute to poverty reduction and to environmental improvement is often neglected. The time is ripe to broaden the focus of policy beyond increasing the quantity of infrastructure facilities to improving the quality and efficiency of services.

The seventeenth annual *World Development Report* examines the record of both successes and failures in infrastructure provision and concludes that obtaining more effective and efficient delivery of services requires important changes in incentives. The Report identifies three ways of reforming institutions to improve incentives:

- Apply principles of commercial management—operating infrastructure more like a business than a bureaucracy, with clear objectives, with managerial and financial autonomy, and with customer satisfaction a key measure of performance.
- Introduce competition—directly where feasible, indirectly where not. By giving users more options, competition makes providers more efficient and more accountable to users.
- Give users and other stakeholders a strong voice and real responsibility in planning, operating, regulating, and financing services.

Governments will need to act more often as facilitator, coordinator, and guardian of the public interest (especially to ensure access for the poor)—and less often as direct operator. The private sector will need to provide management expertise and a significantly greater share of finance than in the past. From a broad menu of specific institutional arrangements for infrastructure provision, the Report assesses four options by sector and type of country. The Report notes that improved performance of infrastructure can enable countries to achieve substantial efficiency gains, a higher level of service from existing infrastructure resources, and improved access to essential services for the poor.

This Report includes the World Development Indicators, which offer comprehensive, current data on social and economic development in more than 200 countries and territories. The Indicators are also available on diskette. An appendix to the Report provides selected statistics on infrastructure.